In the eggs and embryos of animals, pentose nucleic acids have already been demonstrated for the sea urchin[7], chick[8] and fish[9]. The absorption spectrum of the *Drosophila* egg cytoplasm agrees well with that of a nucleic acid[1]. Moreover, the imaginal disks of the *Drosophila* larva, which are dividing rapidly while the larval cells merely increase in size, have a strongly absorbing cytoplasm the absorption spectrum of which has a maximum at 2600 A. In the mid-gut of the larva, where the imaginal cells are present in small nests among the larval cells, it is easy to compare the absorption spectra of the two types (Fig. 1). The functional gut cell of the larva has a much lower concentration of absorbing materials, and the shape of the absorption curve is more like that of proteins.

The system of apical growth in the root of plants is another case in point. We have studied the *Allium* root-tip, finding in the zone where mitoses are occurring, cells with a high concentration of absorbing materials the absorption spectrum of which is of the nucleic acid type. Towards the base the cells which will no longer divide have the absorption spectrum of a protein with cyclic amino acids (Fig. 2).

The absorbing substances are probably pentose nucleotides. In the cases of yeast and the rye embryo, yeast nucleic acid has been extracted. In the *Drosophila* and the *Allium* material a strong orcin reaction for pentoses has been obtained in the same tissues, which on micro-incineration show a plentiful residue of ashes that give a positive test for phosphorus. That the pentose, phosphorus and ultra-violet absorbing substances mentioned above occur in the same tissues gives support for the assumption of the presence of nucleotides.

It seems likely that a high concentration of nucleic acids is the basis of the generally noted basophily of embryonic tissues. Those here discussed are strongly basophilic, in correlation with the high ultra-violet absorption. The presence of pentose nucleotides in high concentrations in rapidly dividing tissues is probably thus a general phenomenon.

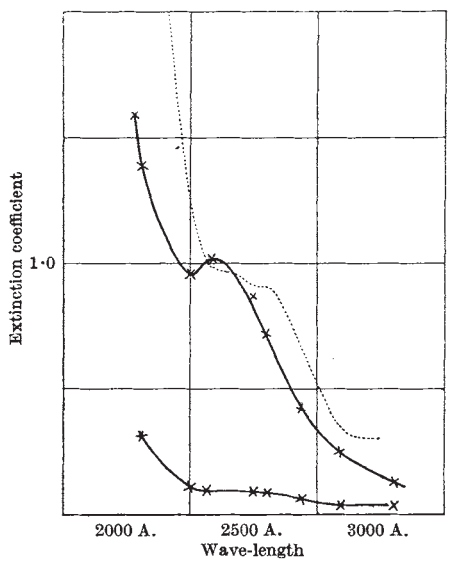

Fig. 1.

A COMPARISON OF THE ULTRA-VIOLET ABSORPTION SPECTRUM OF THE MATURE LARVAL GUT CELL (LOWER CURVE) WITH THAT OF A CELL FROM THE IMAGINAL DISKS OF THE MIDGUT (UPPER CONTINUOUS CURVE). IN THE DOTTED CURVE THE VALUES OF THE LOWER CURVE ARE MULTIPLIED BY THE FACTOR 10 TO PERMIT A COMPARISON OF SHAPES.

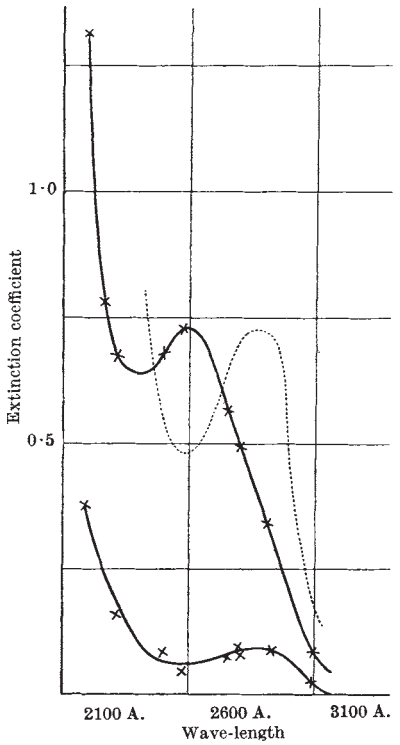

Fig. 2.

THE ULTRA-VIOLET ABSORPTION SPECTRA OF THE CYTOPLASM OF A CELL FROM THE GROWTH ZONE (UPPER CURVE) AND FROM THE BASE (LOWER CURVE). THE DOTTED CURVE HAS THE SAME MEANING AS IN FIG. 1, BUT THE VALUES OF THE LOWER CURVE ARE MULTIPLIED BY 8 IN THIS CASE.

