first appearance of head pigment was found to be really a case of the combination of two crops of head chromatophores, one of which did not develop in the recessive species *F. majalis*.

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A note on the relation of the semi-circular canals of the ear to the motor system.

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The work on the semi-circular canals was undertaken with the object of studying: (1) The results of stimulation of the end organ of the vestibular nerve; (2) the immediate and remote results of destruction of the labyrinth or of the eighth nerve on one or both sides; (3) the effect of removal of various parts of the brain on phenomena which have been observed to follow stimulation or destruction of the labyrinth, and (4) the paths of nervous connection between the labyrinth and the eye muscles — the optico-acoustic path. Later it is the intention to study anatomically the degenerative processes occurring in various parts of the central nervous system after destruction of the labyrinth or eighth nerve.

Method.—The mastoid bone is exposed by a skin incision and the separation of the muscles from their attachment at the linea nuchæ superioris and the anterior inferior border of the pars mastoidea. A trephine opening is made through the outer table and diploe of the mastoid bone. The hard portion of the otic bone, in which the semi-circular canals are imbedded, can be removed with a mastoid gouge and the labyrinth destroyed without direct anatomical injury to the cochlea. Dogs, cats and tortoises were used. The results here given apply to dogs, unless otherwise stated.

Results.—Immediately following recovery from the anesthetic after removal of one labyrinth, there is marked torsion, particularly of the anterior part of the body, of the animal toward the injured side. The animal is unable to walk and falls over toward

the injured side on attempting to stand. It may roll completely over on the floor. There is a quick movement of the eyes toward the sound side and a slow return to the injured side. The unsteadiness of gait and the nystagmus are transient. Marked torsion of the head is permanent (two years).

Stimulation of the labyrinth, under moderate anesthesia, by putting hot water in the trephine opening before destruction of the semi-circular canals, causes slow marked deviation of both eyes to the opposite (unstimulated) side. Ice in the trephine hole causes the eyes to deviate to the same (stimulated) side. On electrical stimulation, the zinc terminal of a battery causes deviation to the opposite side; the carbon terminal, to the same side.

The deviation of the eyes on stimulation of the labyrinth may be obtained after total removal of the cerebrum, the optic thalamus, the anterior portion of the anterior corpora quadrigemina and the cerebellum. The torsion of the head in tortoises following destruction of one labyrinth is as marked after decerebration as before. There are no apparent "shock" phenomena in these reflexes after decerebration.

The nystagmus is not due to irritation of the wound, but to the action of the opposite uninjured labyrinth. Nystagmus following extirpation of the second labyrinth is much less marked, and more fleeting than after extirpation of the first, and is reversed in direction, *i. e.*, the quick movement is to the injured side.

There is no torsion of the body nor any rolling movements after extirpation of both labyrinths at the same operation, nor when the second labyrinth is destroyed after an interval. The animal becomes very ataxic and is unable to grasp food if both labyrinths are removed at the same time.

Complete or partial removal of the cerebellum one or two weeks previous to removal of one labyrinth has no effect upon the onset and course of labyrinthine nystagmus. Eye movements following injury to the cerebellum are jerky, irregular, and quick in all directions. Labyrinthine nystagmus is slow in one direction and quick in the opposite direction. The eye movements following cerebellar extirpation greatly outlast those of labyrinthine origin, and the labyrinthine movements may be superposed on those following cerebellar removal.

Removal of one or both occipital lobes of the cerebrum does not abolish labyrinthine nystagmus. True labyrinthine nystagmus has never been observed after complete decerebration, although the slow deviation of the eye persists. The slow component of nystagmus is of labyrinthine origin. The quick component is probably of cerebral origin.

The results suggest that the vestibular mechanism is connected far more closely with the phylogenetically older motor system (von Monakow) than with the phylogenetically newer system.

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Experimental nephritis in guinea-pigs by subcutaneous injections of chromates.

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After having determined that 1 centigram of bichromate of potash is very nearly a lethal dose for guinea pigs of from 500–750 gm., forty guinea pigs were used in an effort to produce, if possible, lasting anatomic lesions in the kidneys by repeated injections. Great difficulty was encountered in continuing larger doses on account of the extensive necroses produced at the site of injection. In the end it was found that a $\frac{1}{2}$–$\frac{1}{5}$ per cent. solution of chromate of potash to which an equal amount of carbonate of soda had been added was most satisfactory, although still quite irritating. As our experience has taught us that sublethal doses are most effective in experiments of this character, injections of one or one half centigram were used in one half of the experiments and the doses crowded as closely as the animals would tolerate; in other series smaller doses down to a quarter of a milligram were employed and continued for long periods (in one case for nearly two years). The immediate effect of the injection of large doses in the guinea pig is the production of an albuminuria which is usually quite limited in amount and the appearance in the sediment of desquamated cells from the uriniferous tubules, much more rarely of casts. The kidneys in the acute intoxication