average, and the rainfall showed a deficiency of nearly an inch. The bureau is gradually increasing the number of stations, and makes special efforts to have its observers supplied with standard instruments. In addition to its regular stations, it invites the co-operation of voluntary observers, and will furnish reliable instruments at reduced prices. The rainfall chart published by this service is deserving of being introduced into other similar reports.

Tennessee. — The continued drought has damaged the crops, especially in the eastern portion; but in the middle portion the crops are in fair condition. Frost visited some localities, the temperatures in the state ranging from 32° to 95°. The prevailing wind was north; the average rainfall, 2.06 inches; the average number of clear days, 14.

LETTERS TO THE EDITOR.

Teaching language to brutes.

Is it not quite conceivable that some of the lower animals might be taught to use human language rationally? No doubt the reasons for a first hasty answer in the affirmative would be that the animals seem so intelligent as sometimes even to reason, and that they have, in fact, often had human words put into their mouths, and that they seem sometimes to have a language among themselves. Yet, after all, cannot their intelligence, and even wisdom, and occasional apparent reasoning, be satisfactorily explained, without attributing to them true reasoning, as the result of hundreds or thousands of generations of experience and transmitted memory, by which certain objects or actions become associated with a feeling of pleasure or pain that induces pursuit or avoidance? How few, indeed, are the cases that cannot readily be so explained, where an animal appears at first sight to exercise a reasoning-power! and how extremely simple the effort seems then to be!

True reasoning can always be reduced to the syllogistic form, in effect a statement that what is true of a class is true of something in that class. In order, then, to reason, properly speaking, it is necessary to use a general term (a word or sign with the meaning of a common noun) to indicate the class; and, as we do not know of any evidence that brutes have such words or signs, we have no proof that they can reason. In like manner, the lack of evidence that they can reason goes far towards showing that they have no language that includes such general terms, though it may be true that they sometimes understand words in a singular (not general) sense, and have similar expressions for their own feelings.

The question, then, is whether brutes may not be taught the intelligent use of general words or common nouns, which would enable them to reason. As the step does not seem so very enormous from the undeniable intelligence of some brutes to the lowest form of generalization, it is perhaps worth while to consider how they might possibly be taught to take the step, in hope, that, having once taken it, they might be led farther with still greater ease. Since the idea of plurality appears to lie at the very bottom of the idea of class, number would perhaps be the first and simplest step in generalizing, — number, that is, the regarding things merely as individuals or units. It is a step beyond, to regard things as alike in more complex respects. If that is so, the first effort might be made to teach how to count, and, of course, at the beginning only to count up to two. If that can be accomplished, still further counting can unquestionably be taught, and no doubt by degrees a much greater amount of generalization and reasoning itself. Does it seem impossible that a brute may learn to associate invariably the word 'one' with a single object, and 'two' with a pair of objects, no matter of what kind? At first the two objects should always be two like ones; but by degrees a difference in them might be allowed. The teaching of common names might next be taken up; or it might be begun along with the counting, but without the confusing addition of any plural termination. Even if the mere counting up to two could not be taught successfully to any single individual brute, yet the end might nevertheless be attained, perhaps, in several generations.

The question then comes, With what animal would it be best to begin such experiments, — whether with monkeys, or elephants, or birds, or ants? Of course, articulation is not essential; for a language of signs might be devised suitable to the animal, — a language corresponding to the deaf-and-dumb one of signs, or to one using the Morse alphabet, or something like it. Elephants are very intelligent, but so very long lived that it would take ages to observe the effect of training through many successive generations. Perhaps the convenience of excellent articulation and rapid propagation, both combined with apparently good intelligence, might give the preference, on the whole, to a talking bird, such as the Indian mynah. **L. B.**

Nov. 9, 1883.

Climate in the cure of consumption.

In your issues of Sept. 28 and Oct. 5, Dr. S. A. Fisk of Denver, Col., compares the climates of the principal health-resorts of the United States with one he happens to represent, i.e., Colorado. At the commencement of his paper the writer states that "he has given the data for Augusta, Ga., as the best substitute for Aiken, S.C., at which place there is no signal-station; and, in doing so, he thinks that he is presenting data which will fairly represent the climatic condition of Aiken." To those familiar with the two places, this is, indeed, a most astounding revelation; and, with your kind permission, I hope to prove, that, although socially very dear to each other, they have climatically but little in common. Augusta is built upon a marshy flat on the Savannah River, which at times overflows its banks, and submerges a portion of the city; while Aiken is located in what is known as the sand-hill region, five hundred and sixty-five feet above sea-level, which is higher than any other town or village within a radius of seventy miles. The soil of the latter place is dry and porous; and to obtain water, wells have to be sunk to a depth of from a hundred to a hundred and twenty feet; and there is no water-course within two miles of the town, and even at that distance there are but brooks or small creeks. The result of this absence of soil-moisture, and of large bodies of water, would of itself tend to diminish the amount of humidity in the atmosphere; but this is still further diminished by the absence of any hill or mountain to interrupt the free circulation of the wind. Augusta, on the contrary, is situated, as before stated, on a plain lying between a range of hills and the river. All this would lead one to expect that the climate of Aiken would be extremely dry; and that this is really the case is proved by carefully conducted observations extending over many years, which show that the average relative humidity, fifty-eight per cent, is lower than that of any other station east of the Rocky Mountains, and eleven

