but become stranded in the interfollicular tissue. Here they degenerate, and the liberated colloid attracts lymphocytes (Fig. 2). Then one can see large red-stained clumps of colloid in the center of lymph follicles.

The process of colloidophagy, followed by accumulation of lymphocytes, is apparently the underlying cause of so-called chronic thyroiditis, which is so common not only in normal-sized thyroids, but especially in exophthalmic goiter and lymphadenoid goiter (*5*).

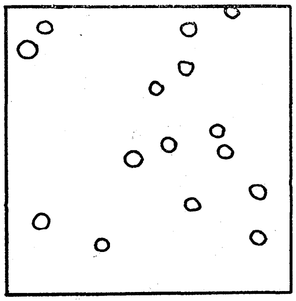

FIG. 3. Colloid of normal human thyroid, without colloidophagy. Camera lucida drawing, × 15 of original electronmicrograph × 5,000 m. (Total magnification × 75,000 m, reduced to × 37,500 in reproduction.)

The cause of chronic thyroiditis has never been satisfactorily explained, and chemical or bacterial agents responsible for this disease have never been found. What, then, causes this invasion of colloid by wandering cells? From animal experiments, we know that excess of thyrotropic hormone stimulates colloidophagy in the normal thyroid. Lymphadenoid goiter in which colloidophagy with aggregation of lymphocytes is always present has been related to an excess of thyrotropic hormone (*6*). We therefore feel justified in assuming that overstimulation of the thyroid by thyrotropic hormone changes the properties of the colloid in such a way that it attracts macrophages.

In the electron microscope the extract of human lymphadenoid goiters and of rabbit thyroids activated by thyrotropic hormone looks different from that of normal thyroids. The colloid of normal thyroids appears in the electron microscope to be composed of globules, about 25 mμ in diameter (Fig. 3), and the colloid of lymphadenoid goiter and of rabbit thyroids stimulated with thyrotropic hormone reveals bizarre, wedge-shaped, angular, and sharp-edged particles measuring about 160 mμ in length (Fig. 4). These structural changes of the colloid suggest chemical alterations that would explain the attraction of macrophages by chemotaxis.

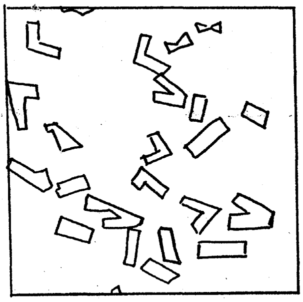

FIG. 4. Colloid of human lymphadenoid goiter with colloidophagy. Camera lucida drawing, × 15 of original electronmicrograph × 5,000 m. (Total magnification × 75,000 m, reduced to × 37,500 in reproduction.)

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Induction and Blossoming of *Xanthium*[1]

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Studies on the photoperiodic induction of *Xanthium* are particularly responsible for the widespread idea that the induction stimulus is the controlling factor that causes the blossoming of plants. A principal item contributing to this belief is the fact that the proper grafting of a flowering plant to a nonflowering one results in the blossoming of the latter. Other plants that blossom systematically (such as soybean) can be made to flower by grafting (*1*), but those that flower only terminally cannot be so "induced." Also, the latter "devernalize" readily with a change in the environment, such as temperature. Conspicuous examples are azalea (*2*), chrysanthemum (*3*) and onion (*4*). From this it is evident that induction does not necessitate flowering. So-called photoperiodic plants, such as pigweed and soybeans (not Biloxi), which become indeterminate with age, and also indeterminate forms, suggest a condition of either internal or self-induction or that flower formation may be independent of induction. At least "ripeness to flower" (*5*) occurs without any conspicuous or readily discernible induction condition having been detectable.

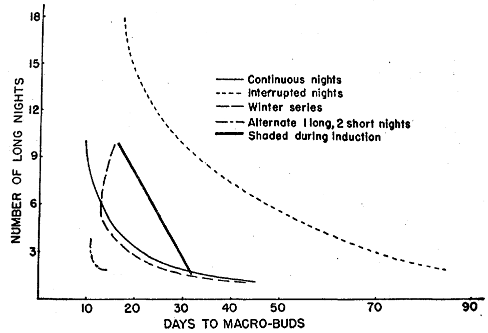

FIG. 1. Relation of inductions (long nights) to time of appearance of macro blossom buds in *Xanthium* (Wis. sp.) under various environmental conditions.

More recent studies with *Xanthium* sp. native to

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[1] Published with the permission of the director of the Agricultural Experiment Station. Supported in part by a grant from the Wisconsin Alumni Research Foundation.

