point for four right angles, *i.e.*, that they have our notion, but misapply it; then it follows that they have our conclusion, that the angles of a triangle together equal two right angles; and their misapplying does not avail anything, seeing that the geometrical conclusion (the universality of which is here disputed) does not propose to deal with facts, but with suppositions only. The supposed rectilinear figures of these beings are (though wanting all physical counterparts) the very figures of Euclid.

Now, first, the fallacy lies in what the late Professor John Grote called the "pseudo-psychology," the confusion of thought and thing, of the psychical and the physical. For the question is here of geometry, the science which regards (say) all the supposed or postulated rectilinear angles about a point as equal to four right angles : the question is not of the physical science which discovers "more or less" exactly what angular or other qualities may belong to any physical object; and so true is this, that geometry is not conversant with right and left hand, nor with above and below. And, secondly, the fallacy is concealed by an ambiguous use of terms in the statement, "with them, the angles of a triangle would always, more or less, exceed two right angles." The "with them" may mean with them in imagination, or with them in fact; and, but for this ambiguity, the fallacy must have exposed itself; for, first, it is obvious that two angles which they imagined right ones would, in their imagination, equal, and not be "exceeded by," the angles of a triangle they imagined rectilinear; we could not have said otherwise than this, with the case clearly stated. And, secondly, we could never have said (distinctly) that the physical fact being one way or another, could affect the universality of a geometrical position which does not affirm anything of physical facts; but we should have perceived that we were only combating a statement that the angles of a physical triangle supposed to be, though not really, rectilinear, are together really equal to two right angles; a statement obviously not true, and as obviously not geometrical.

In mathematical argument, anything I should bring in aid of Prof. Jevons's able comments would be equally presumptuous and useless; and it is only because I feel that his reasonings are not quite so unassailable on the psychological side that I venture any additional evidence. Prof. Jevons asks (I think needlessly), "Could the dwellers in a spherical world appreciate the truth of the 32nd proposition of Euclid's first book? I feel sure that, if in possession of human powers of intellect, they could. In large angles the proposition would altogether fail to be verified; but they could hardly help perceiving that, as smaller and smaller angles were examined, the spherical excess of the angles decreased, so that the nature of a rectilineal triangle would present itself to them under the form of a limit." Now the terms "spherical excess" here mean the quantum by which all the angles of their triangle would, to the knowledge of these beings, exceed two *bonâ fide* right angles. They therefore know already (by Prof. Jevons's supposition) what a rectilinear angle is, and, thence, what a rectilinear triangle is with all its geometrical properties (as above shown), for it is admitted that we require no objective experience beyond that of a rectilinear angle in order to deduce said properties, and these beings, having our intellectual powers and our data, can deduce the same. I would only suggest here that, after this, to suppose any experimental evidence necessary to "verify" the proposition is very much like conceding the hypothesis that geometrical conclusions are not independent of experience.

Another point not directly met by Prof. Jevons is ingenious, but amounts to the assertion that, if we could not actually *draw* a straight line, we should not be able to define it as "the shortest distance between two points;" for these imagined beings, who cannot possess a physical straight line, will have "an infinite number of shortest lines between any two diametrically opposite points in their sphere." An argument, interesting only so far as it illustrates to what lengths of ingenuity a sophism may be carried; for have we not to prove that our geometrical conception or definition depends upon our physical experience, and are we not here advancing for proof, that beings without this experience cannot have the geometrical conception, and that they cannot have it because—we cannot have it? If anything could convince us of the inherent impotence of these *experimental hypotheses*, it should be this inevitable appearance of the "circle" just when proof is called for. And again, "shortest distance" here has two senses. First it means the shortest path available to the imagined beings, and then (in order to invalidate the definition of a straight line) it means the shortest path conceivable.

In this case it appears then (as I proposed to show) that, while the geometrical certainties have been questioned, the logical code has been violated, and all logical certainty confounded by an ambiguous use of terms. I have here attempted no demonstration of the opposite theory; but I think if the eminent supporters of the hypothesis just examined would be content to affirm roundly that all our notions, conclusions, and beliefs are mere resultants of intellectual action *plus* given experience, and to forbear any hypothetic deductions till this thesis is made good, they would find that the essence of the question is distinctly psychological, and that any experiments with hypothetical physics are so many attempts to get out of a complex thing that which is simply not in it.   J. L. TUPPER

Meteorological Phenomena

On the 10th of November, a little after 4 P.M., the sun was behind a bank of thick stratus clouds, on the upper edge of which, attached to it, about 10° above the sun's position, and 15° to 20° to the north of it; I, with two other persons, observed a small irregularly-shaped cloud, about 2° in apparent diameter, which exhibited the colours of the least refrangible portion of the spectrum; commencing with the red on the south end nearest the sun, succeeded by orange, yellow, and pale greenish yellow, fading into white on the north edge, the rays being perpendicular. This appearance continued for about five minutes or upwards while we viewed it, and then faded away. Though the phenomenon appears simple, the light cloud merely refracting the sun's rays, it is not evident why the complementary colours of the more refrangible portion of the spectrum should not have been visible; and, as far as I am aware, a similar appearance has not been recorded before.   G. F. D.

In NATURE of August 31 there is a note headed, "A Rare Phenomenon," from Magdeburg. Your correspondent, I think, evidently refers to what in India, or at any rate in Ceylon, is called "Buddhu's Rays," an appearance in the sky very commonly observed here, and for which I have never heard any scientific explanation attempted. I regret to say that hitherto I have never taken any exact notes of the position of these rays. They generally occur, I think, when the sun is low, sometimes in the west at sunset, but also occasionally in the east. The appearance presented is that of alternate broad streaks of rose colour and blue radiating from one point on the horizon, and extending, I should say, for about thirty or forty degrees. I will, whenever I see them in future, take exact notes of their position, &c. At present I can only say that I certainly think that dust in the atmosphere can take no part in their production.

Colombo, October 1871   .   BOYD MOSS

Crannogs in the South of Scotland

It may interest some readers of NATURE to learn that a considerable number of crannogs, various articles of the New Stone Period, and some "kitchen-middens" have been discovered in connection with the small lochs which stud the surface of Wigtonshire and Dumfriesshire. Dowalton Loch, Machermore Loch, and the lochs which surround Castle Kennedy in Wigtonshire, have been examined within the last few years, and have disclosed ancient lake-dwellings. The Black Loch of Sanquhar and Lochmaben Loch in Dumfriesshire contain platforms of wood and stone. In some cases canoes and causeways connecting the artificial islands with the adjacent shores have been traced. Sir William Jardine, in his presidential address to the Dumfries Natural History Society, 1864-5, gives an interesting account of the crannog discovered at Sanquhar Black Loch; and recently the Rev. Geo. Wilson, Glenluce, read a detailed description or the crannogs in his vicinity to the Scottish Antiquarian Society.
                                                        J. SHAW

Freshwater Lakes without Outlet

In your notice of Morelet's "Central America" (NATURE, December 28, 1871) you speak of the water of the lake of Peten as fresh, though without an outlet. This is uncommon, but not unexampled. The lake of Araqua in Venezuela, described by Humboldt, is of this kind, and so are the lakes near Damascus, into which the Abana and Pharpha respectively discharge. The best account of these latter is, I believe, in Mr. Macgregor's work, "The *Rob Roy* on the Jordan."
                                          JOSEPH JOHN MURPHY

Old Forge, Dunmurry, Co. Antrim, Jan. 1