complicated spectrum of radium C′, it is well to remember that the corresponding spectrum of thorium C′ is very much simpler and contains no families of γ-rays—except perhaps very faint ones—corresponding to those of radium C′, which have been interpreted in the scheme as transitions $q \longrightarrow q-2$, $q \longrightarrow q-3$, and $q \longrightarrow q-4$. It has of course, in addition, a very strong isolated γ-ray of very high frequency. If therefore in attempting to proceed with this analysis, which in any event I believe to be important, one is forced finally to conclude that such models will *not* explain the facts for radium C′, there is no call for surprise or disappointment. It may still be that the proposed scheme of $q \longrightarrow q-1$ transitions will account properly for the important *common* features of the γ-ray spectra of radium B, radium C′, thorium C′, and probably other nuclei. It is more than likely that the striking *differences* between the spectra of radium C′ and thorium C′ should be associated with the two extra free protons in radium C′, the atomic weight of which is of the form $4n+2$, while that of thorium C′ is $4n$.

In the models suggested above, the effect of the protons has been ignored primarily because there seems at present no simple way of incorporating them. But it is clear that the general effect of free protons present in normal and excited states will be to cause the set of low frequency transitions $q \longrightarrow q-1$ to be repeated again at higher frequencies but with the same dependence on q, the constant shift between the two sets representing an excitation energy for a proton. R. H. FOWLER.

Cromwell House,
Trumpington, Cambridge, Aug. 14.

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[1] *Proc. Roy. Soc.*, A, vol. 132, p. 667 : 1931.

Polarisation of a Beam of Electrons by Scattering.

IN view of the recent experimental work of Dymond[1] on the polarisation of electrons by double scattering, it is of interest to make calculations of the effect to be expected, without assuming, as in the author's previous paper,[2] that the number $2\pi Z\epsilon^2/hv$ is small compared to unity, a condition which is not satisfied in practice.

One finds, as before, that the asymmetry in the scattering is very small, unless :

(1) The velocity of the electrons is comparable with c. (2) Both angles of scattering are comparable with 90°. (3) The atomic number of the scattering nucleus is comparable with 137.

With both angles of scattering equal to 90°, and gold for the scattering element, the calculated percentage asymmetry (200 δ of the author's paper) is in the direction found by Dymond, and of the following magnitude, for various velocities, v, of the electrons:

v/c	0·2	0·3	0·4	0·5	0·6	0·7	0·8	0·9	1·0
Energy in kv.	10·5	25	45	79	127	204	340	662	∞
200 δ . . .	0·5	0·2	3·0	11·5	15·5	14	10	5	0

The asymmetry at 70 kv. is thus about five times as much as that found by Dymond. It is difficult to explain why this should be so. Multiple scattering would reduce the polarisation observed, but there should not be much multiple scattering with the foils used. It is improbable also that the Dirac theory of the electron should give a wrong result when applied to the scattering by a Coulomb field, since the results for the energy levels of an electron in the same field are known to be correct. N. F. MOTT.

Gonville and Caius College,
Cambridge, Aug. 10.

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[1] NATURE, vol. 128, p. 149, July 25, 1931.
[2] *Proc. Roy. Soc.*, A, vol. 124, p. 425; 1929.

The Spermatogenesis of Ticks.

THE spermatozoa of ticks are provided with a peculiar 'plasmal-rod' or spermatophore which has long been a puzzle to cytologists, but the careful work of Nordenskiold (1920) on *Ixodes ricinus* Linn. threw considerable light on the subject.

Certain recent observations I have made on the red tick (*Rhipicephalus evertsi*) indicate that the spermatogenesis in this species differs considerably from that given in Nordenskiold's account, and it exhibits certain peculiar features which are of general theoretical interest.

In sections of an impregnated non-engorged female there was found in the seminal receptacle a tangle of long, thick cords, the spermatophore-cords (Fig. 1, *g*).

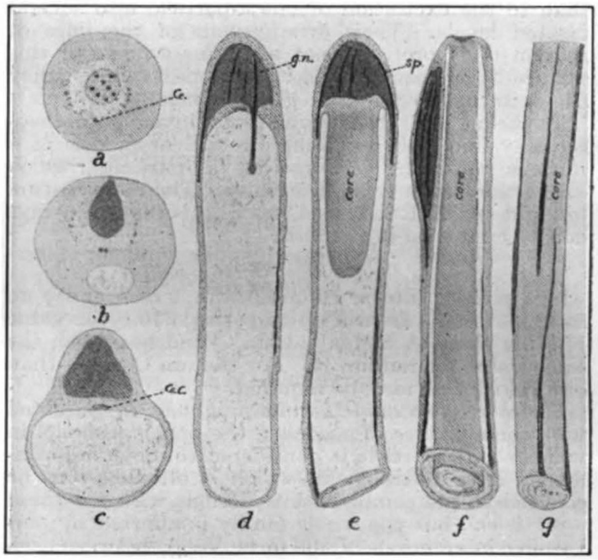

Fig. 1

These are singularly brittle and appear to snap like spun-glass under the microtome-knife, although, doubtless, they are sufficiently flexible in the fresh condition. Each cord carries on its surface a large number of longitudinally arranged filiform spermatozoa, all of which seem to point in one direction. Probably when the eggs are ripe a special secretion is poured into the receptacle, which releases the spermatozoa from the cords.

In sections of a series of male ticks of various ages it was found that each cord and its spermatozoa are formed through the activity of a *single* spermatid. The spermatids, which appear to arise in a typical manner, are unusually large, and it was at once obvious that they are too few to account for the numerous spermatozoa on the spermatophore-cords.

The nucleus of the spermatid bears about eight very small rounded chromosomes. A centrosome (*Ce*) and possibly mitochondria are present (Fig. 1, *a*). Nordenskiold's "centrosomal corpuscle" (*CeC*) can also be seen ; but the structure apparently vanishes and takes no part in the subsequent development. The spermatid expands and a vacuole with semi-fluid contents arises. At the same time the nucleus enlarges, and it assumes a very finely granular or homogeneous structure with diffuse chromatin which stains only weakly with Delafield hæmatoxylin but intensely with iron-hæmatoxylin (*b*, *c*). One or more strongly basophil chromatin-cords are now formed in the nucleus and they pass to its surface. The spermatid