

followed by the development of normal cock-feathering, and drew the conclusion that secondary sexual characters were, or might be, the by-products of internal secretions the real "utility" of which was quite different.

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MR. HUXLEY seems to have missed (NATURE, June 7) the main point I wished to emphasise, namely, that while criticism of one investigator's views by another is always valuable, it is stretching the point to attempt to define the grounds on which an opinion may be advanced. It is natural for a man who has studied a group of phenomena from a certain viewpoint to formulate an opinion as the result of his studies. If the admitted limitations of a paper were appreciated, together with the difficulties under which some zoologists work, I imagine they would be free from the type of criticism under discussion. That Dr. Annandale's opinions may have been strengthened or modified by experimental data I do not deny, and if Mr. Huxley's letter directs attention to the neglect of experimental work in India it will have served a useful purpose; but, as I said, it is expecting too much to require a man already engaged in studies so diverse as Dr. Annandale's to supply the need himself.

Mr. Huxley's assumption of my lack of knowledge of his studies on the courtship of birds is perhaps natural. I may mention, however, that I have always followed his writings with interest, and I ask his indulgence if I missed the ecological importance of the paper he refers to, and previously regarded it as a valuable contribution to bird "behaviour," or rather psychology.

With reference to Mr. Huxley's concluding epigram I would point out that, apart from the limited scope of Dr. Annandale's paper, attempting as it did only correlation, it seems to be inconsistent with recent opinions on the notion of cause. Mr. Bertrand Russell ("Mysticism and Logic and other Essays," pp. 180-208: London, 1919) regards the word "cause" as "so inextricably bound up with misleading associations as to make its complete extrusion from the philosophical vocabulary desirable," and if I interpret him aright he proves that the idea of causation (absent in advanced sciences) as a fundamental axiom of science is erroneous, and that the supposed "causation" is really correlation. Accepting this argument, the geneticist is also correlating, though in a manner quite different from the methods of the pure ecologist.

CEDRIC DOVER.

London, June 12.

Frequency Curves of Genera and Species.

IN NATURE for June 7, Mr. Tate Regan refers to "the series $x, x/2, x/3, x/4, \dots, x/x$, representing the number of genera with 1, 2, 3, 4, etc. species in a group where the sizes of genera are purely a matter of chance." I am unable to attach any definite meaning to the phrase "are purely a matter of chance," since the sizes might be "a matter of chance" in many different ways, and I do not see what process Mr. Tate Regan has supposed to be followed. Will he be so good as to state exactly in what way he supposes the systematist to operate, and to show how the series in question arises from his operations?

G. UDNY YULE.

St. John's College, Cambridge,
June 10.

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THE simple graph published in NATURE of June 7, p. 822, by Mr. Tate Regan demonstrates the result of log plotting $xy=n$, but is otherwise irrelevant. For if the matter were so simple as that, then an infinity of species per genus would be as probable as an infinite number of monotype genera, and there would be no room on the earth for us. The introductory chapter of Mr. Udny Yule's remarkable paper in the Philosophical Transactions is carefully written for the non-mathematical biologist, and should be read by all such.

W. LAURENCE BALLS.

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Near Macclesfield,
June 18.

Study of Explosions.

WHETHER anything physical and instructive about the atmosphere can be learnt from a study of purposely produced explosions, I am not sure. Ordinary explosives must waste much of their energy on the earth; and if atmospheric waves are wanted, it would seem better to explode a balloon filled with a detonating gas, say a mixture of hydrogen and oxygen, at a considerable height. Gas exploded without any rigid envelope, as in a soap-bubble, makes a tremendous noise, since the energy is wholly expended on the atmosphere.

OLIVER LODGE.

Ball Lightning.

HAVING read the article on Ball Lightning by Dr. Simpson in NATURE of May 10, p. 677, I thought the following account of what I once witnessed, and believe to have been ball lightning, might prove of interest to some of your readers.

In August 1900 I was staying at the Voxli Hotel, Hankelid Fjeld, Telemarken, Norway. The hotel is 776 metres above sea-level and not far from the Hankelid Pass (1123 metres). On August 21 there was a terrific thunderstorm, towards the end of which I saw the particular lightning flash which I think must have been ball lightning. I will quote the actual words in which I attempted to describe the occurrence at the time.

"We were sitting in the dining-room at supper (precisely 8 o'clock Norwegian time); on an ordinary day it would still have been good daylight, but owing to the storm it was only just light enough to see the outline of the hills on the opposite side of the lake. This was the direction (south-west) from which the storm was coming, and I had been watching the particularly vivid lightning for some time, when suddenly I saw a streak of 'yellow,' apparently about one inch broad, dart from the sky just above the top of the hill opposite and, gradually falling, make straight for where I was sitting. I was too spell-bound to move, and the length of time of the whole occurrence was too short to call the attention of those who were sitting with me. I remember having the sensation that it must hit my forehead, when just as it got in front of the hotel window it changed to a ball of dazzling yellow fire (about the size of a cricket-ball) and then burst with a frightful crash, emitting volumes of violet-coloured flame, which spread in all directions. This must have happened in one or two seconds, but for several minutes afterwards I was completely dazed.

"Next day I examined the ground and found the track of the flash commenced just 20 metres (no yard measure to be had here) from the hotel window. The whole of the surrounding space is covered with small sods and branches of trees, and two or three small trees are uprooted. The most noticeable thing is a