Wisconsin indicate that induction and flowering may have a marked degree of independence even with this plant. It is readily apparent from Fig. 1 that the time of appearance of blossom buds is as much dependent upon environmental conditions as upon the amount of induction (number of long nights given the plants)—or even more so. The solid line in Fig. 1 shows the average times at which macro blossom buds are readily discernible under conditions of continuous induction. The data for the dotted line were collected from 3 sets of plants having the dark period interrupted at midnight by 30 min of illumination with a 40-w lamp 18–24 in. from the plants. This did not inhibit blossom bud formation but only greatly delayed it. Plants given 3 long nights, with 2 short nights between each of the long ones, formed blossom buds as quickly as with 10 successive long nights (dash-and-dot graph). In midwinter of 1949–50, blossoming was more rapid on plants having 5–6 long nights than on those with 10 long nights (broken line). This was assumed to be due to poor light conditions at that time of year. To test this idea, other lots of plants were grown under a shade that reduced the daylight to 300–400 ft-c (double line). These experiments clearly show the effect of environment, as well as amount of induction, upon flowering. This is also markedly illustrated by additional experiments in which shaded plants were sprayed with a 10% sucrose solution once each day during the induction period. This procedure resulted in blossom buds appearing at practically the same rate as with unshaded plants (Table 1 and Fig. 2). It is now obvious that blossom bud formation is not controlled entirely by the induction stimulus. This may provide a "ripeness to flower," but blossom initiation and development are also dependent upon other factors in the post-induction environment.

One of the principal factors that have contributed to the present belief that flowering is controlled by an induction stimulus is the assumption that induction begins with the appearance of blossom primordia. It has been shown that the stimulus to flower is several weeks prior to floral initials in the case of apples (*6*), cranberries (*7*), and hydrangea (*8*). Induced tulip bulbs have been kept nonflowering for as long as a year by holding them at a high temperature (*9*). Bulbous iris (*9*) and onion (*4*) develop an inflorescence in storage several months after the induced bulbs are harvested. It would seem to be more nearly proper to call the appearance of blossom primordia the end of induction and the start of the flowering stage. This may continue to fruitfulness or, in the case of terminally flowering plants, be interrupted by blossom abortion and a substituted vegetative growth.

TABLE 1

DAYS FROM START OF INDUCTION TREATMENT TO APPEARANCE OF MACRO BLOSSOM BUDS, *Xanthium* (WIS. SP.). AVERAGES OF 4 SERIES OF TREATMENTS, DECEMBER 1949 TO MARCH 1950.* (SIXTEEN PLANTS PER TREATMENT)

Induction periods and returned to long days	Unshaded	Shaded during short days	Shaded and sprayed with 10% sugar solution
Continuous	12.0	22.8	12.7
2 long nights	19.0	30.8	19.3
4–5 long nights	12.3	29.6	12.8
8–10 long nights	13.3	24.9	13.3

* Part of data by Wm. F. Millington.

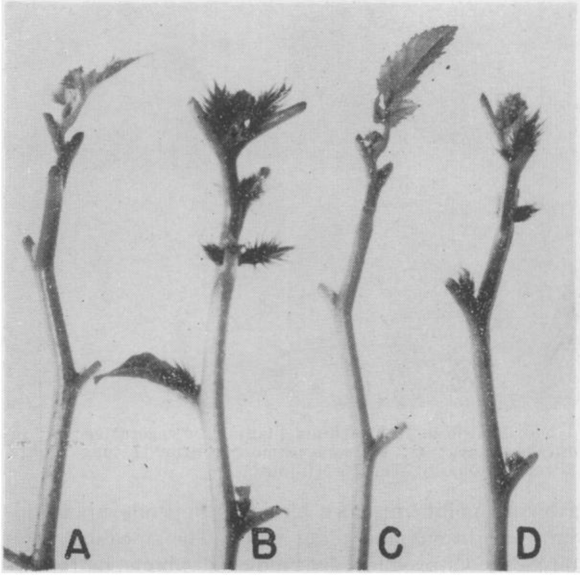

FIG. 2. Tips of cocklebur plants with leaves removed. *A*: long day, vegetative; *B*: 8 short days and 27 long days; *C*: same but shaded during inductions: *D*: same as *C* but sprayed with sugar solution; flower development nearly as fast as *B*.

A particular reason for the induction stimulus not being distinguished from floral development is the fact that both are influenced by short days; that is, the same short days that provide the induction effect on *Xanthium* also hasten the rate of flower formation, simultaneous phenomena, not cause and effect.

