

them. I believe that the physiology of insects has been done in a superficial and disjointed manner, and that the reason is that the majority of workers feel compelled to produce results of some obvious practical importance. I believe that real progress will not be made in applied entomology until this mistake is realised, and until we devote time and labour to the study of the fundamentals of insect physiology.

For example, we know that the spread of plague is to some extent influenced by the effect of temperature and humidity on certain species of fleas; but we do not understand why high temperatures are fatal to some insects, or whether the effect of humidity on insects should be measured as relative humidity, or as saturation deficiency, or in what other way. Again, we know that the greater part of the response of an insect to its environment can be analysed into a number of tropisms, which are relatively simple. We scarcely study these problems of psychology, though it is possible that if we knew the stimuli which control the insects' behaviour we could predict or even alter the behaviour. As an example of this, it has been recently shown that if certain stimuli, such as darkness, are supplied, a species of mosquito will come freely to lay its eggs in water containing arsenic, which is fatal to the larva as soon as it leaves the egg. Then, again, most of the poisons which we use are in favour because they are known to be toxic to vertebrates. We have the fair face of Nature with copper sulphate, and then powder her with Paris green, but we cannot find enough time to make a thorough study of the toxicology of insects.

I believe that progress in the control of noxious insects is at present hampered by our ignorance of the physiology of insects in general. By physiology I mean not only the study of the functions of isolated parts of an organism, but also the extremely difficult task of understanding the relations between the living insect and the whole of its environment, inorganic and organic.

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The Anomalous Flocculation of Clay.

IN recent years it has become common to speak of the flocculation of clay by calcium salts as being 'anomalous,' the particular anomaly being that whereas clay suspensions containing a little sodium chloride are stabilised by the addition of sodium hydroxide, in the case of calcium the flocculation is said to be facilitated rather than repressed by the addition of the alkali. Careful experiments, however, made with a highly purified clay suspension, have convinced us that this anomaly does not exist, and that calcium and sodium compounds behave alike except in respect to the concentration required for flocculation. The following figures show the concentration in equivalents of cation required for flocculation to be half completed in one hour, this being determined nephelometrically:

	Concentrations multiplied $\times 10^4$.	
	Sodium.	Calcium.
All chloride	70	5.6
All hydroxide	480	16.8
Two equivalents of chloride to one of hydroxide	560	19.5

These results are parallel and do not suggest anything more than that compounds of calcium are much more powerful flocculants than those of sodium.

In carrying out this work, however, a much more

interesting phenomenon has been noticed. If to a dilute clay suspension be added gradually increasing quantities of certain mixtures of chloride and hydroxide, and the effect on the flocculation or otherwise of the clay determined nephelometrically after one hour's standing, it is found that the flocculating effect first increases very rapidly with concentration, then rapidly falls off and then again increases without further falling off. The following table shows this for a few mixtures, and also exhibits the similarity in behaviour between sodium and calcium compounds. '+' means flocculated (one-half or more down in one hour), and '-' means no flocculation observed in an hour.

Conc. $\times 10^3$ for Sodium. Conc. $\times 10^4$ for Calcium.	5	20	40	60	80	100	120	140	160	180	200
NaCl : NaOH, 50 : 1 .	-	+	-	-	+	+	+	+	+	+	+
NaCl : NaOH, 175 : 1 .	-	+	+	+	-	-	-	-	+	+	+
CaCl ₂ : Ca(OH) ₂ , 2 : 1 .	-	-	-	-	+	+	+	-	-	-	+

In the case of sodium compounds, the phenomenon is exhibited with ratios for chloride to hydroxide varying between 25 and 175 to one: for calcium it is only shown in the neighbourhood of the ratio 2 to 1. Other mixtures do not show a minimum in the flocculation curves.

Interesting information is being obtained from the pH measurements of the mixtures at critical points, and it is hoped to publish a complete account of the observations shortly.

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X-ray Identification of the Higher Fatty Acids.

THE fatty acids of higher carbon content than stearic acid are of general interest because of their occurrence in oils and fats now employed for edible purposes. Ultimate chemical analysis of higher fatty acids is inconclusive, because of the very slight percentage differences in the elementary composition of these closely related homologous substances, but X-ray examination gives data which are more decisive (Müller, *Chem. Soc. Trans.*, 1923, 123, 2043; Müller and Shearer, *ibid.* p. 3156).

In pursuance of our researches on acids from vegetable fats, including arachis or peanut oil (Morgan and Bowen, *J. Soc. Chem. Ind.*, 1924, 43, 346T; Morgan and Holmes, *loc. cit.*, 1925, 44, 108T, 219T, 491T), we have recently isolated from this oil an acid melting at 77° which has been shown by X-ray examination to be a C₂₆ acid, almost certainly possessing an unbranched carbon chain. We are indebted to Dr. E. A. Owen of the National Physical Laboratory for the X-ray photograph.

This physical evidence confirms an observation published recently by Holde and Godbole (*Ber.*, 1926, 59, 36), who have shown that arachis oil contains a hexacosic acid (m.p. 79°), this acid giving by alkali-metric titration a molecular weight of 394 (calculated 396).

As the chemical constitutions of higher fatty acids from arachis oil have recently been a matter of controversy (Ehrenstein and Stuewer, *J. prakt. Chem.*, 1923, 105, 199, and Cohen, *Proc. K. Akad., Wetensch., Amsterdam*, 1925, 28, 630), we are now examining the chemical and physical properties (including crystal structure) of certain higher fatty acids having branched carbon chains of predetermined configuration.

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