DR. STUART MUDD, professor of bacteriology at the Medical School of the University of Pennsylvania, lectured on December 2 at a meeting of the Theobald Smith Society. The lecture was entitled "Clues Regarding the Structure and Organization of the Simplest Living Systems."

DR. OSCAR RIDDLE delivered on December 1 a lecture in the Four College Genetic Series at Mount Holyoke College. He spoke on "Some Cases of Regulation by the Pituitary Gland."

DR. C. C. LITTLE, director of the Roscoe B. Jackson Memorial Laboratory at Bar Harbor, delivered on November 16 the fifth annual Barnard Hospital Lecture. The lecture was entitled "Parental Influence on the Incidence of Cancer."

DR. WALLACE E. PRATT, director of the Standard Oil Company of New Jersey, spoke on December 6 on "Future Supplies of Crude Oil" at a luncheon meeting of the Kappa Chapter of the Society of Sigma Xi of Columbia University.

THE annual Nobel Prize dinner was held in New York City on December 10. The speakers included Professor Harold C. Urey, of Columbia University, who received the award for chemistry in 1932, and Professor Otto Meyerhoff, of the University of Pennsylvania, who received the award for physiology and medicine in 1922. Father Robert I. Gannon, president of Fordham University, presided, and Chancellor Harry Woodburn Chase, of New York University, was the chairman. More than half of the twenty-seven Nobel Prize laureates now in this country attended the dinner.

SPEAKERS at the second War Conference on December 10 of the National Association of Manufacturers included Dr. Frank B. Jewett, president of the National Academy of Sciences; Dr. E. R. Weidlein, director, Mellon Institute of Industrial Research, Pittsburgh; Dr. A. R. Olpin, director, the Ohio State University Research Foundation; Lewis W. Waters, vice-president, General Foods Corporation; William C. Anthony, president, Anthony Company, Inc., Streator, Ill., and Dr. Gustav Egloff, president, American Institute of Chemists, and director of research, Universal Oil Products Corporation.

THE two hundred and fifty-eighth meeting of the American Physical Society will be held at the California Institute of Technology, Pasadena, on December 27. There will be two sessions, starting at 9:30 A.M. and 1:30 P.M. The morning session will be held in Room 155, Arms Laboratory, and the afternoon session in the Norman Bridge Laboratory. Following six contributed papers at the morning session, two invited papers will be given by Professors Linus Pauling and F. Zwicky. The afternoon session will open with invited papers by Professor Alexander Goetz and Dr. Otto Beeck, and these will be followed by the remainder of the contributed papers.

THE Field Museum of Natural History passed out of existence as a name on December 7, and the new name, Chicago Natural History Museum, went into effect officially with the granting of an amended state charter by the secretary of state at Springfield, according to an announcement made by Orr Goodson, acting director of the museum. The decision to change the name was announced in September by Stanley Field, president of the museum for the past thirty-five years, on the occasion of the celebration of the fiftieth anniversary of the institution's founding by the late Marshall Field. At that time President Field said: "The museum has had three names: Columbian Museum of Chicago—Field Columbian Museum—and Field Museum of Natural History. Mr. Marshall Field, III, has discussed with me several times the matter of the name of the museum. He has felt that since the museum was created and maintained for the public and has become identified in the minds of the public as a Chicago institution, and since it is now playing a growing and important part in the educational activities of the city—it would be appropriate, and also in the best interests of the museum, if the name were changed to the Chicago Natural History Museum, thereby identifying its ownership more closely with the people of Chicago, to whom, of course, it has always belonged."

DISCUSSION

STATISTICAL TREATMENT OF PERCENTAGE COUNTS

MANY data in biology and agriculture are in the form of percentage counts. In entomology, especially, the percentage or proportion of a population affected by some condition is of importance, and in many other fields, data of this type occur. In such cases each individual of the population studied is recognized as either succeeding or failing in a given respect; it is dead or alive, parasitized or non-parasitized, male or female, etc. Where we have a number of individuals we can make a statement of the percentage in each class. The percentages, if determined repeatedly from the same population by random samples, fall in the "binomial distribution" of mathematicians. As a rule they must be determined from very moderate numbers. The question of how far we can go in applying standard statistical methods to them is continually being asked.

