compartment of extracellular water. If, as seems the case, concentration in the blood is the determinant of toxicity, such an approach introduces the possibility of error which approaches 50 per cent. The authors' distrust of this drug is not shared by the majority of clinicians.

A similar nihilism underlies the approach to the treatment of hypertension in unilateral renal disease by nephrectomy. Their conservatism will, we hope, serve to counter the reckless optimism of certain surgeons. But, since it seems an unnecessarily extreme point of view, it may not be given the weight it should have.

An interesting chapter on peripheral resistance is included. The appendix includes succinct descriptions of the methods for its determination and for the study of renal function by the author's methods.

This is a provocative book which reflects and summarizes the author's experience. It is therefore welcome. Disagreement concerning some of its conclusions should, we trust, serve to stimulate efforts to resolve the areas of doubt.

VASCULAR RESPONSES

Vascular Responses in the Extremities of Man in Health and Disease. By D. I. ABRAMSON. Chicago: University of Chicago Press. 1944. $5.00.

DR. ABRAMSON'S book, "Vascular Responses in the Extremities of Man in Health and Disease," reviews his material in critical and comprehensive fashion. The richness of the bibliography is to be commended. After a detailed description of methods for studying peripheral blood flow, the physiologic responses of the blood vessels in different portions of the extremities are described. This is followed by consideration of the responses to various pharmacologic agents, of blood flow in abnormal states and in systemic disease, of peripheral vascular disease, and finally, by an evaluation of methods of treatment of peripheral vascular disease.

The sections on peripheral vascular disease are particularly good and may be read with profit by clinicians. They might be read first, the more so because the detail of the sections on methods and physiological variations might strain the average clinician's patience. The latter will prove especially valuable to physiologists.

In some places the author seems to stretch the interpretation of the results obtained by the plethysmograph. This instrument has not yet reached either qualitative or quantitative perfection. For instance, his results cast doubt upon the view that the arterial hypertonus in hypertension is generalized and is due to a circulating vasoconstrictor substance. Quite apart from the possibility of methodical error, more consideration should be given to the differences in response of peripheral and central arterial beds. Thus the evidence is inadequate indeed for such an important conclusion. But, on the whole, facts are critically, impartially and completely presented.

There is much to recommend books of this type in which a central theme, blood flow in the extremities, is used as the trunk on which to graft knowledge of both the physiology and pathology of the blood vessels. Abramson has done his task well.

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AQUARIUM ANIMALS

Guide to Higher Aquarium Animals. By EDWARD T. BOARDMAN. Cranbrook Institute of Science. 1944. $2.00.

IN 107 pages Dr. Boardman has tersely and thoroughly covered this subject. If you live in Michigan or thereabouts and wish to stock and maintain an aquarium or vivarium with fish, amphibians or reptiles this is your *vade mecum.* My guess is that at least 75 per cent. of the facts presented apply in general to an aquarist in New York or California as well. From lampreys to turtles all the better-known forms are represented by an illustration and brief paragraphs on appearance, size, habitat, breeding habits and food. Full credits are given for the good illustrations, the diction is authentic and clear, the type and format are excellent, and appendices deal with aquaria, their water and management, and hints as to parasites and some common diseases. This is a companion volume to the author's "Field Guide to Lower Aquarium Animals."

WM. BEEBE

SPECIAL ARTICLES

BULBAR INHIBITION AND FACILITATION OF MOTOR ACTIVITY[1, 2]

SINCE Sherrington's discovery of decerebrate rigidity in 1898, it has been known that the bulbar portion of the brain stem exerts an excitatory influence on neural motor systems, particularly those activating the extensor muscles of the body. That this bulbar region, in addition, contains a mechanism capable of exerting a general inhibitory influence on motor activity does

[1] Aided by a grant from the National Foundation for Infantile Paralysis.

[2] Grateful appreciation is expressed to Dr. W. F. Windle, director of the Institute of Neurology, for the loan of most of the apparatus employed in this study.

not appear to have been recognized. It was with some astonishment, then, that electrical stimulation of the bulbar reticular formation in the cat was found to bring completely to a halt motor activity whether induced reflexly, by brain stem mechanisms or from the motor cortex.

