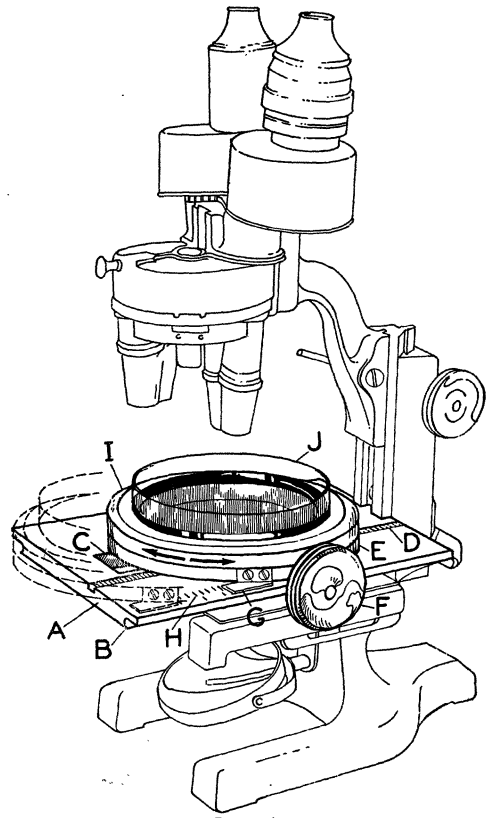

FIG. 1.

traveling element. Parallel to this opening is a slot carrying a rack (D) which meshes with a pinion gear in the bottom of the traveling stage.

This traveling stage (E) is moved back and forth by the adjusting screw (F), the distance being indicated by the pointer (G) and the scale (H). Above the traveling element is the rotating stage (I) which revolves about an axis fixed in the center of the lower disk (E). It bears on its upper surface a circular depression turned to receive a petri dish (J).

To operate the stage one moves the traveling rotating element to a position such that the center of the sorting dish is visible. After examining all specimens in the field of view the stage is moved forward one division on the scale calibrated for the particular magnification used, each division being a little smaller than the width of the field. In the new position the stage is rotated, as picking out progresses, until finally it has been turned through 360°. Then it is again moved forward and again rotated. This process is repeated until the entire sorting dish has been covered.

The front and rear of the stage base are interchangeable so that the adjusting screw may be placed on either the right or the left side of the microscope. Also the stage operates freely when the bottom portion of the microscope stand has been removed. This is a very desirable feature, since most workers prefer the low stand when sorting samples.

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COLORIMETRIC METHOD FOR DETERMINATION OF CO_2 IN GAS MIXTURES[1]

IN a previous publication,[2] a method was described for determination of CO_2 in gas mixtures which depends on determining the pH of a standard $NaHCO_3$ solution in equilibrium with the gas mixture. The theory of the method was treated in that paper and will not be discussed in the modification to be described. In the original method, the pH was determined by means of a glass electrode in order to achieve a reasonably high degree of accuracy. In many cases, however, such accuracy is not so desirable as is a rapid, simple, convenient method. Examples might include determination of CO_2 in the air of a room, greenhouse, hot-bed or over field crops in which relative values for comparative purposes are desired rather than exact quantitative data. For such cases, a modification of the original method by determining the pH colorimetrically is possible.

The pH determinations were made with Hellige color disks, since these offer several advantages over other colorimetric devices, *e.g.*, permanence of standards, compactness and accuracy of reading. With a little experience, an accuracy of 0.05 pH units is possible with the simple system measured in this method.

It was found that the calibration curve prepared for the original method could not be used for colorimetric determinations. The pH values found for a given pCO_2 were 0.1 to 0.3 pH units too low, varying with the indicator. This "systematic error" was constant for a given indicator, hence, if an empirical curve for the indicator used is constructed, the error does not interfere with the application of the method. The data of Higgins and Marriot,[3] who described a colorimetric method similar to this one, likewise show this systematic error, which is probably due to the buffering effects of the indicator and to lack of complete equilibration between solution and atmosphere. It was noticed also that not all indicators were equally satisfactory for the method. Aside from the difference in systematic error, certain indicators did not give accurate readings, except in the middle of the range. The most consistent results were obtained with Brom-thymol-blue for the acid range and Cresol

[1] Frasch Foundation Research in Agricultural Chemistry, Paper No. 69.

[2] P. W. Wilson, F. S. Orcutt and W. H. Peterson, "A Potentiometric Method for the Determination of CO_2 in Gas Mixtures," *Ind. Eng. Chem.*, Anal. Ed., 4: 357–361, 1932.

[3] H. L. Higgins and W. M. Marriot, "A Colorimetric Method for Determination of CO_2 Percentage in Air," *Jour. Am. Chem. Soc.*, 39: 68–71, 1917.

Red or Alpha Naphtholphthalein for the alkaline. Accordingly, these indicators were used in preparing the calibration curve.