Tests using the chi-square distribution or direct calculation of probabilities are described in standard statistical texts (Snedecor,[1] Goulden[2] and others). In one form or another they answer the question as to whether two or more percentages could have been derived from the same population, or one could have been derived from a specified population. In many cases, however, percentages are each based on replicated experiments, as is needed for broad conclusions; and these tests have some limitations in such material, since we often get into somewhat different populations in our replication.

The application to such problems of the computed standard error of a difference or of analysis of variance requires assumptions which are not entirely fulfilled in enumerative data. However, with adequate numbers, and percentages in the range between 10 and 90, there is usually little trouble. While percentage counts are not exactly normal in distribution, they approach normality, and the mean of several will come nearer than any single one. The total number of those succeeding and also of those failing in the replications of a treatment must reach from 20 to 30 before this condition begins to be realized.

Variance among percentage counts is somewhat dependent on the mean, the part due strictly to random sampling being defined as pq/n.[3] However, between 10 and 90 per cent. the form of the relation does not lead to serious error in analysis of variance. Where extreme percentages must be compared, Bliss[4] has given us a transformation eliminating the correlation; it is tabled by Snedecor (Table 16.9). Percentages are replaced by their tabled functions, which are used in analysis and in drawing conclusions. Extreme percentages tend to be more symmetrical in distribution after the transformation, hence the requirement of 20 or more failing and succeeding may be relaxed a little with the transformation. However, it will not make feasible analysis where percentages in some classes are nearly all 0 or 100. The use of the method seldom gives conclusions much different from those from the use of unmodified percentages.

To be freely used, the percentages should be based on equal or nearly equal numbers. If base numbers for each determination are over 30 and do not vary widely, weighting will not give enough gain to be worthwhile.

The error estimate must include in some way the variance between tests at different times, which is usually larger than the theoretical minimum value pq/n, owing mostly to real variations in proportion in successive groups. Calculation of variance or standard deviation among successive percentage determinations and of the standard errors of means or of the mean difference, will follow well-known lines.

With several methods to be compared, analysis of variance may be applied. The form of analysis will follow the design of the experiment. Where each method is tested on several groups, differing from the groups used with the others, only the variance between and within methods will be determined. Where all are tested side by side on the same groups, the determination of variances between groups, between methods and for their interaction is possible. The interaction variance will function as error, and greater precision will be secured than in the first case.

As an example of possible treatment we can cite a comparison of percentage mortality among five insect groups treated with three compounds. Each percentage was determined from 100 insects. Results were as given in Table 1.

TABLE 1

Group No.	Compounds		
	A	B	C
1	25	52	77
2	38	67	82
3	27	48	69
4	30	70	74
5	31	58	78
Mean	30.2	59.0	76.0

The range of percentages, the base numbers and the total number surviving and dying in each treatment fulfil the requirements mentioned for comparisons by standard methods.

Here we may calculate the standard error of the mean difference between two compounds, taking advantage of the pairing, or carry out an analysis of the variance among two or more classes. We may even calculate from the latter analysis a standard error of the difference between any two means, if we are very careful to assure ourselves that it is representative.

On the other hand, consider a set of percentages of fruits attacked, based on 100 fruits each, under two treatments. With treatment A, the percentages are 6, 3, 2 and 5; with B, 7, 8, 5 and 11. The set under A fails in two respects in meeting the suggested standards; the percentages run well below 10 per cent. and the total number affected does not reach 20. With B, the total is over 20, but the percentages are still largely below 10 per cent. With a set based on only 25 individuals per unit, and percentages of 12, 16, 20 and 12, the standards are not met; while percentages are above

[1] G. W. Snedecor, "Statistical Methods," third edition, 1940.

[2] C. H. Goulden, "Methods of Statistical Analysis," 1939.

[3] Snedecor, *l.c.*, Sec. 16.2.

