current number of the *Fortnightly*, I should desire, with your kind permission, to find in your columns the opportunity of saying without delay the single word which still seems necessary between Dr. Stirling and myself.

Dr. Stirling now holds that the real question between him and me is whether or not Hegel "attempted" to produce "a Hegelian Calculus." And so it seems to him a virtual concession of the entire case when I say that the phrase "Hegelian Calculus" is used by me in irony. Dr. Stirling, I fear, misunderstands me. What Hegel has given us on the subject of the Calculus is, strictly speaking, nonsense. But, as I have shown, this nonsense is not mere metaphysic, but involves mathematical absurdity. It is of course only in irony that one can dignify the paradoxes of mathematical ignorance with the title of a Calculus; and if this admission satisfies Dr. Stirling, then our controversy is at an end. W. ROBERTSON SMITH

Aberdeen, April 3

Meteorology of the Future

I WISH to call the attention of the writer of the article "The Meteorology of the Future," which appeared in NATURE of December 12, 1872, to a little work which appears to have entirely escaped his notice.

In the beginning of 1871 I circulated a small book of twenty-four pages, containing results deduced from the observations made at this Observatory, 1841 to 1870. I have given the decimal and annual variations of all the meteorological elements collected, and have pointed out their mutual interdependence. I have also given on an enlarged scale the curves of variations of annual mean temperature and freedom of the sun's disc from spots, which appeared in the Proceedings of the Royal Society, March 23, 1871.

No one acquainted with the subject would, I presume, believe that periodical variations could exist in the temperature without existing also in the other meteorological elements; vapour as measured by tension, hence barometer humidity and rainfall.

In the introduction to the work referred to, it is stated with regard to the curve of temperature and inverse curve of solar spots:—"There is an agreement between the curves which will probably be regarded as too close to be the result of accident, and which renders it probable that the two phenomena, represented by the curves, result from the action of a common cause connected with changes of mean solar energy." And this established with more or less probability, I proceeded to point out (p. 17)—"That the variations of temperature are borne out by those of tension of vapour," and on page 22—"That the correspondence between humidity and rainfall is strongly marked," and also that—"The correspondence between a curve swept to represent the variations in rainfall and the inverse curve of the variations in mean temperature is of a marked character."

You will perceive, therefore, that the connection between solar spots as an indication of less solar heating power and vapour, and rain, as well as temperature, was in the book referred to explicitly pointed out. I may add to this note, that the rainfall for

1871 was 20·098 inches
1872 was 29·325 inches.

E. J. STONE

Royal Observatory, Cape of Good Hope

Bright Meteor

I HAVE this evening, at 7.40, seen the brightest meteor I have ever beheld: starting from a point about half-way between Cassiopæa and the Pole star, it descended through about 20° of arc, when it was lost sight of behind a cloud: this cloud was a thick white opaque cloud shining brightly in the moonlight, but the meteor behind it illuminated the sky, and made the cloud appear for the moment dark against it.

The colour of the meteor was a decided green; its passage was not very rapid; it appeared far brighter than any star or planet, and seemed to have a short tail. Not only was it a gloriously beautiful object in itself, but it illuminated all the sky in its neighbourhood with its greenish light.

EDMUND H. VERNEY, Commander R.N.

H.M.S. *Growler*, off Cape Matapan, March 5

The Great Meteoric Shower of November 27, 1872

THIS interesting display was also observed in the neighbourhood of the small town of Santa Lucia in Venezuela (10° 12′ N., 68° 57′ W. from Paris), by Dr. A. Alamo. The first meteors were seen at half-past 7, about 100 in 30 minutes. Most of them followed an easterly course, some leaving a luminous track visible for several minutes. From 8 to 12 o'clock their number was too large for counting, but after midnight the weather got misty, and few meteors could be distinguished. The shower, however, continued, and still in the morning some meteors were traceable. Unfortunately Dr. Alamo cannot say anything about the radiant point of the shower. At Carácas the sky was densely overcast, and not even a glimpse of the spectacle could be obtained. DR. A. ERNST

Carácas, Feb. 21

The Antiquity of Man

THE letter of Sir John Lubbock in your issue of March 27, induces me to call attention to what seems to me to be an anomaly in the state of our evidence concerning fossil man. Sir J. Lubbock has insisted, and with much reason, on the parallelism between the condition of existing savage races and that of fossil man; but, I would ask, is there any existing savage race capable of delineating animals in the masterly way in which the elephant is delineated on the plate of bone figured at page 326 of NATURE (February 27, 1873)? Such a life-like representation as is here produced by a few rough scratches would not discredit a modern artist. Unless I am under a misapprehension, the best figures that living savages can produce are but uncouth things, in which case either the parallelism between the intelligence of existing savage races and of fossil man fails in one important particular, or else a suspicion arises as to the contemporaneity of these engraved bones with palæolithic man; and a doubt is thrown on the supposed antiquity of the Troglodytes to whose hands this engraving is ascribed.

