absolute surface tension values in terms of dynes. Such an instrument with its proper formula might well be of service in such measurements because of its simplicity of manipulation.

FREDERICK S. HAMMETT
THE WISTAR INSTITUTE OF ANATOMY AND BIOLOGY

VARIATION OF INDIVIDUAL PIGS IN ECONOMY OF GAIN

IN a very interesting article by Ashby and Malcomson, published in the *Journal of Agricultural Research*, Volume XIX., pages 225–234, the following statement is made on page 232:

> The resultant coefficient of correlation
>
> $$r = -0.452 \pm 0.068$$
>
> shows a distinct negative correlation between rate of gain and economy of gain, entirely disproving the apparent relation shown by Tables IX. to XV.

This conclusion is very interesting, especially since it is contrary to the usual belief and usual experience. The writer has recalculated the coefficient of correlation from Table XVI. on page 232 and found a different result from that given by Ashby and Malcomson in that $r = -0.166 \pm 0.083$ which is not a significant correlation.

Thinking that a different treatment of the data might throw further light on this point, a new correlation table was made between the rate of daily gain and the amount of feed required to produce 100 pounds of gain. This correlation was found to be

$$r = +0.140 \pm 0.083.$$

This is not a significant correlation, but it is interesting to note that it is positive instead of negative.

Again Ashby and Malcomson combined cases of animals fed on pasture and of those fed in the dry lot. From a statistical point of view, this is not advisable, since the food derived from the pasture was not taken into consideration.

The average daily gain of 27 animals fed on pasture was 1.14 pounds and the average amount of feed required to produce 100 pounds of gain was 361.2 pounds. The average daily gain of 36 animals fed in the dry lot was 1.41 pounds and 391.8 pounds of feed were required to produce 100 pounds of gain. It is readily seen from these figures that the rate of gain among pasture fed animals was less than among those of the dry lot, and at the same time the amount of feed for 100 pounds of gain was less, because the part of the feed from the pasture was not taken into consideration.

Separate correlations were found for these two groups. In the pasture-fed group

$$r = -0.181 \pm 0.126,$$

while in the dry lot group

$$r = -0.036 \pm 0.112.$$

Both of these are negative but not significant. When treated together

$$r = +0.140 \pm 0.083,$$

a positive correlation but still not significant.

One can not accept the conclusion of Ashby and Malcomson that there is a negative correlation between the rate of gain and economy of gain for the following reasons:

1. On the basis of their own data, there is no significant correlation.

2. From a statistical standpoint it is not legitimate to pool cases of animals fed on pasture and animals fed in the dry lot, for the purpose of determining the correlation between rate of gain and economy of gain since the two groups are dissimilar.

Other factors which might influence the results are initial weight, age, length of feeding period and methods of feeding. In their discussion, the possibility is suggested of using these individual differences as a basis for selecting strains which are more economical producers. But these variations which they found can not be said to be genetic because of too many uncontrolled factors such as cited above. It is interesting to note that even when pigs are self-fed, selection is exercised by individual pigs in the kinds of feed which they consume. The following table taken from a preliminary report by Ashby on page 201 of the 1916 *Proceedings of the*

American Society of Animal Production illustrates this point:

PERCENTAGE COMPOSITION OF RATION

Feed	Range in Per Cent.
Corn	85.21 — 90.65
Shorts	1.53 — 4.11
Tankage	6.22 — 12.10

The method of individual feeding which Ashby and Malcomson used seems to be the only method available for the study of some of the problems of animal production and one to which more attention must be given, but there are many factors operative rendering such a method difficult.

E. Roberts
Agricultural Experiment Station,
University of Illinois

THE AMERICAN CHEMICAL SOCIETY

(*Continued*)

DIVISION OF RUBBER CHEMISTRY

W. W. Evans, *chairman.*
Arnold H. Smith, *secretary.*

The day was devoted entirely to a discussion of the tentative procedure for the analysis of rubber goods.

Reports from the executive committee, abstract committee, accelerator committee, and physical testing committee were read.

Thermal conductivity of some rubber compounds: A. A. Somerville. Rubber mixes have been made containing different amounts of sulphur, with and without accelerators, with equivalent volumes of various fillers, and given a range of cures. The thermal conductivities of these samples have been compared and the results of the test indicate a wide variation in thermal conductivities due to different fillers being used.

Contribution to the knowledge of the resins of Hevea rubber: G. Stafford Whitby and J. Dolid. A number of crystalline substances have been isolated from the acetone extract of plantation Hevea rubber. At least two of these are sterols. The less soluble of the two constitutes roughly 5 per cent. of the extract, it decomposes without melting, and forms an optically active acetate crystallizing in leaflets and melting at 169°. With this sterol another substance, not yet isolated in a state of purity, was associated. The soluble sterol consisted of matted, flexible leaflets, melting at 127°. A substance, optically inactive, melting at 62°, constituting roughly 5 per cent. of the extract, was obtained. Quebrachitol was isolated from the extract, and was found to occur generally in sheet and crepe. The results of a quantitative study of the oxidation of caoutchouc under the catalytic influence of copper are reported.

The solubility of gases in rubber as affecting their permeability: Charles S. Venable and Tyler Fuwa. It was found that when rubber absorbs gas, the gas is held in true solution and not by absorption. In the case of carbon dioxide, which has about an average solubility, the amount of gas thus held in true solution by the rubber is directly proportional to the pressure and decreases with increasing temperature. This solubility is unaffected by degree of vulcanization or by the presence of compounding ingredients. Other gases seem to behave in a similar manner. Relative solubility values obtained for various gases in rubber show that there is a general relationship between the solubility and density of the gas and its rate of penetration through rubber. These results, in general, confirm the original hypothesis of Graham that the penetration mechanism consists in the solution of the gas at one surface of the rubber and the diffusion of the undissolved gas through the rubber and its evaporation at the other surface. The indications are, however, that the actual size of the gas molecule is also an appreciable factor. A striking relationship between the solubility of various gases in rubber and in water has been noted.

Reactions of accelerators during vulcanization. III. Carbo-sulphydryl accelerators and the action of zinc oxide: C. W. Bedford and L. B. Sebrell. Reactions of accelerators producing mercapto groups by action of sulfur are discussed. Thio carbanilide with aniline in benzol solution will dissolve zinc oxide and will vulcanize a zinc oxide cement at room temperature. Other zinc salts of mercaptans such as zinc thiophenol and zinc-ethylxanthate will vulcanize pure gum cements containing sulfur at room temperature. These accelerators are free from nitrogen or alkali and also function in press or steam cures. Without zinc oxide no accelerator has been found which will vulcanize at room temperature. Zinc salts of carbo-sulphydryl accelerators furnish the key to the paper.

The influence of piperidine-piperidyl-dithiocarbamate on vulcanization: G. Stafford Whitby and O. J. Walker. Tested in a 90 : 10 rubber-sulfur mix, 1 per cent. of the base mentioned is