

sion through the earth's atmosphere, he computed that twenty-seven thousand million candles must be spread over the moon's earthward hemisphere, painted black, to send us as much light as we receive from her. Probably forty thousand million candles would be required to allow for absorption. Sir William carried his computations a little farther, and figured, that, if the face of the moon which we see were painted black, and covered with candles standing packed in square order, touching one another, all burning normally, the light received at the earth would be about the same in quantity (as estimated by our eyes) as it really is.

How does moonlight compare with sunlight? On the 8th of December, 1882, Sir William Thomson in Glasgow measured the brilliancy of the sunlight at one P.M., and computed that it was about fifty-three thousand times greater than that of a candle-flame. This, he says, is more than three times the value found by Arago for the intensity of the sun's light. 'So much for a Glasgow December sun!' Hence he derived the conclusions that the Glasgow sunlight was seventy-one thousand times the York moonlight, and that "we cannot be *very far* wrong in estimating the light of full moon as about a seventy-thousandth of the sunlight anywhere on the earth." Those who are curious to know more of this inquiry will find the note to which we call attention in the proceedings of the Glasgow philosophical society for 1882-83.

LETTERS TO THE EDITOR.

*** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

The oldest living type of vertebrates.

I WAS gratified to have my own conclusions as to the systematic relations of the galeoid Selachians verified by so competent an original investigator as Mr. Garman. The differences between us now are fictitious rather than real; or better, perhaps, they are chiefly differences of expression.

As to the characters of the *Opistharthri*, it must be remembered that I assigned them long before *Chlamydoselachus* was known; and then the statement that among living sharks they 'alone exhibit' the 'peculiarities' specified, was literally true.

'The palato-quadrate, not articulated with the skull,' is a true character of the typical sharks and Rhinae. Of course the apparatus, being the suspensorium of the lower jaw, must have *some* connection with the cranium; but it is indirect, and not direct. The name '*Anarthri*' is therefore quite appropriate, contrasting well with '*Opistharthri*' and '*Proarthri*.' The newly proposed term, '*Mesarthri*,' is, however, unobjectionable, although I should still, independent of priority, prefer *Anarthri*. No one who took an intelligent interest in the subjects in question would be misled by the name '*Anarthri*,' or the diagnoses of the *Anarthri* and *Rhinae*.

I must dissent from the opinion that the *Cladodontidae* are related to the *Chlamydoselachidae* rather than to the *Hybodontidae*. To traverse the question would, however, infringe too much on your space.

Mr. Garman, in his substitute for my provisional diagnosis of the *Selachophichthyoidei*, 'vertebral condition unknown,' has added to our knowledge of the group by verifying my suggestion (*Science*, April 11, 1884) that the "anatomy will probably reveal a structure most like that of the *Opistharthri*."

I am pleased to find that the views of Mr. Garman as to the remoteness of the *Xenacanthini* or *Ichthyolomi* from the true selachians agree with those expressed by myself. The *Xenacanthini*, in fact, appear to me to be true fishes rather than selachians, although not teleosts, as has lately been urged.

THEO. GILL.

Hornblende andesite from the new Bogosloff volcano.

A short time since, there were received at the National museum, from Lieut. George M. Stoney of the Unalakpa, several fragments of rock from the new volcano on Bogosloff Island in Bering Sea. On account of the interest just now attached to this locality, it is thought a brief notice of these may not be out of place here.

The rocks are hornblende andesites. Two varieties were received, — one very light gray and slightly purplish in color, fine-grained, friable, and somewhat porous; the other dark gray in color, and much more firm and compact in texture; both varieties containing macroscopic hornblende and plagioclase, and, under the microscope, seen to be nearly identical, each consisting of a gray groundmass in which are embedded deep reddish-brown, strongly dichroic hornblendes, light green augites, and numerous crystals of a plagioclase feldspar. Sanidin is also present, a very little apatite, and the usual sprinkling of iron oxides, which seem to be largely magnetite. The groundmass consists of a microfelsitic base, carrying colorless microlites, grains of opacite, and minute yellowish and greenish particles which are probably hornblende and augite. The light-colored variety contains small patches of a nearly colorless glass, while the dark variety seems felsitic throughout. A more detailed description of these rocks will be given later.

GEO. P. MERRILL.

National museum, Washington,
Dec. 1.

Edison's three-wire system of distribution.

Referring to the article with the above heading in No. 94 of *Science* (Nov. 21), it is not difficult to show that the conclusions reached are not in harmony with the fundamental proposition governing the size of electric conductors. This proposition is, that "the additional running-expense due to the resistance of the conductor shall equal the interest on