tranquillizing action of methylene blue on agitated mental patients as early as 1899.

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[1] Ungar, G., *J. de Physiol.*, **49**, 1235 (1957). Ungar, G., *et al.*, *J. Gen. Physiol.*, **40**, 635 (1957). Ungar, G., and Romano, D. V., *Proc. Soc. Exp. Biol. and Med.*, **97**, 324 (1958).
[2] Aleksandrov, V. Ya., and Nassonov, D. N., *Uspekhi Sovremennoi Biol.*, **24**, 1 (4), 45 (1947). Blei, I., thesis, Rutgers Univ., N.J. Dissertation Abstracts, **17**, 2789 (1957).
[3] Fischer, R., paper presented at the meeting of the Ohio Valley Section of the Soc. Exp. Biol. Med., Columbus, Ohio, Nov. 1, 1958 (in the press).
[4] Fischer, R., and Zaleschuk, J., *J. Histochem. and Cytochem.*, **6**, 237 (1958).
[5] Nelemans, F. A., and Dogteron, J., *Stain Technol.*, **28**, 81 (1953).
[6] Bodoni, P., *Semaine médicale*, No. 7, 56 (1899).

PLANT PHYSIOLOGY

Gibberellic Acid and Growth Correlations

AMONG other effects, gibberellic acid may alter plant-growth correlations by decreasing the inhibitory action of leaves and storage organs. Previous work[1–3] has shown that species of *Bryophyllum*, *B. crenatum*, *B. verticillatum* and *B. daigremontanum* do not flower if kept continually under either long- or short-day conditions. To induce flowering, long-day plants showing long internodes and petiolated oval leaves must be exposed daily for 10 days to 12-hr. illumination or less, whereas short-day plants with their very short internodes and round, almost sessile, leaves must be exposed for 20 days to a long day of 13 hr. or more and then to short-day conditions for a further 10 days. These plants were therefore described as long-short-day plants[4]. The long-day plants could not be induced to flower by treatment with gibberellic acid. Bünsow and Harder were able to induce elongation and flowering of long-day plants grown under short-day conditions by treatment with gibberellins obtained from the fungus[5] and from unripe bean seeds[6]. The same result was obtained in our laboratory by treatment with gibberellic acid of material of *Bryophyllum crenatum* which had been maintained in the form of rosettes for 12 years by continuous exposure only to short-day conditions. If, however, after treatment with gibberellic acid these short-day plants were exposed to continuous illumination or to long-day conditions, they failed to form flower primordia although they elongated strongly, forming long internodes and new oval petiolated leaves. Thus gibberellic acid can replace the long-day requirement but not the quite specific flower-inducing effect of the short day. Extremely rarely a single flower appeared in the axil of one of the upper leaves of the rosette plants grown under short-day conditions; this was only observed in the spring of 1949 in two out of many hundred plants grown in a 9-hr. day.

Studies have also been made with the long-day plant *Circaea intermedia*, which was the first in which the inhibiting effect of higher concentrations of indole-3-acetic acid on flowering was demonstrated[7]. Weak plants which had remained apparently vegetative even under long-day conditions elongated considerably and flowered when a paste containing 0·5 per cent of gibberellic acid was applied to the stem apex. The same effect is produced by defoliation of the upper part of the stem and so removing the leaves controlling growth inhibitions. Tubers of this plant gathered in autumn and then treated at the apex with gibberellic acid paste formed many long orthotropic filamentous shoots whereas control tubers smeared with pure lanolin either remained dormant or developed slowly growing horizontal stolons with tubers at the end. A similar change in geotropic response also occurred with axillary shoots. When axillary buds in one-node cuttings taken from the basal part of the stem were treated with gibberellic acid paste they developed into long and very thin vertical shoots, whereas the control buds smeared with pure lanolin grew into plagiotropic stolons which tuberized. Thus the correlative growth inhibitions of leaves and tubers, so important for the correlations of growth processes, may be decreased by application of gibberellic acid, which thus replaces the growth-promoting effect of the roots.

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[1] Dostál, R., *Věst. Kr. sp. n.*, 1 (1946).
[2] Dostál, R., *Rozpr. Čes. ak. v.*, 2 (1949).
[3] Dostál, R., *Práce Mor.-sl. ak. p. v.*, 22 (1950).
[4] Wellensiek, S. J., Doorenbos, J., and de Zeeuw, D. M., Eighth Congr. Bot., Paris, 11, 12, 308 (1954).
[5] Bünsow, R., and Harder, R., *Naturwiss.*, **43**, 479 (1956).
[6] Bünsow, R., Penner, J., and Harder, R., *Naturwiss.*, **45**, 46 (1958).
[7] Dostál, R., and Hošek, M., *Flora* (Jena), **103**, 1 (1911).

Chlorophyll *a* in some Corals and Marine Plants

ASSOCIATIONS of algae and marine invertebrates are common in coral reefs of tropical seas. According to Yonge[1,2] the algal components of corals obtain carbon dioxide and nutrients from the associated animals; but just what advantages of pseudo-symbiosis accrue for the individual animal body has not been clearly demonstrated. Odum and Odum[3] have expressed the view that the algal-coelenterate complex of tropical coral reefs is "a highly integrated ecological unit (comparable to the algal-fungal complex of a lichen) which permits cyclic use and re-use of food and nutrients necessary for vigorous coral growth in tropical 'desert' waters having a very low plankton content". New approaches to this problem of symbiosis have been developed recently by the growing of single-celled zooxanthellæ isolated in pure cultures from marine jelly fish and sea anemones, and demonstration that these are in reality motile dinoflagellates[4]. It has not been clearly shown whether these photosynthetic flagellates contribute food supplies to the animal polyps.

If the trophic structure of a coral reef is a pyramid of biomass with a considerable excess of producing