urge authors to be extra patient in the matter of receiving their reprints. If the present composition force is diverted to work on reprints, the issue of each of the journals of the society would be delayed to that extent. We have, therefore, taken the liberty of authorizing the printer to postpone the making up of reprints from this *Journal,* and to put all emphasis upon catching up with the regular schedule of publication. We are confident of an extension of loyal cooperation on the part of our contributors.

To adopt the language of the Weather Bureau: "For to-morrow: fair weather."—*Journal of Industrial and Engineering Chemistry.*

SPECIAL ARTICLES

NOTE ON THE USE OF THE DUBOSCQ TYPE OF COLORIMETER FOR THE DEMONSTRATION OF DIFFERENCES IN SURFACE TENSION

Although there are many interesting experiments by which the phenomena of surface tension can be demonstrated to students, as a rule they fail to give a basis of direct visual evidence of the main force concerned. Consequently any procedure which will enable the student to demonstrate to himself in a semi-quantitative manner, that there are differences in the ability of different liquids to sustain themselves by the forces inherent in their surfaces, should assist in an understanding of the underlying principles.

Such a demonstration can be staged by the use of the Duboscq type of colorimeter. Moreover the effects of the additions of minute amounts of various substances to water, on the surface tension of the latter can be strikingly shown.

If that point on the scale at which the dry lower surface of the plunger just comes in contact with the surface of a liquid in the cup or small beaker of about 5 cm. diameter resting upon the cup support is taken as the base line, it is possible to measure with a considerable degree of constancy the height in tenths of millimeters to which the plunger can be raised above the surface of the liquid before the clinging column of fluid breaks contact and slides back into the container. This affords a clear idea of the principle of surface tension from the fact that an obviously weighable volume of liquid is lifted and held above the main surface of fluid by the force of the liquid surface in contact with the plunger.

When a comparison is made of the height to which the plunger can be raised from contact with the surface of such substances as water, ether, absolute alcohol, acetone and toluol, it becomes at once evident that different liquids have different abilities to cling to the plunger surface and hence different surface tensions. When a bit of soap is swished around in the water in the beaker and then removed, the marked decrease in surface force is made plain by the decrease in the height to which the plunger can be raised before contact is broken. A similar result is obtained when a trace of amyl alcohol is added to the water. When a bit of picric acid is dissolved in the water in the beaker the opposite effect is observed and is of sufficient magnitude to demonstrate why picric acid solutions "bump" when heated.

TABLE

Substance	Height in 0.1 mm.	a^2mm^2
Water	40	14.68
Toluol	29	6.72
Acetone	28	6.18
Absolute alcohol	27	5.08
Ether	25	4.61
Water plus soap	36	
Water plus amyl alcohol	33	
Water plus picric acid	42	

The accompanying table shows the values obtained for the substances mentioned. The second column of figures gives the values for the same compounds as copied from Landolt, Bernstein and Roth's tables, 4th edition, in terms of a^2mm^2. The correspondence is pleasingly close, but is of course accidental since contributing factors other than the height in millimeters are obviously involved, though in this group they happen to be mutually compensating.

These few examples suggest the availability of the plunger-cup mechanism as a basis for the development of an accurately calibrated piece of apparatus for the determination of

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.

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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*