

molecule of extraordinary lability. The first product of such polymerisation, which might be, as the author suggests, the aldehyde of aspartic acid, would further condense so as to form a body having the formula ascribed by Liberkuhn to the simplest protein. This substance, "primitive peptone," by polymerisation of two molecules might form albumoses, and by the union of three molecules might form albumen.

Although the facts brought together by the author are interesting, and although we must grant the possibility of aldehyde groups existing in some parts of the protein molecule, and perhaps being responsible for some of the chemical interactions which occur in the living cell, the new facts brought forward are too trivial effectively to modify our opinion on the structure of the protein molecule, which is based on the solid work of Fischer and his pupils.

La Découverte de l'Anneau de Saturne par Huygens.
By Jean Mascart. Pp. 58. (Paris: Gauthier-Villars, 1907). Price 2 francs.

In this small volume of 58 pages M. Mascart tells the history of the discovery of Saturn's rings from the time of Galileo's dramatic anagram concerning the *altissimam planetam*, and his subsequent tragic disappointment and despair, to the time when, after many questionings and discussions, Huygens finally established his accepted theory. This history is most interesting, and includes a number of extracts from Huygens's correspondence on the subject, showing us how he had to fight for the acceptance of his theory and then had to fight again for the vindication of his priority in the matter. The numerous reproductions of original drawings by Gassendi, Hérvétius, Riccioli, Huygens, Wallis, and others give an additional interest to the work, which is concluded by a lucid recapitulation of the later theories, such as that of Otto Struve, and discoveries concerning Saturn's unique appendage.

W. E. R.

German Science Reader, Part i. Mathematics, Physics, and Chemistry. Compiled by C. R. Dow. Pp. 85. (London: J. M. Dent and Co., 1906.) Price 2s.

Twenty pages of this book are devoted to mathematics, twenty-three to physics, nineteen to chemistry, and the remainder to a vocabulary of words not usually found in elementary class-books of German. The mathematical portion is a synopsis of principles of mathematics with enunciations of problems, while the two remaining sections consist of definitions and descriptions of some physical and chemical properties of matter. Any student of science who has an elementary knowledge of the German language should be able to read the book with the aid of the vocabulary, and the task would be more to his taste than reading or translating Grimm's or Andersen's fairy-tales. No grammatical rules are given, as instruction in these is assumed to have been obtained in an earlier course.

Céruse et Blanc de Zinc. By M. G. Petit. Pp. 154.
Préparation mécanique des Minerais. Résumé pratique. By F. Rigaud. (Paris: Gauthier-Villars and Masson et Cie., n.d.)

BOTH these volumes are publications in the now well-known "Encyclopédie Scientifique des Aide-Mémoire." The first deals with the preparation and use in painting of white lead and zinc white respectively. The second book provides a practical account of the various processes in use for the mechanical preparation of ores by separating them from their stony matrix.

NO. 1952, VOL. 75]

LETTERS TO THE EDITOR.

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The Ballot-Box.

IN reference to the weight-judging competition, Mr. Galton says that "the average competitor was probably as well fitted for making a just estimate of the dressed weight of the ox as an average voter is of judging the merits of most political issues on which he votes." These competitions are very popular in Cornwall; but I do not think that Mr. Galton at all realises how large a percentage of the voters—the great majority, I should suspect—are butchers, farmers, or men otherwise occupied with cattle. To these men the ability to estimate the meat-equivalent weight of a living animal is an essential part of their business; and, as an instance of their training, I may mention that one of the butchers here has a son under thirteen years of age who is an adept at this work, and is already, I am told, one of the best weight-judges in the district. This boy has been trained to it by his father, and already surpasses his instructor. Moreover, many of the competitors doubtlessly compete frequently, compare notes afterwards, and correct future estimates by past experience. Now the point of all this is that, in so far as this state of things prevails, we have to deal with, not a *vox populi*, but a *vox expertorum*. I am afraid that the majority of such competitors know far more of their business, are far better trained, and are better fitted to form a judgment, than are the majority of voters of any party, and of either the uneducated or the so-called "educated" classes. I heartily wish that the case were otherwise.

