Small amounts of the tissues and separated egg were smeared direct on to filter-paper strips; the crushed root tips being attached by means of a starch support. As a check on the possibility of protein degradation after death, a duplicate smear of each cell type was fixed by flooding with ethyl alcohol; but no difference in results was found. The paper strips were run in one dimension only, using water-saturated phenol as the solvent. The air-tight chamber in which separations were carried out contained a two-phase solution of water and phenol at the bottom. After 24 hours treatment, the filter-paper strips were dried in a water-oven at 98° C., sprayed with ninhydrin and dried again in the oven to allow the colour spots to develop. Only two kinds of result were obtained: (1) no coloration (that is, no free amino-acids): salivary glands and white of egg; (2) two or more colour bands indicating the presence of two or more free amino-acids: all the plant cells and yolk of egg.

The nature and exact location of the free amino-acids is at the moment a matter for speculation. Previous work by the use of other methods has already shown them to be present in plant tissues³. Whether their absence in salivary glands can be attributed to the absence of mitosis remains to be shown.

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² Gordon, A. H., Martin, A. J. P., and Synge, R. L. M., *Biochem. J.*, **37**, Proc. xlii (1943).

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Metabolism of Fatty Livers

EARLIER work on the metabolism of fatty livers by Ennor¹ showed that the oxygen consumption and the acetoacetic acid production of liver slices from guinea pigs poisoned with carbon tetrachloride is considerably in excess of normal. Since adenosinetriphosphate is essential for the oxidation of fatty acids², it was considered of interest to determine a possible correlation between high-energy phosphate content and the increased metabolism of such livers.

0.1 ml. of carbon tetrachloride in arachis oil was given by subcutaneous injection to well-fed guinea pigs of approximately 300 gm. body-weight. Two to four doses were given at 24–48 hour intervals, and both control and treated animals were starved for 24 hours before killing. The major portion of the liver was dropped into liquid air within 30 sec. of the death of the animal; the remainder of the liver was taken for fat, nitrogen and total phosphorus determinations. Duplicate samples of the powdered, frozen liver were extracted twice with trichloroacetic acid and, after removal of the protein, aliquots were taken for an analysis of the barium-insoluble fraction precipitable at pH 8.2. Determinations were made of the inorganic phosphorus originally present and that released on heating at 100° C. in *N* sulphuric acid for varying time intervals up to three hours. All figures are calculated on the basis of the nitrogen content of the original liver.

From the accompanying table it will be seen that the readily hydrolysable phosphorus (7 min.) is higher in the livers of the treated animals than in the control series. The relative amounts of adenosine

Controls			Treated		
No. of expt.	N gm. %	mgm. % P on 7 min. hyd.	No. of expt.	N gm. %	mgm. % P on 7 min. hyd.
34	3.89	1.2	35	2.15	4.5
37	3.58	1.7	38	2.53	2.1
39	3.63	1.1	47	1.85	3.7
52	3.25	1.0	53	1.84	3.3
56	3.51	1.6	57	2.20	2.8

di- and tri-phosphates present in this fraction have not been fully established; but it is of interest that the increase, due primarily to the presence of these compounds, is associated with the increase in metabolism found in fatty livers of this type.

A full report of this work will appear elsewhere.

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Mechanism of the Action of X-Rays on Enzymes in Water-Solution

It is a well-established fact¹ that the action of ionizing rays on substances dissolved in water often proceeds in a way suggesting an interaction of some irradiation products of the water molecules. As regards the nature of these hypothetical intermediary products and the mechanism of the action on the dissolved substances, Weiss² has discussed the possible formation of H-atoms and OH-radicals. The biological significance of the reactions has also been tentatively discussed. If a second component is added, the action of X-rays on the substance under consideration may change owing to dissipation of the primary X-ray products between the two substances.

Some experiments may further elucidate the mechanism. The X-ray dose given was 12,400 r., the intensity 275 r./m. The enzyme studied here was pure crystalline catalase³ diluted to a concentration of 3.7×10^{-6} gm./ml. The experiments were run at pH 7.4 and in an atmosphere of nitrogen in order to avoid the interaction of gaseous oxygen; 6–12 tests were used for each substance (see accompanying table).

Substance added (conc. 0.1–0.2 mM.)	Inactivation (per cent)
Enzyme alone	53.9 ± 1.4
Maleic (fumaric) acid	30.9 ± 3.2
Malonic acid	54.3 ± 2.1
Succinic acid	53.1 ± 0.9
Pyruvic acid	40.8 ± 1.7
Lævulinic acid	46.3 ± 3.6
Glutathione	71.0 ± 3.7
Oxidized glutathione	30.2 ± 1.3
Cysteine	67.5 ± 7.4
Cystine	28.6 ± 1.4

Unsaturated substances, which may be expected to react with the water products (for example, fumaric and maleic acids), act as protective systems. Related saturated acids (malonic and succinic acids) show no signs of influence, whereas ketocarboxylic acids, for example, pyruvic and lævulinic acids, are protective (the latter in a less pronounced manner).

Some of the other experiments reported in the table are more instructive as to the mechanism of the