Comments and Communications

Auxin and Flower Initiation

The recent note by Green and Fuller (*Science,* October 15, pp. 415–416) on the delay of flowering in petunias by treatment with auxin solutions raises the question as to whether such effects are specifically exerted on flower initiation. It has been known for some years that auxin does inhibit bud development, and this is presumably true for floral as well as for vegetative buds. It would seem that the controls for such experiments should perhaps be not the untreated plants but the vegetative buds of treated plants. This would enable any specific effect of auxin on flowering to be distinguished from general bud inhibition.

In our own experiments with barley, which are being reported elsewhere (*Amer. J. Bot.,* in press), auxin treatments had an inhibitory effect on the vegetative buds. In addition, however, it is of interest that low concentrations, which produced such a vegetative inhibition, definitely increased the number of flower primordia in flowering plants. High concentrations reduced the number of flower primordia. This suggests a parallelism with the known effect of auxins in promoting flowering in the pineapple (H. E. Clark and K. R. Kerns. *Science,* May 22, 1942, pp. 536–537, and other later workers).

TABLE 1

EFFECT OF INDOLE ACETIC ACID ON FLOWER INITIATION OF BARLEY

Treatment	Flower primordia per plant	Per cent of controls
Water control	26.4 ± 1.3	...
10^{-5}M IAA	30.0 ± 3.3	114
10^{-4}M IAA	34.3 ± 1.7	130
10^{-3}M IAA	25.4 ± 1.7	96

Variability is expressed as standard deviation of the mean.

Wintex barley plants, which require long days for flowering, were grown for 3 weeks in a 10-hr day and then transferred to a 16-hr day. Groups of 10 plants were treated with solutions of indole acetic or naphthalene acetic acid, ranging in concentration from 0.01 to 400 mg/liter. Each plant was given 1 ml of solution by infiltration through cut leaf tips. Three weeks after treatment the plants were dissected, and the flower primordia were counted and compared with the water controls.

The results with indole acetic acid are presented in Table 1. It will be seen that application of the 10^{-4} molar concentration increased the number of flower primordia 30% over that of the water control. The 10^{-5} molar solution had a less pronounced effect. Naphthalene acetic acid produced similar results. At concentrations below 10 mg/liter, the number of flower primordia was increased. At 10 mg/liter and above, the number was decreased, the decrease being approximately proportional to the logarithm of the auxin concentration. The latter inhibition is similar to that reported by Thurlow and Bonner for *Xanthium* (*Amer. J. Bot.,* 1947, 34, 603) and by Green and Fuller (*loc. cit.*). The ability of low concentrations of auxin to increase the number of flower primordia, however, indicates that auxins may not be acting simply in opposition to flowering.

A. C. LEOPOLD and K. V. THIMANN

Hawaiian Pineapple Co., Ltd., Honolulu, and
Harvard Biological Laboratories

A Note on the Fungicidal Property of Actidione

In a significant article by Kornfeld and Jones (*Science,* October 12, pp. 437–438) concerning the chemical structure of Actidione, a new antibiotic substance, the comment is made that "this interesting material is highly active against almost all yeasts but is relatively innocu ous to other microorganisms."

Interest in this material will be heightened by the discovery by Drs. I. M. Felber and C. L. Hamner, now in press, that Actidione is effective against powdery mildew in concentrations of 5 ppm. There are suggestions that Actidione may be effective against other fungi as well. This is an instance of an antibiotic substance derived from a fungus which is effective against a plant microorganism.

H. B. TUKEY

Department of Horticulture, Michigan State College

Propagation of *Metasequoia* by Juvenile Cuttings

A note pertaining to the propagation of *Metasequoia glyptostroboides* should be interesting to those who have read of the recent discovery of living trees of *Metasequoia* (H. H. Hu. *J. N. Y. bot. Gard.,* 1948, 49, 201–207; G. L. Stebbins. *Science,* July 30, pp. 95–98) and especially to those who have received some of the seed distributed by Dr. Merrill, of Harvard University.

While the use of juvenile cuttings is not new, there have been few opportunities when this method could be used extensively. However, where so many people have a supply of only seedlings of *Metasequoia,* this method is well adapted for rapidly increasing the number of plants available for testing and distribution.

Seed received by the Division of Plant Exploration and Introduction was sent in May 1948 to the U. S. Plant Introduction Garden, Glenn Dale, Maryland, where it was immediately sown. The resultant seedlings were then potted and grown in the greenhouse. In September a limited number of cuttings were made from the young, lateral shoots of these 5-month-old plants. These cuttings were handled in a routine fashion; that is, the basal leaves were stripped from the stems and the cuttings inserted into a bed of moist sand. Because the stems of these cuttings were very delicate, care in removing the leaves and inserting them in the sand was necessary.

