

quently been expressed to me before in the same manner and in the like terse and elegant language, is now enforced by what he deems to be Prof. Carey Foster's judicial opinion, delivered at the Plymouth meeting; and I find myself, therefore, fully justified in my opinion that by his introduction of the word "intentionally" Prof. Carey Foster made his judgment legitimately bear a meaning, which, as he has stated, he would consider insulting to my character. And I cannot but believe that Prof. G. Carey Foster will regret having thus given a new handle to a man who obviously wishes to insult me on account of my antagonism to spiritualism. As the writer of the post-card continues to use Prof. G. C. Foster's authority, after that gentleman's explicit disavowal of the offensive meaning here attached to it, and as I may, of course, expect that he will continue to avail himself of that authority, I should like him to know through your columns that it is scarcely worth while for him to trouble himself to repeat these attacks, since they have long since ceased to do anything else than amuse me, and will only furnish me with materials for amusing other people.

It seems much to be regretted that neither spiritualism nor attendance at the meetings of the British Association, nor even the reading of NATURE seems able to teach this person to behave like a gentleman.

WILLIAM B. CARPENTER

October 29

Potential Energy

YOUR correspondent "X." has described some of his troubles respecting potential energy. Many a learner could describe similar troubles respecting force and energy in general. They who earnestly contend for definiteness and accuracy do not always teach with definiteness and accuracy. For example: in his "Treatise on Heat," p. 137, Dr. Tyndall tells me that by raising a weight from the floor I have conferred upon the weight potential energy. Presently he tells me that this energy is derived (not from me, but) from the pull of gravity. He next tells me that we might call the energy with which the weight descends, moving force, *i.e.* he teaches me to confuse force and energy; and after all this he bids me remember that "exactness is here essential. We must not now tolerate vagueness in our conceptions."

Take another example. In his lecture on "Force" (NATURE, vol. xiv. p. 462), Prof. Tait teaches that force is a mere name, and that it has no objective existence; he also teaches that the product of this non-existence by its displacement has an objective existence. Few learners would say that is a very lucid statement. Again, in the same lecture he says "there is no such thing as centrifugal force, and accelerating force is not a physical idea at all;" but in his "Nat. Phil." he speaks of both these forces, and describes their effects (Nos. 185, 187, 598, 248).

When teachers deservedly eminent make statements like the foregoing, so likely to mystify and confuse a novice, it is no wonder that there is a good deal of smattering in popular science.

Prof. Tait says "the so-called accelerating force is really no force at all, but another name for the kinematical quantity acceleration." I venture to entirely disagree with this statement, and

for the following reason:— $\frac{dv}{dt}$  is a number, and may be that

number of units of force, or that number of units of acceleration. When it is called accelerating force it is the representative of

$m \frac{dv}{dt}$  when  $m = 1$ , and  $m$  does not appear in the expression;

and it means  $\frac{dv}{dt}$  units of force. When it is called acceleration

it means  $\frac{dv}{dt}$  units of acceleration. Accelerating force is just as

real as moving force, for it is, in fact, the  $m$ th part of the moving force. In like manner  $v$  may mean either  $v$  units of velocity, or  $v$  units of momentum; in the latter case it is the representative of  $mv$ , when  $m = 1$ , and means the momentum of a unit of mass which has  $v$  units of velocity. In like manner  $m$  may mean either  $m$  units of mass, or  $m$  units of momentum, or  $m$  units of kinetic energy; in the two latter cases it is the representative of  $mv$  or of  $mv^2$  when  $v = 1$ , and means the momentum, or the *vis viva* of  $m$  units of mass moving with unit of velocity.

A few simple definitions would remove the difficulties respecting force. Thus: If a mass of  $m$  units of mass is at any

instant receiving an acceleration of  $a$  units of acceleration in any given direction, the force which is acting on it at the given instant in the given direction is  $ma$  units of force. The force acting on the mass in the direction of its motion is called the moving force. The force in the normal to the direction of its motion and towards the centre of curvature is called the centripetal force. An equal and opposite force is called the centrifugal force. The  $m$ th part of the moving force is called the accelerating force, which is the moving force acting on a unit of mass.

In the case of a planet's orbit it is too common to give the name centrifugal force to two forces which generally differ both in magnitude and in direction, one of them being in the direction of the normal, the other in the direction of the radius-vector. This is the last instance which I shall give of sins against definiteness and accuracy.

E. G.

Bardsea

Hartlaub's "Birds of Madagascar"

THE excellent review, exhibiting traces of a master's hand, of the above-named useful work, which appeared in NATURE (vol. xvi. p. 498) prompts me to offer some remarks on the ornithology of Madagascar and its neighbouring islands, and to take exception on two points therein laid down.

The first of these is propounded by your reviewer and seems to me absolutely contrary to fact. He says:—"Compared with Madagascar itself the appendent island groups are poor in species, although in every case there are many interesting forms among their winged inhabitants. The Comoro Islands muster only some forty-four species of birds, Mauritius about sixty, of which fifteen or sixteen have been introduced by man's agency, and Bourbon about the same number, while Rodriguez appears to have only about twenty-five species now existing in it, of which four or five are certainly recent introductions."

