great where hardpan or underlying rock restricted root growth, while the wetness of the soil due to four days of rain prior to the storm was an important factor in weakening the anchorage of shallow-rooted trees.

There has been a lesson to be gained from the hurricane by every one interested in trees. While New England may not be visited again by so great a storm for another hundred years or more, the factor of wind destruction to trees is always with us to a greater or lesser extent and the planting of sturdy varieties and proper care of our valuable shade trees should lessen and restrict to a considerable degree storm damage in the future.

STANLEY W. BROMLEY
BARTLETT TREE RESEARCH LABORATORIES,
STAMFORD, CONN.

THE POINT OF ORIGIN OF THE BLOSSOM-INDUCING STIMULUS[1]

THE use of such techniques as grafting,[2] defoliation and the exposure of different parts of the plant to unlike photoperiods[3] has given rise to the belief that a "flower-forming hormone" originates in the foliage near the tip of the plant. The classical experience of inducing plants to flower by girdling would suggest that the leaves may not be the exclusive means of control of the blossom-inducing stimulus.

To observe the response of some plants to the transfer of the flower-forming substance by grafting, flowering and non-flowering plants of *Cosmos sulphureus* var. Klondike, morning glory, var. Heavenly Blue, *Petunia,* poinsettia, soybean var. Biloxi, stock (*Matthiola incana*) var. Xmas pink, tobacco var. Maryland Mammoth and *Xanthium echinatum* were grafted by the approach method, a modified tongue being used. Positive results were secured with morning glory, *Petunia,* soybean and *Xanthium,* the "donor"[3] plants stimulating the "receptors" to produce blossoms. The state of growth of the plants as well as the cultural environments appear to affect the results secured from grafts. For example, deflorating the *Xanthium* donors increases their influence. Flowering was not initiated by grafting in the case of plants of *Cosmos,* poinsettia, stock and tobacco.

It appears that a successful transfer of the flower-forming stimulus by a graft contact depends upon whether the species being used will give a systemic or local response to a photoperiod treatment of only a part of the plant. Exposure of a part of a morning glory, *Petunia,* soybean or *Xanthium* plant to the proper environment induces flowering throughout the plant. *Cosmos,* poinsettia[4] and tobacco, on the other hand, give local responses, as the part being exposed to the proper photoperiod comes to flower and the remainder stays vegetative.

The older receptor branches of *Petunia* in a warm environment blossomed in short days before the younger donor branches which were exposed to long days. That is, it appears that the presence of flowers is not essential to the functioning of branches as donors of the stimulus to flower.

Poinsettia and tobacco plants were induced to blossom in a warm, short-day location, contrary to their habit,[5] by the application of a current of cool air to a short length of the stem some three to four inches below the tip of the plant. These species were also stimulated to blossom in warm, short days by wrapping a taut rubber band about the stem a few nodes below the tip to constrict it.

The variable responses to grafting and to donor branches depending upon the flowering habit of the species and the effects of a "temperature girdle" and banding in causing blossoming indicate that the stem of the plant plays a part in the appearance of blossoms as well as does a leaf-formed hormone-like substance.

R. H. ROBERTS
B. ESTHER STRUCKMEYER
UNIVERSITY OF WISCONSIN

[1] Published with the approval of the director of the Agricultural Experiment Station.

[2] M. Ch. Cajlachjan, *Compt. Rend. Acad. Sci. U. R. S. S.*, 18: 606–612, 1938.

[3] K. C. Hamner and J. Bonner, *Bot. Gaz.*, 100: 388–431, 1938.

[4] R. H. Roberts, J. E. Kraus and N. Livingston, *Jour. Agr. Res.*, 54: 319–343, 1937.

[5] R. H. Roberts and B. E. Struckmeyer, *Jour. Agr. Res.*, 56: 633–678, 1938.

ON DESLOTHING THE SLOTH

DURING several visits to Panama and while making other observations, the possibility of raising the level of activity of the sloth made an interesting appeal. Considered academically and also to test the action of certain substances or conditions, this animal makes an excellent subject. Its basal level of movement is exceedingly low, and increments may readily be observed. Other features make it almost ideal for study, including its ease of handling and training and the plentiful supply in the tropics. Tests were made on both two-toed and three-toed species, the experimental work having been carried out mainly at Barro Colorado Island Laboratory, Canal Zone, and Gorgas Memorial Laboratory, Panama. It may be said that several ways were found of speeding up their activities.