Only 2 cuttings of the entire lot died, and the remaining 13 cuttings rooted successfully. At the end of 3 weeks an examination of the cuttings indicated that roots were forming. The cuttings remained in the sandbed for 5 weeks, at which time they were removed and potted. When it was obvious that the original lot of cuttings was rooting successfully, a second, larger propagation was made. These have begun to root in a comparable manner, with roots appearing in 3 weeks. Apparently, cuttings made from lateral shoots when the plants are still in the seedling stage root easily and rapidly.

The only objection that might arise from the use of such juvenile cuttings is the possibility that prostrate plants or juvenile forms would result. However, since the Chinese are reported (see Hu) to propagate their trees from cuttings, we may expect similar results, for we may assume that their cuttings came from the lower horizontal branches and not from the terminals. This possibility will, of course, be determined only when the cuttings have grown considerably.

JOHN L. CREECH

Division of Plant Exploration and Introduction, Bureau of Plant Industry, Soils, and Agricultural Engineering, USDA, Beltsville, Maryland

Science and Social Problems

With the advent of new, horrible, and efficient weapons of destruction resulting from the application of the scientific method to the problem of killing or incapacitating men, a new sense of responsibility has developed among scientists. Some have proposed that they refrain from using their talents in further researches of this kind, others have forcefully advocated the formation of a world government, and still others have proposed that the scientific method now be directed toward a study of the problems of sociology, economics, and politics with the hope that a resultant better understanding could lead to the development of a society in which war would be eliminated. Thoughtful people not actively engaged in science have also begun to look to it to provide knowledge which will assist men in using their ever-increasing power over nature in wise and nondestructive ways.

In a world in which the scientists of a few important nations have no freedom of choice, the first proposal appears to be foolish; it would be equally foolish to ignore the professed objectives of the rulers of these nations and put our trust in a world government. Furthermore, there is nothing to indicate that the people of the world are yet ready to surrender a sufficient measure of their sovereignty to allow a world government to function in any effective way. If a solution to the problem of war is to be found with the assistance of scientists, the third proposal would seem to be the only one offering a significant prospect for success.

This approach, however logical, is not as simple as it might appear. Dr. E. U. Condon, in a recent paper (*Science*, June 25, pp. 659–665) discussing science and security, remarks: "In short, the greatest contribution to real security that science can make is through the extension of the scientific method to the social sciences and a solution of the problem of complete avoidance of war." Earlier in the paper he had deplored the reluctance encountered even in civilized countries to accept and extend the use of the scientific method to sociology, economics, and politics. He defined science as "the process of studying and the results of study of the facts of experience derived from a conscious program of observing, while systematically varying the factors of a given situation in order to arrive at a rational understanding of the observational data so obtained." Perhaps an explanation for the reluctance which disturbs Dr. Condon and other scientists lies in this definition of science.

Understandings arrived at as a result of the application of this scientific method to the social sciences would have a high probable accuracy and would therefore provide logical bases for legislative or educational actions. However, it must be noted that in order to vary systematically the factors of a given situation, the scientists conducting the studies of necessity must have control over them. Since it is unlikely that sufficient numbers of people would voluntarily subject themselves to such control, it follows that legislative action establishing it would be required. While it can be argued that the stakes are high enough to justify the risks involved in such procedures, it is unlikely that sufficient support can be developed in this country to permit such a radical change to be made without resort to subterfuge and deception. This is perhaps one reason for the cool reception such proposals have received from the public and the Congress.

Social science studies conducted to date, with minor exceptions, have been observational and statistical rather than experimental, and perhaps this is the kind of research which the advocates of broader application of the scientific method have in mind. Here is, however, another difficulty. Understandings so achieved are only approximations, and in many cases inaccurate approximations at that, due to the inherent limitations of the methods employed. Their accuracy can be improved by subjecting them to experimental verification, but this immediately raises the problem of control again. Under these conditions it is unlikely that there will be unanimity of opinion among scientific specialists as to the meaning of the understandings reached or as to their validity. Positive action based on such a shaky foundation would be definitely hazardous even if the people and their legislators could be persuaded of its reasonableness.

It may be true that expanding the application of the scientific method to social sciences will provide us with knowledge which will lead to the elimination of war. All concerned should, however, recognize the difficult problems to be solved, and scientists should be the first to point them out so that all of the people have a clear understanding of the hazards and difficulties involved.

Meanwhile, a careful appraisal of the differences between the beliefs of science and of the important religious faiths, with due regard for the probable accuracy of each aspect of their respective dogmas, should have at least equal value, relative to the solution of social prob-