The procedure of chromatographing the amines was essentially the same as described in ref. 2, with two slight modifications: (*a*) the amines were extracted from the aqueous solution by ethyl acetate at *p*H 11·5; (*b*) in order to remove the green pigments of the aqueous phase, which are interfering with good chromatographic resolution of the amines, the aqueous solution was extracted at *p*H 3·5 (made with 2 N hydrochloric acid) with several portions of ethyl acetate, prior to the extraction of the amines at *p*H 11·5.

From Table 1 it can be seen that, a short while after chopping, the amine content of the cut plants increases. Of special interest is the appearance of serotonin (5-OH tryptamine), which could not be detected in the fresh maize and which again disappeared in the ensiled maize.

The identification of this strong physiologically active amine, which is distributed in many fruits and vegetables[3], could be verified by the following tests: the spot—R_F 0·42, run in solvent butanol/acetic acid/water (120 : 30 : 50), gave: (1) a brown colour reaction with ninhydrin reagent; (2) a blue colour with Ehrlich's reagent; (3) a blue colour with xanthydrol; (4) a violet colour with α-nitroso-β-naphthol reagent made with nitrous acid; this test is specific for 5-OH-indoles[4].

Table 1

	Dry matter (%)	*p*H	p.p.m. in dry matter: Hist-amine	Ethanol-amine	Sero-tonin	Tyr-amine	Unident-ified amines
Fresh maize	21·4	5·85	3·5	8·1	nil	4·6	2·8
Chopped maize*	20·5	5·35	6·9	15·3	13·7	29·3	14·0
Chopped maize† 9 days after ensiling	20·0	3·50	45·0	15·0	nil	300·0	7·5

* The average of two samples.
† In addition to the above amines, β-phenylethylamine (18·7 p.p.m.) was also found.

It is of interest to point out that sometimes cattle will consume only small amounts of chopped green maize, when it is fed several hours after chopping.

Although serotonin may not have a direct influence on appetite when fed in the foregoing concentration, its presence in the maize may nevertheless serve as an indicator for metabolic changes which took place in the chopped maize and which may depress the appetite of cattle.

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SOIL SCIENCE

Change in the *b*-Dimension when Dioctahedral Smectite is converted to 'Illite' in Soils

Radoslovich[1,2] has indicated that the sheet dimensions of phyllosilicates in which the octahedral sites are not fully occupied should be affected to a much greater extent by the nature of the interlayer cations than by the degree of tetrahedral substitution of aluminium for silicon. Burns and White[3] have given experimental support to this hypothesis by showing a significant decrease in the *b*-dimension of muscovite on removal of potassium by the molten lithium nitrate technique. The same authors also demonstrated a similar but less marked trend in soil clays. The phyllosilicates from the *C* horizon of a Crosby silt loam soil, which were predominantly dioctahedral mica, showed the effects of loss of potassium, by weathering, in the upper horizons. The latter consisted of expanded material with a slightly smaller *b*-dimension.

During a recent investigation, I have established that the phyllosilicates in the parent materials of some solonetzic soils consist mainly of smectite and have found evidence that these have been converted to 'illite' (10 Å spacing and higher potassium content) by pedogenic processes. This may be represented by the equation 'illite' ⇌ intermediates ⇌ smectite, in which the reaction has moved from right to left rather than, as commonly, from left to right. Burns and White worked on the products of a reaction that had moved part of the way, and to some extent entirely, from left to right. The solonetzic soils afforded an excellent opportunity to test Radoslovich's hypothesis on the reverse reaction, which should produce phyllosilicates having a larger *b*-dimension than the original phyllosilicates.

To carry out the tests, samples of coarse (2–0·2μ) and fine (< 0·2μ) clays were separated from the *B* and *C* horizons of a solodized-solonetz soil from the Trossachs Association in Saskatchewan, Canada. The phyllosilicates in both clay fractions of the *C* horizon were almost entirely smectite. Those in the coarse clay fraction of the *B* horizon were almost entirely 'illite', whereas those in the fine clay fraction consisted of both 'illite' and smectite. In addition, corresponding fractions were obtained from the Bearpaw Formation (shale) and from some bentonitic lenses which occur in the Bearpaw. The parent material of the Trossachs is generally considered to have been derived from the Bearpaw, which is primarily smectitic.

Non-oriented mounts of all the separates were prepared and the (060) spacings were measured by a step-scanning technique with a Philips diffractometer. The *b*-spacings derived from the (060) values are shown in Table 1.

Table 1. *b*-Spacings (Å)

	Coarse clay (2–0·2μ)	Fine clay (< 0·2μ)
Trossachs *B*	9·007	9·008
Trossachs *C*	8·998	8·998
Bearpaw shale	8·999	8·999
Bentonitic lenses	8·999	8·987

The reaction smectite → 'illite', in the soil, has indeed resulted in a significant increase in the *b*-dimension. However, in contrast to the findings of Burns and White, no measurable differences were detected between the coarse and fine clay fractions.

Not unexpectedly, the values for both fractions of the Bearpaw shale and the coarse clay of the bentonitic lenses were almost identical to those obtained for the soil parent material. However, as in the work of Burns and White, the fine clay fraction of the bentonitic lenses did give a lower value than the coarse clay from the same material.

Although it is difficult, from these experiments, to determine whether particle size is a significant factor, the foregoing results lend additional support to the predictions made by Radoslovich.

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PSYCHOLOGY

Discrimination Learning: Non-additivity of Cues

Animals solve a discrimination problem more rapidly when two cues are present and relevant than when either cue is present on its own. Thus Eninger[1] found that rats learned to take the correct turn in a maze faster when the correct turn was signalled by both a visual and an auditory cue than when it was signalled by one without