F. H. PERRY-COSTE.

Polperro, Cornwall, March 21.

I INFERRED that many non-experts were among the competitors, (1) because they were too numerous (about 800) to be mostly experts; (2) because of the abnormally wide vagaries of judgment at either end of the scale; (3) because of the prevalence of a sporting instinct, such as leads persons who know little about horses to bet on races. But I have no facts whereby to test the truth of my inference. It would be of service in future competitions if a line headed "Occupation" were inserted in the cards, after those for the address.

FRANCIS GALTON.

MR. HOOKER, in NATURE of March 21, seems not to have quite appreciated my principal contention in the letters "One Vote, One Value" and "Vox Populi" of February 28 and March 7 respectively. It was to show that the verdict given by the ballot-box *must be* the Median estimate, because every other estimate is condemned in advance by a majority of the voters. *This being the case*, I examined the votes in a particular instance according to the most appropriate method for dealing with medians, quartiles, &c. I had no intention of trespassing into the technical and much-discussed question of the relative merits of the Median and of the several kinds of Mean, and beg to be excused from not doing so now except in two particulars. First, that it may not be sufficiently realised that the suppression of any one value in a series can only make the difference of one half-place to the median, whereas if the series be small it may make a great difference to the mean; consequently, I think my proposal that juries should openly adopt the median when estimating damages, and councils when estimating money grants, has independent merits of its own, besides being in strict accordance with the true theory of the ballot-box. Secondly, Mr. Hooker's approximate calculation from my scanty list of figures, of what the mean would be of all the figures, proves to be singularly correct; he makes it 1196 lb. (which is the mean of the deviates at 5°, 15°, 95°), whereas it should have been 1197 lb. This shows well that a small *orderly* sample is as useful for calculating means as a very much larger *random* sample,

and that the compactness of a table of centiles is no hindrance to their wider use. I regret to be unable to learn the proportion of the competitors who were farmers, butchers, or non-experts. It would be well in future competitions to have a line on the cards for "occupation." Certainly many non-experts competed, like those clerks and others who have no expert knowledge of horses, but who bet on races, guided by newspapers, friends, and their own fancies.

FRANCIS GALTON.

Ketene.

WHILE engaged in a research on the polymerisation of unsaturated compounds, we were led to try the action of a strongly heated platinum wire on various organic substances. It is unnecessary at this stage to discuss our general results, and we will therefore deal at once with the action of the wire on acetic anhydride. This substance when treated with the hot wire yielded a compound boiling about -65° and freezing about -130° , which on standing at ordinary temperatures condensed fairly rapidly, yielding a brownish-yellow oil which, like the gas, has an extremely pungent smell. We have not yet succeeded in obtaining the new body in a completely pure state, but as our work has been interrupted for some time, we venture to give the following preliminary data.

On exploding one volume of the gas with excess of oxygen, there was a contraction of 1.01 volumes, and 1.85 volumes of carbon dioxide were formed, while 1.86 volumes of oxygen had disappeared. The corresponding numbers for the reaction $\text{CH}_2 : \text{CO} + 2\text{O}_2 = 2\text{CO}_2 + \text{H}_2\text{O}$ are 1 : 1 : 2 : 2.

Another sample gave a density of 39.9 ($\text{H}_2 = 2$), while that calculated for $\text{CH}_2 : \text{CO}$ is 42. This sample was, however, far from pure.

The gas is absorbed by all the ordinary reagents, including water. It combines with bromine, and appears to give a crystalline compound with bisulphites. It chars when treated with phosphorus pentoxide or concentrated sulphuric acid. These two reagents themselves produce traces of the gas when they are allowed to act on acetic anhydride. We would add that we have also obtained the substance from acetone, and it seems probable that it can be obtained by our method from all substances containing the group $-\text{CH}_2-\text{CO}-$.

