

phrine injection, alkalosis, acidosis, and exercise and (b) the prompt recovery of glycogen after it has been lowered by anoxaemia, it would seem that there exists a quite efficient mechanism for the maintenance of cardiac glycogen.

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**Unilateral Overflexion of the Limbs Following Experimental Lesions in the Pons and Upper Medulla.\***

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A characteristic and constant unilateral overflexion of the limbs, during progression or isolated movement of the limbs, has been observed in 12 to 15 cats following hemisection of the brain-stem at the level of the pons or upper medulla—the vestibular nuclei being uninvolved. The abnormal action occurs in the limbs on the opposite side from the lesion. Maximal rather than graded flexion occurs at the ankle, knee, shoulder, or hip joints. In some instances in progression the flexion was maintained to the extent that the animal fell to the affected side because of the failure of the fore limb to extend in time to catch the weight of the body. This overflexion has been seen to involve a fore limb or a hind limb individually. In cases where the lesion extended across the mid-line so as to involve a small medial segment of the opposite half of the stem the ability of the animal to right and to maintain the righted position was impaired or eliminated. In these cases the overflexion occurred when rhythmic running movements were executed. If the animal was passively held in the righted position, typical walking movements embodying overflexion occurred.

Overflexion did not occur following: (1) hemisection of the stem through the thalamus or mid-brain, or even after complete unilateral removal of the mid-brain. (2) Unilateral or bilateral section of the lateral quarter segments of the pons or upper medulla. It was therefore not due to the absence of a rubro-spinal tract. (3) Hemisection of the spinal cord at upper cervical levels. (4) Injury or removal of the lateral lobes or vermis of the cerebellum.

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The observations suggest that this disturbance in muscular movement results from injury to structures located in the medial quarter segments of the pons and upper medulla.

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Localization of the Mechanisms for Righting in the Brain-Stem  
of the Cat.\*

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Magnus and Rademaker<sup>1</sup> have demonstrated the dependency of the body righting reflexes from the body and of the labyrinthine righting reflexes upon the mid-brain. Their experiments indicated the dependency of these reflexes on the red nuclei. Ingram and Ranson<sup>2</sup> recently report intact righting reflexes and movements of progression after bilateral destruction of the red nuclei; our experiments, performed independently and using quite a different approach, verify and extend Ingram's and Ranson's observations.

An unoperated animal exhibits the following reactions: (1) it rights the body in falling through the air a short distance, and lights on its feet; (2) when placed on the side, the fore quarters right after the raising of the head, by a rolling, lifting motion in which the fore limbs do not participate to a great degree. The hind quarters follow the fore quarters in like manner. The head, the fore quarters, or the hind quarters will right independently if the other parts are passively fixed. As soon as righting is completed, progression proceeds. (3) If in the standing position, the hind quarters are grasped and passively rotated to one side, the head and fore quarters resist this action by a compensatory rotation in the opposite direction. (4) If the animal is suspended vertically in the air by the hips, the body hangs straight and the head is dorsi-flexed. (When struggling movements are absent.) (5) Equal resistance

\* This investigation is being continued and extended to dogs and monkeys with the aid of a grant from the Ella Sacks Plotz Foundation.

<sup>1</sup> Magnus, "Körperstellung", Berlin, J. Springer, 1924.

<sup>2</sup> Ingram, W. R., and Ransom, S. W., *Proc. Soc. Exp. Biol. and Med.*, 1932, **29**, 1089.