man (after years of careful study of university education, and a critical inspection of every important university in the world) and received but few modifications, as the result of its successive rounds, it was prepared by authority of the national association, and also embodied the consensus of a still larger number of persons deeply interested in the effort thus made to advance the interests of university education in America. In a word, it was a bill authorized and practically approved by the national association, and no amount of pettifogging can efface the record of the almost unprecedented unanimity with which it was so authorized and approved.

3. Again: nothing could be more astonishingly false than the statement that "neither bill [the one under consideration and another one presented during the same session of congress] was supported by anybody in any way." For the records of the house of representatives will show that the bill matured by the national university committee was not only fully considered by the committee on education and labor of that honorable body, but was at length reported in a strong and able manner with the unanimous recommendation that it pass, as will appear from the concluding passage of the report as published by the house: —

"If, then, it be true, as the committee have briefly endeavored to show, that our country is at present wanting in the facilities for the highest culture in many departments of learning; and if it be true that a central university, besides meeting this demand, would quicken, strengthen, and systematize the schools of the country from the lowest to the highest; that it would increase the amount and the love of pure learning, now too little appreciated by our people, and so improve the intellectual and social status of the nation; that it would tend to homogeneity of sentiment, and thus strengthen the unity and patriotism of the people; that by gathering at its seat distinguished *savants*, not only of our own but other lands, it would eventually make of our national capital the intellectual centre of the world, and so help the United States of America to rank first and highest among the enlightened nations of the earth, — then is it most manifestly the duty of congress to establish and amply endow such a university at the earliest possible day.

"The committee therefore affirm their approval of the bill, and recommend its passage by the house."

4. Last of all, I call attention to the sublime self-complacency with which, in the face of all his superficiality of inquiry and flippancy of statement, the writer under notice deals with the able and learned secretary of the interior and with the merits of the national university question; telling us gravely, as a final settlement of the whole matter, that, "by all the would-be benefactors of American education, many of the difficulties in the way of establishing a national university have been overlooked." And this the dictum of a writer who, in a discussion involving matters of personal justice as well as of public interest, has been content to rely on *ex-parte* testimony, — this his *ex-cathedra* condemnation of a proposition first made by Washington, afterwards supported by a number of his most distinguished successors in the presidential office, and still more recently approved by such statesmen as Sumner, Howe, Schurz, Hoar, Ingalls, and Lamar; by such men of science as Agassiz, Peirce, Shaler, Henry, and Baird; by the heads of nearly all the universities of the United States; and by the largest association of educators in the world.

After this extraordinary manifestation, it does not seem worth while to descant upon our critic's notions concerning the evils of 'free education' and of what he is pleased to call 'the paternal government.' The demonstration of their unsoundness has been so often made, in the past, by educators who are indeed leaders, that it need not be repeated, unless there should at length appear some real 'leader of education' bold enough to express like 'un-American principles.' Up to this time, so far as I know, but one man in the United States, especially entitled by his position to be heard on the subject of a national university, has declared against the measure. Nor is it easy to see why any liberal-minded friend of American education should oppose the general proposition to found and amply endow one great institution for post graduate work, planted in the midst of the many important scientific establishments, as well as libraries, provided by the government, and so planned as to sustain helpful relations to all the universities, colleges, and common schools of the country.

JOHN W. HOYT.

Cheyenne, W. T., Jan. 11.

Temperature of the moon.

My first communication on the temperature of the moon was regarded as supplementary and confirmatory, and not controversial; my second one, as a correction of an erroneous view of my position too hastily formed. Something further here seems necessary with regard to my 'hypothetical moon,' 'an absolutely airless body' with 'equal relative radiating and absorbing powers,' and the 'endless list of limitations.' Unfortunately this is a subject, in whatever way we look at it, in which hypotheses not altogether certain have to be adopted, and in which we have to be satisfied with approximate results, subject to limitations. But my hypothetical moon is very much like the real moon as it has come to me from physicists and astronomers. More than a quarter of a century ago, Stewart established the equality of the radiating and absorbing powers for each kind of heat-ray, and so, of course, for all collectively. But this was from experiments in which there was not much difference between the temperature of the absorbing body and the body from which the heat was radiated; and this law has been extended, without sufficient warrant, to all cases, however great this difference of temperature. Professor Tait, less than two years since ('Heat,' 1884), in giving the usual definition of the equality of radiating and absorbing powers, adds the conditions of a dark body and of equality of temperatures, but immediately after adds, "We assume, with probability, that these latter conditions are not necessary."

In my paper on the 'Temperature of the atmosphere and the earth's surface' (Professional paper of the signal-service, No. 13), I thought it best to make a distinction between the heat received from the sun and that from terrestrial bodies of ordinary temperature. This was suggested by experiments made by De la Provostage and Desains, from which it appeared that polished metals reflected more, and consequently absorbed less, of the heat received from the sun, than from a Locatelli lamp. Accordingly, throughout that paper, a is used to represent the absorbing power of a body for heat from terrestrial

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-