We would suggest that the body is the parent substance of Staudinger's ketenes. We hope to be able to publish a fuller communication shortly.

N. T. M. WILSMORE.
A. W. STEWART.

University College, London, March 25.

Technical Terminology.

THE writer on engineering terms in NATURE of March 21 (p. 490) says that a single word is required to denote a central electric generating station.

Perhaps *megadyne* would be acceptable, signifying "great power," and suggestive of the dynamo equipment of the station. As a convenient abbreviation, *mega* would readily enter into common use.

J. T. RICHARDS.
67 Thurlleigh Road, Balham, S.W., March 23.

HIGHER EDUCATION IN THE UNITED STATES.

THE most recent report issued from the United States Bureau of Education at Washington gives detailed information respecting recent developments of the various grades of education in the States down to June 30, 1904, and in it the Commissioner of Education gives a prominent place to the work of universities and colleges. The statistics now provided make it possible to supplement the article published in these columns (vol. lxviii., p. 25) dealing with university education in the United States, and to give some indication of the progress which has been made in American institutions of higher education during recent years.

NO. 1952, VOL. 5]

There has been, in the first place, a large increase in the number of students attending universities and colleges in the United States. Whereas in the year 1899-1900 the total number of men students was, roughly, 61,800, and of women students 25,300, the numbers in 1903-4 had become, for men, nearly 72,000, and for women nearly 31,000.

The number of professors and instructors has increased in a similar manner. In 1899-1900 the number of such teachers in institutions for men and for both sexes was 12,664 men and 1816 women; in 1903-4 these numbers had become 15,342 men and 2272 women. In institutions for women alone the increase is not so decided. The number of men teaching in these institutions was in the former year 697, and in 1903-4 only 631. The number of women, however, shows a marked increase from 1744 to 1834.

It is interesting and instructive, too, to study the rise and fall in the popularity of the various subjects taken up by students. At the two periods under comparison there were some remarkable differences. In 1899-1900 the number of students studying classics and other subjects of general culture (as the report calls it) was roughly 57,000, but in 1903-4 the number had reached 65,000. In the earlier year the number of students in classes of pure or applied science was well on towards 26,000; in 1903-4 this number had increased to 32,000. The relative popularities of humanistic and practical studies may be said to have undergone little change at institutions of the rank under consideration. But in this connection it must be remembered that at the great technological institutions, which are not included in these statistics, large numbers of men are engaged entirely in studying branches of applied science.

The total value of property possessed by the institutions for higher education in the United States amounted in 1899-1900 to about 72,120,000*l.*, and in 1903-4 this large sum had increased to 93,043,000*l.* The endowment funds in the former year were valued at 33,240,000*l.*, while in the latter year this provision for future contingencies had grown to 41,313,000*l.*

The value of gifts and bequests received by institutions for higher education during 1899-1900 was 2,399,000*l.*; in 1903-4 the amount had increased to 2,740,000*l.*; and last year as much as 5,000,000*l.* was raised in this way. Twenty-five institutions in the former year received from private donors gifts of as much as 20,000*l.*, and in 1903-4 as many as twenty-nine institutions were equally fortunate.

For the first of the years with which we are concerned in this comparison, the total income, excluding benefactions, amounted to 5,712,000*l.*, of which about 2,234,000*l.* was received in the form of tuition and other fees. In 1903-4 the total income had reached 8,066,000*l.* In connection with this sum, the Commissioner for Education remarks:—"It is a well-known fact that the income derived from fees received from students forms only about one-third of the total income, the remainder necessary to meet the expenses of the institutions being derived from endowment funds, State aid, and miscellaneous sources."

In 1903-4 the State and municipal aid to higher education amounted to 1,984,600*l.*, as compared with 893,000*l.* in 1899-1900.

It is thus seen that the striking disparity between public and private efforts in behalf of higher education in the United States and Great Britain, pointed out in the article to which reference has already been made, has, in the interval of four years with which we are here dealing, become more accentuated; and, instead of having made up leeway, we appear to have fallen even further behind.