Buchner was apparently the first to use litmus media for bacteria, although the ophthalmologist Leber preceded him by three years, employing litmus gelatine to demonstrate acid production by *Aspergillus.*

Cahen, and not "Cohen (?)," published his paper in the *Journal* given, in the next volume to that cited. While the citation is not correct as to volume and page, still with the name and *Journal* given it hardly justifies characterization as "apparently altogether erroneous."

It thus appears that both of us have been to some extent guilty and the present note is therefore offered in mutual condonation.

The following list of *authentic references* prior to 1890 was supplied by Professor Novy and each has been confirmed by the undersigned.

Leber—*Berl. klin. Wchnschr.,* 1882, 19. 163.
H. Buchner—*Arch. f. Hyg.,* 1885, 3, pp. 417, 418, 419.
Marpmann—*Centralbl. f. d. allgemeine Gesundheitspflege; Ergänzungshefte,* 1885–1886, 2, Heft 2, p. 123. (The number appeared in 1886 but the title page of the volume bears date of 1889.)
Weisser—*Ztschr. f. Hyg.,* 1886, 1, p. 334.
Cahen—*Ibid.,* 1887, 2, pp. 387, 394.
Neisser—*Virchow's Archiv. f. pathol. Anat. u. Physiol.,* 1887, 110, p. 394.
Loeffler—*Berl. klin. Wchnschr.,* 1887, 24, pp. 610, 631.
Berhring—*Ztschr. f. Hyg.,* 1889, 6, p. 142; 7, pp. 173, 177.
Petruschky—*Centralbl. f. Bakteriol.,* 1889, 6, pp. 628, 657.

Ivan C. Hall

University of California

ANOTHER DRIFT BOTTLE WHICH CROSSED THE ATLANTIC

In a previous note[1] the writer gave the record of a bottle which drifted from the Gulf of Maine to the Azores. Recently record has been received of a bottle which was picked up in the Orkney Islands. This bottle, No. 230, was set out on the same day (August 29, 1919) as No. 198 which went to the Azores and was put out about 6½ miles to the southeast of it, *i.e.,* 7½ miles southeast of Point Lepreaux in the Bay of Fundy. It was picked up on the Island of Papa Westray, one of the northwestern islands of the Orkney group, on January 21, 1921, about one year and five months after it was set out. This bottle probably followed the northern route of the North Atlantic wind drift ("Gulf Stream") as indicated for another bottle recorded previously.[1]

James W. Mavor

Union College,
Schenectady, N. Y.

NEWSPAPER SCIENCE

To the Editor of Science: The recent press reports quoting me as saying that I had "obtained the closest approach to a perfect vacuum ever recorded" are false and without foundation. The daily press copied and added to an item in the *Utah Chronicle,* a student paper, which itself was inaccurate in saying I had "perfected the apparatus." The student reporter after seeing in the department of physics a well-known form of vacuum pump wrote the original article without submitting it to me before publication. I am taking this opportunity to deny the statements credited to me by the newspapers which have given me so much undesirable and distasteful publicity.

Orin Tugman

University of Utah,
April 8, 1921

SCIENTIFIC BOOKS

Atmospheric Pollution.[1] Sixth Report of the Committee for the Investigation of Atmospheric Pollution.

(In Science, November 28, 1919, a summary of the fourth report of this committee, on the work in 1917–18, is given.)

---

[1] "On a bottle which drifted from the Gulf of Maine to the Azores," Science, N. S., Vol. LIII., No. 1365, February 25, 1921. Through a misprint the writer's name was given as "James W. Moor" instead of "James W. Mavor."

[1] Meteorological Office. Report on Observations for year ending March 31, 1920, London, 1921.

In all 29 gages are in operation—distributed as follows: Birmingham 3, London 8, Glasgow 9, Southport 2, and 1 each at Kingston, Malvern, Newcastle, Rochdale, Rothamsted, St. Helens, and Sterling. Two more stations are about to operate.

Full returns have been published in the *Lancet*.

The following data are given in this report:

1. Monthly deposits for the two stations representing high and low deposits.

2. Total solids deposited monthly at all stations.

3. Mean monthly deposits for summer half years, *i.e.,* April to September, 1918 and 1919.

4. Mean monthly deposits for winter half years, *i.e.,* October to March, 1918–19, and 1919–20.

5 and 6. Classification of stations according to amounts of elements.

7 and 8. Totals of classified stations for each element of pollution.

9. Comparison of mean monthly deposit during summer and winter.

10. Average deposit of each element for each month for two London and four Glasgow stations.

Also six summaries and analyses.

The station showing the highest mean monthly deposit for the year is Southwark Park, London, with 15.35 metric tons per square kilometer, but it is said that probably Newcastle or Rochdale, for which full year results were not available, might have exceeded this figure. The lowest value was 3.17 at Malvern.

