the mammals. The ova of *Acanthias vulgaris* contain practically 30 per cent fat, but the ova still retain a density of 1·055.

It is true that the flattening might take place during the very early stages of development of the sea-urchins, but at this stage there would scarcely be any pronounced ovaries; and again if these supposedly light ova could lift the upper shell of the urchin, would it not occur in one sex only and thus impress marked sexual dimorphism, which appears to be so markedly lacking among the echinoids?

A. G. LOWNDES.

The Laboratory,
  Citadel Hill,
    Plymouth.
      Sept. 28.

A New Type of the *Salmonella* Genus

IN a previous communication[1], as a matter of preliminary report, a few properties of *S. hormœchei* were described, the antigenic structure of which differed from those of all known types.

This *Salmonella* was isolated by means of Kauffmann's 'combined method' from the ovary of a hen the blood of which gave a positive reaction with the pullorum antigen coloured and dead.

S. hormœchei presents morphological, tinctorial and culture characters, which coincide, except for the slight variations described below, with the bacteria belonging to the *Salmonella* genus. It is mobile. It develops vigorously in the usual culture media. In agar, the culture is adherent. In liquid media, a noticeable turbidity can be observed, which later becomes intense, the sediment is abundant and does not easily disintegrate by agitation. It shows in the liquid mass, as well as in contact with the inner wall of the container, a fine granulation. The formation of a slight superficial veil can be noticed.

It ferments, with the production of acid and gases, dextrose, arabinose, dulcitol, galactose, rhamnose, lævulose, maltose, manitol, manose, sorbitol, trehalose and xylose. It does not attack starch, erithrite, inosite, inulin, lactose, raffinose, saccharose or salicine. It does not produce indol. It does not coagulate milk. It does not produce hydrogen sulphide. It does not liquefy gelatine. It gives a positive reaction with Stern's test; Bitter, Weigmann and Habs media, positive, with dextrose and arabinose; subpositive, with dulcitol and rhamnose; Simmons media, with arabinose, dextrose, dulcitol, rhamnose and citrate, all positive. Positive reaction opposite to *d*-tartrate, mucate, *l*-tartrate, *i*-tartrate and citrate. Reduces nitrates to nitrites; does not hydrolyse urea.

The antigenic structure, which has been studied by means of the 'mirror test', indicates that *S. hormœchei* possess the same antigenic '*O*' thermostable of *S. ballerup*; but on the other hand it has not been possible, at least thus far, to find antigen *Vi*.

The flagellar antigens present special interest, since they are considered to be an antigenic 'mosaic', constituted by two fractions not referred to hitherto, where one of them corresponds to '*H*' antigen specific, which we designate by the symbol Z^{30}, and the other is common with *S. ballerup*; we distinguish it by the symbol Z^{31}. Concerning the latter, researches are being continued. The abbreviated serological formula of *S. hormœchei* is represented in the following form, $XXIX.Z^{30}.(Z^{31}).—.$, where Z^{31} is in brackets in order to show that in certain circumstances it may

be lacking. Inoculations in mice, guinea pig and rabbits, by the oral, subcutaneous and intraperitoneal routes, have not caused death in any case.

S. hormœchei corresponds to the second new type of *Salmonella*, isolated and classified in Argentina by me, the first having been *S. bonariensis*.

JOSÉ MONTEVERDE.
Facultad Agronomía y Veterinaria,
  Buenos Aires.
    July 4.

[1] Monteverde, J. J., *Nature*, **149**, 472 (1942).

Collapse of Determinism

NOW that this subject has been raised again in these columns[1] I should like to ask a question which puzzles the 'everyday' physicist who is paid to keep his feet on the ground.

In his Guthrie Lecture, Prof. Whittaker, after discussing hidden parameters in relation to the reflexion or transmission of light, says: "Thus the choice between the alternatives of transmission and reflexion at the Nicol is truly indeterminate, so far as individual photons are concerned, and is qualified only by a statistical regularity when great numbers of events are considered" (that is, $\cos^2 \varphi$ of the intensity is transmitted and $\sin^2 \varphi$ reflected).

My difficulty is that if the final result of, say, one million, or billion, photons is regular (that is, determined), then how can the choice of any (except the first few) be individually indeterminate? Surely there must be some influence set up by the first 999,000 photons which will bias the indeterminate motion of the last 1,000 in order to balance the statistical result if the first arrivals have been a little too free with their indeterminacy. The introduction of a certain experimental error in measurement of the intensity does not affect the argument.

The difficulty is so obvious that I feel one has the right to demand a *simple* explanation to clear it up. It is independent of any particular knowledge of photons or of the mathematics of indeterminacy.

WILFRED W. BARKAS:
   "Under Cross",
    Whiteleaf,
Via Aylesbury, Bucks. Oct. 11.

[1] *Nature*, **154**, 464 (1944).

FOR a profound study of the question of determinism in physics, reference may be made to Prof. J. von Neumann's "Mathematische Grundlagen der Quantenmechanik", p. 157 *et seq*. I doubt if any very simple treatment can be quite rigorous; but in connexion with Mr. Barkas's point, the following line of thought might be profitable. If a coin is tossed a thousand times and the number of occurrences of heads recorded, and if this experiment is repeated a very great number of times, there will be a statistical regularity in the records, which may be calculated by the ordinary theory of probability. Does the calculation at any stage involve the assumption that the tossing of coins is crypto-deterministic, or does it involve only the assumption (as regards the tossing) that there is symmetry in the system, so that there is no reason to expect heads rather than tails in a single trial?

E. T. WHITTAKER.