A few of these appear to be undescribed, but most of them are of species that are widely distributed in the West Indian region.

Dr. Rusby showed specimens of spurious ipecac roots which have found their way into the markets. The true ipecac (from *Cephaëlis Ipecacuanha* of the family Rubiaceæ) is now hard to obtain and high-priced. Some of the spurious root comes from other species of the same genus, but the most common adulterant is from the genus *Ionidium* (*Calceolaria*) of the family Violaceæ. Dr. Rusby exhibited also specimens of *Porteranthus stipulatus,* which is sometimes called the North American ipecac.

Dr. Britton showed living plants of two species of Crassulaceæ which had come into flower in the greenhouses of the New York Botanical Garden. One was *Sedum Nevii,* hitherto described from dried material, a species collected originally in southwestern Virginia, but since found to extend to Indiana. The other was a *Pachyphytum* from Mexico. Dr. Britton stated that in North America, north of the Isthmus, 284 species of Crassulaceæ may be recognized, distributed in 25 genera. Representatives of all these genera have now been studied in the living state.

Marshall A. Howe,
Secretary pro tem.

DISCUSSION AND CORRESPONDENCE.

THE METRIC ERROR.

To the Editor of Science: In your issue of March 24, Mr. Henry B. Hedrick, of the United States Naval Observatory, Washington, D. C., shifts from one metric fallacy to another. The regulation school children fallacy, as illustrated by the Hon. James H. Southard, chairman of the Committee on Coinage, Weights and Measures, in his report to the House of Representatives in 1902, and by Lord Belhaven in discussing a compulsory metric bill in the House of Lords on February 23, 1904, is that the adoption of the metric system will shorten the school life of every child, including all branches of study, from two thirds to three years; in other words, that the eight years will be cut down to seven and one third or even to five years. It is on this basis that Mr. Southard estimates a saving of $1,000,000,000 in every generation. It is clearly impossible to save by the adoption of the decimal system any of the time occupied by the study of non-mathematical branches, such as physical training, penmanship, languages, geography, history, nature study, drawing, cooking, sewing or music. The saving must be made in the time devoted to the study of compound numbers, weights and measures, which occupy 20 per cent. of the school arithmetic. Applying this rate, 20 per cent., to the 34⅛ weeks occupied during the eight years by all branches of mathematics, we find 6.8 weeks to be so consumed. This estimate is not only fair, but extremely liberal to the metric system. It is based on the eight-year schedule adopted for the public schools of New York City. The weekly time of 1,500 minutes is apportioned among the different branches, and the uncertain amount of time devoted to study outside of school hours is not included. Thus there is no confusion of schedule weeks with regular weeks. The case is simple. This metric fallacy is the claim that from two thirds to three years of the entire school life can be saved by the adoption of the metric system of weights and measures; when in fact, less than seven weeks is now devoted to compound numbers, weights and measures.

Turning from this old fallacy, let us consider the new one formulated by Mr. Hedrick to the effect that the adoption of the metric system would save ten per cent. of the time devoted to mathematics, or about two thirds of what may be called a mathematical year of school life. In other words, that 'the pupil would be about a year ahead in mathematics at the end of the eight years if he had only the decimal system to learn.'

In exposing this new fallacy it is unnecessary to dwell on the fact that the study of weights and measures in the school is merely very superficial memorizing and that the real knowledge of weights and measures is acquired outside of the school by using them; nor on the fact that the 34⅛ weeks covers

geometry and algebra, from which the special study of weights and measures is excluded. We can ignore these considerations because the fallacy of Mr. Hedrick's claim is due chiefly to his assumption that the use and study of fractions can be restricted to decimals. That is impossible because the universe is not built that way. To save time by abolishing the study of vulgar fractions is to promote ignorance, not knowledge. Such a policy of saving, carried to its legitimate conclusion, would do away with all study and award diplomas for what the graduate from the school of ignorance does not know.

The earth, from which the French scientists a century ago thought they had derived the meter, persists in revolving on its axis $365\frac{209226}{864000}$ times during one revolution around the sun. Everything from the chemical combinations of the elements to the arrangement of the planets and fixed stars proclaims the eternal verity which John Quincy Adams thus expressed to Congress in 1821:

> Decimal arithmetic is a contrivance of man for computing numbers, and not a property of time, space, or matter. Nature has no partialities for the number ten, and the attempt to shackle her freedom with them will forever prove abortive.

It seems like a waste of time to demonstrate this self-evident proposition, but as many, including the House of Lords and the chairman of the Committee on Coinage, Weights and Measures of the House of Representatives, have reached the opposite conclusion, it may be worth while to ask them to examine a French arithmetic. Take that excellent work by Joseph Garnier, 'Traité complet d'arithmétrique théorique et appliqueé au commerce, a la banque, aux finance et a l'industrie.' The fifth edition (1900) contains not merely a few incidental references, but many comprehensive chapters dealing with vulgar fractions. Here are a few chapter headings: 'Numeration et propriétés des fractions ordinaires,' 'Reduction des fractions au même denominateur,' 'Simplification des fractions ordinaires,' 'Conversion d'un numbre entier, et d'une expression fractionnaire,' 'Addition des fractions ordinaires,' 'Soustraction des fractions ordinaires,' 'Multiplication des fractions ordinaires,' 'Division des fractions ordinaires,' 'Conversion des fractions ordinaires en fractions décimales et réciproquement,' 'Fractions décimales periodiques,' 'Question sur les partages proportionnels, sur les mélanges.'