The following table[2] gives the mean monthly deposits as selected stations:

MEAN MONTHLY DEPOSIT IN METRIC TONS PER SQUARE KILOMETER

Meteorological Office	8.43
Finsbury Park	10.78
Ravenscourt Park	14.09
Southwark Park	15.35
Hesketh Park	6.41
Woodvale Moss	5.34
Bellahouston Park	8.87
Botanic Gardens	10.91
Queens Park	8.01
Richmond Park	12.15

Generally speaking there is evidence of a considerable diminution of summer deposit in practically all the districts.

The highest deposit of tar in the London group was in February, the lowest in May; while in the Glasgow group the highest was in November and the lowest in September. This may be regarded as a normal distribution, as the winter months, including the two highest deposits, are the time when domestic fires are in operation, while the lowest deposits occurring in May and September, are in the summer months when fires are presumably not required. In Glasgow there is a second minimum in December and February. Wind doubtless has a great influence on the quantity of deposit, high winds sweeping it away from the vicinity of its origin and calm weather favoring deposit near the source of impurity.

Of the research work, the chief problem has been accurate measurements of acidity in the air. Automatic filters have been devised, holding 24-hour discs and many records have been made of impurities in London air. It has been shown that there is a definite cycle in the distribution of the impurities during the 24 hours. From midnight to 6 A.M. the air is practically clean of impurity, very little being recorded except during fogs. At about 6 A.M., when fires are lit, there is an increase in impurity continuing until 11. From 11 to 10 P.M. the quantity varies very little. At 10 it begins to diminish rapidly and has almost disappeared by midnight.

The committee is considering the possibility of utilizing standard rain gages. For large deposits this might work, but for country places with small deposits the 20 cm. gage (8 inch diameter) would not suffice since the area of this gage is practically 1/10 that of the standard deposit gage. One great objection to the use of the standard rain gage is the impossibility of estimating the quantity of tar and

---

[2] Abridged. Full table gives quantities of tar, carbonaceous matter, etc.

sulphates present; and these indicate the origin of the deposit.

To investigate this matter, however, the committee had the water collected in the 8-in. rain gage on the roof of the Meteorological Office analyzed for two or three months. During the month of November the small 8-in. gage collected 900 c.c. of water, the total deposit was 0.445 gramme, the total soluble 0.34 gramme, while in the standard deposit gage, the water collected was 783 liters, total deposit 1.962 grammes, total soluble 0.53 gramme. There was, therefore, a large excess of soluble matter in the water collected in the rain gage. The same result was found in subsequent months, and it was ascertained that the excess of soluble matter was due to metal dissolved from the rain gage.

It was therefore useless to continue the experiment unless the solution of the metal could be prevented. In order to do this the rain gage was given a coating of Duroprene varnish, in the hope that this would prevent the solution of the metal without any contamination of the water.

The result of the analysis of a month's rainfall showed for the 8-in. rain gage a considerably larger proportion of soluble and insoluble matter per liter of water as compared with the standard deposit gage, owing to the varnish yielding to the action of the rain water. It is therefore clear, if observations are to be taken with small gages these must be constructed of something which will not dissolve in the water, and the use of the ordinary copper rain gages is therefore inadmissible.

ALEXANDER MCADIE

SPECIAL ARTICLES

THE MECHANISM OF AN ENZYME REACTION AS EXEMPLIFIED BY PEPSIN DIGESTION[1]

ONE of the most striking peculiarities of living matter is the fact that nearly all the reactions which take place in the organism are due to enzymes. The mechanism of enzyme reactions is therefore very closely connected with the mechanism of the living cell. Many enzyme reactions, however, may be studied in vitro and are therefore amenable to quantitative study. The present paper is an attempt to show that the peculiarities of a typical enzyme reaction, pepsin digestion, may be explained by the accepted laws of chemical reactions and that the apparent divergencies from these laws are due to the fact that the enzyme as well as the protein with which it reacts exist in solution as equilibrium mixtures, consisting, in the case of the protein of ionized and non-ionized protein, and in the case of the pepsin of free and combined pepsin. The influence of the various factors on the digestion are primarily due to changes in these equilibria.

It is well known that enzyme reactions in general have certain peculiarities which distinguish them from ordinary chemical reactions. These may be briefly stated as follows:

1. The final amount of change caused by the enzyme is independent of the amount of enzyme present.

2. The rate of change may or may not be proportional to the concentration of enzyme present.

3. The rate of change is proportional to the substrate concentration in dilute solution but increases less rapidly than the substrate concentration in solution of higher concentration.

4. The amount of substrate decomposed in the same time interval by varying enzyme concentrations is not always proportional to the concentration of enzyme but is often proportional to the square root of this quantity (Schütz's rule).

5. The reaction proceeds most rapidly at a certain definite hydrogen ion concentration.

It has been found in a study of pepsin digestion that the above peculiarities may be quantitatively accounted for on the basis of the following mechanism.

1. The protein reacts with the acid of the

---

[1] The experimental data on which this paper is based may be found in *J. Gen. Physiol.*, 1918–19, I., 607; 1919–20, II., 113, 465, 471, 595; 1920–21, III., 211.