We should, I think, until this discrepancy is explained, look with still greater suspicion upon the contemporaneity of engraved representations of animals with so early a form as Miocene man, or accept them as any evidence of his existence at that epoch.

While suggesting the above caution, I would not, however, be understood to dissent from the probability of some form of man having existed as far back as the Miocene period, since, eleven years ago, I observed in the *Phil. Mag.* (for April, 1862, last paragraph but one of the paper) that the views there discussed "seemed to me to lead us to the presumption of a far greater antiquity for our race than had hitherto been accorded to it, reaching perhaps far back into the Tertiary period."

Brentwood, Essex SEARLES V. WOOD, JUN.

Skeletons at Mentone

A VERY accomplished geologist, a friend of mine, is now staying at Mentone, for the benefit of his health, and he writes to me under the date of the 25th ult. as follows:

"Another skeleton has just been found here in one of the caverns. It is far less perfect than the former one. The head is crushed and partly wanting, and a considerable portion of the vertebral column is absent. The limbs, however, indicate a person of larger size than the first skeleton. On the arms are bracelets of shells, which are bored for stringing. The parts found are lying in their natural position. With the skeleton are traces of what looks like very fine iron ore. Of this substance there is but a very small quantity, perhaps two or three tablespoonfuls."

With regard to the iron ore, there have been many conjectures, and it is extremely remarkable that about the same quantity of a similar substance was found with the first skeleton. The more general opinion seems to be, that this material was employed in some burial rite. W. T.

Torquay, April 1

[From a cutting from *Les Echos de Cannes* sent us by W. T., we learn further that the head was covered by a network of shells, and that beside the skeleton were found many implements of bone, and even drawings of fish and swans.—ED.]

Instinct

Perception in Ants

THE following fact with respect to the habits of ants, which I believe to be quite new, has been sent to me by a distinguished geologist, Mr. J. D. Hague; and it appears well worth publishing. CHARLES DARWIN

On the mantelshelf of our sitting-room my wife has the habit of keeping fresh flowers. A vase stands at each end, and near the middle a small tumbler, usually filled with violets.

Sometime ago I noticed a file of very small red ants on the wall above the left-hand vase, passing upward and downward between the mantelshelf and a small hole near the ceiling, at a point where a picture-nail had been driven. The ants, when first observed, were not very numerous, but gradually increased in number, until on some days the little creatures formed an almost unbroken procession, issuing from the hole at the nail, descending the wall, climbing the vase directly below the nail, satisfying their desire for water or perfume, and then returning. The other vase and tumbler were not visited at that time.

As I was just then recovering from a long illness it happened that I was confined to the house, and spent my days in the room where the operations of these insects attracted my attention.

Their presence caused me some annoyance, but I knew of no effective means of getting rid of them. For several days in succession I frequently brushed the ants in great numbers from the wall down to the floor; but as they were not killed the result was that they soon formed a colony in the wall at the base of the mantel, ascending thence to the shelf, so that before long the vase was attacked from above and below.

One day I observed a number of ants, perhaps thirty or forty, on the shelf at the foot of the vase. Thinking to kill them I struck them lightly with the end of my finger, killing some and disabling the rest. The effect of this was immediate and unexpected. As soon as those ants that were approaching arrived near to where their fellows lay dead and suffering, they turned and fled with all possible haste. In half an hour the wall above the mantelshelf was cleared of ants.

During the space of an hour or two the colony from below continued to ascend, until reaching the lower beveled edge of the shelf, at which point the more timid individuals, although unable to see the vase, somehow became aware of trouble and turned about without further investigation; while the more daring advanced hesitatingly just to the upper edge of the shelf, where, extending their antennæ and stretching their necks, they seemed to peep cautiously over the edge until beholding their suffering companions, when they too turned and followed the others, expressing by their behaviour great excitement and terror. An hour or two later the path or trail leading from the lower colony to the vase was almost entirely free from ants.

I killed one or two ants on their path, striking them with my finger, but leaving no visible trace. The effect of this was that as soon as an ant ascending towards the shelf, reached the spot where one had been killed, it gave signs immediately of great disturbance, and returned directly at the highest speed possible.

A curious and invariable feature of their behaviour was that when such an ant, returning in fright, met another approaching, the two would always communicate, but each would pursue its own way; the second ant continuing its journey to the spot where the first had turned about and then following that example.

