

system (status thymico-lymphaticus), or in acquired insufficiency of this system (Addison's disease), the craniosacral autonomic innervations are in excess of the sympathetic innervations, many think because of deficiency in the supply of the sympathicotonic hormone, epinephrin.

In how far those sudden and violent excitations of the autonomic nervous system which accompany strong emotions are due to the intervention of the glands of internal secretion, and in how far they depend upon direct neural conduction from the brain, we are as yet but ill-informed. I need only remind you of the vaso-dilatation of the face in the blush of shame, of the stimulation of the lacrymal glands which yields the tears of sorrow, of the palpitation of the heart in joy, of the stimulation of the sudoriparous glands which precedes the sweat of anxiety, of the stimulation of the vaso-constrictors, the pupil dilators and the pilomotor in the pallor, mydriasis and goose-skin of fright, to illustrate some of these violent autonomic excitations. While we do not yet understand the exact mechanisms of association among the activities of the cerebrum, the endocrine glands and the reciprocally antagonistic autonomic domains and their end-organs, we can begin to see the paths which must be followed in order that more exact knowledge may be gained.

In the following table, compiled from the papers of several authors (Langley, Brodie and Dixon, Elliott, Dale, Meyer and Gottlieb, Eppinger and Hess, Fröhlich and Loewi, Biedl, Higier) the effects of electrical and chemical stimulation of the two autonomic systems are epitomized.

THE TONUS IN THE AUTONOMIC SYSTEMS, AND THE BALANCE MAINTAINED.

While the body is alive there is, constantly, a certain amount of activity in each of the antagonistic systems. In other words, a certain "tonus" prevails in each system, maintained (1) by stimuli arriving in the autonomic systems through neural paths, and (2) by direct chemical action (hormones) upon the systems. This matter of tonus* is very complex, since so many factors, neural and chemical, are involved, and since each system can be acted upon at any one of several points between the cerebral cortex and the end-organ (smooth muscle; secreting gland). The balance maintained normally between the two antagonistic systems is one of the most interesting of physiological phenomena. Think, for example, of the rate of the heart beat—how constantly it is maintained at a

*A distinction must, of course, be made between tonus and excitability.