excuse is provided for the first time for the public to leave research in the universities to "look out for itself."

I am not interested in discussing here the ethics or morality of the matter. The way it is working out is proving dangerous: it tends to shut off unselfish exchange of ideas and information, it tends to kill a critical and impartial attitude, it tends to introduce quarrels and bitterness and to consume time and funds in lawsuits. It may quite naturally influence the choice of university personnel and the choice of research problems. If, in addition, the policy of taking out patents for revenue be interpreted as a declaration of independence the public may quite cheerfully acquiesce and leave research work to earn its own way. Why should gifts intended for the general welfare play the rôle of capitalizing a business? And what becomes of the peculiar function of university research as contrasted with that of the shrewdly administered business enterprise?

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THE COEFFICIENT OF CORRELATION

IN a recent article describing a least-square curve fitting machine[1] the authors make use of the Pearson product-moment coefficient of correlation to test the agreement of the parameters obtained by use of this device with those obtained by an algebraic method. This use of the correlation coefficient to test the agreement of two methods of measuring the same quantity is frequently seen in the literature, but the soundness of the procedure is open to question.

The idea of correlation as conceived by Galton implies that there is such a measurable quantity as *degree of relationship,* and the coefficient developed by Pearson is taken to give this measure. In keeping with this idea it is argued that if two methods of measurement agree well, their results will be "closely related" and *vice versa;* hence the use of the coefficient. As a matter of fact, the correlation coefficient is more correctly understood, specifically as a particular parameter obtained in a least-square fit of a straight line to the data correlated, and its significance is not general, but varies with the character of the data to which the fit applies.

In the case at hand, it can easily be shown that the coefficient measures, in large part, something quite different from what is intended. The method of procedure when two instruments or methods of measurements are to be compared is as follows: A series of determinations over the entire range of instrument or method x is made, and upon the same data determinations are made with instrument y. The corresponding measurements are then correlated. The coefficient may be given by

$$r=\sqrt{1-\frac{\sigma_{x.y}^2}{\sigma_x^2}}$$

Where r is the coefficient, σ_x is the standard deviation of the x measurements, $\sigma_{x.y}$ is the partial standard deviation of x, for a fixed value of y. Now, in instances of this kind, the distribution of x is not generally normal, but rectangular, *i.e.,* about the same number of measurements is made at each value of x. Under these circumstances σ_x depends on the range of x, being given by $\sigma_x^2=\frac{R_x^2}{12}$ where R_x is the range of x. Consequently, r is greater the greater the range of the measurements made. That the method can easily lead to paradoxical results may be seen as follows. Suppose two instruments to be uniformly comparable over their entire ranges, one with the other. A series of measurements is made over the lower half of the range and correlated, yielding a particular value of r. The same procedure is repeated for the upper half and the same value of r is obtained, appearing to give a good check of the measure of how well the two methods agree. But if now all the data are put together as a single series, the correlation will be greater. For instance, if r was 0.5 in the first case, it would be 0.9 in the second.

This fallaciousness in the use and interpretation of the correlation coefficient creeps in in other instances than where methods of measurement are compared. For instance, it is present when a physical trait like height is correlated with age, and the age range is arbitrary. It also vitiates not a little of the use made of the coefficient by psychologists.

In passing, referring to the main topic of the article first mentioned, it may be noted that the idea of obtaining a least-square fit of a line on the principle of elastic bands stretched from the points to be fitted was mentioned at least as early as 1921 by L. J. Reed.[2]

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ATTEMPT TO CONFIRM THE EXISTENCE OF A FILTRABLE CYCLE OF BACTERIA BY THE USE OF "K" MEDIUM[1]

AN attempt has been made to confirm the results of Kendall reported in the *Northwestern University Bulletin* (xxxii, 5, 1931). Complete failure with 'K' medium made by us according to his directions, was

[1] Gains and Palfrey, "A Least-Square Curve Fitting Machine," SCIENCE, 76: 472, November 18, 1932.

[2] Lowell J. Reed, "Fitting of Straight Lines," *Metron,* Vol. 1, p. 3, 1921.

[1] A detailed account of the work appears in the *Journal of Infectious Diseases,* 52: 20. 1933.