bodies of ordinary temperatures, and a_2 for that from the sun ; and this distinction is made throughout, in all the numerous equations into which the radiated heat of the sun enters.

The necessity for this, which at the time was considered only highly probable, is now fully shown by Mr. Langley's recent very interesting and important experiments on invisible heat spectra (*Amer. journ. sc.*, January, 1886). It requires a glance only at the graphic representation of his results (plate iii.) to see that when the temperatures of the bodies differ, the absorbing power of the body of lower temperature, for the heat of a body of higher temperature, is greater than the radiating power at the end of the spectrum of short wave-lengths, and the reverse at the other end. Hence, where there is selective absorption, as there usually is more or less where any part of the heat is reflected, the radiating and absorbing powers of a body, for the heat-rays as a whole, may not be equal. If the reflected heat were considerable, and mostly of the rays of either end of the spectrum, the difference might be considerable. The amount of heat reflected by the moon is probably much less than that radiated, and the white light of the moon does not indicate that there is much, if any, selective reflection. There cannot, therefore, be much difference between the radiating and absorbing power of the moon for the sun's heat-rays taken collectively. The little difference which there may be would, of course, affect my result slightly. If the absorbing power were a little greater than the radiating power, then the temperature of the moon would have to be a little higher to radiate as much heat as it receives and absorbs. It is seen from what precedes that the possible inequality of radiating and absorbing powers has not been overlooked, and was provided for in my paper referred to above, at a time when there was scarcely a suspicion with regard to the general applicability of the law. But its greatest possible effect on my result was considered of too little consequence to refer to in a short communication on a matter in which, at best, we can expect only approximate results. It is true that the equality of the radiating and absorbing powers was one of my conditions, and that the result is strictly true only for this assumed equality, and that this is therefore one of the 'limitations.' But it does not seem that the 'airless body' should be put into the 'endless list;' for I think that astronomers are very nearly, if not quite, unanimous in the opinion that the moon has no atmosphere which can sensibly affect its radiations.

My conditions, strictly, are for mean or stationary temperatures only; but they are applicable without sensible error to the case of the varying distance of the moon, on account of the slowness with which the distance and the corresponding temperature change. With regard to the lunar diurnal variations, the conditions determine nothing more than the limit beyond which the maximum temperature of any part of the moon's disk cannot go; but this is all that has been claimed. If the method is not of general application, or the results deduced extremely accurate, I think they are not to be despised where we, as yet, know scarcely any thing. The laws of Kepler were important in his time, notwithstanding they did not take into account the 'endless list' of perturbations.

I am sorry Mr. Langley has resolved to have nothing more to say on these interesting subjects, for there are many things, somewhat in common with our separate lines of research, which I would like to discuss in a candid and friendly manner.

WM. FERREL.

Washington, Jan. 28.

Professor Newcomb's address before the American society for psychical research.

In your editorial note of Jan. 29, on Professor Newcomb's presidential address to the American society for psychical research, reference is made to his 'very acute observation' that in certain drawings published by the English society as apparent results of thought-transferrence, "the lines join perfectly, as would be the case with the work of a draughtsman who could see, and this too in the drawings made blindfold." You go on to say that 'the natural inference is that there was some trickery;' and you add, that the English society's work 'bears the character of that of amateurs and enthusiasts.' I think you ought, in justice, to let your readers know that the drawings particularly referred to in the address were five in number. Of the series to which three of these belong, it is conspicuously said, in the accompanying report, that, 'as regards the bandage round his eyes,' the draughtsman 'sometimes pulls it down before he begins to draw.' The two other drawings belong to a series which the report says were executed while the draughtsman 'remained blindfolded.' But, if Professor Newcomb will himself try to reproduce these drawings with his eyes closed, he may perhaps be led to agree that their accuracy can hardly be deemed to fall outside the range attainable by the muscular sense alone, especially if aided by a little practice. To brand as dupes and enthusiasts (on the strength of this single 'acute observation') a set of gentlemen as careful as these English investigators have proved to be, seems to me singularly unjust.

WILLIAM JAMES.

Cambridge, Mass., Jan. 30.

Death of Father Gaetano Chierici.

Prehistoric archeology in Italy has just met with a most serious loss in the sudden death, on the 8th of last month, of Father Gaetano Chierici, professor in the college at Reggio, in Emilia, and director of the admirable Museum of antiquities, in that city. In association with Professor Strobel of Parma, and Professor Pigorini, director of the Ethnographic museum, at Rome, he founded, and has continued to edit, the *Bulletino di paletnologia Italiana*, a monthly journal of prehistoric science, now entering upon its twelfth year. Indefatigable in his prehistoric explorations, he is best known for his investigations of the remarkable *Terremares* of Emilia, which have established the existence of the age of bronze in that country. His last work was to superintend the excavation and transport to Reggio of several tombs from a very ancient cemetery discovered at Renedello, near Brescia. This seems to belong to a period of transition from the age of polished stone to a time when weapons of copper were used, anterior to the age of bronze. Chierici believed that they are remains of the ancient, obscure Pelasgic race.

It is proposed to place a simple bust to the memory of this modest and learned ecclesiastic in the museum which he so admirably arranged and illustrated, and of which he deserves to be called the founder. Con-

tributions for this purpose are asked of Italian paleethnologists, 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.