

$\Delta G''_{\frac{1}{2}} = 1047$, $\Delta G''_{\frac{2}{3}} = 1464$, $\Delta G''_{\frac{3}{4}} = 1440$ (calculated from band origins, not from heads). The same is true for the values of B (Table 2). In Table 2 are given the B values for both states, as well as those for r and α . The B'' values coincide with those calculated by Rosenthal and Jenkins for the lower 1Σ level.

TABLE 2

		B	
1Σ	$v'' = 0$	1.643	$r''_0 = 1.33 \text{ A.}$
	$v'' = 1$	1.623	$\alpha'' = 0.020$
1Π	$v' = 0$	1.296	
	$v' = 1$	1.280	$r'_0 = 1.50 \text{ A.}$
	$v' = 2$	1.266	$\alpha' = 0.015$

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¹ *Ark. Mat. Astron. och Fys.*, 20 A, 1; 1928.

² *Phys. Rev.*, 33, 163; 1929.

³ Cf. R. S. Mulliken, *Phys. Rev.*, 32, 186; 1928; and G. Herzberg, *Z. Phys.*, 57, 601; 1929.

Coacervation

IN a preliminary communication Kruyt and Bungenberg de Jong¹ proposed the name *coacervation* for the phenomenon of separation into two liquid layers in systems containing one or more compounds in the colloidal state.

The separation takes place under the influence of several agents (for example, electrolytes, alcohols, polyphenols) at a temperature above the temperature of gelation.

Kruyt and de Jong suggested a typical difference between the analogous phenomena in molecularly dispersed systems, studied by the classical phase-theory, and the peculiar type of flocculation already mentioned.

We have analytically determined the composition of the co-existing liquids in the systems: water-gelatin-ethanol, w.-g.-sodium sulphate, and w.-g.-resorcinol. The preparation used in our experiments was ash-free iso-electric gelatin, prepared by means of Loeb's method.

It should be pointed out that, in all cases, we were dealing with perfect equilibria and that nearly all the protein was present in the lower layer, the upper layer being practically free of gelatin.

Moreover, there is a decided difference between the influence of ethanol and sodium sulphate on one hand and resorcinol on the other as indicated below.

Ethanol.	Sodium sulphate.	Resorcinol.
Rather large concentrations required for separation.		Separation takes place at exceedingly small concentrations.
Ratio of water to agent greater in lower layer than in upper layer.		Ratio of water to agent smaller in lower layer than in upper layer.
Separation does not appear at higher concentrations of the agent.		Separation disappears at a certain concentration of the agent.

The lower layer may be considered as an accumulation of micellæ, only separated by a binary liquid. This explains the name 'coacervate' for the sub-layer (*acervus* = heap).

It is well known that Einstein's formula for the relative viscosity of sols enables us to calculate the volume connected with the colloidal matter in solution. We have plotted this volume against the concentration of one of the above-mentioned agents. We have also, in the same diagram, shown the

volumes of the corresponding coacervates, calculated per gram gelatin. As a matter of fact, the data used by the first method were obtained at lower concentrations, whereas the results of the second experiments were related to large concentrations of the agent. It is interesting to note that both curves nearly coincide.

Through these and other facts we are led to the conclusion that one might well consider the micellæ as a 'wall-substance' covered with a layer of solvating matter. It will be noted here that our analysis brings out the relationship existing between the composition of the solvate film and the upper layer.

The fact is that the presence of a solvate film has always been considered as one of the stabilising factors of a sol (electric charge and solvation), but in our case it is clear that we have to seek the stabilising factor especially in the transition: solvate film-medium.

The existence of stability is due to the fact that this transition bears a continuous character. Under the influence of dehydrating agents, this transition becomes discontinuous at the critical concentration of the agent: the diffuse solvation film has become concrete and thus gives rise to a surface tension. The origin of coacervation is decrease of the total free surface energy.

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¹ *Proc. Royal Academy of Amsterdam*, 32, 849; 1929.

Fats of Brown Sea-weeds

INVESTIGATIONS recently carried out in this department on the marine algæ have shown that there would appear to be some connexion between the depth of immersion of such weeds and their metabolism, as expressed by their chemical composition. Such connexion has been traced in regard to their carbohydrate¹ and nitrogenous² constituents, and the present investigation was undertaken with the view of ascertaining whether a similar connexion holds for the fatty constituents.

The weeds examined in the present instance are *Pelvetia canaliculata*, *Pelvetia canaliculata forma libera*, *Fucus vesiculosus*, and *Laminaria digitata*. *Pelvetia libera* is a free floating marsh form which is exposed to desiccation for considerable periods of time, being immersed only during spring tides. *Pelvetia canaliculata* grows at a lower zone, fixed to stones or rocks, and is covered with water for fairly long periods daily. *Fucus vesiculosus* grows somewhat lower than *P. canaliculata*, but is considerably more exposed than *Laminaria digitata*, which, being a deep sea-weed, is only exposed for a short period during spring tides. These sea-weeds therefore present a fairly wide range of variation in regard to habitat conditions. How far these conditions are reflected in their chemical composition may be seen from the results below.

The petrol ether extract—though representing a mixture of substances besides true fat—shows a regular decrease with depth of immersion, and the same holds for the true fat content, as calculated from the fatty acids isolated from the extracts.

	Petrol Ether Extract.	Iodine Value of Extract.	Percentage True Fat.
<i>Pelvetia libera</i>	8.0	106	6.2
<i>Pelvetia canaliculata</i>	4.9	115	3.6
<i>Fucus vesiculosus</i>	2.6	114	1.9
<i>Laminaria digitata</i>	0.3	123	0.16

The figures in all cases are calculated on oven-dry material.