

48. Lilly, John C. 1957. "Learning Elicited by Electrical Stimulation of Subcortical Regions in the Unanesthetized Monkey." *Science*. 125:748

LEARNING ELICITED BY ELECTRICAL STIMULATION OF SUBCORTICAL  
REGIONS IN THE UNANESTHETIZED MONKEY: THE "START"  
AND THE "STOP" PATTERNS OF BEHAVIOR

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(Abstract of talk presented at the National Academy of  
Sciences Annual Meeting, April 22, 1957, Washington, D.C.)  
Science, 125, No. 3251:749, 1957.

It has been demonstrated that an animal can learn to operate  
a switch in order (a) to start a train of electric stimuli  
(Olds and Milner, Brady et al.) or (b) to stop a train of stimuli  
(Delgado, Roberts and Miller) in different regions of the  
unanesthetized brain. In our experiments, we have tested and  
mapped approximately 500 zones in the brains of 3 restrained,  
unanesthetized monkeys (*Macaca mulatta*) within approximately  
6 mm. of the midplane in experiments lasting from 3 to 12 months.  
The "start-the-stimulus" zones are found to be much more numerous  
than the "stop-the-stimulus" ones.

To date, "start" zones can be found in the septum, caudate,  
globus pallidus and putamen; and "stop" zones, in the pre-optic  
and anterior hypothalamic regions. To date, most of the neocortex  
appears to be relatively neutral.

Stimulation of a "start" zone can function as a reward for  
lever pressing, alternation, delayed alternation, and quasi-  
counting. With a proper choice of stimulus parameters, stimu-  
lation of a "stop" zone can be shown to function as a punishment;  
the animal can learn to turn off the stimulus train without any

external clues and without exhibiting any of the clinical signs of "fear" or "pain" which are elicitable at higher values of current. In most of the "start" zones mild "searching" or "hallucinating" behavior is elicited and attack or escape actions are inhibited. In the "stop" zones, either pain-like or fear-like behavior can be reproduced in different regions with inhibition of feeding, grooming, and similar types of spontaneous activity. During stimulation of these animals, the various clinical syndromes elicited do not allow a secure diagnosis of either the presence or absence of a subjective concomitant.