

liquid. The temperature of the German *bottom* fermentation varies from 5°5 C. to 7° C., a temperature that can only be maintained by the employment of large quantities of ice.

The *bottom* and *top* yeasts are probably distinct species. M. Pasteur, however, seems to be in error in stating (p. 190) that the *bottom* yeast may be distinguished by being less spherical than *top* yeast. It is true that in London and Edinburgh yeast the cells will be found usually round; hard water, however, such as that at Burton, or artificially made so, yields yeast in which the cells are distinctly ovoid in appearance, resembling very closely Bavarian *bottom* yeast. M. Pasteur further states (pp. 188 and 192) that the *bottom* yeast yields a beer of finer flavour, and hence argues the replacement of ales produced by *top* fermentation by those made on the Bavarian system. Here surely he must be thinking rather of the inferior products of the surface fermentation in France and Germany than of those of England and Scotland. His assertions (pp. 12-17) that by *bottom* fermentation store beers can be produced, whereas those produced by *top* fermentation must be consumed at once and cannot be transported are certainly strange to an Englishman.

So far from these unfavourable comparisons being true in all cases, the exact opposite is generally the case. Bavarian and other *bottom* fermentation beers are in fact those which can neither be preserved nor transported without the liberal employment of ice; even that sent from Vienna to London must be kept cold artificially in order to avoid rapid destruction. As regards flavour, there are many who think a glass of Burton pale ale or of good old college rent ale to be superior to any Bavarian beer. The chief cause of the decline in the production of *top* fermentation beers on the Continent has been the want of attention in the fermentation process, whereas the English brewer, especially the brewer of high-class ales, has been unremitting in his attention to the temperature in fermentation and to the perfect cleansing of the ale. Now where such attention is given it is not difficult to obtain ales which will keep a few years. While objecting to our English produce being so hastily depreciated by M. Pasteur, our brewers will be the first to avail themselves of his biological researches in order to render their produce more stable and better flavoured, without having recourse to the general adoption of the vastly more costly system of *bottom* fermentation.

Let us now leave this question of the respective value and future development of the two systems of fermentation, and assume that by either the one process or the other we have obtained our glass of beer. The question now naturally presents itself to us, as to others before us, to what is fermentation due? Pasteur's answer to this I propose to discuss next week.

CHARLES GRAHAM

#### OUR BOOK SHELF

*Manual of the Vertebrates of the Northern United States.*  
By David S. Jordan, M.D. (Chicago: Jansen, McClurg, and Co., 1876.)

THIS useful work contains a short diagnostic account of the whole of the vertebrated animals of the Northern United States, and has been written, as the author tells

us, to give collectors and students who are not specialists a ready means of identifying the families, genera, and species described. The mammals as well as the birds of North America have been so ably and elaborately treated of by Prof. Baird, Dr. Coues, and others, that those who are studying these branches of zoology will not find this smaller volume of special service, nevertheless we are not acquainted with any work having a range of treatment which includes the reptilia, amphibia, and fishes with the two other classes. The sub-kingdom, as well as each class and order, are concisely defined, and the most modern arrangement is adopted, based upon the best authorities, the relative importance of the characterising features being clearly brought forward. The system of employing artificial keys so useful in botanical determinations, and so successfully employed by Dr. Coues in ornithology, is employed throughout the book, and will, no doubt, be found to work well. A glossary of the principal technical terms used in the body of the book is also appended. As an example of the manner in which the different species are described, we will take that of one of the species of Fly-catchers: "*Empidonax acadicus* (Gm.), Baird. SMALL GREEN-CRESTED FLY-CATCHER.—Clear olive-green; wing bands buffy; whitish becoming yellowish below; yellowish ring about eyes; bill pale below; primaries nearly an inch longer than secondaries; second, third, and fourth primaries nearly equal, and much longer than first and fifth; first much longer than sixth; L. 6; W. 3; T.  $2\frac{1}{4}$ ; Ts.  $\frac{3}{8}$ ; Tcl.  $\frac{1}{2}$ ; E.U.S. frequent." To naturalists on this side the Atlantic the work will be found a valuable one of reference on account of its inclusiveness, and a glance through it makes us feel how useful a similar one on the British vertebrate fauna would prove to students and collectors.

*The Emigrant and Sportsman in Canada.* By John J. Rowan. (London: Stanford, 1876.)