If these titles are not sufficient the metric advocate in English-speaking countries can be convinced by reading the French arithmetic and studying its problems. It includes 43 pages on the metric system; 12 pages on old pre-revolutionary weights and measures; 13 pages on the comparison of the old measures with the new; 22 pages on compound numbers; and 36 pages on vulgar fractions.

The chapter on the metric system, entitled: 'Poids et Mesures—Nouvelles Mesures au Système Métrique,' effectually dispels the illusion that the metric system in its entirety is simple. The system is explained there, not to make converts to the metric cause, but for practical application to every-day work. The metric system in the French arithmetic with its foreign nomenclature and combination of decimal with binary divisions, such as *hectolitre, demi-hectolitre, double decalitre, decalitre, demi-decalitre, double-litre, litre, demi-litre, double decilitre, decilitre, demi-decilitre, double centilitre and centilitre,* is the very uniformity of confusion. There are the same complex vulgar fractions and weird problems that one finds in all school arithmetics, only in the French form perhaps a little more weird. And all this in France more than a hundred years after the following decree was issued by Robespierre:

> Decree of August 1, 1793.
>
> Art. 1. The new system of weights and measures founded on the measurement of the earth's meridian and the decimal division will be used throughout the Republic.

In the face of such evidence, what is left of the claim that the metric system will save two thirds of a year or two thirds of a minute in the study of mathematics in school?

That the teaching of the metric system in American schools at the present time is but a pretense can be proved by asking any graduate a few simple questions. The fact is, that the introduction of the metric system into English-speaking countries, instead of making

the education of the child easier, will make it vastly more difficult, because it will then be necessary to teach the old system, which will persist in use, and also to teach in fact as well as in name the metric system with the confusing ratios, direct and reciprocal, between the English and metric units.

If any one wants proof of this he can find it in the same French arithmetic. One chapter, 'Nomenclature des anciennes mesures et comparison avec les nouvelles,' treats of old units, a few of which are: *toise, pouce, ligne, aune, pas, lieue, perche, arpent, solive, corde, setier, muid, mine, minot, livre, once, denier, grain.*

If he still doubts let him go to some great French industry, textile manufacturing for example, and there study the chaos of weights and measures, thus described in 1902 by Paul Lamoitier, a French manufacturer:

> We are as much in the anarchy of weights and measures for the textile industry as at the time of the Revolution. * * *
>
> The famous aune, do you know its equivalent? Exactly 3 feet, 7 inches, 10 lines, and 10 points, or in other words, 1.188447 meters; the foot being equal to .324839 meter and divided into 12 inches, the inch into 12 lines and the line into 12 points.
>
> You would not imagine this as you are in the habit of calling it 1.19 meters. You laugh! It is, however, no laughing matter, unless you consider it as I do, profoundly ridiculous. * * *
>
> I will take my oath that the manufacturer of Rouen if he has not studied each section separately, has no idea what is the standard of Reims or the denier of Lyons or Milan. And on the other hand the manufacturers of Reims and Lyons are likewise puzzled in making comparisons of the diverse numberings of the diverse materials.

Such is the condition of French weights and measures at the present time. The evidence here presented is from French sources and makes ridiculous not only the claim of saving in education, but the whole metric proposition as well. This school children fallacy is confined to English-speaking countries where in the absence of experience with the metric system the imagination supplies the foundation for argument. The French labor under no such delusion.

Of course, if they insist, English-speaking countries can learn about the metric system in the high priced school of their own experience, but more than a century of experience in France can be had without money and without price.

Samuel S. Dale.

Boston, Mass.,
March 27, 1905.

Will the Metric System Save Time in Education?

In the article entitled, 'The Metric Fallacy,' Science, March 3, p. 353, is the statement that, in the New York public schools: 'The time allotted for all branches of mathematics amounts to 34⅛ weeks for the eight years.' These figures relate to the actual time spent in recitation, which extends through nearly one year of school life, that is, about one eighth of the entire time. A complete education, to which Lord Kelvin referred in the British Parliament, includes high school and college, eight years more, which, with the same division of time, gives two years of solid mathematics. In England, one sixth, instead of one eighth is given to mathematics, and it is not extravagant to say that one half of this is wasted because of our barbarous weights and measures. Part of the economy of time shown in this country is due to our decimal money, part to the disuse here of many of the old English measures still taught in the English schools, and part to the greater use here of the metric system in our higher education, or perhaps it would be more correct to say, the non use therein of the English system.

Wm. H. Seaman.

Special Articles.

The Pelé Obelisk Once More.*

The recent massive-solid extrusion from within the crater of Mont Pelé has been de-

* Descriptions of the 'dome' and of 'spine' or 'obelisk' of Mont Pelé, with references to many previous papers relating to the volcano, may be found in: Hovey, E. O., 'The New Cone of Mont Pelé and the Gorge of Rivière Blanche,' in *American Journal of Science*, Vol. XVI., 1903, pp. 269–281. Hovey, E. O., 'The 1902–1903 Eruptions of Mont Pelé, Martinique, and the Soufrière, St. Vincent,' in *Comptes Rendus IX. Congrès géologique international*, de Vienne, 1903, pp. 707–738.