The calibration curve was constructed by mixing CO_2 with air to give an atmosphere of known pCO_2; the volume of each component was measured in a standardized flow meter. The CO_2 content was checked by absorption of the CO_2 in a measured volume of the atmosphere in 0.1 N NaOH contained in a Truog tower and titrating the excess alkali to the Thymol Blue end-point. At the same time, the atmosphere was bubbled through about 4 cc of standard $NaHCO_3$ solution plus indicator in a 13 mm Board of Health test-tube fitted with an inlet tube drawn to one mm capillary tip. The equilibration of the $NaHCO_3$ solution required about 5 minutes, after which the test-tube was transferred to the comparator and the pH estimated. Duplicate determinations, which never varied more than 0.05 pH units, were made with each indicator used.

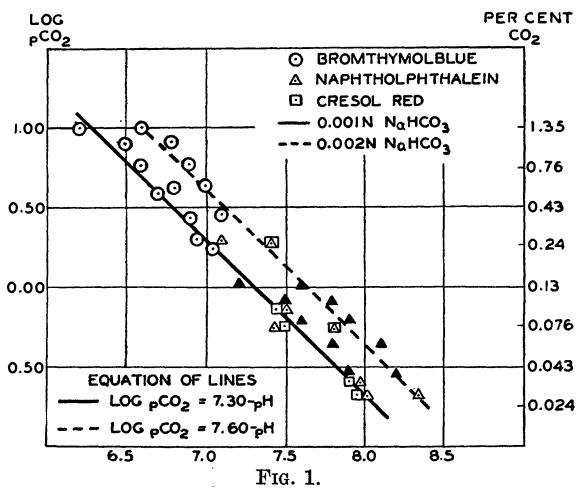

FIG. 1.

The calibration curve is given in Fig. 1; two concentrations of $NaHCO_3$ were used to give a check on the systematic error of the indicators. The solid symbols represent values obtained with 0.0107 N and 0.0214 N $NaHCO_3$; the pCO_2 corresponding to each of these points was divided by 10 before plotting. The curve, as given, is for use with 0.001 N or 0.002 N $NaHCO_3$, but by use of 0.0107 N or 0.0214 N $NaHCO_3$ solution, pressures of CO_2 ten times those indicated on the ordinates can be estimated.[2] The values for the percentage of CO_2 were calculated on the assumption of an average barometric pressure of 740 mm. It is to be noticed that the points lie along a line with the proper slope of unity and are displaced from each other by the theoretical value, *viz.*, 0.3 pH units.

Use of the method in routine analysis of air in a greenhouse is illustrated by the following example: To 20 cc of standard $NaHCO_3$ solution is added 1 cc of indicator solution (Brom-thymol-blue for a pCO_2 greater than 0.15 per cent.) and approximately 4 to 5 cc of the mixture placed in a 13 mm test-tube provided with a drawn-out inlet tube. The outlet tube is attached to a bottle containing water and fitted with a syphon. About 500 cc of air is drawn through the $NaHCO_3$ solution by displacement of water in the syphon, the pH determined by comparison with the proper color disk, then the pCO_2 read from Fig. 1. For routine analysis, a table in 0.05 pH units can easily be constructed for average barometric pressures by means of the equations of the lines given in Fig. 1. If the pH is read to 0.05 units, the error in the determination will be 10 per cent. or less.

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SPECIAL ARTICLES

A VIRUS ENCOUNTERED IN THE STUDY OF MATERIAL FROM CASES OF ENCEPHALITIS IN THE ST. LOUIS AND KANSAS CITY EPIDEMICS OF 1933

A VIRUS has been disclosed by the intracerebral inoculation of special mice with brain tissue from fatal cases of encephalitis occurring in St. Louis and Kansas City during August and September, 1933.[1] The mice employed, bred in our laboratory as part of a study of inherited factors in susceptibility and resistance to infectious diseases,[4] had previously proved susceptible to an infectious encephalitis of sheep.[5] It seemed possible, therefore, that experiments with these animals might throw light on the nature of the human encephalitis.

Brain tissue preserved in 50 per cent. glycerol from each of eight St. Louis cases[6] was ground in a sterile mortar, diluted in 0.85 per cent. salt solution to approximately a 10 per cent. solution by weight, cultured aerobically and anaerobically to detect the pres-

[1] Muckenfuss, Armstrong and McCordock have already reported (foot-notes 2 and 3) that a condition similar to the St. Louis encephalitis has been reproduced in monkeys and has been maintained through five passages.

[2] J. P. Leake, *J. A. M. A.*, 101: 928, 1933.

[3] R. S. Muckenfuss, C. Armstrong and H. A. McCordock, *Public Health Rep.*, 48: 1341, 1933.

[4] L. T. Webster, *J. Exp. Med.*, 57: 793, 1933.

[5] L. T. Webster and G. L. Fite, *Proc. Soc. Exp. Biol. and Med.*, 30: 656, 1933.

[6] Dr. Muckenfuss collected and sent material to us in New York. This assistance is gratefully acknowledged.