For several days after this there were no ants visible on the wall, either above or below the shelf. Then a few ants from the lower colony began to re-appear, but instead of visiting the vase which had been the scene of the disaster, they avoided it altogether, and following the lower front edge of the shelf to the tumbler standing near the middle, made their attack upon that. I repeated the same experiment here with precisely the same result. Killing or maiming a few of the ants and leaving their bodies about the base of the tumbler, the others on approaching, and even before arriving at the upper surface of the shelf where their mutilated companions were visible, gave signs of intense emotion, some running away immediately and others advancing to where they could survey the field, and then hastening away precipitately.

Occasionally an ant would advance towards the tumbler until it found itself among the dead and dying, then it seemed to lose all self-possession, running hither and thither, making wide circuits about the scene of the trouble, stopping at times and elevating the antennæ with a movement suggestive of wringing them in despair, and finally taking flight.

After this another interval of several days passed during which no ants appeared. Now, three months later, the lower colony has been entirely abandoned. Occasionally however, especially when fresh and fragrant violets have been placed on the shelf, a few "prospectors" descend from the upper nail hole, rarely, almost never, approaching the vase from which they were first driven away, but seeking to satisfy their desire at the tumbler. To turn back these stragglers and keep them out of sight for a number of days, sometimes for a fortnight, it is sufficient to kill one or two ants on the trail which they follow descending the wall. This I have recently done as high up as I can reach—three or four feet above the mantel. The moment this spot is reached an ant turns abruptly and makes for home; and in a little while there is not an ant visible on the wall.

JAMES D. HAGUE

San Francisco, California, Feb. 26, 1873

Perception in Butterflies

THE interesting discussion on this subject in your columns has hitherto been almost entirely confined to facts of extraordinary "perception" with mammalia. But in other classes of the animal kingdom there occur instances perhaps even more astonishing still, showing a power of perception which we needs must attribute to smell, unless we are inclined to talk about natural forces hitherto unknown, to which I should prefer saying that we do not yet understand the matter at all.

In the valuable monthly, "Der Zoologische Garten," v. X. (1869) p. 254, there is a paper on the sense of smell in butterflies, recording, among other cases, the following one.

A well-known collector, the late M. Riese of Frankfort, bred a crippled female of *Lasiocampa pruni*, a species very rare here. M. Riese dwelt in a narrow and densely-peopled lane near the centre of this city. He put the said moth before the window with his other boxes, and soon had the pleasure to find it surrounded by some males, which became the collector's welcome prey. Here, as the writer fitly remarks, the performance of the male in finding out the female was the more surprising, by the latter being confined in the middle of the town as well as by the rarity of the species in general.

If, as the writer adds, there can be any doubt of the males being guided in these cases by smell, what is more to be wondered at, the acuteness of the males (supposed to be located in the large comb-shaped antennæ) or the enormous divisibility of the odour emitted by the females?

I may add that similar and even more striking cases (the females being confined within a room, and the males appearing outside at the windows) have been recorded by that most reliable observer, the late Dr. von Heyden.

Though I am not prepared to follow the whole length of Mr. Darwin's ideas on "Pangenesis," yet I cannot avoid observing how much such facts as these seem to support the fundamental assumption of that "provisional hypothesis," namely that organised matter is capable of a degree of divisibility scarcely conceivable by us, yet retaining in those most minute particles, infinitely smaller than any which can be revealed by our microscopes, all its specific distinctness,—the "gemmulæ" issuing from the female of a particular species reaching and affecting the distant male, and thereby testing their particular, specific nature.

J. D. WETTERHAN

Frankfort-on-the-Maine, April 5

Perception in Fowls

SEEING in NATURE many letters on the instinct of animals I am tempted to send you an incident which fell under my notice and which would seem to denote in domestic fowls a greater amount of reasoning power and of intercommunication than the lower animals are usually credited with.

Three years ago I was staying at a house in Ireland where a good deal of poultry was kept, and a young white duck just feathered being the only one left of a brood was allowed to roost with a hen and a young brood of chickens under the furnace in the back kitchen, to keep it from the rats which infested the out-houses. One evening our attention was called by the servants to a great commotion between the hen and the duck, which had always before been excellent friends, and upon close examination it was discovered that the duck was not the hen's usual companion, but although closely resembling it in age and colour, was a perfect stranger, not even belonging to the premises at all, whilst the proper duck was found quietly resting with the other ducks in the duck-house. The intruder having been ejected, and the ordinary bed-fellow restored to the hen, peace again reigned between the feathered companions; but the singular part of the affair is, how the duck could have