Now twenty years ago my friend, Mr. Sclater, in that remarkable paper of his on the geographical distribution of birds (*Journ. Linn. Soc. Zoology*, ii. p. 130), which so happily laid the true foundation for our present researches into the subject, showed that the proper mode of comparing the wealth or poverty of one fauna with another was to state the proportion which the number of species composing it bears to the area over which they range. The same view was adopted very shortly after by Mr. Wallace, who took occasion (*Ibis*, 1859, p. 449) to question certain of Mr. Sclater's results, and its correctness seems to have been since generally admitted. Yet, applying this test to Madagascar and its neighbouring islands, we find a state of things to exist very different from that which your reviewer has alleged. The area of Madagascar is said<sup>1</sup> to be 10,751 German square miles, that of the Comoros collectively 38'57, of Mauritius 34'76, of Bourbon 42'05, and of Rodriguez 5. It will be sufficient for my purpose to compare the first and last of these. Your reviewer is willing to allow twenty indigenous species to Rodriguez; then—

Area of Rodriguez.	:	Area of Madagascar.	:	Species in Rodriguez.	:	Species in Madagascar.
5	:	10,751	:	20	:	$x$
$x = \frac{10,751 \times 20}{5} = 43,004.$						

But instead of an avifauna of 43,004 species, or about four times the number known to exist throughout the whole world, Dr. Hartlaub gives it 218, and your reviewer generously adds two more, making 220! Suppose (an extravagant supposition) that future explorations enable us to double the last number, it is Madagascar that will still be out of all proportion "poor in species" compared with "the appendent island groups," and not these with Madagascar.

The next point to which I must demur is that "the individuality of the fauna of Madagascar is so unique that even that of New Zealand can hardly be compared with it." I will leave to fitter hands than mine to show that this is not the case generally, and shall only remark here that it is not so with birds. Of the sub-class *Ratitæ* there have been until lately five strongly-marked groups, each of which is equivalent to an "order" among the *Carinatae*. Now two of these groups were peculiar to New Zealand, and one (*Apterygidae*) is so now, while the other (containing the families *Dinornithidae* and *Palapterygidae*) is but recently extinct. Willingly granting that *Æpyornis*, when we

<sup>1</sup> Behm und Wagner, "Areal und Bevölkerung der Erde" (Petermann's Geogr. Mittheilungen, Ergänzungsheft, November 20, 1876).

know more about it, may prove to form a sixth group, the balance of "individuality," if I understand the meaning of the word, will still be on the side of New Zealand. Turning to the Carinate birds, *Harpagornis* stands alone, while *Cnemidornis* will certainly count for as much as the *Didida*. The extraordinary Mascarene Rails (*Miserythrus* and *Aphanapteryx*) are well represented by *Ocydromus*, which so much resembles them, and *Strigops* is undoubtedly a more abnormal form than, so far as we can judge, either *Lophopsittacus* or *Nicropsittacus*; just as *Nestor* is more aberrant than *Coracopsis*, and *Heterolocha* than either *Fregilupus* or *Nicropsar*. But there is no need to continue the list, and in conclusion I will only declare that I think far too highly of the fauna of Madagascar and of the Mascarene Islands to wish that its extraordinary peculiarities should be undervalued, though I do not want them to be unduly magnified at the expense of those of the fauna of New Zealand.

ALFRED NEWTON

Magdalene College, Cambridge, October 27

### Eucalyptus

HAVING read with great interest the article in your journal (vol. xvi. p. 443) on the *Eucalyptus* I take the liberty of sending you a pamphlet on the same subject, in which I have endeavoured to unite all the arguments likely to persuade and convince the Italians of the immense utility of the above-named tree, the cultivation of which would be of the greatest importance for the *Agro Romano*.

As is well remarked in the article in NATURE, the *Eucalyptus* is extensively cultivated in France, Spain, and Portugal. But in Italy, where it prospers almost all over the country and might be cultivated with facility, in spite of the most earnest efforts on my part during my residence here for the last ten years, in spite of its being recommended in Parliament by one of the most influential members, it has not been adopted.

In my gardens on the Lake Maggiore, I cultivate forty different varieties of the *Eucalyptus*. Of these the *amygdalina* and the *globulus* have attained, in eight years, the height of 17 metres. It is to be remembered that the temperature has sometimes been as low as 7° C. below zero without injury to these plants.

If you consider it probable that these few words could be of interest to your readers I willingly authorise you to publish them in your estimable journal.

