is highest in the medial parts (phylogenetically old cerebellar areas; Fig. 2). Under higher magnification it is possible to demonstrate greater accumulation of methionine sulphur-35 in the granular layer of the cerebellar cortex.

Methionine sulphur-35 is not distributed equally throughout the grey matter of the spinal cord. The largest amount is present in motor cells of the anterior horn (Fig. 3). Even in the anterior horns it is possible to differentiate cells with activity higher than the rest.

Very little methionine sulphur-35 is present in the cerebrospinal membranes. No accumulation of methionine sulphur-35 could be demonstrated in the central nervous system surrounding blood vessels or in the vascular walls themselves.

J. FISCHER
J. KOLOUŠEK*
Z. LODIN*

Laboratory of Neuropathology,
Institute of Pathological Anatomy
of the Medical Faculty,
and Institute of Physiology of the
Czechoslovak Academy of Sciences,
Prague. Aug. 8.

* Present address: Czechoslovak Academy of Sciences, Institute of Physiology, Praha XIX, Na cvičišti 2, Czechoslovakia.

¹ Gaitonde, M. K., and Richter, D., *Biochem. J.*, **59**, 690 (1955).

² Koloušek, J., and Lodin, Z. (in the press).

³ Greenberg, D. M., and Winnick, T., *J. Biol. Chem.*, **173**, 199 (1948).

⁴ Tarver, H., and Morse, L. M., *J. Biol. Chem.*, **173**, 53 (1948).

⁵ Cohn, P., Gaitonde, M. K., and Richter, D., *J. Physiol.*, **126**, 7P (1954).

⁶ Palladin, A. V., and Vladimirov, D. E., "Primeneniye izotopov v tekhnike biologii i selskom khozyaystve", 227 (Izdat. Akad. Nauk, S.S.S.R., Moscow, 1955).

⁷ Lodin, Z., and Koloušek, J., *Physiol. Bohemoslovenica*, Supp., **5**, 43 (1956).

⁸ Fischer, J., Koloušek, J., and Lodin, Z., "Československá Morfologie" (in the press).

Possible Interaction of Anti-diuretic and Sodium-retaining Hormones in the Kidney

WHILE investigating the renal excretion of water and sodium by rats in response to intravenous infusion of isotonic saline^{1,2}, it became desirable to consider some aspects of the renal tubular re-absorption of these substances³. We have attempted to do this by considering a model of the tubules based upon properties of a membrane the characteristics of which have already been studied. Some properties of frog skin have been described by Ussing and Zerahn⁴, and it seems that this membrane can act as a 'sodium pump', actively transferring sodium ions; the activity of the 'sodium pump' appearing as an e.m.f. of about 100 mV. across the membrane. The rate of water transfer may be regarded as dependent upon hydrostatic and osmotic pressure differences across the membrane and upon its permeability to water.

For a membrane having these properties the rate of sodium transfer may be shown to be a function of the rate of transfer of water and vice versa. In this case a change in the flux of water across the membrane may lead to a similarly directed change of the sodium flux. Were the e.m.f. developed by the 'sodium pump' controlled by a sodium-retaining hormone and the permeability of the membrane to water by an anti-diuretic hormone⁵, then there would appear to be an interaction between these two hormones which is, however, a function of the membrane upon which they act.

It is suggested that the activity of the renal tubules in re-absorbing sodium and water from the lumina may show properties not entirely dissimilar from the characteristics of frog skin mentioned above. On this supposition the renal responses to certain physiological stimuli have been deduced and found to agree with observations. In particular, the excretion of a urine initially hypotonic in response to an isotonic saline infusion is explained, as also is the inability of physiological doses of anti-diuretic hormone to inhibit diuresis caused by infusing isotonic or hypertonic saline.

D. F. COLE
(I.C.I. Fellow)

Department of Medicine,

J. F. MEREDITH

Department of Electrical Engineering,
University of Durham,
Newcastle upon Tyne 1.
Sept. 14.

¹ Cole, D. F., *Acta Endocrin.*, **19**, 397 (1955).

² Cole, D. F., *Quart. J. Exp. Physiol.* (in the press).

³ Cole, D. F., and Meredith, J. F., *Bull. Math. Biophys.* (in the press).

⁴ Ussing, H. H., and Zerahn, K., *Acta Physiol. Scand.*, **23**, 110 (1951).

⁵ Sawyer, W. H., "The Hormonal Control of Water and Salt Electrolyte Metabolism in Vertebrates", *Mem. Soc. Endocrinol.*, No. 5, Pt. 2, Ed. I, Chester Jones and P. Eckstein, pp. 49 and 69 (Cambridge University Press, 1956).

Effect of Fast Neutrons on Different Stages of Spermiogenesis in *Drosophila melanogaster*

FROM X-ray studies, it is known that the rates of chromosome aberrations vary with the age of the males¹ and the time from irradiation to insemination². Lünig³ showed that these variations were due to differences in the rates of chromosome breaks in different stages of spermiogenesis and that in spermatids there was a higher rate than in mature spermatozoa. After Baker and Von Halle's⁴ observation that there was a difference in the rate of dominant lethals in sperm between the first and second day, this was further studied by Lünig⁵ on other types of aberrations. He proposed that this difference was due to a difference in the rate of breaks in 'mature' (the first-day) and 'near mature' (the second-day) sperm. This conclusion ought, however, to be revised as some yet unpublished experiments have shown.

From experiments by Baker and Von Halle⁶ with fast neutrons it is known that the rates of dominant lethals were the same in sperm from the first and the second day. This result is difficult to explain on the hypothesis of a difference in sensitivity between sperm of the first two days.

Hence it seemed to us worth while to attack the problem of different sensitivity by means of irradiation with fast neutrons also on other types of aberrations. In this study we used two types of mutations, namely, sex-linked recessive lethals, and II-III translocations. The purpose of this experiment was also to obtain information concerning the effectiveness of the fast neutrons compared with X-rays on the two types of mutations. In order to be sure that the dose and stages in spermiogenesis were the same for both types of mutations, certain precautions have to be taken. In our case we used a 'dual-purpose' stock from which we could take the daughters for tests of recessive lethals and their brothers for translocation tests.