In the records shown in Fig. 1 A and B, the blink

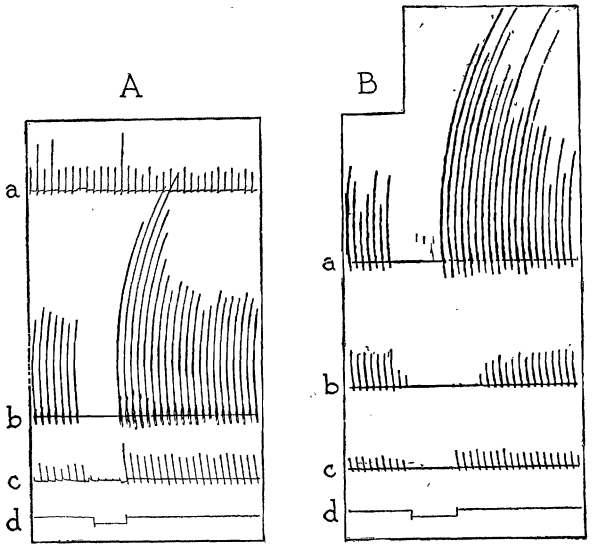

FIG. 1. A and B. Effect of bulbar stimulation (d) on flexor reflex (a), knee jerk (b) and blink reflex (c), evoked at 2 second intervals. Chlorolosane anesthesia. In all records the bulbar stimulus consisted of 60 cycle current at 3–5, R. M. S. volts.

reflex of the eyelids (c), the flexor reflex of the foreleg (a) and the knee jerk in the hindleg (b), evoked at 2-second intervals, were abolished by bulbar stimulation during the period marked by the signal (d). These reflexes, initiated respectively by tactile, nociceptive and proprioceptive stimuli, involve muscles—posturally indifferent, flexor and extensor—distributed over the length of the body. The bulbar inhibitory influence thus appears to be a general one, not limited in its action to topographically circumscribed or to functionally specific reflex acts.

The effect of bulbar stimulation upon decerebrate rigidity was observed visually with the animal supine and its legs extended in the air. Upon stimulation the limbs became flaccid and collapsed and their reflexes were lost. At the cessation of the stimulus extensor hypertonus and reflex activity promptly returned. In Fig. 2 A, flexion of the hindleg (a), induced by activating descending fibers from the motor cortex in the internal capsule (c), was abolished by stimulating the bulbar reticular formation (b).

In some of the instances illustrated (Fig. 1 A, b and c; Fig. 1 B, a; Fig. 2 A, a), the bulbar inhibitory effect was followed at the cessation of the stimulus by a subsequent augmentation of whatever motor activity was proceeding, a phenomenon attributed in other situations to the activation of intermixed inhibitory and facilitatory elements. Perhaps supporting this interpretation was the observation of purely facilitatory responses (Fig. 2 B, a) elicited from adjacent regions of the medulla.

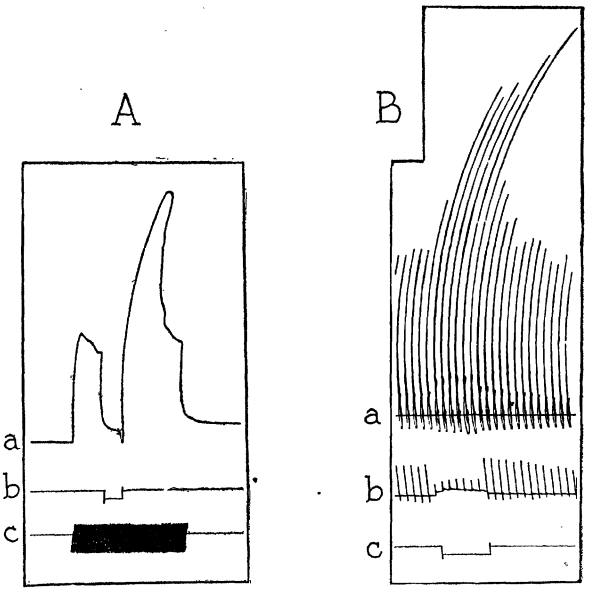

FIG. 2. A. Effect of intercurrent bulbar stimulation (b) on flexion of the hindleg (a) induced by activating the internal capsule (c) with induction shocks. Nembutal anesthesia. B. Effect of bulbar stimulation (c) on knee jerk (a) and blink reflex (b). Chlorolosane.

Retention of bulbar inhibitory and facilitatory responses after low decerebration excluded the possibility that they resulted from activating ascending pathways to higher neural levels. Similarly, they were unimpaired after decerebellation. The possibility that they were evoked by activating descending pathways simply coursing through the medulla has not been so certainly eliminated, though no comparable general effects have yet been obtained by midbrain stimulation.

At this preliminary stage, the relation of the bulbar mechanism described to other motor components of the nervous system can only be conjectural, but the duality and widespread distribution of the effects of its activation certainly suggest its potential importance in the regulation of motor activity.

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RELATIONSHIP OF PENICILLIN THERAPY TO BRAIN INVOLVEMENT IN EXPERIMENTAL RELAPSING FEVER[1]

PREVIOUS papers[2, 3, 4] on the therapeutic efficacy of

[1] From the Department of Bacteriology, the University of Texas, Austin, Texas.