PRINCE PIERRE TROUBITZKOY  
Villa Troubitzkoy, near Intra, Lago Maggiore, October 15

THESE trees are now attracting so much attention that even the small amount of experience I may be able to offer may not be unacceptable to your readers. Considerable stress is laid upon their influence in dissipating malaria; but I have not found this to be the case in Queensland, one of the head-quarters of the tree. I have personally suffered from malaria in the very heart of a forest extending for many miles in every direction, and composed mainly of all the varieties of *Eucalyptus*, and not by any means remarkable for the extent of swampy ground, and have known many instances of febrile attacks among shepherds and stockmen in the locality. Moreover I was told on inquiry that these attacks were not confined to any particular year, but that every year some cases might be expected. I was greatly surprised at reading in your "Notes" (NATURE, vol. xvi. p. 557) that the mosquitoes had disappeared with the introduction of the "gum" trees into Algeria. This would not be the experience of any one who has lived in Australia, I believe. I have found these pests so intolerable on high land, where almost the only tree to be found was one variety or other of *Eucalyptus*, and sometimes all, that sleep was impossible while camping out at night, and life a burden in the day by reason of these pests. The gums emit a most decided odour, especially in strong sunlight. When riding across the great Queensland plains and approaching wooded spurs I have (*Scottée*) "felt" the characteristic smell of the gums at a considerable distance. These plains—ten miles in breadth—are not crossed in a short time, and the resinous odour of the gums, omnipresent in the forest and scarcely noticed there, strikes one forcibly when approaching the trees after the olfactory organs have been for some time deprived of it. Whether this odour has any effect or whether it is the preservative against malaria, I do not know. The growth of these trees in South America is very rapid. When in the Banda Oriental some years ago I examined a plantation of red and blue gums, then eight years old. The trees were at

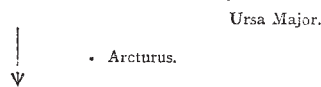
least forty feet high, and many of them measured thirty-six inches in circumference at three feet from the ground. They had a profusion of foliage such as I have never seen on the same trees in Australia. This was right out on "pampa" land, in deep alluvial soil. These trees had fought their way up, in spite of the black ants so destructive to foliage—the owner told me that they had at first stripped the young trees—and the tremendous gales which sweep over this open country. Those to the westward and south-westward of the plantation were far inferior in size to those on the east and north. This was the only grove of *Eucalypti* in the Banda, and it demonstrates the possibility of covering the naked pampas to any extent with forest. English settlers in the River Plate countries should note this fact, and I am sure the enlightened owner of the Estancia "Sherenden" would supply any of his countrymen with seed.

ARTHUR NICOLS

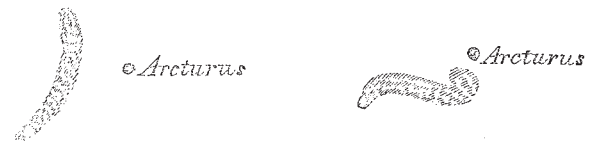
### Meteor of October 19, 6.15 P.M.

THE large meteor described by two correspondents (NATURE, vol. xvi. p. 551) was observed also by several persons in this district, but most of the accounts are so meagre and doubtful as to possess little scientific value. The meteor appears, however, to have been well seen by Mr. W. Watkins Old, of The Parade, Monmouth, and his notes are so interesting that I beg to transcribe them. He says:—

"The meteor fell at 6.15 exactly. It appeared to me to descend perpendicularly some degrees from and to the west of Arcturus (which was shining brightly), and it disappeared behind a bank of dark cloud above the horizon at a point in a line projected beyond Arcturus, half the distance between that star and the last of those in the tail of Ursa Major, as roughly shown in the diagram below:—



Thus it remained stationary, like a dazzling white wand, while I counted twenty, during which time I could perceive the vapour, of which the trail was composed, as it were in ebullition. It then gradually curved towards the north as depicted in the following sketch; and drifted slowly away during eight minutes,



until it lay almost horizontal though still brightly illuminated, while the clouds gradually rose and covered it from my view. Altogether I observed it over eight minutes by my watch. There was much twilight in the west and the moon was shining brightly from which one may judge the extreme brilliancy of the meteor. I should add that when it appeared there was simultaneously a sensible rent or flip, like one sometimes hears with a sharp flash of lightning, and which may possibly be due to the appulse of light, as it could scarcely be the sound of explosion if there was any. It was too simultaneous to be the report of the descent of the meteor through the air, but it was sufficiently loud to be pronounced and caused some people standing near me, with their backs to the west, to inquire what it was, though they evidently saw nothing of the meteor nor even turned towards its direction. I listened but heard no further sound."

Ashleydown, Bristol, October 26

W. F. DENNING.

### Curious Phenomenon during the Late Gale

YOUR correspondent, "G. A. M." (vol. xvi. p. 551), may be interested to know that the "ball of fire" he saw descend on the evening of the 14th inst. was seen here by me, and by those who accompanied me, at precisely the same time (6.50 P.M.) that he mentions. We were walking in a south-easterly direction, and it seemed to fall from about half-way between that point of the compass and the moon, which was due south of us, and shining brightly. The ball itself appeared to us luminous white, while the "wake" left in its passage through the air, was bluish green. It was visible, I should say, for twenty seconds.