THIS is a capital book in many respects. Mr. Rowan is himself an old Canadian settler and knows the country well in various aspects. He tells the plain truth as to the suitability of Canada as a field for emigration, and the intending emigrant could not get a better guide as to the resources of the country, and the kind of settlers for which it is adapted. Mr. Rowan is a keen sportsman and has a fair knowledge of zoology. His descriptions of hunting life in Canada are thoroughly interesting and abound with fresh information on the many animals which are still to be found there. Mr. Rowan is a good observer, and some of the information which he gives regarding the animals with whose habits he is familiar may be new even to naturalists. He describes, at considerable length, especially, the habits of the beaver as observed by himself, and adduces some facts to show that previous popular statements with regard to this animal must be to some extent modified. The volume will be found of interest not only to the emigrant, the sportsman, and the naturalist, but to all who love good hunting and trapping stories well told. Its principal defect is the want of an index.

#### 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. No notice is taken of anonymous communications.]

##### On a Mode of Investigating Storms and Cyclones

I SCARCELY know anything more interesting in connection with the investigation of cyclones and of our storms than the theoretical investigations of Reye, Mohn and Guldberg, and the practical ones of Mr. Clement Ley. Mr. Ley's papers in the *Journal of the Scottish Meteorological Society*, iv. 66, 149, 330, have especially attracted my attention. We have to study the

form of the craters, as I might call them, of the barometric depressions, and their steepness in different directions.

The following note has some connection with this inquiry, and I beg you, if you think it suitable, to give it a place in your esteemed journal:—

In 1874 I proposed to lay, as well as it can be done, a plane or planes, having such a slope as would represent the barometric height at some two distant places, and to indicate (in geodetic terms) the fall and strike, or the inclination on the horizon and the azimuth of the projection of the perpendicular on such a plane, and I still recommend it. In the Netherlands, where my area is small (see Jour. Scot. Met. Soc., iv. 25) it is always easy to find such a plane, and of course its perpendicular. Now I have inquired whether the projection of that perpendicular moved round the horizon generally in a direct way (with the sun) in the same manner as M. Dove has found that the direction of the wind does, and which I demonstrated in *Pogg. Ann.*, lxviii. 417, 553, to be the case thirteen times per annum in our latitude.

On examination I find that in 1874 and 1875 the projection has gone round the horizon in a direct way ten times more than the opposite way; further, that it often goes back when the direction of the projection lies to the south-east, but that when it has veered to be to the north-west it veers forward surely and quickly enough in a direct way to the east, which is in accordance with the fact that when we have a depression over Ireland or Scotland it then moves in the direction of Norway and Finland. I don't think it superfluous to call the attention of others to this research, and I propose to calculate the results for other years in this respect, which is easily done by means of the Netherlands' *Annales*, and thus find thrice a day the direction and size of the steepest gradient.

Utrecht, December 23, 1876

BUYS BALLOT

#### Mind and Matter

THE problem, "How consciousness stands related to the material organism," has been attempted to be solved by Mr. Duncan, under the head of "Mind and Matter" (*NATURE*, vol. xv., p. 78). Now that a more exact scientific examination has reconciled so many differences on this question, a return to the old *à priori* method of mere logic is still perfectly legitimate, provided the logic is sound.

Admitting that consciousness is *related* to matter, and without contending, for the present, that it may not be a *state* of matter (under certain restrictions of the term), I will content myself with pointing out what seem to be fallacies in this "solution." "It is as easy," says Mr. Duncan, "to predicate subjectivity (susceptibility to consciousness) of one entity called matter as of another entity called soul or spirit. It is no more difficult to conceive of matter being subjective than of spirit being subjective." Let us see if this is or is not *petitio principii*. It was the difficulty, real or apparent, of ascribing certain attributes (mental) to matter, that demanded the supposition of some support other than material. So that when we say that spirit is alone susceptible to consciousness, we merely express that matter is not thus susceptible. Therefore, to affirm that the one may be as susceptible to consciousness as the other is to assume, *in limine*, that matter may be susceptible to consciousness, the very probability which has to be established.

