SCIENCE.

FRIDAY, DECEMBER 12, 1884.

COMMENT AND CRITICISM.

THE QUESTION of manual training is beginning to receive in this country the attention it deserves. Among the indications of this fact, we point to the experiments which are in progress in New York, Philadelphia, St. Louis, Chicago, Baltimore, and other important cities; to the admirable debate (never, we believe, adequately reported) which occurred in the section of mechanics at the Philadelphia meeting of the American association; to the report presented to congress a year or more ago on technical education, by Gen. Eaton, the U. S. commissioner; to the interest which has been awakened by the British-commission report on the same subject, of which three volumes have appeared; and, finally, to the action of the Slater trustees in insisting that the income which they distribute among the schools for freedmen shall only be given to schools where manual labor or handicraft is encouraged.

Some light is thrown upon principles and methods by a recent paper on technical education, by David Sandeman and E. M. Dixon of Glasgow. They discuss the relations of the elementary school and the work-shop; second, the part which secondary schools may take in preparing boys for industrial pursuits; third, the sphere of school work-shops or technical schools. Their conclusions, which are of general interest, though intended only for Scotland, are briefly stated, as follows: Every child should have as good a general education as he can get; as circumstances differ, schools must be adapted to different wants of the industrial classes; there should be elementary schools for children less than thirteen years old, secondary schools for more who can continue to study until they are sixteen; and, in both, school work-shops should be established; apprenticeships might thus be reduced in time; finally, trades should be taught systematically to the young, after they leave school, either in a work-shop or in a special building detached from a work-shop, as experience may suggest.

AN ARGUMENT which did good duty during the dark ages, but which has fallen into disuse in later times, has seldom been more *naïvely* employed than in the following passage, taken from a little book just published, 'On the discovery of the periodic law:' —

> "Are the atomic weights invariable? This question must most probably be answered in the affirmative. If the atomic weight of an element varies, such variation is most likely very slight, otherwise the simple relation between the atomic weights of the elements when arranged in their natural order would be liable to be disturbed."

Mr. Newlands (late professor of chemistry in the City of London college), who is the author of the above passage, is also a claimant to the honor of having discovered Mendelejew's periodic law. How far chemists were from suspecting the truth of that law in 1866, appears from the fact, that, at a meeting of the Chemical society, Prof. G. F. Foster humorously inquired of Mr. Newlands whether he had ever examined the elements according to the order of their initial letters.

HOW MUCH brighter is sun than moon? Can anybody tell? Has anybody tried to tell? What shall be the standard of measurement? Sir William Thomson has lately printed a note which conveys some curious data bearing on these questions. During the meeting of the British association at York in 1881, he observed the moon when it was nearly full, and at about midnight. He found the light to be equal to that of a candle at a distance of two hundred and thirty centimetres. Making no account of the loss of moonlight in transmis-

sion through the earth's atmosphere, he computed that twenty-seven thousand million 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 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 Ounalaska, 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 felspar. 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