degrees less than the figure given by Dr. Fisk as the mean of four years' observation at Augusta. As further proof of the dryness of the atmosphere of Aiken, I would direct attention to the absence of mould on boots and shoes, and to the fact that guns, and even delicate surgical instruments, may be exposed to air for months at a time without rusting. There are many other differences between the climates of Aiken and Augusta; but the above is sufficient to show that Dr. Fisk has indulged in an inference, when, with a little trouble, he could have obtained facts, the meteorological data for Aiken being on file at the office of the chief signal-office, U. S. A., since the establishment of that bureau, and prior to that time at the Smithsonian institution, not to speak of various publications on the climate of Aiken, which have appeared in the different medical journals of the country.

W. H. GEDDINGS.

Aiken, S.C., Nov. 5, 1883.

On the possible connection of the Pons-Brooks comet with a meteor-stream.

I desire to call attention to some slight evidence of the existence of a meteor-stream which may possibly stand in some sort of connection with the Pons-Brooks comet. From an examination of all the available material of published meteor-tracks in the interval Dec. 5–8, I find, that after excluding those manifestly emanating from the well-known and active radiants in Andromeda, Gemini, and Taurus, there remain twenty-three meteors observed by Heis on Dec. 8, — about two-thirds of them in 1847, and the rest in 1855, 1857, and 1867, — and ten meteors observed at Vienna, Dec. 7, 1868; all of which indicate a strongly marked radiant in Draco. From these data I have carefully determined the position of this radiant, as follows: —

	R. A.	Decl.	Long.	Lat.
10 meteors on Dec. 7,	198.0°	+72.0°	135.0°	+65.6°
23 meteors on Dec. 8,	190.0	+69.7	137.2	+62.4

and from these I derive the following orbits, to which I add for comparison that of the Pons-Brooks comet.

	Meteors of		Pons-Brooks comet.
	Dec. 7.	Dec. 8.	
T = Perihelion passage.	Dec. 28.	Dec. 23.	1884. Jan. 25.82.
Long. of perihelion .	44.5°	55.1°	93° 21′
Long. of node . . .	256.1	256.3	254 6
Inclination	68.5	72.7	74 3
Log. per. dist. . . .	9.9600	9.9784	9.8894
Eccentricity	–	–	0.9550

The resemblance is thus not sufficient to give any considerable probability to the hypothesis of an intimate relation. On the other hand, the position of the radiant from present data is too uncertain to enable us to pronounce against that hypothesis.

The differences in inclination and longitude of perihelion are not greater than are due to uncertainty in the observed radiant points: the T and the node are, of course, of no significance in the comparison. The descending node of the comet's orbit lies at the distance 0.200 inside the earth's path, and the difference of the perihelion distance of the comet and the meteors is about 0.15. There is nothing in our present knowledge of the dimensions of meteor-streams, or of the nature of their relations to comets, definite enough to render such a breadth as is here implied evidence against a possible connection. On the whole, therefore, it appears desirable that meteor-observers should give close attention to the radiant in question about the date of the earth's passage through the plane of the comet's orbit, Dec. 5 to Dec. 7. Observations this year are likely to prove especially instructive on account of the proximity of the comet, which passes the node only a few weeks later.

S. C. CHANDLER, Jun.

Harvard college observatory,
Nov. 12, 1883.

Prize-essays on the experimental method in science.

Dr. Maurizio Bufalini, an Italian *savant* who died nearly ten years ago, left provision in his will for the payment of a prize to the person presenting the best essay on the subject of 'the experimental method in science' to the section of medicine and surgery of the Royal institute of higher studies at Florence. The essay must be written in Latin or Italian, and be presented to the chancellor of the section of medicine and surgery on or before the 31st of October, 1884. The prize is five thousand francs.

The institute has declared that all persons are at liberty to compete for this prize; and accordingly the representative of the Italian government, acting under instructions from that government, forwarded to our Department of state a programme giving in detail the subject proposed for the essay, and the conditions to be followed by the competitors, with a request that it be brought to the attention of Americans. The programme has been forwarded to the Bureau of education by the Department of state, and will be published as a bulletin as soon as practicable. In the mean time, such information, relative to the matter, as the Bureau of education possesses, may be obtained by addressing Gen. Eaton, commissioner of education, Washington, D.C.

CHARLES WARREN.

Bureau of education, Washington,
Nov. 9, 1883.

The model of Architeuthis at the Fisheries exhibition.

In the number of SCIENCE for Nov. 9, you have copied without correction a photograph of part of the London International fisheries exhibition, which shows my model of Architeuthis wrongly put together. For convenience of packing, the tentacular arms were made to take apart in three pieces; but, when the model was set up, the basal and terminal pieces were put together, making the tentacles ten feet too short. The man who had charge of the work, not knowing what to do with the remaining pieces, stuck them in at the sides of the mouth, thinking that he might find in some other box a pair of terminal clubs to put on them. In this way the model was left at the opening of the exhibition, until some visitor happened to notice the mistake, when, I believe, the extra pair of arms was taken out, leaving the tentacles still too short.

J. H. EMERTON.

New Haven, Nov. 11, 1883.