and, it may be said, the oviparity of the monotremes firmly established, the fact had been authoritatively proclaimed. Sir John Jamison, for instance, especially declared that 'the female is oviparous, and lives in burrows in the ground' (*Trans. Linn. soc. London*, xii. p. 585). The Rev. Dr. Fleming, in his 'Philosophy of zoölogy' (ii. 215), published in 1822, remarked, that, "if these animals are oviparous (and we can scarcely entertain a doubt on the subject, as *the eggs have been transmitted to London*), it would be interesting to know the manner of incubation." Further, Fleming refused to admit the monotremes among the mammals, dividing the Vertebrata 'with warm blood' into 'quadrupeds' and 'birds,' and the former into 'I. Mammalia' ('1. Placentaria' pedota and apoda, and '2. Marsupialia'), and 'II. Monotremata.'

But, notwithstanding all these facts, scepticism as to the truth of the representations and authenticity of the eggs, developed into positive disbelief; and Bonaparte himself recanted, and took that decidedly retrograde course, which others had entered upon, of associating the monotremes with the marsupials in the unnatural and artificial negative group of Ovovivipara, or Implacentalia. I, too, was so far influenced by the prevalent scepticism or disbelief, and by the similiarity of the monotreme egg to that of a reptile, that I retained viviparity as a special attribute of the mammals in 1872, although I declined, on other evidence, to include a small size for the eggs in my diagnosis of the class. I then, also, adopting the subclasses Monodelphia, Didelphia, and Ornithodelphia, segregated them into the major groups, combining the first two under the name Eutheria, and contrasting the last as the Prototheria. These names have since been accepted by Professors Huxley, Flower, and others; and, inasmuch as Professor Huxley did not accredit their origin, they have been ascribed to him. I must add, however, that Professor Huxley has restricted the name Eutheria, although apparently with a hypothetical qualification, to the monodelphs, while he has coined a new name (Metatheria) for the marsupials. I fail to appreciate the need for such modifications, which virtually become exact synonymes of Monodelphia or Placentalia, and Didelphia.

Finally, the old data as to the oviparity of monotremes became almost lost to memory, so that no one has recalled them since the rediscovery. In view of such forgetfulness and scepticism, therefore, further information was necessary to insure the admission of the old evidence as valid. But Mr. Caldwell has further added the intelligence, quite new, that the eggs of Ornithorhynchus are meroblastic. This discovery will have an important bearing on the question of the origin of the mammals, and is antagonistic to the suggestion of Professor Huxley that the type was a direct derivative from the amphibians, while it increases the possibility that Professor Cope may be nearer the truth in affiliating the ancestors of the mammals to the theriomorphous reptiles of the Permian.

THEO. GILL.

Sun-spots.

The long-delayed maximum of solar spots, now undoubtedly passed, has attracted unusual attention to the spot-periodicity. To-day and yesterday the visible hemisphere of the sun was, for the first time in nearly fourteen months, observed to be entirely free from spots; the occasion next preceding this being 1883, Sept. 25. During the past two years, the only additional days on which the sun was observed to be without spots were, in 1882, Oct. 9 and Dec. 3, and, in 1883, Feb. 23, and May 25, 26, 27, and 28.

DAVID P. TODD.

Lawrence observatory, Amherst, Mass., Nov. 8.

The numerical measure of the success of predictions.

Suppose we have a method by which questions of a certain kind, presenting two alternatives, can in every case be answered, though not always rightly. Suppose, further, that a large number of such answers have been tabulated in comparison with the events, so that we have given the following four numbers: —

(aa), the number of questions for which the answers were the first way and the events the first way;

(ab), the number of questions for which the answers were the first way and the events the second way;

(ba), the number of questions for which the answers were the second way and the events the first way;

(bb), the number of questions for which the answers were the second way and the events the second way.

Then the problem is, from these data to assign a numerical measure to the success or science of the method by which the answers have been produced. Mr. G. K. Gilbert (*Amer. meteorological journal*, September, 1884) has recently proposed a formula for this purpose; and I desire to offer another.

I make use of two principles. The first is, that any two methods are to be regarded as equal approximations to complete knowledge, which, in the long-run, would give the same values for (aa), (ab), (ba), and (bb). The second principle is, that if the answers had been obtained by selecting a determinate proportion of the questions by chance, to be answered by an infallible witness, while the rest were answered by an utterly ignorant person at random (using *yes* and *no* with determinate relative frequencies), then the approximation to knowledge in the answers so obtained would be measured by the fraction expressing the proportion of questions put to the infallible witness. The second witness may know *how often* he ought to answer 'yes;' but I give him no credit for that, because he is ignorant *when* he ought to answer 'yes.'

Let i be the proportion of questions put to the infallible witness, and let j be the proportion of questions which the ignorant witness answers in the first way. Then we have the following simple equations: —

$$(aa) = i\{(aa) + (ba)\} + (1-i)j\{(aa) + (ba)\},$$
$$(ab) = (1-i)j\{(ab) + (bb)\},$$
$$(ba) = (1-i)(1-j)\{(aa) + (ba)\},$$
$$(bb) = i\{(ab) + (bb)\} + (1-i)(1-j)\{(ab) + (bb)\}.$$

Now, whatever the method of predicting, these equations can always be satisfied by possible values of i and j, unless the answers are worse than if they had been taken at random. Consequently, in virtue of the two principles just enunciated, the value of i obtained by solving these equations is the measure of the science of the method. This value is,

$$i = \frac{(aa)}{(aa)+(ba)} - \frac{(ab)}{(ab)+(bb)},$$
$$= \frac{(aa)}{(aa)+(ba)} + \frac{(bb)}{(ab)+(bb)} - 1,$$
$$= \frac{(aa)(bb) - (ab)(ba)}{\{(aa)+(ba)\}\{(ab)+(bb)\}}.$$

Mr. Gilbert's formula has the same numerator, but