were found. In a recent flying trip through the Lagoa Santa region, I made inquiries in regard to the matter, but failed to obtain any very definite information. According to the reports of the common people, many caverns were explored by Lund and his assistants in person for the express purpose of collecting fossils, while others were worked by the people of the vicinity for saltpetre, who, under instructions from Lund, and probably as far as possible under his supervision, saved the fossils disinterred in their operations. I could learn nothing as to the conditions under which the human skull now in the museum at Rio de Janeiro, and stated to have been found with remains of extinct mammals, was met with. More definite, and apparently reliable information was given in regard to a complete human skeleton which was one of a lot sent to Copenhagen. A workman in one of the saltpetre caves at some distance from Lagoa Santa found the skeleton in his work, and, to gain the reward offered, took it to Lund, who gave him the sum of forty milreis (about twenty dollars). This man is still alive; but, from lack of time, I was unable to see him. It is said, that, on his recent visit to Minas, the emperor had an interview with him on the subject.

Recently, while in New York, I had the good fortune to meet Mr. Nicholas Brandt, son of the late Prof. P. A. Brandt, who was for many years the secretary and companion of Dr. Lund. Mr. Brandt, who had spent some time at Lagoa Santa in company with his father and Dr. Lund, kindly gave me the following note: "The remains of the prehistoric man, discovered by Dr. Lund in Minas before I came to Brazil, and about which the professor sent his memoirs to the *Instituto historico e geographico* of Rio de Janeiro in January, 1842, and April, 1844, were often the subjects of our conversation. The doctor's opinion was positive that the skeletons belonged to the same period as the fossil fauna with which he enriched the knowledge of natural history to such a large extent. The opinion of Cuvier and Humboldt, Dr. Lund's friends, was fully justified in urging the doctor to go to Brazil, and use his energies in the service of this branch of science. The doctor was, of course, a pure follower of his friend Cuvier. Darwin and Darwinism were at that time hardly heard of, as his *Blik paa Braseliens Dyreverden* fully shows." Mr. Brandt adds, that but for the loss of all his private papers, including his Brazilian journal, and many letters from his father and Dr. Lund, in the Atlantic disaster some years ago, he would have been able to give a much more definite and detailed account of Lund's life and work at Lagoa Santa.

ORVILLE A. DERBY.

LETTERS TO THE EDITOR.

Solar constant.

THIS term is becoming prominent, and its use has given rise to some confusion. I find some authorities, taking the value given by Forbes, give 28.2 calories, while others give 2.82 calories. Since a calorie is the definite amount of heat required to raise a kilogram of water 1° C., it is evident that one of these is in error.

Professor Young, in his 'Sun,' p. 263, defines the solar constant as the amount of heat received per minute by one square metre exposed perpendicularly to the sun's rays at the upper surface of the atmosphere. No mention is made of the substance receiving the heat. In correspondence with Professor Young, I have received the following equation: the solar constant $= \frac{w}{s} \times \frac{t}{m}$, in which w = mass of water, s = surface, t = quantity of heat, m = unit of time. On this basis we may define the solar constant as the amount of heat received in a unit of time, by a unit of mass, spread upon a unit of surface, exposed as above. In this equation, however, we may divide w by s, and obtain d = depth, and we shall have the solar constant $= \frac{d \times t}{m}$; i.e., the solar constant equals the quantity of heat received from the sun at the limit of the earth's atmosphere, by a unit of depth of water, in a unit of time.

We may express this numerically as follows: take a square metre and spread upon it a kilogram of water; it will lie 1 mm. deep. Since the kilogram is the unit used in defining the calorie, we may say, using Forbes's value, that the solar constant, 28.2 calories, is the amount of heat received by 1 mm. depth of water exposed as above. The use of the term 'calorie' seems unfortunate; and we might adopt, as more satisfactory, a centimetre as the unit of depth, and degrees as expressing heat. We would then have the solar constant equal to 2.82 Centigrade-centimetre-minute degrees, or 2.82 ccm°.; i.e., the sun's heat falling upon a centimetre depth of water would raise it 2.82° C. in one minute.

This will be recognized as of the same form of expression as adopted by Herschel, who describes the sun's heat as sufficient to melt a coating of ice an inch thick in 2 h. 13 m. nearly. H. A. HAZEN.

Spanish folk-lore.

In the account of folk-lore in Europe, in SCIENCE for May 25, I see no notice of Spanish efforts in that field. My acquaintance with the subject is but slight, yet it has extended to the important and interesting works of Antonio de Trueba, who, in 1873, spoke of himself as "almost the only writer of our country who has given himself with any diligence to this task (the collection of popular stories), especially now that the illustrious Fernan Caballero rests from his most glorious labors." The method of Trueba differs from that of the brothers Grimm, for example, in that he adds the polish of his admirable style to the rough form of the stories as they fall from the mouth of the people; such a process being necessary, he maintains, in order to fit them for a place among the products of the literary art. I subjoin a list of his publications in this department: *Cuentos de color de rosa, Cuentos campesinos, Cuentos populares, Cuentos de vivos y muertos, Cuentos de varios colores,* and *Narraciones populares.*

ROLLO OGDEN.

Cleveland, O., May 28.

Capture of the crested seal on the coast of Massachusetts.

