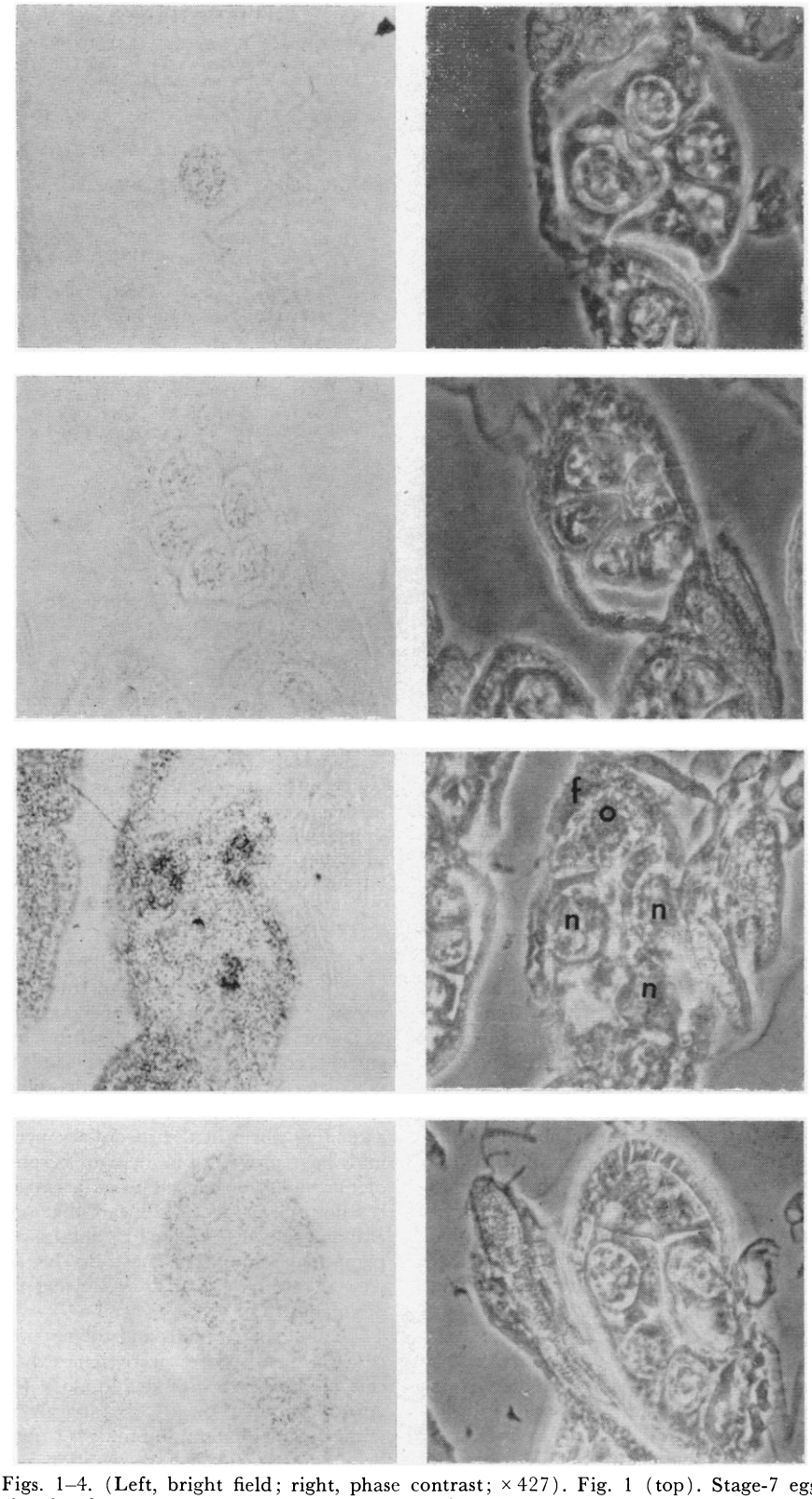

Figs. 1–4. (Left, bright field; right, phase contrast; ×427). Fig. 1 (top). Stage-7 egg chamber from the ovary of a fly fed thymidine-H^3. The section passes through three nurse cell nuclei, only one of which gives an autoradiograph. Fig. 2 (upper middle). Stage-7 egg chamber from the ovary of a fly fed uridine-H^3. The section passes through five nurse cell nuclei, all of which give an autoradiograph. Fig. 3 (lower middle). Stage-8 egg chamber from the ovary of a fly fed uridine-H^3. The section passes through three nurse cell nuclei (*n*) and through yolky oöplasm (*o*). The density of developed grains is greatest above the nurse cell plasmosomes, next greatest above nurse cell nucleoplasm and cytoplasm and the cytoplasm of the columnar follicle cells (*f*), and least above the oöplasm. Fig. 4 (bottom). Stage-8 egg chamber from the ovary of a fly fed glycine-$2H^3$. Tritium is distributed homogeneously throughout the chamber.

from ingested, labeled uridine was localized in the epithelium surrounding the developing chorionic appendages.

