

tributions for this purpose are asked of Italian pale-ethnologists, and of such foreign friends as may choose to forward their offerings to Professor Pelligrino Strobel, at Parma. HENRY W. HAYNES.

Boston, Feb. 1.

The moon's atmosphere.

I would be glad if James Freeman Clarke would explain the projection of a planet on the moon's face by the refraction of an atmosphere, as implied in his letter to *Science* of Jan. 8. Would not the rays from the planet pass through the atmosphere in a curve, and reach the eye of the observer in a tangent to that curve at the point where it leaves the atmosphere? If so, then, as this tangent would lie without the moon's disk, the planet could not, by refraction, appear projected upon it.

W. G. BLISH.

Niles, Mich., Jan. 21.

After reading the question by Mr. Blish in regard to the phenomenon described by me, viz., of the projection of the disk of Jupiter on the face of the moon at the moment of occultation, I addressed notes to Prof. Edward C. Pickering of Harvard observatory, and Prof. B. A. Gould, asking for their opinions in the matter. Both have kindly answered me, and I transmit a portion of their letters for publication. It will be seen that they agree in the main with Mr. Blish, that refraction by a lunar atmosphere can hardly explain the phenomenon.

JAMES FREEMAN CLARKE.

Jamaica Plain, Mass., Feb. 1.

[From Professor Pickering.]

"A homogeneous and quiet lunar atmosphere would pretty certainly not account for the apparent projection of a star or planet on the disk of the moon, although a disturbance in the atmosphere, either of the moon or of the earth, might momentarily confuse the images viewed through it. I should prefer explaining the phenomenon by the physiological effect of irradiation, which increases the apparent size of bright objects, and so might make two disks seem to overlap each other when they were merely tangent."

[From Professor Gould.]

"The phenomenon which you observed, is, I am inclined to believe, by no means an uncommon one, although, as is natural, the published accounts of it relate chiefly to bright fixed stars, rather than to planets.

"I fear that refraction by a hypothetical atmosphere would not explain the phenomenon adequately, although it seems to me that Mr. Blish has overstated his case, and that the ray emerging from the atmosphere would not necessarily be tangent to the curve at the point of emergence. Turning to Herschel's 'Outlines of astronomy,'—a convenient though not altogether trustworthy book,—I find the same phenomenon mentioned in a footnote to art. 414. He speaks of it as an 'optical illusion,' which perhaps it is; but calling it by that name does not explain it. I myself have seen it, and believe that it has been noted by most observers of occultations, and I have seen attempts to explain it by 'irradiation' and by indentations in the moon's limb; but I have never seen any explanation which has appeared to me satisfactory. It belongs to the same class of phenomena as the 'black ligament,' seen when an inferior planet transits the solar disk. This has never,

to my knowledge, been satisfactorily explained either."

Festoon clouds of a tornado.

The clouds so termed by your recent correspondent were more strikingly exhibited than I remember ever to have seen them, on the 17th of June, 1882. They formed the under surface of the high advanced sheet overhanging the memorable tornado that destroyed Iowa college and one-third of the town of Grinnell. Other terms referred to by your correspondent more properly describe the appearance, such as sand-bags, droplets, mammillary cloud, or they might be spoken of as innumerable filled pockets hanging from the under surface of the sheet. It was first seen by me in the western sky at 7 P.M., after a bright sultry day. Near 8 P.M. the whole west was filled with heavy clouds transfused with gold. A fierce thunder-storm followed, and passed by. Immediately after this there was a dead calm for a brief time, and then, at 8.45 P.M., the sudden destructive funnel-cloud. It was a local storm, traced a hundred miles, more or less.

Since then I have watched every threatening sky, and have noticed the same phenomenon, less strikingly shown, in at least a dozen instances, alike in local or limited thunder gusts, widely extended storms, and in rainless skies overspread by wild-looking clouds. A splendid exhibition of the last mentioned was seen at sunset last summer. The whole sky was overcast by gilded cloud showing the 'sand-bag' feature, but in larger bags, either absolutely so, or because drifting at a medium cloud-height and overhead. No evidence of rain, nor any unusual surface winds, preceded, attended, or followed on this occasion.

H. W. P.

Grinnell, Io.

Death-rates among college graduates.

The recent death of Charles W. Sanborn of New Hampshire is the occasion for calling attention to a remarkable fact.

His death is the first that has occurred in the Dartmouth college class of 1872. Sixty-nine men graduated, and for thirteen and one-half years their number has continued unbroken by death. The Chandler scientific class of the same year early lost one man from eleven who graduated.

The deaths in the two preceding and nine succeeding classes to 1872 are recorded as follows:—

Class.	No. graduated.	Deaths since graduation.
1870	50	11
1871	68	9
1873	71	4
1874	63	5
1875	48	1
1876	69	4
1877	54	2
1878	74	3
1879	46	3
1880	48*	1
1881	49	3

* One died just before commencement, and received degree *post obit.*, but is not included here.

EDWIN J. BARTLETT.

Jan. 28.