

(4) Land shells occur in both the upper and lower sandstones and in the red earth.

It was at once evident that the flints were not of any considerable age—certainly not Pliocene. The most interesting specimens found *in situ* were a side-scraper of Mousterian type and two small Levallois cores. The remainder were mere chips and small flakes. Among those found adhering to fallen blocks, or on the quarry floor, were three good Levallois flakes, a rough circular scraper, and a Levallois core; the remainder were small flakes and chips. So far as can be judged from the material at our disposal, the industry closely resembles the Upper Mousterian found in the caves of the Wady Mughara (Mugharet-El-Wad, Layer G; Et-Tabūn, Layer B).

It seems safe to conclude that the bulk of the ridge is relatively late Pleistocene in age, and that it is essentially æolian in origin.

These discoveries raise more than local problems in Palestinian geology and prehistory, and we propose early next year to make a detailed investigation, not only of this ridge, but also of the coastal deposits southwards.

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Dielectric Polarisation of Phenol

It is well known that the molecular polarisation of alcohols in a non-polar medium is exceptional in that it at first increases with concentration and then falls finally to a lower value than that at which it started. The data of Williams and Allgeier¹ show that at 25° up to a molar fraction of 0.345 the polarisation of phenol in benzene is constant, whilst those of Donle and Gehreckens² show a decrease in polarisation at 22° up to a concentration of 0.05 molar fraction phenol and those of Philip and Haynes³ an increase at 20° in dilute solutions. I have measured the polarisation of phenol in benzene at 70° with the following results:

c_2	ϵ	d	P_2
0.10737	2.540	0.84750	73.43
0.13464	2.639	0.85340	73.56
0.20170	2.934	0.86808	75.35
0.20330	2.943	0.86804	75.55
0.32460	3.567	0.89425	76.20
0.40717	4.063	0.91188	75.85
0.45454	4.375	0.92147	75.52
0.59956	5.468	0.95200	73.79
0.72570	6.517	0.97812	69.78
1.00000	9.161	1.0307	66.72

c_2 is the molar fraction of phenol, ϵ is the dielectric constant, d is the density, and P_2 is molecular polarisation of phenol. The molecular polarisation of benzene at this temperature is 26.928.

The behaviour of phenol at this temperature appears to be similar to that of the lower alcohols, which would be expected from its hydroxylic nature.

These results give a value of ∞P_2 of 71.0, which, if we take $P_E + P_A$ to be 31.0⁴, gives 1.5 debyes for the dipole moment, compared with the values 1.55 of Donle and Gehreckens and 1.70 of Williams.

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¹J. Amer. Chem. Soc., 49, 2416; 1927.

²Z. Phys. Chem., B, 18, 316; 1932.

³J. Chem. Soc., 87, 998; 1905.

⁴Donle and Gehreckens, *loc. cit.*

Catalysis of Ester Hydrolysis by D₃O⁺ Ions

It has been observed by Moelwyn-Hughes¹ that the catalytic influence of D₃O⁺ ions on the inversion of cane sugar in heavy water is greater than that produced by H₃O⁺ ions in ordinary water, and Schwarz² observed that the acid hydrolysis of methyl and ethyl acetates takes place about 50 per cent more quickly in heavy than in light water under similar conditions.

The rate of hydrolysis of methyl acetate in sulphuric acid solutions has been determined by means of a viscosity method by which the whole reaction can be followed with less than 1 c.c. of solution, and it is found that the ratios of the catalytic coefficients in heavy and light water (taking the sulphuric acid as completely dissociated in both cases) are $k_{D_3O^+}/k_{H_3O^+} = 1.86$ at 15° and 1.68 at 25°. These ratios are nearly the same as those found by Moelwyn-Hughes for the inversion of cane sugar.

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¹Z. phys. Chem., B, 26, 272; 1934.

²Akad. Anz. Wien, April 1934.

Esterification of Phosphate in the Respiratory Breakdown of Sugar in Higher Plants

HARDEN and Young¹ showed that phosphate undergoes an important cycle of changes in the fermentation of sugar by yeast juice, being first converted into a hexosephosphoric ester and finally liberated as inorganic phosphate when all the sugar was fermented. Recently, Meyerhof² showed an identical condition in the production of lactic acid from hexose in muscle extracts. The view has therefore been expressed that esterification with phosphoric acid may be a necessary step in the biological degradation of sugar. In the higher plants, however, there has been no direct proof of esterification in respiratory sugar metabolism, though a close parallel between alcoholic fermentation and anaerobic respiration has been assumed from the first and has been confirmed not only by the discovery of identical enzymes in both, but also by the fact that phosphate stimulates plant respiration. Phosphate has also been shown to disappear when added to ground peas³; and phosphoric esters have even been isolated from plants⁴.

I have obtained definite results on this phase of sugar breakdown in higher plants by devising a method of preparing cell-free glycolytic aqueous extracts (stable for a few hours) by plasmolysing fermenting peas (*Pisum sativum*). The fresh extract, presumably containing the full zymase-complex in solution, actively ferments glucose, fructose or sucrose with evolution of carbon dioxide, under strictly aseptic conditions. In order to follow esterification and sugar breakdown, 40 c.c. of the fresh extract at pH 6.2, after nitrogen had been bubbled through, was incubated with glucose, in presence of toluene, at 30° C. A suitable quantity of a phosphate buffer was added and samples withdrawn after every 5–15 minutes of mechanical shaking. The value of inorganic phosphate in the trichloroacetic acid filtrate