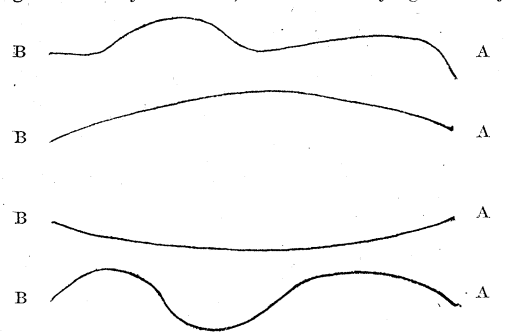
At various times large seals have been seen or taken on the coast of Massachusetts, and, although in no case positively identified, presumed to be examples of the crested seal (Cystophora cristata), mainly because a specimen of this species, described long since by Dr. DeKay, was taken in 1824 in a small creek emptying into Long Island Sound at East Chester, about fifteen miles from New-York City. As two other large seals — the gray seal (Halichoerus grypus) and the bearded seal (Erignathus barbatus) — are almost as likely to occur on the New-England coast as this one, it is some satisfaction to be able to record the capture of a well-identified example of the crested seal in Newburyport harbor, May 2, 1882. Mr. E. C. Greenwood of Ipswich, by whom the specimen was secured and mounted, informs me that

it was a fine adult male, eight feet in length, weighing very nearly one thousand pounds. The specimen was purchased by Dr. G. E. Manigault for the museum at Charleston, S.C., where it is now preserved.

That this species is prone to wander far from its usual haunts — the icefields eastward of Newfoundland and northward — is attested by its capture, not only near New-York City, but also at Cambridge, Md., in an arm of Chesapeake Bay, as recorded some twenty years ago by Professor Cope. The present record, however, is the first of the capture of a positively identified example of any seal on the New-England coast other than the common small harbor seal (Phoca vitulina). J. A. ALLEN.

Flight of the flying-fish.

On a recent trip from New York to Galveston, with the weather at the start cold and chilly, wind north-east, and ending in the Gulf with clear sunny days and summer breezes, there was every opportunity afforded for watching the flight of flying-fish. The first fish were seen two days out of New York; and on every day thereafter, save on one when off the coast of Florida, numerous brown pelicans were observed. Probably the flying-fish found the atmosphere a trifle heavy, flitting about with pelicans for interested spectators, and attended strictly to their domestic duties. The act of flying is somewhat startling, the fish emerging with much energy, and, from the very start, buzzing its wings like a humming-bird; and in no instance did the buzzing cease until the fish disappeared in the sea at the end of its flight. The longest flight observed continued, without any contact with the water, for nine seconds; estimated distance, six hundred to eight hundred feet. In some cases the flight was nearly horizontal; in most cases, however, it was arched vertically. Flying across the wind, it was noticed that contact with the water did not apparently retard the movement of the fish in the air. Some of them made four contacts before finishing the flight. The wind had some effect upon the direction and character of the flying; but fish were noticed going with the wind, and crossing it in every direction, and a few flying directly



against it; A being the starting-points; B, the end, and the line of flight being shown as it appeared from a point in a vertical plane connecting A and B.

GEORGE J. CARNEY.

Lowell, Mass.

Sun's radiation and geologic climate.

It seems to me that Mr. Warring, in his objection (SCIENCE, p. 395) to the assumption that the dissipation of solar energy from loss of heat diminishes the supply of sun-heat received by the earth, has overlooked the very important factor of the variable area of the contracting sun. To make this clear, let

Q = Quantity of heat incident normally on a unit surface in a unit of time, at the earth's distance from the sun.

R = Radiating or heat-emitting power of each physical point of the sun.

A = Area of projected surface emitting heat normally = Area of great circle of sun regarded as a sphere.

Then evidently, at a given distance, we have, Q varies as $R \times A$: hence, taking the example cited from Newcomb (as A varies directly as the square of the sun's diameter), if the temperature of the condensed gaseous mass is doubled by contraction to one-half its primitive diameter, its area (or A) would be reduced to one-fourth its original area; so that, notwithstanding the assumed augmentation of temperature of the sun, the supply of heat received by the earth (or $R \times A$) would not be increased, unless R augmented in a ratio greater than the square of the temperature. It is difficult to assign precisely what function R is of the temperature of the radiating body: some physicists (Rossetti) make it proportional to the square of the absolute temperature; while others (Stephan) make it as high as the fourth power of the absolute temperature.

JOHN LECONTE.

Sphere anemometer.

I am rather amused to see in SCIENCE, p. 228, that Dr. Sprung of Hamburg has re-invented an anemometer well known (but not used) in this country; viz., Howlett's. Dr. Sprung, and all who wish to help forwards our knowledge of wind-force, should begin by making themselves acquainted with what has already been done. In the *Quarterly journal of the meteorological society*, viii., p. 161, will be found an Historical sketch of anemometry and anemometers, by J. K. Laughton, M.A., F.R.G.S., president meteorological society, and in it will be found notices of about two hundred patterns. The full description of Howlett's is given in the *Proceedings British meteorological society*, iv., p. 161; but even Howlett was not the first to use the sphere; for in Mr. Laughton's address he remarks, "The sphere as a pressure-plate at the end of a swinging rod had been suggested, and possibly used, many years before Mr. Howlett's time, as a rude anemoscope. It is mentioned vaguely by Hülse (*Allgemeine maschinen encyclopädie*, under anemometer) in 1841, and is said by Mr. Bender (*Proc. inst. civil engineers*, March 14, 1882) to have been used by Parrot; but this I have not been able to verify." G. J. SYMONS, F.R.S.

62 Camden Square, London N.W.,
May 19, 1883.

SCIENCE AND RELIGION.

Studies in science and religion. By G. FREDERICK WRIGHT. Andover, *Draper*, 1882. 16+390 p. 16°.

WE hail the appearance of a book on this subject by one who is an earnest worker in both theology and science as a sign that the unnatural conflict between these two great departments of thought will speedily abate, and their differences be adjusted on a rational basis. The conflict is, in our opinion, the