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This Week's Citation Classic®

Mountcastle V B, Lynch J C, Georgopoulos A, Sakata H & Acuna C. The posterior parietal association cortex of the monkey: command functions for operations within extrapersonal space. *J. Neurophysiol.* 38:871-908, 1975; **Lynch J C, Mountcastle V B, Talbot W H & Yin T C-T.** Parietal lobe mechanisms for directed visual attention. *J. Neurophysiol.* 40:362-89, 1977; and **Lynch J C.** The functional organization of posterior parietal association cortex. *Behav. Brain Sci.* 3:485-534, 1980.
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Clinical and experimental evidence relating to the function of parietal association cortex, with emphasis on the question of whether parietal neurons contribute to the initiation and control of voluntary eye and limb movements. [The *SCI*® and the *SSCI*® indicate that these papers have been cited in more than 875 publications.]

Parietal Association Cortex: Sensory or Beyond?

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I had gone to Johns Hopkins to work as a postdoctoral fellow under Vernon Mountcastle in 1971, just as he was beginning to study the functional properties of single neurons in the somatosensory association cortex of behaving monkeys. Single-cell recording in behaving animals had been done in only a few laboratories and never in the association cortex. It was a tremendously exciting time.

I was overwhelmed by the size and technical sophistication of Mountcastle's laboratory. However, I had spent several years training monkeys to do operant behavioral tasks and also had done some single-neuron recording as a graduate student, so I was able to become a contributing member of the team fairly quickly.

After three years of intense work on the part of a multitude of professional and support people, we published the first paper on our work, the topic of this classic commentary, followed two years later with our second. The rate of publication was rather slow by today's standards, but the papers did attract a fair amount of attention. In fact, one prominent group took considerable exception to our conclusion regarding the possibility that posterior parietal neurons played an active role in the initiation and control of certain behavioral acts, particularly goal-directed eye movements. They insisted that all activity in parietal neurons could be explained on the basis of passive sensory input, and what was sometimes referred to as a "controversy" was born.

An invitation to write about the question for *Behavioral and Brain Sciences* (*BBS*) presented a unique opportunity to review the rapidly developing field of parietal association cortex function, with particular attention to arguments on both sides of the "command function" debate. The article, the third covered in this classic, also included some original, recently acquired data from my new laboratory at the Mayo Clinic in Minnesota. I, of course, argued as eloquently as I was able in favor of our earlier interpretation, while attempting to present a fair description of the opposing point of view. In addition, because of the unusual format of the *BBS*, 33 scientists working in related fields, including the other principals in the debate, wrote short commentaries on the article that were published at the same time as the article itself. I think this format is an example of scientific communication at its best, and I have always believed that the popularity of this article has been as much due to the commentaries that followed it as to the target article itself.

Events over the years have supported and confirmed our original interpretation. A direct pathway from the parietal cortex to the brainstem oculomotor system was demonstrated a few years later.[1] Behavioral studies have shown that lesions of the parietal cortex produce eye movement deficits comparable to those produced by frontal eye field lesions.[2] Some parietal neurons have been observed that are active prior to the initiation of learned eye movements, even when they are executed in the total absence of any visual stimulus.[3] In recent years, the concept of a posterior eye field that normally functions in parallel with the frontal eye fields to initiate and control purposive, target-directed eye movements has become generally accepted in both the experimental and clinical literature.[4]

1. **Lynch J C, Graybiel A M & Lobeck L J.** The differential projection of two cytoarchitectonic subregions of the inferior parietal lobule of macaque upon the deep layers of the superior colliculus. *J. Comp. Neurol.* 235:241-54, 1985. (Cited 30 times.)
2. **Lynch J C & McLaren J W.** Deficits of visual attention and saccadic eye movements after lesions of parietooccipital cortex in monkeys. *J. Neurophysiol.* 61:74-90, 1989.
3. **Andersen R A.** Visual and eye movement functions of the posterior parietal cortex. *Annu. Rev. Neurosci.* 12:377-403, 1989.
4. **Zee D S.** Eye movement disorders and ocular motor control. *Curr. Opin. Neurol. Neurosurg.* 2:749-58, 1989.

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