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The Enzyme System Transferring the Amino-Group of Aspartic Acid

I HAVE, in recent communications[1,2], described a method for the preparation of a purified enzyme from muscle tissue, catalysing the reversible transfer of amino nitrogen from glutamic acid to monocarboxylic α-ketoacids[3]. The enzyme preparation is inactive with regard to the *Umaminierung*, or 'trans-amination' of aspartic acid, whereas this process is readily effected

by the original muscle pulp[4]. I have since been successful in obtaining from muscle tissue, by means of a modified purification scheme to be described in detail elsewhere, enzyme preparations catalysing the transamination of aspartic acid at a considerable rate in the presence of a thermostable activator, or coenzyme, contained in tissue extracts.

This enzyme preparation still contains the enzyme of glutamic acid trans-amination, but from vegetable materials preparations can be obtained that are active only with regard to aspartic acid while completely indifferent to glutamic acid. The aspartic enzyme differs from the glutamic enzyme in that it is more readily extracted from tissues by aqueous solvents, and also in its higher lability. The glutamic enzyme appears to contain an active group similar to the coenzyme of aspartic enzyme, but less readily dissociable. The chemical nature of the active thermostable constituent is under investigation in this laboratory.

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Purification of Uricase

URICASE is an enzyme which catalyses the oxidation of uric acid. It was reported recently by Davidson[1] that he had been able to obtain a preparation of uricase about a thousand times more active than the acetone powder of liver which was used as a starting material. Several purified preparations showed, according to him, a high and fairly constant iron content ranging from 0·15 to 0·20 per cent, which he regards as evidence in favour of the view that iron is a constituent of uricase.

Using a modified method of purification, I have been able to obtain preparations 1,000–1,400 times more active than the acetone powder of pig's liver used as initial material. My preparations are completely colourless, insoluble in water and only sparingly soluble in alkaline buffer solutions. The iron content of these preparations as determined on samples up to 16 mgm. of dry weight, is only 0·02 per cent.

Their catalytic activity is poisoned reversibly by potassium cyanide but not by hydrogen sulphide, αα-dipyridyl, pyrophosphate or diethyldithiocarbamate.

The lack of proportionality between iron content and activity in preparations obtained with different methods and the very low iron content (0·02 per cent) in highly purified enzyme preparations make it very improbable that iron is a constituent of uricase.

An account of the purification and properties of the purified enzyme will be given elsewhere.

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Marrubiin, a Diterpenoid Lactone

ACCORDING to Gordin[1], marrubiin, the optically active bitter principle of *Marrubium vulgare*, is a lactone, $C_{21}H_{28}O_4$, m.p. 154·5°–155·5°, which on hydrolysis yields marrubic acid, $C_{21}H_{30}O_5$, m.p. 173°–174°, forming an ethyl ester, m.p. 87°.

In the course of an investigation on the constitution of this compound, which has m.p. 158°, we have found that the analytical results and molecular weight determinations given by marrubiin and a number of its derivatives are in agreement with the formula $C_{20}H_{28}O_4$ for the lactone which on hydrolysis gives rise to a monobasic acid $C_{20}H_{30}O_5$, m.p. 197° (methyl ester, m.p. 85°; ethyl ester, m.p. 88°). Hydrogenation of marrubiin and marrubic acid gave the corresponding tetrahydro-derivatives, m.p. 132° and m.p. 187° (ethyl ester, m.p. 95°) respectively, which like the parent compounds are interconvertible.

Determination of active hydrogen indicates that marrubiin contains one hydroxyl group and, since the compound does not appear to form acyl derivatives under the usual conditions, this is in all probability a tertiary alcoholic group; the fourth oxygen atom is present in an oxide system. Marrubiin, which is readily resinified by warm mineral acids and by hot formic acid, gives rise on oxidation with potassium permanganate to a neutral compound, m.p. 211°, and a lactone, m.p. 161° (acid, m.p. 208°), which is also formed along with a liquid acid by the action of ozone, whilst dehydrogenation with selenium furnishes a comparatively good yield of 1 : 2 : 5-trimethylnaphthalene (agathaline). It is concluded that marrubiin is a hydroxyditerpene lactone of the manoyl oxide type.

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Effect on Bacteria of Continued Cultivation in Lecithin Broth

THE pathogenic properties of bacteria (typhi, dysenteriæ, coli) are slowly reduced by daily subcultures (about a hundred) on bouillon containing between 0·2 per cent and 4 per cent colloidal lecithin[1]. For the sake of brevity these will be designated as *L*-bacteria and normal organisms as *N*-bacteria.

Particularly interesting results were obtained with *B. typhi murium*, which after four hundred subcultures required 10,000 times the original dosage to produce a fatal effect when injected intraperitoneally into mice (1,000 and 10,000,000 living bacteria, respectively). Neither fifty subsequent subcultures on ordinary media nor twelve animal passages induced a return of the pathogenic properties. The agglutinability of the *L*-bacteria with immune serum produced by the corresponding *N*-bacteria was not measurably lessened, nor was their ability to produce H and O agglutinins in affected animals.

The duration and intensity of the immunity resulting from intraperitoneal administration of *L*-strains were equal to the results observed in surviving animals infected with *N*-strains, and the results were better than those obtained by the injection of 10–100 times as many *N*-bacteria killed at 60° C.