In the case of ovaries labeled with tritium from ingested glycine, a homogeneous distribution of silver grains is seen above the chambers in stages 1 to 8 (Fig. 4). The concentration of grains rises with increasing chamber size. For example, autoradiographs above stage-8 chambers had 5 times as many grains per unit area as did those above stage-2 chambers. Since the stage-8 chamber has a volume 100 times that of a stage-2 chamber, the tritium content must be 500 times greater. In a late stage-9 chamber yolky oöplasm has about one-half as much tritium as the cytoplasm of nurse and follicle cells. Nurse-cell plasmosomes showed more tritium than the surrounding nucleoplasm. Stage-9 oöplasm may contain less tritium from ingested glycine than the cytoplasm of adjacent follicle cells because of the barrier provided by the newly synthesized vitelline membrane. Glycine can now enter the oöcyte only by way of the nurse cell chamber. Stage-13 oöcytes show an autoradiograph above the degenerating nurse cell nuclei and above the epithelium surrounding the developing chorionic appendages (*4*).

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4. This work was supported by the U.S. Atomic Energy Commission (contract No. AT(11-1)-89, project 12), the National Science Foundation (research grant NSF-G 4816) and by the graduate school of Northwestern University. Valuable technical assistance was performed by H. Pakeltis and A. Bartha. The labeled uridine and glycine were supplied by the New England Nuclear Corp. The labeled thymidine was supplied by Schwarz Laboratories.

23 January 1959

An Auxin-like Action of Coumarin

Abstract. Coumarin, usually regarded as an inhibitor of growth processes in plants, markedly stimulated the elongation of excised segments of *Helianthus* hypocotyls. Substitution in the molecule of hydroxy-, methyl-, or chloro-groups, in the neighborhood of the unsaturated bond in the lactone ring, markedly altered the growth-promoting activity.

Coumarin has long been known to be an inhibitor of germination and root growth (*1–3*). It has also been reported that coumarin inhibits auxin-induced elongation, as measured by the *Avena*

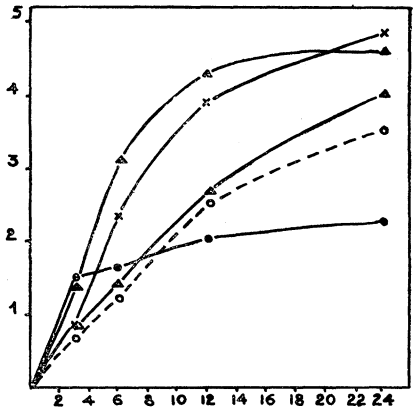

Fig. 1. The effect of coumarin in various concentrations on the elongation of segments of sunflower hypocotyl. Ordinate, increase in length, in millimeters; abscissa, time, in hours. (△) Coumarin, 10 ppm; (×) coumarin, 100 ppm; (▲) coumarin, 500 ppm; (●) coumarin, 1000 ppm; (○) water.

straight-growth test or the split pea test (*4*), though in low concentrations ($10^{-5}M$ to $10^{-3}M$) it acts synergistically with indoleacetic acid. In the course of an investigation of the latter effect in sunflower hypocotyls I have observed that coumarin is itself a strong promoter of elongation.

The experiments described in this report were carried out on *Helianthus*, variety Pole Star. Seedlings were grown in vermiculite at 26°C in the dark. One-centimeter sections of the hypocotyl, taken about 1 cm below the cotyledonary node of 6-day-old plants, were placed in the solutions to be tested in red light. The subsequent increase in length of the sections was determined under a binocular dissecting microscope with a micrometer scale.