[4] C. I. Bliss, *Ohio Jour. Sci.*, 38: 9–12, 1938.

10 per cent. the total number affected does not reach 20.

We may cite another hypothetical case, of four treatments with 3 replications each percentage based on 100 (Table 2).

TABLE 2
PERCENTAGE OF FRUITS ATTACKED

Replication	Treatment A	Treatment B	Treatment C	Treatment D
1	6	2	1	4
2	59	55	46	60
3	66	48	36	54

This would fulfil in part the standards suggested, but the low values in one replication would make it seem desirable to employ Bliss's transformation. While the use of the transformation will not modify conclusions greatly, the results with the transformed data are somewhat more trustworthy, where very extreme percentages are mixed with intermediate ones.

In conclusion, it may be stated that the standard methods discussed have some limitations in application to enumeration data of the percentage count type. However, where percentages are based on adequate and similar numbers, where they are between 10 and 90 per cent, and where individuals succeeding and failing each total 20 or more in a treatment, these methods may be used. With more extreme percentages a transformation may be of help, and larger total numbers may be needed.

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THE GERMINATION OF DORMANT LETTUCE SEED

IN improvement work with lettuce dormancy in freshly harvested seed often causes delays and loss of valuable seed. Workers have reported that light, high oxygen and high carbon dioxide concentrations aid in breaking dormancy. Thompson and Kosar[1] found that two ml of 0.5 per cent. thiourea in water markedly stimulated the germination of most of the lots of lettuce seed (*Lactuca sativa* L.) which they germinated on filter paper in 95-mm Petri dishes in darkness at 24° to 26° C.

In a preliminary attempt to germinate freshly harvested dormant seed of *L. serriola* L. two lots of seed were treated in thiourea as done by Thompson and Kosar,[1] and similar lots were handled in exactly the same manner except that they were kept in diffused light of about 150 foot candles. After 72 hours 98 per cent. of the seed in the light had germinated as compared with less than 1 per cent. of those in the dark.

In an attempt to evaluate the benefit derived from thiourea and from light three lots of strains of *L. sativa*, closely related to 456 and seven lots of *L. serriola* seed were treated with thiourea and with water both in darkness and in light. All seed had been harvested the previous day, but much of the *L. sativa* seed had been mature for a considerable time and had not been harvested because the plants were grown in a greenhouse and were protected from winds. The *L. serriola* seed were gathered in abandoned fields near Ithaca two days after a period of considerable wind that would have blown off seed that had matured before that time. Temperatures ranged between 21° and 28° C. Counts were made after 72 hours. Results are given in Table I.

TABLE I

Lot number	Thiourea Light	Thiourea Darkness	Water Light	Water Darkness
Lactuca sativa				
1	100	96	10	16
2	100	76	0	4
3	100	96	4	6
Lactuca serriola				
1	96	4	6	0
2	94	44	4	0
3	78	10	16	0
4	64	0	2	0
5	56	0	4	0
6	72	0	8	0
7	72	20	10	0

As pointed out by Thompson and Kosar[1] thiourea markedly retards the growth of the seedlings. This retarding effect of thiourea can be largely eliminated without loss of stimulation of germination if the seed is treated with thiourea for 24 hours and then washed. This can be done conveniently by transferring the filter paper with the wet seed clinging to it to a Büchner funnel, washing well with distilled water and returning it to the rinsed Petri dish. Six lots of freshly harvested *L. serriola* seed treated in that manner varied in germination from 100 per cent. to 88 per cent. with an average of 94 per cent., while but one seed of the 300 of the 6 comparable lots moistened with water and left in the dark germinated.

In using this method for the growing of plants the treatment is started in the late afternoon so that the seed may have a maximum period of light following the night period when absorption of the thiourea solution may take place. Late the following afternoon the seed is washed with distilled water and returned to the Petri dish for planting the next morning in sand wet with dilute nutrient solution.

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[1] Ross C. Thompson and William F. Kosar, *Plant Physiology*, 14: 567–573, 1939.