(1) The distances between the lines are unequal and of different order of magnitude from that determined by the moments of inertia of the diphenyl ether molecule.

(2) The intensity of the lines $\nu_1 = 21$ cm.$^{-1}$ and $\nu_4 = 100$ cm.$^{-1}$ is greater than that of $\nu_2 = 39$ cm.$^{-1}$ and $\nu_3 = 69$ cm.$^{-1}$. When the crystal is melted, these lines broaden into a continuous spectrum (wings), while other Raman lines do not undergo any marked change. It seems, therefore, that we can ascribe the former lines to vibrations characteristic of the crystal lattice and the latter to molecular vibrations. The fact that the former lines do not disappear in the liquids shows that apparently some elements of the crystal lattice remain, although deformed, also in the liquid state.

A more careful investigation of the Raman spectrum of liquid diphenyl ether showed that a broad diffuse maximum of intensity appears in the region of the wings corresponding to the strong line $\nu = 100$ cm.$^{-1}$ in the crystal. On raising the temperature to 250° C., this maximum broadened until it could not be noticed against the continuous spectrum of the wings.

All these observations are in good agreement with the theory of the quasi-crystalline structure of liquids often discussed in connexion with the diffraction of X-rays[4].

In some degree the appearance of the wings is characteristic for most, if not for all, liquids. There is no reason to expect that in other liquids (such as benzene), this phenomenon has a different origin from that in diphenyl ether. Thus, generalising the above results, we may say :

(1) The usually accepted explanation of the wings is not correct. This phenomenon is principally due not to the rotational but to the vibrational Raman effect. A slight asymmetry in the intensity distribution on the red and the violet side[5] as well as the dependence on the primary frequency[6] is easily explained.

(2) The part of the wings adjacent to the primary line, which grows in intensity with rising temperature, is probably a prolongation of the continuous spectrum observed[7] between the components of the Rayleigh line by instruments of great resolving power. Perhaps for this part of the wings the rotation hypothesis is valid, though it may be connected also with Debye heat vibrations.

(3) Our experiments give new facts in support of the theory of the quasi-crystalline structure of liquids. They indicate the possibility of examining this problem by means of the Raman effect.

At the present time, detailed investigations of the wings from this new point of view are in progress in our laboratory with different compounds in the liquid, crystal and gaseous states.

E. Gross.
M. Vuks.

Optical Institute,
Leningrad.
Nov. 25.

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Identity of the Growth-Promoting and Root-Forming Substances of Plants

In a recent brief communication on the chemical nature of the root-forming hormone of plants[1], the following evidence was brought forward :

(1) The hormone is an organic acid, dissociation constant about $10^{-4.5}$, the activity of which is readily destroyed by oxidising agents.

(2) The hormone has about the same solubilities in various organic solvents, and distils in the same temperature range *in vacuo*, as the auxin, or growth-promoting hormone, obtained from *Rhizopus suinus*.

(3) The crystalline auxin preparations prepared by Kögl and co-workers from urine[2] show root-forming activity, and their activity is destroyed by oxidising agents; when the destruction is partial, the root-forming and growth-promoting activities are destroyed to the same extent.

The evidence thus points to the identity of the two hormones, but on account of the inconstancy of the ratio of the two kinds of activities in various preparations and for other reasons, the matter was left open.

It has since been found by Kögl, Haagen-Smit and Erxleben[3], that one of the active growth-promoting hormones present in urine is identical with β-indolyl-acetic acid. We have, therefore, prepared this substance synthetically, and find it to be fully active in promoting root formation. The possibility of an active impurity in the products obtained from natural sources scarcely arises in the case of a pure synthetic compound, and no doubt therefore remains that, of the factors promoting root formation, this one is identical with that which gives rise to growth by cell elongation. The pure substance has an activity of from 7·4 to 28 $\times$ 10^4 root units per mgm., and a growth-promoting activity of 31 $\times$ 10^4 growth-stimulating units per mgm., hence a ratio root units to growth-stimulating of from 0·2 to 0·7. This agrees satisfactorily with the figures previously quoted by us for the crystalline auxins of Kögl and co-workers[1], so that the root-forming activity of these substances could not have been due to traces of impurities either. It may be noted that the ratio between our growth units and those of the Utrecht workers, previously deduced on theoretical grounds[4], would give β-indolyl-acetic acid an activity of $2{\cdot}5 \times 10^7$ *Avena* units (A.E.) per mgm., compared with 1 to 2×10^7 A.E. per mgm. given by Kögl and co-workers.

The fact that two such different functions as the formation of roots on cuttings and the growth of tissues by cell elongation should be brought about by the same specific substance raises interesting questions of mechanism, particularly since all three of the substances are about equally active in both functions.

The homologues of β-indolyl-acetic acid, namely β-indolyl-propionic and indole-β-carboxylic acids, are without activity in root formation; they were correspondingly shown to be inactive in growth promotion by Kögl, Haagen-Smit and Erxleben[3]. Our own preparations and tests confirm the results of the latter workers in respect of growth promotion. Indole itself is also inactive. The propionic derivative, which was a commercial product, showed, even after two recrystallisations, slight growth-promoting activity in concentrated solutions, due doubtless to the persistence of traces of its lower homologue. The activity, which was less than 0·2 per cent of that of β-indolyl-acetic acid, was still further reduced on again recrystallising.

