conclusion of the treatment. In the case of Dog 2, however, the microfilaria count fell approximately 45% after 9 days of treatment. Subsequent counts during the continuation of the treatment and 10 days post treatment confirmed this larval reduction. It is possible that this apparent reduction in microfilaria was not due to the drug but to normal physiological variations. That such variations may occur is indicated by the microfilaria counts of Dog 1, which increased during treatment with Prontosil.

A week after the conclusion of the sulfanilamide therapy by mouth, Dog 1 was given a series of intramuscular injections of a soluble sulfonamide. This treatment consisted of 2 daily intramuscular injections of 10 cc of a 2.5% solution of disodium 4-sulfamidophenyl-2-azo-7-acetyl-amino-l-hydroxynaphthalene 3,6-disulphonate (Prontosil, Winthrop). The drug was administered over a period of 9 days. The microfilaria count which was 250 per cc before treatment rose to 420 on its completion.

It is apparent from the results obtained that sulfanilamide in the amounts given and over the time continued is without effect on *Dirofilaria immitis* as judged by microfilaria counts.

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Ocular Rotation. Influence of Anesthetics and Operations on Various Parts of the Central Nervous System.

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In experiments on the brainstem of cats the appearance of a striking oblique position of the pupils was observed, indicating an asymmetrical inward rotation of the eyeballs. The question presented itself as to how far this rotation was due to the anesthetics used. In experiments on 67 cats before and during the course of anesthesia the position of the pupil or of a linear scar burnt into the anesthetized cornea as closely as possible to the vertical diameter, was recorded. The smallest range of rotation (8½° outward to 7½° inward) was noticed under the influence of ether, chloroform, and Gréhant's mixture (5% chloroform in 50% alcohol). A variety of effects could be observed: in or outward rotation of one eye only or of both eyes, but also rotation of both eyes in the same

direction ("homonymous rotation"). The effect of barbiturates (sodium barbital, sodium phenobarbital, sodium pentobarbital, dial-urethane) and also of chloralose and urethane was much more marked, the range of rotation reaching from 35° inward to 30° outward. In the majority of the cases of this second group the eyes were inwardly rotated (bilateral inward rotation in 31 of 49 observations, inward rotation of only one eye in 4 cases). Much more rarely outward rotation appeared (4 instances of bilateral outward rotation of relatively slight degree), or rotation of both eyeballs in the same direction (10 observations). The tendency for homonymous rotation was manifested particularly in dial-urethane anesthesia (3 of 6 cases). The rotation is usually more marked in one eye than in the other and subject to variations during the anesthesia; often, however, the eyeballs retain the same degree of rotation for several hours. Involuntary horizontal and more rarely vertical movements of the eyeballs appeared in some experiments, but the rotation was as a rule independent of these motor phenomena.

Thus particularly those anesthetics that act mainly on the brainstem, such as the barbiturates, produce a marked ocular rotation, while cortex-anesthetics, such as ether, chloroform, or chloroform-alcohol, have only a slight effect. A sharp division between cortex- and brainstem anesthetics seems, however, not possible, since a so-called cortex-anesthetic (chloralose) may produce a marked bilateral inward rotation.

For further analysis of these phenomena the influence of various parts of the central nervous system upon the eyeballs with special reference to rotation around their antero-posterior axis was studied (stimulation and extirpation experiments under superficial ether anesthesia).

Stimulation of the cortical oculogyric centers in the frontal or occipital lobe produces, besides conjugate deviation to the opposite side and less frequently vertical deviation, a slight rotation in the majority of the experiments. The most frequent reaction is the rotation of the opposite eye towards the stimulated hemisphere (in regard to the upper end of the vertical diameter of the cornea, average less than 5°, maximum 15°). The reaction of the homolateral eye is more variable. The inward rotation of the opposite eye may be accompanied by a slighter inward rotation of the homolateral eye, or the homolateral eye may rotate outwardly, or a reaction of the ipsilateral eye may be absent. In a few instances outward rotation was observed in the homolateral eye only, or this reaction was accompanied by a weaker outward rotation of the op-

posite eye. Extirpation of the frontal or occipital oculogyric centers or combined elimination of these areas resulted only in a slight and temporary inward rotation reaching not more than a few degrees. Thus a tonic effect of the cortex upon the position of the eyes in regard to rotation could not be found. The inward rotation of the eyeballs became somewhat more pronounced (at an average of 3°) when the decortication was followed by elimination of the subcortical ganglia in front of the mesencephalon. Such high degrees of rotation as were obtained under the influence of anesthetics were, however, not reached. This may be partly due to impairment of the tone of the mesencephalic ocular nuclei after section in front of the midbrain. Furthermore, a direct action of the anesthetics upon the lower parts of the brainstem, reaching the rhombencephalic vestibular nuclei must be considered. This is suggested by cases with marked homonymous ocular rotation, which is usually of unequal degree in both eyes and which reaches much higher degrees (up to 25°) than observed in the above-mentioned cortical experiments. Such marked homonymous rotation appears after unilateral labyrinth extirpation (Rademaker[1]). In our labyrinthectomies this rotation was more developed in the opposite eye (average 20°) than in the homolateral eye (average 7°); it could still be observed after the nystagmus following the extirpation subsided. Thus the fact that the homonymous rotation in anesthesia may appear without nystagmus does not speak against the assumption that the effect of the anesthetic in these cases reaches the rhombencephalic vestibular nuclei disturbing the balance between the nuclei of both sides.

Summary. Under the influence of anesthetics, particularly of the so-called brainstem anesthetics, a marked ocular rotation was observed. The analysis of this phenomenon by experiments on cortex, brainstem, and labyrinth, indicates that it is due not only to the elimination of pros- and diencephalic impulses but in part also to an effect upon lower parts of the brainstem.

[1] Rademaker, G. G. I., Réactions labyrinthiques et Equilibre, Masson, Paris, 1935.