Mr. Duncan next asserts that "How energy is related to matter in all its forms, is no less mysterious than how subjectivity may be a property of matter." Now every opponent of materialism admits that how energy is *related* to matter is a mystery, and avows that he cannot conceive of consciousness as a *property* of matter; but the difficulty of understanding the *how*, even if we grant it equal in both cases, cannot establish any parity of probability as to the facts; for while we know as a fact that energy is *related* to matter, we do not know as a fact that subjectivity (susceptibility to consciousness) is a *property* of matter. And even if we put the argument more exactly, and affirm that we know that subjectivity, like energy, is *related* to matter, still nothing in point is gained, seeing that while we know *all* matter in relation to energy, it is only a certain form of matter (the human) which we *know* to be related to subjectivity; for if we surmise this of a dog, we cannot *know* it till he tell us.

The next position, "Energy may be divided. Why not subjectivity?" would seem to demand nothing less than absolute proof, since subjectivity, or the state of the Ego, appears indivisible in virtue of its essential unity. Yet no support is advanced except the foregoing assertion, which we have seen is a mere assumption on the side of materialism, and which we shall next

see contains an admission all but fatal to the cause it advocates. When Mr. Duncan says, "How energy is related to matter is no less mysterious than how subjectivity may be a property of matter," he admits that we cannot understand either, while he believes the first because it is a fact. But why should we believe the last? Because we cannot understand it, and because it is not a fact? Will he admit that we have advanced any proof of an oyster being an astronomer, when we have affirmed that this would be no more mysterious than the relation of energy to matter? Yet his three remaining arguments go on this ground: they assume that the probability of subjectivity being a property of matter equals the fact of energy being related to matter.

Rugby

J. L. TUPPER

#### Solar Physics at the Present Time

AT the conclusion of his letter of the 1st inst. (*NATURE*, vol. xv. p. 196), Sir G. B. Airy alludes to a paper of mine as being cited by me (in my last letter to *NATURE*) as being "in the 'Philosophical Transactions.'"

The paper referred to *ought*, with little doubt, to have appeared there, but it did not, and I was most careful to avoid implying that it had; my words being with regard to it (see your pages 157 and 158):—

1st, "which I had the honour of communicating to the Royal Society of London *six* years ago;" and

2nd, "that paper of six years ago, and still in the hands of the Royal Society;"

nor is there any mention of the "Philosophical Transactions" throughout.

PIAZZI SMYTH,

Edinburgh, January 5

Astronomer Royal for Scotland

#### Towering of Birds

SNIPES frequently tower—also pigeons. I saw a mallard that flew nearly half a mile, towered, and, fell dead. Teal also tower, but their towering is different to the ordinary, as they are as often alive as dead when they fall. I have also remarked this in widgeons, and once in a partridge. In the latter case birds fell right and left, the second a towerer. It was in heavy turnips that had been planted when mangel had missed. The towerer fell on an isolated mangel; when picked up, he was at least ten yards from the mangel and still alive. Some years ago there was a discussion on this subject in *Land and Water* or the *Field*, and I think it was shown it was due to pulmonary hæmorrhage. At least I was quite aware of the cause, and that head or spine injuries had nothing to do with it.

Ovoca, Ireland

G. H. KINAHAN

#### Rooks Building at Christmas

ON Christmas morning I saw a few rooks engaged in building in a clump of elms near my house. Four nests are now in progress, though the gale of December 30 made the rooks desist from their work. During the ten years (about) that I have watched their proceedings, I think I have never seen these birds begin building till February.

I may add that our well-watered lands and woods are being visited with wild duck, teal, peewits, and gulls in great numbers.

Valentines, Ilford, Essex

C. M. INGLEBY

#### Are We Drying Up?

THE above question has been asked in the columns of *NATURE*. As a small contribution towards an answer, it may be stated that at this place the two last years, 1875 and 1876, have been the two wettest in a series of twenty-four years.

In 1875, the rainfall was 44.05 inches.

In 1876 " " " 42.42 " "

The average of twenty-four years has been 33.11 inches.

Clifton, January 7

GEORGE F. BURDER

#### Radiant Points of Shooting Stars

IN December, from observations of 163 shooting stars seen in 20½ hours' watching, chiefly in the evenings, I amply confirmed several of the positions of radiant points as given in my note (*NATURE*, vol. xv., p. 158), and observed that several of the showers there mentioned were actively continued. The centres, as I gave them, of two of these require revision, as the additional meteors seen in December indicate the radiants with