plorers will land with their supplies and 100 dogs, and for a year will make a close study of the coast of the Weddell Sea. Captain Larsen accompanied Amundsen's 1925 Arctic Expedition.

EARLY in January, according to *Museum News,* the Rochester, New York, Museum of Arts and Sciences was voted an additional $9,000 appropriation by the city council and will remain open. For a time the financial crisis in the city, which was receiving only a limited income from taxable property and had 50,000 welfare cases to care for, threatened to close the museum and Director Arthur C. Parker had tendered his resignation. With the added appropriation the museum is to continue its work; and at the request of the city museum board Mr. Parker has agreed to remain in charge.

THE committee of the American Psychological Association on Precautions in Animal Experimentation, consisting of Drs. C. P. Stone, E. G. Wever and C. J. Warden, *chairman,* desires to call attention to the following bills which have been introduced since January first to limit experimental work on animals: (1) New York Assembly, A. 63, proposing to prohibit any experimental work upon a living dog; (2) New York Assembly, A. 181, proposing to make it a misdemeanor to experiment or operate on a live dog for any purpose other than to heal or cure the animal; (3) Massachusetts Senate, S. 113, proposing to penalize certain experiments and operations on live dogs, and (4) Maine House, H. 217, proposing a fine for the practice of vivisection in schools supported wholly or in part by the state. Dr. Warden writes: "It is hoped that members of the American Psychological Association, residing in these states, will write letters of protest against the passage of these measures to the appropriate legislators. Bills of this kind are backed by powerful organizations whose efforts to obstruct scientific research must be met by active and determined resistance."

THE printed *Proceedings* of the Land Use Symposium, held at the summer meeting of the American Association for the Advancement of Science at Syracuse University, have just been issued. They contain all the papers presented at the meeting, which was well attended by economists, business men, research workers, foresters, agronomists, geographers and representatives of other earth sciences. Among the subjects treated in the *Proceedings* are the activities of the National Land Use Committee, Land Use and Agriculture, Land Use and Forestry, Land Use and Erosion, Land Use and Transportation, The Relation of Taxation to Land Utilization and Planned Land Use. The speakers included Dr. L. C. Gray, secretary of the National Land Use Planning Committee, Washington, D. C.; Dr. G. F. Warren, head of the Department of Agricultural Economics and Farm Management, Cornell University; Dr. F. P. Weaver, head of the Department of Agricultural Economics, Pennsylvania State College; Dr. Joseph S. Illick, head of the Department of Forest Management, New York State College of Forestry, Syracuse University; Mark Graves, director of the budget of the State of New York; Dr. Jacob G. Lipman, dean and director of the New Jersey Agricultural Experiment Station; Dr. Henry G. Knight, chief of Bureau of Chemistry and Soils, U. S. Department of Agriculture; Dr. Charles L. Raper, dean of the College of Business Administration, Syracuse University; L. R. Schoenmann, in charge of the Michigan Land Economic Survey. The *Proceedings* are arranged in a 60-page bulletin of standard book size, which can be procured from the Department of Forest Management, New York State College of Forestry, Syracuse, N. Y.

DISCUSSION

A NEW MATHEMATICAL FORMULA FOR CHEMICAL ANALYSIS IN A TWO PHASE SYSTEM[1]

OWING to the depression, the biochemist may be faced with a reduction in floor-space and budget, and, hence, one piece of apparatus may have to serve for a number of analytical procedures. I have shown[2] that the Bausch and Lomb micro-colorimeter may be used for the analysis of over 60 substances.

In many analytical procedures, the titration of a substance in water solution in the presence of large quantities of impurities leads to error which is greater the greater the ratio of the impurities to the "unknown."

In colorimetric analysis, colored impurities may often be ruled out by the use of monochromatic light that transforms the colorimeter into a spectrophotometer. Luminous, rarefied-vapor-tubes giving bright line spectra may be easily obtained, and color-filters used to filter out all bright lines except the one desired.

Impurities may not have worried chemists who were analyzing large samples of the unknown substance. But as the methods are adapted to smaller and smaller quantities of the "unknown" without a proportional reduction in the impurities, side-reactions which were insignificant in the older work become significant to the micro-chemist.

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[1] From the University of Minnesota and Tohoku Imperial University.

[2] McClendon, "A System of Microchemical Analysis, Handbook of Experimental Chemistry." (1st ed., Japanese and English) Kyo-rytsu-sha, Tokyo, 1932.

