A CONFERENCE on geodesy, aeronautical charts and topographic maps in which twenty-five distinguished visitors from Latin America and Canada took part, was held recently in Washington. The conference was sponsored by the American Geographical Society at the suggestion of the Committee on Cartography of the Pan-American Institute of Geography and History, of which Pedro C. Sanchez is director. Dr. Andre C. Simonpietri is the secretary of the Commission on Cartography. Headquarters are in Mexico City. The purpose of the committee is to promulgate uniform standards and technical methods which can be adopted by all the countries involved; to improve education and training in the science of map making through the exchange of professors and technical personnel. Reports are being compiled in each country to indicate the status of mapping, complete with index charts showing geodetic control, completed and under way. Biographical data are being assembled on those engaged in cartographic work in each country and a glossary of scientific terms used in mapping is being prepared in English, Spanish and Portuguese. Following the conference in Washington the delegates inspected the production of aerial mapping equipment by the Bausch and Lomb Optical Company.

AS reported by Science Service, cultural leaders in the Western Hemisphere recently met in Washington in wartime session to consider how best to promote scientific and scholarly cooperation. The Inter-American Committee on Intellectual Cooperation, under the chairmanship of Dr. Miguel Azorio de Almeida, Brazilian physiologist, is a Western Hemisphere regrouping of the national committees on intellectual cooperation that were organized under the League of Nations a decade ago. Conferences were held in the buildings of the Pan American Union and the Carnegie Endowment for International Peace, with those organizations and the Division of Cultural Relations of the State Department cooperating in the program. Dr. Waldo G. Leland, director of the American Council of Learned Societies, recently named chairman of the American Committee on Intellectual Cooperation, has been instrumental in arranging the conference. The American delegate to the meeting is Dr. James T. Shotwell, of Columbia University, now honorary chairman of the American committee. Other delegates are Dr. Victor Lascano, of Argentina, Dr. Julian Nogueira, of Uruguay, Dr. Alfonso Reyes, of Mexico, Dr. Cosme de la Torriente y Peraza, of Cuba, and Dr. Oscar Vera, of Chile. Dr. Herminio Rodriguez is secretary of the committee. Technical experts present included Dr. Robert Valeur, of New York, Dr. Mariano Brull, of Cuba, and Dr. Antonio Castro Leal, of Mexico.

THE Earl E. May Seed Company has made a gift of $75,000 to Iowa State College, to be spent over a period of five years, for a study of the basic problems relating to the growth and development of the corn of Mexico and Central and South America, and the contribution the corn of those areas may be able to make to the United States.

IT is reported in *Chemical and Engineering News* that a National Security Award has been established by the Office of Civilian Defense to give recognition to outstanding achievements of certain essential facilities in protecting the safety of employees, plants and production schedules from air raids, fire, sabotage and accident. A Board of Review has been formed to pass final judgment on records of plants nominated for the award.

A UNITED PRESS dispatch reports that the Swedish Government has decided against the awarding of Nobel prizes for peace, literature, physics, chemistry or medicine in 1943.

DISCUSSION

SYNAPSIS AND SYNGAMY AS STIMULATING PROCESSES OF PLANT DEVELOPMENT[1]

THE structural features of sexual reproduction in higher plants have been worked out and described with great precision, yet very little is known of the physiological aspects of this very important phase of their life. This despite the fact that most of the economic plants are grown for their seeds and fruit—organs and tissues associated directly or indirectly with reproduction. Even a cursory observation of many species, especially the annuals, should convince one that sexual reproduction has a very marked effect on growth and development, certain important aspects of which are now being recognized and studied.

In a series of experiments, chiefly with horticultural plants, the effects of developing flowers and fruit on vegetative growth have been amply demonstrated by the senior author,[2] which leaves little doubt about the conspicuous physiological control that these organs exert on metabolism. The influence, characterized by

[1] Contribution from the Department of Horticulture, Missouri Agricultural Experiment Station Journal Series No. 909.

[2] A. E. Murneek, *Plant Physiol.*, 1: 3–56, 1926; 7: 79–90, 1932. *Mo. Agr. Exp. Sta. Res. Bul.*, 106, 1927. *Proc. Am. Soc. Hort. Sci.*, 21: 274–276, 1924; 40: 201–204, 1942. *Growth*, 3: 295–315, 1939.

various degrees of inhibition in the subsequent development and function of flowers, leaves, shoots and roots, is shown most markedly after reproduction has progressed towards completion, *viz.*, fruit and seed formation.