The test for root-forming activity, using pea cuttings, has been described by Went[5]. The β-indolylacetic acid was prepared by the method of Majima and Hoshino[6]. The indole-β-carboxylic acid was prepared by direct combination with carbon dioxide as described by Zatti and Ferratini[7].

KENNETH V. THIMANN.
J. B. KOEPFLI.
William G. Kerckhoff Laboratories of Biology and Gates Chemical Laboratories,
California Institute of Technology,
Pasadena, Calif.
Nov. 15.

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Starvation and Regenerative Potency in *Dendrocoelum*

THE regenerative potency of Planarians may be depressed in several ways, for example, by irradiation (Wiegand, 1930, and others), or by repeated regeneration of the head-region (10 days after a previous amputation: Sivickis, 1931). This has been interpreted by some authors as due to a reduction in the amount of formative material available, by others as due to alterations in the general metabolism of the body and the degree of differentiation of the tissues involved (Sivickis).

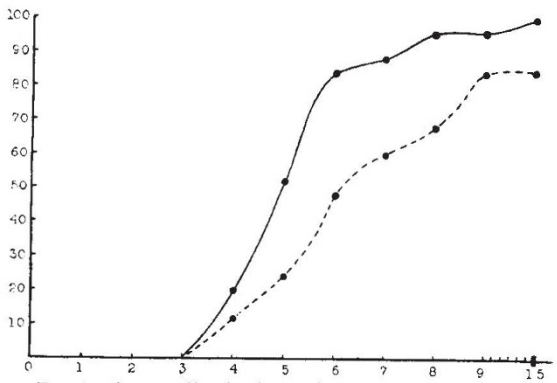

FIG. 1. Regeneration in starved *Dendrocoelum* (dotted line) and normal control (continuous line); ordinates, percentage of regenerates showing eyes; abscissae, time in days.

Well-fed stocks of defined degrees of starvation were taken, their heads amputated, and observation continued for 15 days (for details see Sivickis). The appearance of eyes were taken as the criterion of successful regeneration. Four series, differing slightly in detail as to level of cut, degree of starvation and temperature, have given concordant general results, in that the regenerative potency was always lower in the starved stocks, regeneration being delayed, and (in three of the four series) the percentage of non-regenerating specimens increased (see Fig. 1 and table). The proportion of non-regenerating specimens for all series was 0 per cent for controls and 10 per cent for the starved stocks, although the mortality rate of the latter was not increased at all.

Starvation thus has the same effect on regeneration as radium treatment or as previous head-amputation (see especially Sivickis, Fig. 3). This indicates with a high degree of certainty that the reduction of regenerative potency in all three cases is due to a reduction in the amount of formative material available for regeneration. Studies on the histology of starvation (for example, Schultz, 1904, Stoppenbrink, 1905, Berninger, 1911, Bartsch, 1923) clearly show that such material is used up during starvation, and the work of Steinmann (1925, 1926) shows the close resemblance of the histological changes observed in starvation and in regeneration.

ALEXANDER A. WOLSKY.
Biological Research Institute,
Tihany, Lake Balaton,
Hungary. Nov. 20.

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Series	Anterior level of cuts	Days of starvation	Number of cut pieces			Number survived at the end of expt.			Number of regenerations			Delay in time of completion of regeneration
			starved	control	Σ	starved	control	Σ	starved	control	Σ	
1.	A[1]	10	25	25	50	23	22	45	23	22	45	> 24 hours
2.	A[1]	8–10[3]	25	25	50	21	23	44	18	23	41	24 hours
3.	B[2]	8–10[3]	25	25	50	16	16	32	14	16	30	> 24 hours
4.	A[1]	20	25	25	50	25	25	50	21	25	46	> 24 hours
Summary			100	100	200	85	86	171	76	86	162	

[1] Closely posterior to eyes. [2] Midline between eyes and pharynx. [3] Judged only by the colour of the intestine.

To test these ideas, experiments were undertaken on the effect of starvation. For this purpose, the abundant species *Dendrocoelum lacteum* is very convenient, since the degree of starvation is reflected in the colour of the animals, the dark gut contents showing through the translucent white body.

Duration of Life-Cycle of the Death-Watch Beetle

So far as published accounts record, the death-watch beetle (*Xestobium rufovillosum*, De G.) has never been bred in the laboratory and no study has, therefore, been possible of the factors affecting its development and the duration of its life-cycle. In discussing the treatment of timber roofs attacked by *Xestobium*, Lefroy[1] summarised in 1924 the knowledge of the biology of the insect up to that time and pointed out how little was known of its life-history and habits.

During the past four years, a study of the life-cycle and duration of the different stages of the insect has been in progress at the Forest Products Research Laboratory, and in the course of this work the beetle has been reared from egg to adult. The results of this investigation—a full account of which will be published elsewhere—lead to the general conclusion that, given a suitable timber, for example, oak or willow, the