there was placed a narrow glass tube, closed at the lower end and extending to about the centre of the flask. The radium bromide weighing 23.7 milligrams was enclosed in a small metal capsule supported by a thread, and was inserted alternately in the glass tubes. The flasks, originally at atmospheric pressure, were immersed in a water bath kept in a constant temperature room, and were connected by a xylene tube which served as a manometer. The heating effect was measured by the movement of the xylene column, observed by a telescope with micrometer eye-piece, and the scale was calibrated by a small heating coil of approximately the same dimensions as the radium. Two sets of experiments were carried out, in one of which the ends of the glass tubes were inserted in lead cylinders 3 cm in diameter and 3 cm. high, and in the other with aluminium cylinders of exactly the same dimensions.

The lead envelope absorbed more than half the γ rays, while the aluminium absorbed only a few per cent. The readings were found to be very steady and consistent, but no appreciable difference in heating effect could be detected in the two experiments. As a check, the heating coil was employed in both experiments to calibrate the readings, the means of which agreed to about 1 per cent.

According to Paschen's results, the heating with the lead cylinders should have been at least 50 per cent. greater than with the aluminium cylinders. In our experiments we could not have failed to detect a difference of 5 per cent. We conclude from this that the γ rays do not supply more than a small percentage of the total heating effect of radium.

<div style="text-align:right">E. RUTHERFORD.
H. T. BARNES.</div>

McGill University, December 1

Singularities of Curves.

THE compound singularities of algebraic curves offer a wide field for discussion, but the naming of the simple singularities has not yet been placed on an entirely satisfactory footing. The latter consist of (1) point singularities, which are nodes and cusps; (2) line singularities, which I prefer to call bitangents and inflections. Mr. Basset calls them double and stationary tangents; but if this is done, symmetry requires that the point singularities should be called double points and stationary points, and this is not admissible, because the phrase double points (as now used) includes cusps as well as nodes. If a curve has a double point Mr. Basset calls it *autotomic* (self-cutting); but this term is incorrect when all the double points in the curve are cusps (as in the cardioid), for the curve does not then cut itself. If it is really desirable to have a means of distinguishing curves that have nodes or cusps from those that have none, they may perhaps best be described respectively as curves with or without point singularities.

<div style="text-align:right">December 8.   T. B. S.</div>

1 *CHRISTMAS BIRD-BOOK*.[1]

THE success which attended his last children's bird-book has induced Mr. Kearton to cater once more for the wants of young people interested in the animal life around them, and the result is the present charming little volume, illustrated, as usual, by reproductions from photographs taken direct from nature by the author and his brother. In the guise of a narrative told by "Cock Robin" to his offspring, the author has contrived to convey in his own inimitable manner a vast store of information concerning bird-life, interspersed with observations relating to other animals. Although, as already said, intended primarily for juvenile readers, the volume contains a certain amount of information which may be new to some of their seniors, including those to whom natural history is not an unknown study. For instance, until we learnt it from Mr. Kearton's pictures, we ourselves were ignorant of the marked and easily recognised difference between the foot-prints of a rabbit and those of a hare, despite the number of times they have come under our notice in the snow.

[1] "The Adventure of Cock Robin and his Mate." By R. Kearton. Pp. xvi+240; illustrated. (London: Cassell and Co., Ltd., 1904.) Price 6s.

Generally Mr. Kearton conveys his information in simple language, but he is very prone to speak of a bird picking up food between its two mandibles when it would be "shorter, simpler, and better understood" (to quote from a well known Bar story) if he said beak. Apparently old fables connected with animals die hard, for, according to the author, many young people at the present day believe that a wren is a female robin, and that male robins lose their red breasts in summer.
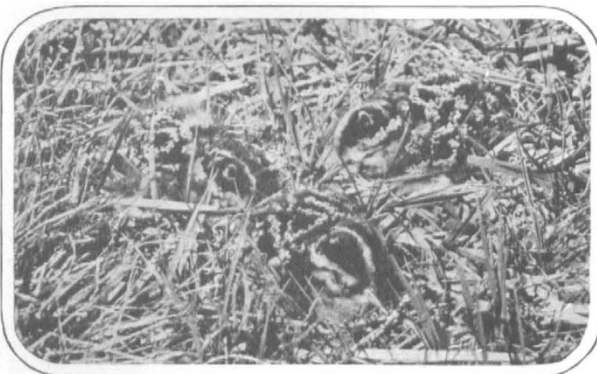

FIG. 1.—Young Dunlins in their natural surroundings. From Kearton's "Cock Robin." (Cassell and Co.).

These and other old wives' legends Mr. Kearton does his best to replace by accurate and interesting accounts of the mysteries of bird-life.

The best (if there can be a best where all is so interesting) of the five chapters are the two on nesting and the clamour of chicks, both being illustrated by a number of photographs of nests and young birds. Very graphically does the author bring out the remarkable difference in development at the date of hatching between a young sparrow, for instance, and that of a woodcock, and he also shows how much this difference depends on habit, a young skylark showing a somewhat intermediate stage. Very striking are the two photographs here reproduced, the one showing young dunlins skulking amid their native covert, and
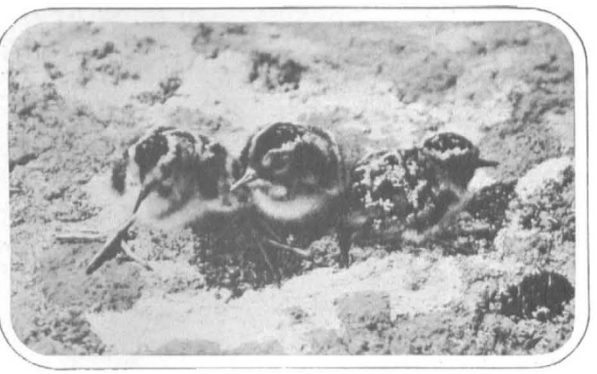

FIG. 2.—The same birds in unnatural surroundings. From Kearton's "Cock Robin." (Cassell and Co.)

the other the same birds removed to an uncongenial environment.

"Nature-teaching" could not be conveyed in a better manner, or in one less free from affectation and faddism, and we trust that the "Kearton annual" will enjoy the extensive patronage that it certainly merits among those on the look-out for suitable Christmas presents for their young friends.

<div style="text-align:right">R. L.</div>