LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

Percussion Caps for Shooting in Schools.

THE extraordinary explosive power of fulminate of mercury is known to all chemists, but it is not generally known that the explosion of a percussion cap on a gun will cause a current of air sufficient to extinguish a candle at a distance of ten or fifteen feet. The distance, of course, varies with the length and bore of the gun, and with the nature and the size of the candle. The gun must be pointed at the lower part of the wick, and in order to blow out the candle the aim at this distance requires to be nearly as accurate as would be required to make a centre with a rifle at a hundred yards. In a speech to the Primrose League on May 9, Lord Salisbury mentioned the expediency of every man having the chance to learn to handle a rifle within reach of his own cottage. By beginning with percussion caps children might be taught to handle a gun at such an early age, that, in case of invasion of this country, boys of fourteen might be able to act as soldiers, as they are said to be doing amongst the Boers at the present time. The objections to training children to handle a rifle are, first of all, the danger of the child shooting either itself or some one else; and secondly, the expense. But the inclination of children to play soldiers might readily be utilised by teaching them to handle first of all a toy gun, and then to practice shooting at a candle with caps. For those who shoot best with caps, the practice with a saloon rifle might be held out as a reward. One single-barrelled old muzzle-loading gun would suffice for many children, and as 240 caps cost a shilling, the expense of providing a gun and material for practice would be very small. LAUDER BRUNTON.

Escape of Gases from Planetary Atmospheres.

IN NATURE of March 29 (p. 515), Dr. Stoney, in referring to a paper by the writer in the January number of the *Astrophysical Journal*, raises the question as to the correctness of the use of Maxwell's distribution of velocities in computing the escape of gases from the earth's atmosphere. He maintains that this distribution does not hold at its attenuated limits. In my paper I have not taken conditions which may exist there, but boundary conditions, which are much more favourable to the escape of the molecules of a gas, and certainly compatible with the kinetic theory, if we are to accept such a theory at all.

Of the four conditions discussed in my paper, I will only refer to the third, the data for which are based on direct observation, namely, $-66°$ C. at a height of 20 kilometres (the mean of several ascensions really giving $-65°$ C. to $-70°$ C. for a height of only 16 kilometres). The pressure is calculated from the usual exponential formula, which agrees closely with observations to this height. At these temperatures and pressures there can be no question as to the validity of the kinetic theory.

Let us assume now that the atmosphere abruptly terminates at this height, and at this temperature the loss would certainly be greater (in fact, very much greater) than under the actual conditions, where the temperature and pressure are much lower. It should also be noticed that in my tables I have assumed the atmosphere to be entirely made up of one gas—for example, helium or hydrogen. Even then only $26{\cdot}73 \times 10^{-23}$ c.c. of helium would escape in 10^7 years. Hence the assumption that helium is now escaping from our atmosphere is without foundation. In the case of a hydrogen atmosphere only 0·54 c.c. will escape in one year. If the total amount of air in the atmosphere be taken approximately at 10^{24} c.c., and if the actual density and temperature at the outer limits of the atmosphere be also considered, it will be evident how baseless the supposition is that either helium or hydrogen is escaping. It should be further noted that Maxwell's distribution of velocities from zero to infinity is the only one giving a sufficient velocity for any escape at all, Clausius' theory not being adequate.

It was the assumption that helium is escaping from the atmosphere—since it had not been detected—that first led me to verify it on the kinetic theory of Maxwell. The discovery, by Ramsay, of helium as a constituent of our atmosphere only tends to confirm the results of my calculations of the impossibility of its escape. S. R. COOK.

Physical Laboratory, University of Nebraska, April 26.

Racket Feathers.

YOUR able reviewer of Meyer and Wiglesworth's "Birds of Celebes" (NATURE, April 26), criticising the arguments used to account for the formation of the racket tail feathers of the parrot, *Prioniturus* (as an inherited effect of mechanical attrition on objects against which the tail is liable to be brushed—boughs, walls of nesting-hole, &c.), asks the pertinent question, why so few exposed feathers, such "as the external rectrices and remiges of all birds, and specially the lengthened feathers of wedge-shaped tails (*Dicrurus*) are neither bare nor racket-shaped nor incipiently so." The insignificant length of the outer rectrices of *Dicrurus* perhaps safeguards them; when these feathers are longer, as in the closely-allied *Bhringa* and *Dissemurus*, they *are* racket-shaped. As to the remiges and rectrices of birds generally, one feather overlies and to a great extent protects the next; but still, the outer webs *are* always very much narrowed in the outermost and most exposed feathers, less narrowed in the next, and so on till in the middle of the wing and tail (where they are well protected on both sides) they are not narrowed at all. But, while normal wing and tail feathers are exposed to attrition on one web only, long feathers standing well out from the rest are liable to have the web frayed on both sides of the shaft as far as they project beyond the other feathers, and to some extent where they rest upon the other feathers through friction against the latter. It is assumed that at some period earlier in the history of the race these elongated feathers were of the usual simple shape, but they are now known to issue from the follicles displaying peculiarities which are often much the same as those obtained by scraping an ordinary feather with a knife—namely, if the shaft is stiff and not very long, a small terminal spatule is formed (as in *Prioniturus*, *Parotia*); if the shaft is long and weak, a large spatule (as in *Tanysiptera*, *Loddigesia*). A difficulty, perhaps, to the acceptance of the theory is its apparent consequence—that epidermal (in a sense, dead) structures, like feathers, possess the power of transmitting mutilations to posterity. For my own part, I think that the modification of shape of the feathers is communicated to the sensitive tissues (much in the same way as the shape of a stick placed in the hand of a blind man is comprehended by him after touching other things with it), and that a corresponding physiological adjustment is made and gradually inherited. The result is probably not an exact recapitulation of the mutilation, but it sometimes appears to be very nearly so.

L. W. WIGLESWORTH.

Castlethorpe, Stony Stratford, April 30.

MR. WIGLESWORTH in the above note hardly does more than recapitulate the (?) arguments advanced in the "Birds of Celebes." He does not offer any explanation of the crucial difficulties indicated in the review; why "mechanical attrition on objects," or by the wind, is effective only in so few cases throughout the class *Aves* when so many species are subject to the necessary conditions; why, for instance, the species of *Palaeornis* (belonging to the same sub-family as *Prioniturus*), or those of the genus *Irissor*, do not conform to the "law"; and why one sex of a species may have "sabre wings," or spatulate ornaments in various situations, and the other sex not.

The question may also be asked *apropos* of Mr. Wigleworth's statement above, why in *Paradisea rubra* the *long* and *weak*-shafted tail feathers have the *small* spatule (which eventually vanishes) instead of a *large* one, if the knife-scraping analogy holds good?

The reasons for the *exceptions* to the author's rule is what chiefly demands an explanation, in the opinion of

THE REVIEWER.

THE APPROACHING TOTAL ECLIPSE OF THE SUN.

THE approaching total solar eclipse, on the 28th of the present month, promises to contribute some valuable additions to our scientific knowledge of the centre of our system, inasmuch that the track of the moon's shadow on the earth's surface passes, to an unusual extent, through regions which are easily accessible. Entering the North American continent near New Orleans, in Louisiana, the central line of eclipse traverses the States of Mississippi, Alabama, Georgia and Carolina,