giving about 417,000 per c.c. after considerable shrinkage in 5 per cent formalin during four months. This result is considered not incompatible with an independent count of 11,928 larvæ (preserved in the slightly smaller trochosphere stage) in one drop of liquid, giving about 300,000 per c.c. without close packing.

J. M. DODD.
J. MCCLOY.
H. C. DAVIES.
F. B. J. EDMONDS.
J. H. ORTON.

Zoology Department,
University, Liverpool.
Dec. 21.

[1] Orton, J. H., NATURE, **110**, 212 (1922).
[2] Dantan, J.-L., *C. R. Acad. Sci.*, **157**, 871 (1913).

## Interchange of Hydrogen Isotopes in Complex Cobaltammines

ERLENMEYER and Gartner[1] have reported that interchange of hydrogen isotopes takes place when hexammine cobaltic nitrate, $[Co(NH_3)_6]$ $(NO_3)_3$, is dissolved in heavy water, all the hydrogen atoms being replaceable. Bankowski[2], however, has stated that the hydrogen in complex ammines is only partially replaceable, one atom being interchanged in $[Co(NH_3)_4(H_2O)_2]Cl_3$, and three atoms in $[Co(NH_3)_4CO_3]Cl$.

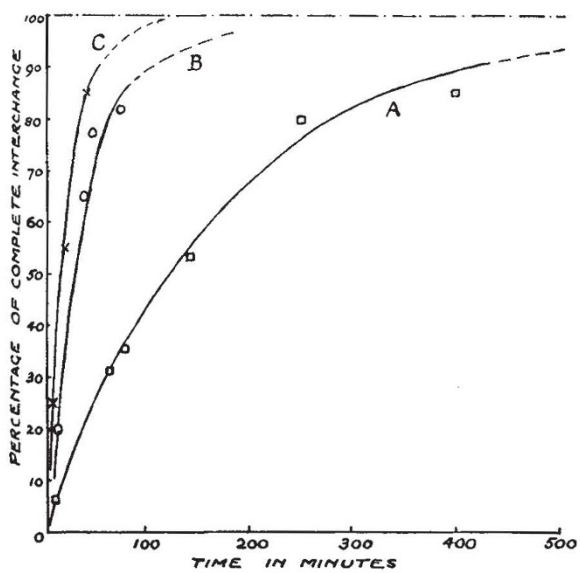


Fig. 1.

We have re-examined the question of isotope interchange with complex ammines in solution, with special reference to 1,6 dinitro tetrammine cobaltic nitrate, carbonato tetrammine cobaltic nitrate, hexammine cobaltic chloride and triethylene diamine cobaltic chloride. In agreement with Erlenmeyer's results, we find that all the amine hydrogen contained in the complex may be interchanged with deuterium; we also find, however, that at 25° and 35° the interchange proceeds quite slowly, the time of half change being several hours; and Bankowski's inherently improbable conclusion may be due to his failure to observe this fact.

In our experiments, which have been most fully worked out for hexammine cobaltic chloride, the salt was dissolved in approximately 3 per cent heavy water, and at suitable intervals a portion of the solution was removed and the extent of interchange was ascertained by separating the water therefrom and observing its density relative to that of the original heavy water by a micro-flotation method, giving relative densities within $\pm$ 0·5 $\gamma d$ on a sample of 0·25 c.c., which will be described elsewhere. The first experiments were made by distilling off the water from the samples *in vacuo* as rapidly as possible (Fig. 1, *A* and *B*). Afterwards, it was found to be preferable to add the samples to excess of dry, powdered, mercuric chloride, thus precipitating the complex cation as the mercurichloride, $[Co(NH_3)_6]Cl_3.HgCl_2$, and arresting the interchange quite sharply. After filtration, the water was purified by distillation and its density was determined as before (Fig. 1, *C*).

As may be seen from Fig. 1, complete interchange requires a considerable time, and the interchanges at shorter times lie on curves asymptotic to the line representing complete interchange.

By a further modification of the experimental method, it has been possible to make a full kinetic analysis of the reaction mechanism, and the results of this further work, which appear to be of considerable significance in relation to the theory of the co-ordination complex, will shortly be published in full.

F. W. JAMES.
J. S. ANDERSON.
H. V. A. BRISCOE.

Imperial College of Science,
London, S.W.7

[1] Erlenmeyer and Gartner, *Helv. chim. Acta*, **17**, 1008 (1934).
[2] Bankowski, *Monats.*, **65**, 266 (1935); cf. Erlenmeyer and Lobeck, *Helv. chim. Acta*, **18**, 1213 (1935).

## The Fifth Skull of Peking Man

A RECENT letter via the trans-Siberian mail brings the information that the fifth skull of Peking man, lately discovered, is the most complete specimen ever found at Choukoutien, near Peking.

It was discovered by Mr. L. P. Chia on November 26, 1936, in the same layer of the fossiliferous deposit as the other two skulls collected ten days before (see NATURE, Dec. 12, 1936, p. 1004, and Dec. 19, 1936, p. 1056), but about six metres farther south.

Except for the teeth, which are missing, this specimen is exceptionally well preserved and complete; the nasal bones and the left orbit are undamaged, and connected with the back parts, including the foramen magnum and other delicate bones, which are in very good condition. The middle vault of the skull has not been badly crushed in the brecciated matrix, which has made it possible for Prof. F. Weidenreich to remount it within a week of its transport from the field to the laboratory.

This skull (male type) does not belong to a fully adult individual, but to one who is evidently older than that represented by the No. 1 skull. The orbital ridges are more strongly developed than, but the general architecture remains the same as, the skull No. 1, described by the late Prof. Davidson Black.

Prof. Weidenreich is now preparing a short note which will appear in the near future, and will present his preliminary observations, with diagrams, on the last three skulls. Before the appearance of his official