mented with it in about 25 different cases involving tobacco, cotton, wheat and corn. Presumably it can be extended to other crops. In every case where it has been tested the ratio of the yields of two successive years and not the absolute yield of the second year has served as the dependent variable. If for some reason primary statistical interest should rest on the absolute yield, instead of the annual change, the method outlined would have to be modified and a curve of the form $y = ax - bx^2$ fitted to the observed data. In actual practise the need hardly arises for following this alternative procedure.

Simplifications which have been effected in the technique of forecasting still leave ample ground for further improvement. Econometricians familiar with this field perceive that the day is not yet in sight when the extent of an annual crop change can be foretold with anything like complete accuracy. The results of climatological investigations eventually may help to clarify the reasons for errors which are made. Measurements of the periodicities of possible component curves of the total solar energy curve by Dr. C. G. Abbot, of the Smithsonian Institution, are being regarded in a sympathetically critical and hopeful spirit. Likewise the studies of Dr. A. E. Douglass, of the University of Arizona, on tree rings as a medium for determining annual growth variations of the past, and of the staff of the Scripps Institution of Oceanography of the University of California on the relationship between ocean temperatures and solar energy, are being watched with interest. The suspicion persists that if the research of these and other investigators should lead ultimately to the development of long-range weather forecasting on a practical basis, long-range crop forecasting also may follow. In that event both the old methods of predicting crop yield changes and those lately developed will be revealed at best as being only makeshift attempts.

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IS METHYLENE-BLUE ANTI-CARCINOGENIC?

WARBURG[1] in his study of yeast found methylene-blue to counteract the effect of carbon monoxide and potassium cyanide. This protective action of methylene blue upon the respiratory enzymes was extended by Sahlin,[2] Eddy[3] and Brooks[4] to small mammals, and ultimately by Geiger[5] to human cases.

Now, as already shown,[6] malignant growth is based upon the suppression of respiratory enzyme (oxidase-dehydrogenase) activity by (a) dietary enzyme depletion and (b) environmental inhibition.

In cases where malignant growth is dominated by such specific industrial conditions as the effect of coal-tar and mineral oils, we find the respiratory enzymes are influenced by definite carcinogenic substances such as 1:2:5:6 Dibenzanthracene, 5:6 cyclo-penteno, 1:2 Benzanthracene, 1:2 benzpyrene, etc., the activity of which may perhaps be likewise counteracted by methylene blue.

Some support to such a possibility is afforded by (1) the action of carcinogenic substances upon the dehydrogenase group of enzymes,[7] (2) the existence of anti-carcinogenic substances, as, for example, dichloro-diethyl sulphide (mustard gas),[8] and (3) the intimate connection existing between respiratory enzymes and certain coloring matters,[9] the function of the latter being that of a co-enzyme rather than substrate.

Bearing in mind the colloidal nature of the enzymes in relation to the whole system of their contact and inductive activity—the characterization of the cancerous cell by its abnormal state of colloidal dispersion and the suggested extension of Bancroft's physico-chemical corrective treatment to such malignant cell colloids[10] is also in full accord with the conception put forward here.

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COURSES IN THE LITERATURE OF BOTANY

FOR several years, the writer has been developing a graduate course entitled "Literature of Botany," the aim being to acquaint advanced students with classic and current literature related to botany. This work has proved both difficult and interesting, having opened new worlds of botanical thought, appreciation and knowledge. Since the work has been crystallizing, it was thought desirable to compare the course with similar courses in other educational institutions. This led to the study of the university and college catalogues which were on file in the Kansas State College library. With few exceptions the 1931–1932 catalogues were available. The institutions which included courses in botany in their curricula totaled 545. Of these, 20 were outside of the United States. Of the 545 institutions, only six offered courses in or including literature of botany as such. These are as follows: University of Montana, "Botanical Literature"; University of Nebraska, "Botanical Literature"; Kansas State College, "Literature of Botany";

[1] *Zeits. Physiol. Chem.*, 66: 305, 1910.
[2] *Skand. Arch. Physiol.*, 47: 284, 1926.
[3] *Jour. Pharm. and Exp. Ther.*, 41: 449, 1931.
[4] *Proc. Soc. Exp. Biol. and Med.*, 29: 1228, 1932.
[5] SCIENCE, 77: 1986, January 20, 1933.
[6] Copisarow, *Nature*, 130: 1001, 1932.
[7] Boyland, *Nature*, 130: 274, 1932.
[8] Berenblum, *Rep. Brit. Emp. Cancer Camp.*, 76, 1932.
[9] Warburg and Christian, *Biochem. Zeits.*, 257: 492, 1933.
[10] Crawley, *Jour. Phys. Chem.*, 36: 1282, 1932.