Recognition that the body temperature of the sloth is normally much lower than that of other mammals suggested a temperature test. Mere exposure to the tropical sun for an hour or two raised the rectal temperature 4° or 5°, and thereupon the activity of the animal became much greater. This was evidenced by its rate of travel along the under side of a twelve-foot horizontal pole, timed by stop-watch. Again, setting up an emotional reaction in the sloth, by simple feints and passes before it, augmented its speed very markedly. Extract of the adrenal cortex made in this laboratory, when given in moderate doses (5 cc or so every hour or two), also provided an adequate stimulus to increased activity. Two other substances, adrenalin and prostigmin, were also found to be effective in raising the sloth from its (anthropomorphically considered) sluggardy. Several other preparations which were tested over several days (thyroid and pituitary, also benzedrine and strychnine solutions) gave negative results.

Raising the body temperature appeared to be the best stimulator; on the average the increments in rate of walking on warming approximated 50 per cent., and several cases showed increases of over 100 per cent. Cortico-adrenal extract was observed to maintain the increased rate of upside-down travel by the sloth for some ten or twelve hours after injection. This is in keeping with the earliest observations on the influence of the cortical hormone in augmenting activity.[1] Prostigmin as well as emotional excitement appeared to bring out the fighting instinct in sloths, along with the greater ability to "run" away.

The rate of progress of the sloth may be given interestingly on a mileage basis. It appeared from several hundred tests that the two-toed sloth normally averaged a little over three hours to the mile, and three-toed animals almost four-and-a-half hours. The slowest individual tardigrades, however, took over six hours for the distance. Under excitation such as that noted above, the mile was possible in about two hours, and in a burst of speed by one animal only, a mile an hour was accomplished.

It is likely that in the wild the higher rates of progress indicated would not obtain, because of difficulties of arboreal travel, lack of stimulus, etc. In some cases the sloth rests, indeed, for weeks on end, in the same place in the same tree. Beebe has written very engagingly on its habits.[2] It may be recalled that the sloth possesses only about one half the amount of muscle (percentally) found in other mammals, and that about one quarter of its weight is made up of stomach and contents—both serious handicaps to fast movement.[3] The present observations indicate, nevertheless, that several fairly effective methods of deslothing the sloth may be employed.

S. W. Britton
R. F. Kline

Physiological Laboratory,
University of Virginia

1 E. Eagle, S. W. Britton and R. F. Kline, *Am. Jour. Physiol.*, 102: 707, 1932.

2 W. Beebe, *Zoologica*, 7: 1, 1926.

3 S. W. Britton, R. F. Kline and H. Silvette, *Am. Jour. Physiol.*, 123: 701, 1938.

SCIENTIFIC BOOKS

PHYSIOLOGY

Physiology of the Nervous System. By J. F. Fulton. London, New York, Toronto: Oxford University Press, 1938. Pp. xv + 675.

In this extensive work the author has pursued his declared intention of serving the study of clinical medicine and of meeting the needs of the medical student. From this point of view the work has, in the main, been well done, and much valuable material for the student or clinician is included. To the reviewing physiologist, it seems that the book should rather be called "physiological anatomy." By far the greater part of the book is given to anatomical details, and indeed much of the fundamental physiology of the nervous system is so sketchily treated, with important parts of the subject omitted altogether, that a sense of unbalanced emphasis is left in the reader's mind. The entire fields of conditioned reflexes and electrophysiology—the latter a topic of rapidly expanding interest—are omitted; and, though it is explained that their omission is intentional, the book is thereby rendered an incomplete treatment of the subject indicated in the title. There are several evidences of haste in preparation, but this is to be expected in so large an undertaking by such a busy worker.

An admirable feature of the arrangement is the beginning of each chapter with a historical note and the conclusion of each with a concise, well-worded summary. The historical notes are both interesting and instructive, serving to enhance the understanding of present knowledge. The sequence of chapters, beginning with receptors, motor units and elementary reflexes and then proceeding upward through the spinal cord to the cerebrum, is logical and in the main clear, but it involves some repetition, as in the case of postural reflexes.

The author's interest lies in organization and integration, rather than in basic principles and constituent mechanisms. This is frankly stated in the following sentence (p. 71): "The problem of organization is the principal subject of the present volume; the nature of synaptic transmission, important though it always remains, must here be relegated to a few brief paragraphs." The major foundation stone of the physiology of the nervous system is that well-known but little understood event which we call the nerve impulse. There is scarcely a reference to the vast body of research which for a century has been directed to elucidating this phenomenon, and hardly a word of the results of these researches, beyond a brief, but excellent statement of the all-or-nothing principle.

The influence of the author's great teacher, Sher-