$Hg(NO_3)_2 . 2\ HgS$, and $HgSO_4 . 2\ HgS$. The bulk of the solution, upon standing overnight in a small stoppered flask, deposited an almost white precipitate, and the supernatant liquid contained only mercuric perchlorate and perchloric acid. This precipitate, which can readily be obtained pure and white, was found to correspond in composition to the formula, $Hg(ClO_4)_2 . 2\ HgS$. It will be more fully described in a future publication.

In conclusion, it is desired to emphasize that the solution obtained by the interaction of 2 mols of mercuric perchlorate and 1 mol of hydrogen sulfide, or of one mol each of mercuric perchloride and sulfide, contains a complex salt which on the one hand reacts with soluble chlorides, nitrates and sulfates to yield more or less insoluble precipitates, and on the other hand spontaneously decomposes in accordance with the equation, $2[Hg(ClO_4)_2 . HgS] = Hg(ClO_4)_2 . 2\ HgS + Hg(ClO_4)_2$.

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EFFERENT CHARACTERISTICS OF RECEPTION CENTERS

THE peripheral efferent nerves of mammals arise as axones of cells having a definite type of structure, a structure characterized by the arrangement of the Nissl substance within the cell in large sharply defined granules. Other efferent cells closely related to the peripheral efferent neurones have been shown by Jacobsohn to present much the same type of structure, and in a previous article I have described the location of these cells in various regions of the brain; such cells may be termed premotor to express their functional and structural relation to the peripheral motor cells.

Further study convinced me that due to the complex relations within the central nervous system a rigid classification of nerve cells into types would offer little hope of elucidating the functional significance of cell structure. We do not know what determines the structure of a nerve cell, but it must be related at least partly to the stimuli which the cell receives. Since the activity of the central nervous system consists essentially of diffusion of impulses through diverse paths and recombination into new paths it is evident that, while in some cases the total stimulus to two nerve cells may be practically identical or else very different, in many cases two cells may receive stimuli which are similar in some respects but different in others. I consider cell activity (function) and cell structure (together with size and form) as complexes and have attempted partially to analyze each of them, observing under what functional conditions a certain character of cell structure constantly appears in cells otherwise structurally different. Thus the structural characteristic of efferent cells is the presence of relatively large and discrete Nissl granules, while the large size and polygonal form which such cells often exhibit are not directly related to their efferent function but to other aspects of cell activity.

Having isolated from the complex of cell structure the element corresponding to the efferent tendency it was then possible to identify this structural character in cells known to be more remotely related to the musculature than are the peripheral efferent cells or those pre-motor cells closely related to them; and as the relation of the cell to the peripheral efferent neurones became more remote the cell showed a corresponding change in the efferent character of its structure, the Nissl granules becoming smaller and often less sharply defined. In studying the more remote efferent cells I was finally confronted with the fact that many so-called sensory centers contain at least some cells with a structure as characteristically efferent or even more efferent than that of certain undoubted efferent cells. This efferent character of cell structure as revealed in reception centers of the human brain and cord will now be considered.

Our knowledge of reception centers for general proprioceptive sense is limited largely to those related to the spinal nerves. The peripheral efferent column of gray matter is a reception center for general proprioceptive impulses involving the simpler reactions, and the failure formally to include it among the proprioceptive reception centers has tended to obscure the relation between afferent and efferent nerve centers. Another proprioceptive center is Clarke's column, whose cells are structurally related to the efferent type; these cells send their axones to the cerebellum, and the significance of this connection will appear later. The nuclei gracilis and cuneatus constitute a more afferent type of center transmitting impulses to the thalamus, and the trace of efferent structure in their cells is possibly related to an indirect cerebellar connection.

Equilibrium is a special proprioceptive sense whose reactions are not local but general, and accordingly the entering vestibular root fibers form no direct connection with peripheral efferent centers. With the exception of the cerebellum the vestibular reception centers are composed of two kinds of cells, sharply separated neither topographically nor structurally; the larger cells are more numerous in the oral and lateral portions of the vestibular reception system and in structure resemble to a varying extent the cells of peripheral efferent centers. The smaller cells, situated more medially, are structurally also definitely efferent but in less degree. The larger strongly efferent cells connect directly with peripheral efferent centers, while the smaller less strongly efferent type apparently has a similar but more indirect connection; which type sends axones to the internal nuclei and cortex of the cerebellum is not known. Some vestibular root fibers end directly in the cerebellum, in both cortex and internal (efferent) nuclei. Through this direct connection as well as developmentally and functionally the cerebellum is closely related to the vestibular nuclei, and these are efferent. I have observed that the cells of all centers known to send axones to the cerebellum have an efferent structure, often not pronounced but yet definite. The cells of Clarke's column and of the vestibular nuclei have been mentioned; to these must be added the cells of the nuclei pontis and arcuate nuclei, those of the inferior olive and lateral reticular nucleus. In the cerebellum itself the Purkinje cells show efferent structure as do those of the internal nuclei, while the small cells of the cortex are devoid of such structure. I regard the cerebellum as a complex center decidedly more closely related to the efferent than to the afferent system.

The reception nuclei for general exteroceptive sense differ radically from those of the proprioceptive system, for the source of stimulus demands as a rule a less fixed and more general type of response. The majority of cells of such centers show no efferent structure, and their relation to the peripheral efferent centers is indirect. I have observed, however, cells of a definite efferent character both in the dorsal column of gray matter of the cord (in addition to those of Clarke's column) and also in the reception nuclei of the trigeminal nerve. The exteroceptive reception centers are complex, and in their local reactions the efferent impulse begins, at least partially, within these centers themselves.

Since the optic nerve is really a central tract its reception centers will not be considered. The cochlear nerve, serving the special exteroceptive sense of hearing, has central relations complex and imperfectly known. Some of its root fibers end in the dorsal and ventral cochlear nuclei, others in a group of cochlear reflex centers; some axones from the first group of centers end in the other cochlear reception centers. Many cells of the dorsal and ventral cochlear nuclei show efferent structure. The superior olive, trapezoid nucleus, and nucleus of the lateral fillet give origin to an extensive system of efferent paths and their cells are efferent in structure; although their connections are not accurately determined I regard these centers as probably purely efferent. Even in the inferior colliculi (secondary cochlear centers) I have observed a few cells of efferent type.

As yet I have not studied the visceral reception centers, but it is evident that those of the proprioceptive and exteroceptive groups are structurally closely related to the efferent system, that they may be peripheral efferent centers, pre-motor centers of different grades, or complex centers containing not only afferent but also efferent cells which vary as to number as well as to degree of efferent structure. I believe that caudal to the diencephalon sensory correlation is limited to the quadrigeminal plate, cerebellum and certain exteroceptive (and probably visceral) reception centers; none of these centers are purely sensory, while the cerebellum is largely efferent. In my opinion the extent of the efferent mechanism for local correlation has been greatly underestimated, and in this article I have shown its presence even within the primary reception centers.

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