An examination in detail of some of the earlier, very significant though less evident, stages of reproduction has disclosed, that, in addition to an inhibitory or retarding influence, as is exhibited during fruit and seed development, a more or less specific stimulation also occurs with initiation of fruit development and the early stages of fruit setting.[3] Hence coincident with sexual reproduction, vegetative growth is first stimulated and later retarded, in tandem order as it were.

The concept that, as a result of gametic union, growth is stimulated was introduced and demonstrated some time ago (Murneek, 1926),[3] while later observations suggested a similar stimulation during synapsis (Murneek, 1937).[3] As a result of further study of the problem we have now on record considerable proof, details of which will be presented in a forthcoming publication, that during the process of sexual reproduction metabolism is indeed accelerated, specifically at the approximate time of union of the chromosomes at meiosis (synapsis) and during union of nuclei at fertilization (syngamy). The two periodic stimulations in growth, therefore, have their origins in the process of fertilization with its two cytogenetically important phases, chromosome conjugation and gametic union, accepting the view long current that synapsis is the final or culminating phase of the sexual process, and disconsidering for the present exceptional cases or alternating mechanisms, as in certain polyploids or parthenogenetic organisms (Sharp, 1937).

It has been possible for us to demonstrate repeatedly by means of removal of reproductive organs at different stages of their development from a variety of plants (spinach, cucumber, strawberry and sour cherry) that a period of renewed growth, presumably arising from increased metabolic efficiency of the roots and leaves, follows each of the above two crucial phases of reproduction. These intervals of accelerated activity in the plant manifest themselves by increases in vegetative extension, the production of fresh and dry matter, the absorption of soil nutrients, and the accumulation of products of photosynthesis. In inflorescences of many plants the post-synaptic and post-syngamic periods are characterized by an augmented elongation and changes in movement of the pedicels. Two spurts in growth and alterations in movement usually occur, one during bud development, the other following fertilization of the egg.

[3] A. E. Murneek, *Mo. Agr. Exp. Sta. Res. Bul.*, 90, 1926. SCIENCE, 86: 43–47, 1937. S. H. Wittwer and A. E. Murneek, *Proc. Am. Soc. Hort. Sci.*, 40: 205–208, 1942.

Determinations of catalase activity in developing flowers and accessory tissues of the pear tree and corn plant showed two prominent peaks. The first increase followed synapsis in the microspore mother cells, the second occurred after nuclear fusion in the majority of the embryo sacs.

Following the initiation of chromosome conjugation in the staminate and fertilization in the pistillate flowers of corn, substances possessing marked growth stimulating properties (growth hormones) were produced, the greatest concentration being attained within the tassels 10 to 14 days after beginning of synapses, and in immature kernels an equal period subsequent to syngamy. The pre-synaptic stage in the male and the pre-syngamic period in the female inflorescences were distinguished by an absence of growth substances in the respective reproductive organs. The two maxima representing hormone concentration correspond quite precisely with (a) the peaks in catalase activity, and (b) the spurts in growth following gametophyte and embryo inception.

Extracts of the immature corn kernels, applied in lanolin paste, were active in fruit setting and parthenocarpic fruit induction in the tomato. The set, yield and size of the fruit were superior to that obtained by means of artificial pollination and by the use of synthetic growth substances.

These results have an unexpected confirmation and permit the interpretation of certain heretofore unintelligible results secured by Kreusler and his coworkers on the growth of the corn plant and published some 60 years ago.[4] A critical reexamination of their data and consideration of the time factor in morphogenesis of the corn plant reveal a striking correlation between (a) periods of greatest vegetative extension, accumulation of dry matter, absorption of soil nutrients and accumulation of photosynthetic products (Kreusler's data) and (b) peaks in production of growth hormones in the reproductive organs, as disclosed by our studies. The intervals of maximal increase in stimulating substances followed closely in all cases the beginning of synapses in the flower buds and embryo initiation in the young fruit.

A. E. MURNEEK
S. H. WITTWER
UNIVERSITY OF MISSOURI

NAME AND CLASSIFICATION OF THE CURLY-TOP VIRUS

SYMPTOMS induced in affected plants are the best characteristics now known for the classification of phytopathogenic viruses. The symptoms induced in beets as well as in other hosts by the curly-top virus complex would lead to the placing of this virus in the

[4] U. Kreusler, *et al.*, *Landw. Jahrb.* 6: 759–786, 787–800, 1877; 7: 536–564, 1878 and 8: 617–622, 1879.