Vertical suspension in the air by the hips resulted in rotation of the head and fore quarters to the side opposite the lesion. (5) Unequal distribution of muscular tone on the 2 sides of the body was evidenced by (a) the tendency of the body to bow to the side opposite the lesion, and (b) a marked resistance to the passive bowing of the body to the side of the lesion.

6421

Injection of Peripheral Nerves from the Subarachnoid Space.

LOUIS MANTELL. (Introduced by W. E. Sullivan.)

From the University of Wisconsin.

The injection mass used by Funaoka and Yamada[1] suggested such interesting possibilities that their work was repeated and extended. For the most part their mixture of ultramarine blue 2 parts, ether 15 parts, and turpentine 30 parts was satisfactory.

The principle of inlet and outlet cannulation was adopted in all of the work. In one group 2 laminectomies were done, one in the cervical region, the other in the sacral. The dura mater was opened and relatively large glass cannulae were introduced into the subarachnoid space. The cervical cannula served as the inlet, the sacral as the outlet. For another group the inlet cannula was placed in the lumbar segment, the severed optic nerves served as outlet cannulae. The pressure was usually from 3 to 5 pounds. Fifteen dogs were used. The injections were usually begun with the animal under an anesthetic. They died as soon as the injection mass reached the brain.

In no instance was a complete injection obtained and there were variations from animal to animal. Perhaps the most constant result was the injection of the cervical lymph nodes. At one time or another many of the peripheral nerves were injected. Specifically there may be mentioned the brachial plexus and its branches as far distally as the hand; the 2 sympathetic chains and their ganglia; the phrenic nerves including their ramifications on the diaphragm; the intercostal nerves and their branches. The position of the ligatures for the cannulae prevented the injection of the nerves of the caudal extremities.

[1] Funaoka, S., und Yamada, J., *Folia Anatomica Japonica*, 1929, **7**, 399.

Other injection masses have been found satisfactory. The important factor seems to be to select one that is not readily miscible with the body fluids.

6422

A Method for Making Quantitative Intestinal Studies.

CHARLES G. JOHNSTON. (Introduced by S. Goldschmidt.)

From the Laboratory of Surgical Research, University of Pennsylvania.

The intestinal loop devised by Thiry[1] and modified by Vella[2] has been used by numerous workers in studying the absorption of various materials from the intestine. Either the original method or its modification permitted observation of qualitative changes in the introduced material in an unanesthetized animal. Furthermore, the loop is more or less permanent and permits repeated experiments on the same animal under similar and varying conditions.

The Thiry loop has one fistulous opening on the anterior abdominal wall while the Vella modification consists of a fistulous opening at each end of the intestinal loop. The chief objection to either of these methods is the inability to prevent leakage. In an attempt to overcome this difficulty Gumilewski[3] placed rubber balloons in both ends of a Thiry-Vella loop. One balloon served as a plug while the other was penetrated by a short rubber tube which permitted filling and emptying of the loop. Modifications of the Gumilewski method have been used by Nagano,[4] Cobet,[5] and White and Rabinowitch.[6] The Gumilewski technique has 2 definite disadvantages. A single balloon placed within the loop has a tendency to be drawn in or pushed out by peristalsis, and it is difficult to anchor the balloons sufficiently to make an effective seal. With a short tube in the end of the loop the fluid tends to pocket in segments making complete emptying almost impossible. Loops prepared by the old Thiry technique, in which the gut is brought through the abdominal wall, have a tendency to prolapse through the fistulous opening. In order to obviate certain of the difficulties

[1] Thiry, *Sitzgsber. d. Wiener Acad. Math.-naturhist.* Abth. L. 1864, 77.

[2] Vella, S., *Moleschotte unters, Z. Naturlehre,* 1882, **13**, 40.

[3] Gumilewski, D., *Arch. Pflüger,* 1886, **39-40**, 556.

[4] Nagano, J., *Arch. Pflüger,* 1902, **90**, 389.

[5] Cobet, R., *Biochemische Zeitschrift,* 1921, **114**, 33.

[6] White, H. L., and Rabinowitch, J., *J. Biol. Chem.,* 1927, **74**, 449.