Another reason for believing that induction causes flowering is the habit of plants which flower systemically to continue to blossom and not revert or "devernalize" with a change in the environment (*10, 11*). It is believed that an understanding of this condition may have been found. Anatomical studies of the stem apex by numerous workers all reveal a change in width and appearance of the apex prior to the first floral initials (*12*). That is, for a time the apex is neither vegetative nor does it have blossom primordia. In *Xanthium* (Fig. 3) the "induced" apex is a relatively well-developed and conspicuous micro structure (Fig. 3, *B*).

Preliminary investigations reveal that all growing points on the plant make this transition when short days (inductions) are used. Thus the plant has lost its vegetative apices, and with this change, its power to revert or again become vegetative. Whether all

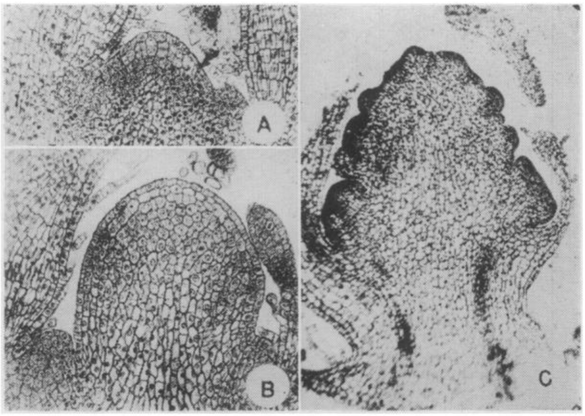

FIG. 3. Apices of *Xanthium* plants. *A*: vegetative; *B*: induced 4 days; *C*: blossom primordia after 7 long nights. (Preparations by Wm. F. Millington.)

growing points produce blossoms depends upon cultural conditions and plant vigor. The so-called vegetative shoots produced by "induced" plants, as following pruning, for instance, are in reality induced branches comparable in morphological condition to the main axis of a plant which has had only one or a few long nights and which requires 3–5 weeks for macro blossom buds to appear.

Plants that flower terminally have noninduced vegetative buds from which new shoots arise with a change in the environment.

It is obvious that the cocklebur, which has been looked upon as furnishing evidence for believing that induction causes blossoming, has a definite if not marked degree of independence of these two phenomena. Future studies of why plants blossom could profitably give more consideration to the "competition" or balance between the vegetative and flowering stages as well as the role of induction in blossoming.

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Comments and Communications

The International Commission on Zoological Nomenclature and the Name of the Monarch Butterfly

WE RECENTLY prepared a paper about the name of the Monarch Butterfly, protesting the hasty and wrong action of the International Commission and also Hemming's mail proposal to correct the error. After seeing the communication by Field, Clarke, and Franclemont (*Science*, **113**, 68 [1951]), which is so much like the one we were writing, we believe that our paper is unnecessary, and that a brief note will serve to show our entire accord with their paper.

First, we wish to say that it is impossible for us to understand the misstatements of fact made by Hemming in his mail proposal. We refer to his statement that the North American species "came to be known as *Danaus plexippus* (Linnaeus), the name universally applied to it" (p. 2, Point 4 of the Hemming proposal), and to his statement that the Indo-Oriental species "is now universally known as *Danaus genutia* (Cramer)."

Field, Clarke, and Franclemont have shown (and we have verified) that these are not correct statements. Misstatements of fact like these put Hemming in a very bad light, at least among us here. As secretary of the International Commission, his responsibility in writing and circulating such proposals is indeed a very great one—he should not advance statements that are so far from reality.

Second, an important fact was overlooked by Hemming in his proposal. This is the designation by Corbet of a "male specimen bearing the Linnaean name label as the name-type of *P. plexippus*" and thus as the lectotype of this insect. This male is a specimen of the Chinese species, not of the North American species. We agree with Field, Clarke, and Franclemont that the commission should first consider this designation before taking any action on the matter.

We go further and say that we doubt that the International Commission on Zoological Nomenclature should act at all upon problems having to do with systematics. This is not a problem of nomenclature but one of systematic zoology. We believe that only workers on the systematics of Lepidoptera or upon systematic zoology can discuss the designation of a lectotype for *P. plexippus* and the identification of this species.

Third, the designation of an illustration published by Holland in 1931 as the type of *Papilio plexippus* Linnaeus, 1758, is one consequence of work by people like Hemming who do not practice systematic zoology. This kind of action is a "new" systematics; it appears again in Hemming's mail proposal. There we are told