no particular note is produced for a whole second, and, therefore, not perceived for a whole second.

But, on the other hand, it is clear that we can listen to a high-pitched note for a second or for a minute or for any length of time. When we are hearing a note of 20,000 d.v. per second pitch, we are almost certainly *not* receiving 20,000 impulses per second into the central nervous system. To take an analogy from vision: when we perceive red light, we are certainly not receiving anything like (395×10^{12}) impulses per second, which is the "pitch" of red light. If, in seeing coloured light, such an enormous number of vibrations in the æther affect the retina, there must be something of a very different character as regards frequency, which, ascending the optic nerve, so stimulates the visual centre that we see coloured light.

We have in perceptual consciousness qualitative differences corresponding with objective quantitative differences, an ever-present problem of psycho-physics; and no one has ever suggested that our optic nerves and visual centres are dealing with impulses at many millions a second. Why, then, may we not apply the same reasoning to the ear?

When we are listening to all possible tones from, say, 1000 d.v. per second pitch to 40,000, may we not somehow have in consciousness qualitative differences corresponding with objective quantitative (arithmetical) differences? We cannot, apparently, be more definite than this.

In the case of the eye there is no conceivable possibility of an identity between the rhythm of optic-nerve impulses and that of the vibrations of the æther; is it not by analogy probable that neither is there any direct correspondence between the auditory nerve-impulses and the periodicity of sonorous vibrations?

D. FRASER HARRIS.

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November 29, 1918.

A Mistaken Butterfly.

THOUGH I cannot claim any special knowledge of insect behaviour, I hope you will allow me to make a few remarks on "A Mistaken Butterfly" discussed in *NATURE* for September 5 and December 12, 1918. I have my doubts as to whether it was the butterflies or the observers who were mistaken. A butterfly does not always alight on a flower, or on what it supposes to be one, but appears frequently to alight for rest. Now, in selecting a resting-place, it will naturally select a good "taking-off" position, and the knob of a hatpin and a golf ball are evidently from the butterfly's point of view good "taking-off" positions, especially the golf ball, it being surrounded by no good "taking-off" places, and its whiteness would help to direct attention to it.

A number of years ago I met two keen entomologists in Italy who were disappointed in not succeeding in capturing a butterfly they particularly wanted, though they had seen a number, but failed to net them. As I knew where that particular butterfly was likely to be found, I took my walk in that direction the following day, and on returning presented my friends with two specimens of the butterfly. These were captured without a net, by what I imagine is a well-known method. When the butterfly alighted I approached it from behind, keeping as well out of the range of its eyes as possible, and moving *very slowly*. When within arm's reach the hand was slowly stretched out, keeping it as low as possible and behind the insect. When the stalking is carefully done a capture is generally made, and the wings, before lifting it, may be folded to prevent

their upper surfaces being damaged by contact with the fingers.

Now in the case of the two butterflies referred to, one was picked off a leaf of a bush, and the other had settled on my shoulder. I do not think they are so easily picked up if they have settled on flowers, as they are there on business, and are restless and away whenever they have accomplished their object.

JOHN AITKEN.

Ardenlea, Falkirk, December 17.

THE FUTURE OF BRITISH MINERAL RESOURCES.

NOW that the activities of a number of Government Departments, which were called into existence by the exigencies of the war, are happily likely to be nearing their end, we may hope to see the reports of their work given to the public; it is to be desired that a mass of valuable information, accumulated often at vast expense, should not be relegated to the limbo of a cobwebbed official pigeon-hole, but should be made generally available. It is scarcely to be expected that many of these reports will be as valuable as that lately issued by the Controller of the Department for the Development of Mineral Resources in the United Kingdom (Cd. 9184, price 6d. net), seeing that Sir Lionel Phillips was one of the rare exceptions amongst the small army of Controllers appointed by the Government, inasmuch as he had a thorough acquaintance with his subject before he assumed control; perhaps also that is why he did not hold his office for very long. It is characteristic of the attitude of the Ministry of Munitions towards a courageous and capable official under it, that the Minister takes special care to state that he accepts no responsibility for the opinions and conclusions contained in this report.

The report consists first of a summary of the conclusions arrived at by the Controller, and then of a part divided into two sections, dealing with statistics of production and the inferences to be drawn therefrom. For the numerous valuable tables contained in this report the original must necessarily be consulted, but some of the conclusions of Sir Lionel Phillips deserve both study and comment. He shows clearly that the native British production of non-ferrous metals falls far short of our requirements in normal times, as follows:—

		Production. Tons.		Consumption. Tons.
Lead	...	17,000	...	179,000
Tin...	...	5,139	...	21,000
Zinc	...	4,797	...	185,000
Copper	...	139	...	130,000

The tendency of the report is to show that no very great improvement in output is to be expected, except perhaps in a few isolated instances; it is shown that the output of non-ferrous metals has been falling off continuously for the last sixty years. The main causes assigned for this fact are the impoverishment or exhaustion of the deposits, and the increased costs of ore extraction and of pumping on one hand, and fall in value of metal on the other. Sir Lionel Phillips also lays stress