voyage of circumnavigation, you found Gallia to be composed—a substance to which your geological attainments did not suffice to assign a name.'

"The professor took the cube, and, on attaching it to the hook of the steel yard, found that its apparent weight was one kilogramme, and four hundred and thirty grammes.

"'Here it is, gentlemen; one kilogramme, four hundred and thirty grammes. Multiply by seven; the product is, as nearly as possible, ten kilogrammes. What, therefore, is our conclusion? Why, that the density of Gallia is just about double the density of the earth; which we know is only five kilogrammes to a cubic decimetre. Had it not been for this greater density, the attraction of Gallia would only have been one-filteenth instead of one-seventh of the terrestrial attraction.'

"The professor could not refrain from exhibiting his gratification that, however inferior in volume, in density, at least, his comet had the advantage over the earth."

We have given this long extract to show the pleasant way in which, in this latest form of French light literature, amusement is combined with instruction. It would not be fair to the book to say more of the plot or of the *dénouement*.

We have dwelt especially upon Jules Verne's latest book, but equal praise must be given him for all those we have named. A boy, for instance, who had read how the frozen island in the "Fur Country" was kept together by Dr. Black's device, would at once understand the *rationale* of Pictet's and Cailletet's recent splendid work, to say nothing of the physical geography he would have gradually absorbed in following the strange adventures recounted in that volume.

We are glad to have such books to recommend for boys' and girls' reading. Many young people, we are sure, will be set thirsting for more solid information.

OUR BOOK SHELF

The Geometry of Compasses; or, Problems Resolved by the mere Description of Circles, and "the Use of Coloured Diagrams and Symbols." By Oliver Byrne. (London: Crosby Lockwood and Co., 1877.)

THIS is only our old friend, "La Geometria del Compasso di Lorenzo Mascheroni" (Paris, 1797), decked out in the manner we have indicated in the quoted portion of the title. The order of sequence has been departed from, but this is not a material point. The constructions are the same and the proofs the same with, we believe, one exception, in which case we give the preference for simplicity to Mr. Byrne.

There are twenty problems, which are in most cases given in duplicate, first construction and figure in colours, then proof and unadorned figure on the next two pages.

The merits and nature of Mascheroni's work are well known; hence the present work, for reasons given above, is good. But we cannot call this Mr. Byrne's book. Problem XX., which is the last, is an elegant construction for dividing the circumference into seven equal parts by plane geometry. But for this the compiler is indebted to an able mathematician, Dr. Matthew Collins. The book is very neatly and correctly got up, and for frontispiece has a hand with a pair of compasses transferring a given length.

Proceedings of the American Philosophical Society. Vol. xvi., No. 99. January to May, 1877.

PROF. COPE has several noteworthy papers in this part: one, on the Batrachia of the coal-measures of Ohio, describes the new genus, Ichthycanthus, and the new species of Leptophractus and Tuditanus. He also describes remains of a Dinosaurian from the trias of Utah; the humerus is one of the longest, and distally the most contracted known in the group. These remains are the first discovered fossils in the triassic beds of the Rocky Mountain regions. Another valuable paper is on the brain of Coryphodon. One of the longest contributions will be much esteemed by geologists, viz., Mr. Ashburner's measured section of the palæozoic rocks of Central Pennsylvania (Huntingdon County), a section extending vertically through 18,394 feet. A very valuable series of physiological experiments is recorded in a paper by F. L. Haynes, on the asserted antagonism between nicotin and strychnia. Philology is well represented by a paper on the Timucua language, by Mr. A. S. Gatschet; this language, formerly spoken in Florida, appears to be the oldest within the American Union of which writings of some extent are preserved.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

The Radiometer and its Lessons

WITH reference to the controversy between Mr. Stoney and Mr. Osborne Reynolds about the laws of the conduction of heat in gases, it seems desirable to call the latter gentleman's attention to the fact that neither Clausius' nor Clerk Maxwell's investigations, as published in the *Philosophical Magazine*, affect the controversy between them.

The latter, in his papers in the *Philosophical Magazine*, vol. xxxv., lays particular stress upon the fact that he supposes the motions of the molecules to be uniformly distributed in every direction. He says, however, on page 188: "When one gas is diffusing into another, *or when heat is being conducted through a gas*, the distribution of velocities will be different in the positive and negative directions instead of being symmetrical, as in the case we have considered." From this theory of the uniform distribution of velocities he deduces the formula (29), (31), and (32), as he numbers them, and to which he subsequently refers. On page 214 he gets an equation (143) which represents the transference of heat through the medium, and says: "The second term contains quantities of four dimensions in $\xi\eta\zeta$, *whose value will depend upon the distribution of velocity* among the molecules. *If* the distribution of velocity is that which we have proved to exist when the system has no external forces acting on it, and when it has arrived at its final state we shall have by equations (29), (31), (32) . . ." certain results from which he deduces his equation for the conduction of heat in gases.

When he says "has arrived at its final state" it is evident from his reference to the equations that he means the state of a gas in which neither diffusion nor conduction of heat nor currents of any kind are going on. It will thus be seen that his final result is only a first approximation and could not possibly be expected to hold within distances comparable with the mean length of the path of a molecule between two encounters.

Clausius in his paper as translated in the *Philosophical Magazine* for June, 1862, does suppose a distribution of velocity among the molecules of such a kind that the velocity and number of molecules moving in the positive and negative directions is different, but assumes the mean between them to be the same as the number moving in a direction normal to the direction of the transference of heat. This is evident from the fact that what he practically does is to assume that the number of molecules moving in a direction making an angle θ with the direction of transference of heat can be expressed by a formula of the form—

$$n = n_0 (1 + e\cos\theta),$$

for he neglects e^2 throughout his investigation. In this form it is evident that n_0 is the number when $\theta = \frac{\pi}{2}$ and is the mean of the values $n_1 = n_0(1 + e)$ and $n_2 = n_0(1 - e)$, which represent the numbers going towards and from the points of high tempera-