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McEwen B S, Davis P G, Parsons B & Pfaff D W. The brain as a target for steroid hormone action. *Annu. Rev. Neurosci.* 2:65-112, 1979.  
[Rockefeller University, New York, NY]

This review article summarizes evidence that steroid hormones of the adrenals and gonads exert effects on brain function and behavior through direct interactions with receptors in neural tissue. Steroid actions occur at the level of the genome and, in some instances, at the neuronal surface. [The *SCI*® indicates that this paper has been cited in over 185 publications.]

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In 1966, when I arrived at Rockefeller University to take a position in Neal Miller's laboratory, Don Pfaff had just joined the laboratory of Carl Pfaffmann. My temporary office was near Don's, and I soon learned of his PhD thesis work on the localization by autoradiography of steroid hormone uptake in the brain. My own interests were, and still are, centered around the role of the genome in nervous system function, and steroid hormones offered an excellent way of studying the role of the brain genome. Because Don's interests were clearly headed in the same direction, we began a long-lasting and rewarding collaboration and cooperation in our research efforts. Our first joint publications appeared in 1970; during the years we have worked together, our laboratories have produced 15 joint research papers and 4 jointly authored review articles, of which this, in 1979, is the second. Our coauthors in that review,

Paula Davis and Bruce Parsons, were, at that time, respectively, a postdoctoral fellow and graduate student. Davis's research focused on intracranial sites of hormone action, and Parsons's work dealt with the timing of hormone action and induced changes in neural protein synthesis in relation to behavior.

The article summarized published work on the following topics: localization and properties of steroid receptors in brain, steroid metabolizing enzymes, and biochemical effects of glucocorticoids and estrogens in the nervous system. It also emphasized that there are both genomic and nongenomic actions of steroids in the nervous system. Most importantly, we introduced the idea that steroid actions can usefully be studied in terms of "spatial" and "temporal" aspects. Spatially, steroids act in discrete areas of the brain to regulate specific neural and behavioral events. Temporally, their actions are often delayed in onset and prolonged in duration, sometimes occurring after the virtual disappearance of hormone from the tissue.

One of the reasons that this review is cited so often, aside from the excellent distribution and visibility of the *Annual Review* series, may be that it brought together an extensive literature on both gonadal and adrenal steroid effects in the nervous system. Earlier attempts to do this had preceded a rapid increase in work on this subject during the mid- to late 1970s. Since 1979 the interest in this area has grown further, stimulated by a growing interest among neuroscientists in the general problems of neural plasticity and gene expression. For two recent jointly authored reviews of these areas, interested readers might wish to consult references 1 and 2.

1. Pfaff D W & McEwen B S. Actions of estrogens and progestins on nerve cells. *Science* 219:808-14, 1983.
2. McEwen B S & Pfaff D W. Hormone effects on hypothalamic neurons: analysing gene expression and neuromodulator action. *Trends Neurosci.* 8:105-8, 1985.