absorption maximum of adenosine. It is assumed that the carriers are excited from impurity- or imperfection-levels, and the small values of E_N calculated are in agreement with this point of view.

It has been noted that the measured value of E_p for a given sample does vary somewhat from measurement to measurement. The small difference of E_p for adenosine obtained for the various morphological forms may thus not be considered as significant. It is concluded that the value of E_p is primarily a measure of the average barrier between neighbouring adenosine molecules and the effect due to morphological differences is rather small.

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Periodogram Analysis of Precipitates

THIELE et al.[1] have provided many examples of partially periodic precipitation phenomena, some of which resemble in a surprising manner the patterns found in tissues. The analysis of these patterns has a special interest because the pattern of the periodic precipitates is not quite regular, but more or less influenced by chance or by more than a single factor.

The material to be analysed is in the form of electron microscope negatives on pieces of film 2 cm × 2 cm, kindly sent to me by Prof. H. Thiele. These pieces fit into the graduated disk of a scanning apparatus already described[2], in which they can be oriented and scanned at any angle from 90° to −90°. The apparatus consists of a microscope with a modified motor-driven stage, a photocell, an amplifier, and a recorder. It is calibrated with standard neutral filters to measure optical density. Sometimes the precipitates appear to be arranged in one direction rather than another; it may then be convenient to place the film in the graduated disk so that this direction lies along the line joining 90° and −90°, but there is often much uncertainty in making this adjustment.

The negative is scanned at 20° angles from 90° to −70°, that is, in 9 different directions. This results in 9 periodograms, on which two kinds of calculation can be carried out. The first is to take each periodogram separately and to find the frequency with which maxima and minima occur. If there are M maxima and minima in a scanning distance of 10,000 Å, the half-period P_1 will be $10,000/M$, and there will be one such value for each periodogram. This tells us nothing about the size of the maxima and minima. The second kind of calculation is to find the mean and the standard deviation (root-mean-square deviation) for each of the 9 periodograms, and then to plot the standard deviation against the scanning angle θ. The result is a curve which shows maxima and minima, usually occurring regularly. After completion of this second kind of calculation, the average value of P_1 which corresponds to the largest half-periods P_2 of the σ versus θ graph can be selected as being specially interesting, and can be called P_{1max}; alternatively the values of P_1 for all 9 periodograms can be tabulated.

If the periodic precipitates were entirely regular, the minimum value of the standard deviation provided by the second kind of calculation would be zero, but for the material under consideration it is h, which can be interpreted as a measure of the extent to which a regular arrangement is disturbed by secondary factors or by chance irregularities. These disturbances lead to an increase in

Table 1

	Half-period P_2 (radians)	Half-period $P_{1\,max}$ (Å)	h	Amplitude of S.D.
Copper alginate	1·57	1450	0·23	0·24–0·42
Cadmium alginate	1·57	1100	0·24	0·25–0·45
Sodium alginate	n.s.	n.s.	0·17	n.s. *
Copper alginate †	0·70	760	0·25	0·20–0·40
Cadmium alginate †	0·61	830	0·23	0·23–0·50
Lead alginate †	0·53	910	0·24	0·25–0·61
Lead pectinate	1·57	1000	0·12	0·12–0·30

* Not significant.
† Probably represent mixtures.

the value for the minima and to a decrease in the value for the maxima, and if the value for the maximum of the σ versus θ graph were M in the case of a regular periodic precipitate, it would be $(M − h)$ when the entirely regular arrangement was disturbed by secondary factors or by chance.

The periodic precipitates of micelles which Prof. Thiele has sent me give the values shown in Table 1.

There are two important special cases. The first is when the material is precipitated at random, as in the case of sodium alginate or in the case of the human red cell ghost[2]; then the period and the amplitude of the oscillations are not significantly different at any angle. The second is when there is a mixture of micelles. In this case, the period and the amplitude of the root-mean-square deviation changes significantly in the course of the scanning operation, or the half-period is less than 1·57 radians and the curve of σ versus θ can usually be reduced to two or more curves, each with a half-period of 1·57 radians but with maxima and minima at different scanning angles (for example, the curve for copper alginate seems to be the result of a mixture of two species each with a half-period of 1·57 radians, but the one with a maximum at 20° and the other with a maximum at 90°).

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BIOCHEMISTRY

Variant Forms of Arachin

IN the past few years, analysis of samples from individual animals has revealed variants of many of the blood proteins. In man, for example, hæmoglobin, haptoglobins, transferrins, albumin and several glycoproteins are known to exist in two or more closely related forms, the distribution of which follows a simple hereditary pattern. In milk, β-lactoglobulin and α-lactalbumin show similar polymorphisms.

So far, I believe that no such polymorphism has been demonstrated in plant proteins though there is no obvious reason why one should not exist. In an attempt to find variants, the proteins of single seeds from Virginia and Spanish strains of peanut (Arachis hypogaea) have been examined by using acrylamide-gel electrophoresis[1]. Seeds were homogenized in electrophoresis buffer, centrifuged to remove oil and debris and the protein concentration adjusted to about 2 per cent before electrophoresis. Arachin exists under these conditions in a monomer–dimer form[2]; these are shown in Fig. 1, which also shows the variant, more rapidly migrating form found in some of the seeds of the Virginia strain. The form with highest mobility is called arachin A and the slower arachin B. Although the differences are most clearly seen in the monomers, the dimers also showed small differences in mobility. In addition, it was just possible to resolve the two forms by electrophoresis in agar gels at pH 8·6.