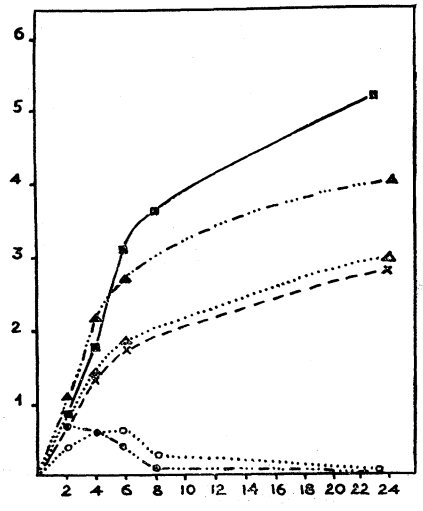

Fig. 2. The effect of coumarin and of 4-hydroxycoumarin on the elongation of segments of sunflower hypocotyl. Ordinate, increase in length, in millimeters; abscissa, time, in hours. (■) Coumarin, 250 ppm; (○) 4-hydroxycoumarin, 250 ppm; (△) 4-hydroxycoumarin, 50 ppm; (●) coumarin, 250 ppm, plus 4-hydroxycoumarin, 250 ppm– (▲) coumarin, 250 ppm, plus 4-hydroxycoumarin, 50 ppm; (×) water.

It was found, when a comparison was made with controls placed in water, that coumarin very markedly stimulated elongation of the sections. Measurements made after 24 hours indicated that the magnitude of the stimulation was related to the concentration of coumarin, the optimum curve resembling that for stimulation induced by auxins. Maximum stimulation was produced by a concentration of coumarin of about 250 parts per million. Measurements made after shorter time intervals, however, revealed that even the supraoptimal concentrations of coumarin strongly stimulated growth during the first few hours; there was then a decline in rate of elongation (see Fig. 1). The sharpness of this decline increased with increase in coumarin concentration.

Previous workers (*2, 3*) have investigated the relation between the structure and the activity of coumarin and its derivatives. Usually, alteration of the coumarin molecule caused a decrease in the effect on germination and root growth. In the investigation reported here, the effect of substitution was found to be greatest in positions 3 and 4, adjacent to the unsaturated bond of the lactone ring. As measured after 24 hours, the increase in length of segments in 250-ppm solutions of coumarin, 4-hydroxycoumarin, 3-chlorocoumarin and 3-methylcoumarin was 295, 0, 120, and 130 percent, respectively (relative to 100 percent in water). Application of 4-hydroxycoumarin in concentrations which did not inhibit elongation partly abolished the stimulating effect of coumarin when the two compounds were applied together (Fig. 2). The effect of substitution demonstrated here for hypocotyl elongation is considerably more marked than that reported for seed germination (*2*) and root growth (*3*).

The growth-promoting effect of coumarin is not confined to *Helianthus* hypocotyls. It has also been observed in preliminary experiments with *Avena* coleoptiles (see *5*), *Pisum* epicotyls, and *Phaseolus* hypocotyls. This activity, when considered in conjunction with the fact that coumarin in the concentrations usually applied inhibits root growth but at very low concentrations may stimulate it (*6*), suggests that this substance should be regarded as a naturally occurring growth regulator (*7*).

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7. The work described in this report was done in connection with a thesis for the M.S. degree at the Hebrew University, Jerusalem. I should like to thank Dr. A. M. Mayer and Dr. A. Poljakoff-Mayber for their interest and guidance.

20 February 1959

Antidromic Cortical Response to Stimulation of Isolated Pyramidal Tract

Abstract. Direct electrical excitation of the intact medullary pyramids evokes a complex cortical response. When the pyramidal tract was dissected away from the bulb and stimulated in isolation, the antidromic cortical response consisted of a simple, positive potential, regardless of the stimulus parameters. This finding necessitates a reinterpretation of previous results obtained by stimulation of the intact pyramids.

Stimulation of the medullary pyramids has been widely used to study the behavior of various parts of Betz cells (*1*)—for example, apical dendrites, recurrent collaterals and others—and to map the origin of the corticospinal tract. Studies purporting to demonstrate ascending fibers in the medullary pyramids have proved to be in error because of the spread of current to adjacent ascending fibers (*2*). It appears that several other results obtained by antidromic pyramidal stimulation need to be reviewed in the light of the following experiments (*3*).

The bulbar pyramids and the anterior cerebral hemispheres were exposed in cats anesthetized with α-chloralose (35 mg/kg, intraperitoneal) and paralyzed with decamethonium bromide (1 mg/hr, intravenous). The preparation was placed supine, and bipolar silver-wire electrodes were placed on one exposed pyramid. Monopolar surface recordings were made from the ipsilateral pericruciate cortex. Stimulation of the intact pyramid yielded the cortical potential shown in Fig. 1*A*. The positive (downward) wave *a* (latency, 0.4 to 0.6 msec; duration, 1 msec) had the lowest threshold, faithfully followed repetitive shocks