A method that has long been used for getting rid of impurities is the extraction of the "unknown" from water-solution with CCl_4 or other non-miscible solvent. (Chloroform and CS_2 spontaneously decompose in storage and CS_2 is highly volatile and inflammable.) In case the partition-coefficient CCl_4/H_2O is 200 or higher, some chemists have assumed that all the "unknown" is extracted with one extraction.

If the substance is colored, it may be determined directly in the colorimeter, and this is easier than getting it back into water to determine it by titration; and is just as accurate, if 10 readings of the colorimeter are made (finding the average being simply addition and moving of the decimal point). If the unknown solution is set at unit depth the colorimeter readings of the standard give the concentration of the unknown *directly,* without any calculation whatever (assuming the standard is in unit concentration).

In case the partition-coefficient, CCl_4/H_2O, is small enough to make repeated extractions necessary, the work becomes very laborious, owing to the fact that an infinite number of extractions are necessary to remove all the "unknown" from water-solution. If the partition-coefficient is known, the total "unknown" may be calculated from one extraction (knowing the ratio of volumes of the water-solution to the CCl_4). But the presence of impurities may alter the partition-coefficient to an unknown extent.

I have worked out a formula for calculating the total "unknown" from 2 extractions. It is not necessary to know the ratio of volumes of the water-solution to the CCl_4, but the ratio must be the same in the 2 extractions. The extraction is made in a separatory funnel and all the CCl_4-extract and none of the water-solution is removed. The funnel is stoppered and inverted and the water-solution in the hole in the stop-cock allowed to run back into it before admitting CCl_4 for the second extraction. If

x = total,
x_1 = 1st extract and
x_2 = 2nd extract

the formula is:

$$x = x_1 + \frac{x_1 x_2}{x_1 - x_2} \quad \text{or} \quad x = x_1 + \frac{x_2}{1 - \frac{x_2}{x_1}}$$

J. F. McClendon

GROWTH RETARDATION BY THE PARTIALLY OXIDIZED SULFHYDRYL OF CYSTEINE

In the spring of 1930, I presented before the American Philosophical Society the experimental data leading to the postulate that growth by increase in cell number is regulated by a naturally occurring chemical equilibrium comprised of sulfhydryl as the accelerating portion and its partially oxidized derivatives as the retarding. The full report was published in *Protoplasma,* Vol. 11, pp. 383–411, in the same years.

At that time I recognized that complete validation of the postulate depended upon the demonstration of cell proliferation inhibiting properties by a partially oxidized derivative of the sulfhydryl group carried by a naturally occurring sulfur compound.

Since I had found that cysteine, cystin and glutathione (a cysteine-containing compound) all accelerated cell multiplication, and since these compounds occur naturally in living growing things, the obvious thing to do was to use a partially oxidized sulfur derivative of one of these compounds.

Such a derivative was not available nor had it ever been prepared, to my knowledge. I therefore gave this chemical problem over to Dr. Gerrit Toennies, chief of the chemical division of our institute. After three years of concentrated effort he has succeeded in producing and isolating a sub-oxidized sulfur derivative of cysteine, starting with cystin. This is a notable achievement. He himself will make the report of his method and the chemical properties of the product elsewhere. Suffice it to say here that his tests show the compound to be neither an SH combination nor cysteic acid, the completely oxidized sulfur derivative, but some intermediate stage.

For practical purposes, I had postulated in the paper referred to above that the compound must be water soluble, essentially neutral and fairly stable in aqueous solution for a reasonable period. Dr. Toennies has produced a compound which meets these requirements.

With the material which he has supplied me I have tested out its action on the growth of Hydra hydranths and the embryonic development of Crepidula eggs and larvae. Uniformly have I found that definite and marked retardation is produced by this partially oxidized sulfur derivative of cysteine, a naturally occurring sulfur-containing compound. The retardation is produced by a concentration of about one part per million sulfur in the sub-oxidized state. This concentration is of the same order of magnitude as that used for sulfoxide in previous experiments and which was found similarly retardative.

This finding, therefore, demonstrates for the first time the growth-inhibiting effects of partially oxidized sulfhydryl from naturally occurring compounds and thus puts on unequivocal foundation the postulate that growth by increase in cell number is regulated by the naturally occurring chemical equilibrium comprised of sulfhydryl and its partially oxidized derivatives.

Dr. Toennies' brilliant success puts in our hands a