frequency of the primary circuit. The latter characteristic determines the duration of individual shocks, which are of the order of the chronaxie of mammalian nerve and muscle. The apparatus functions without moving parts and is apparently capable of giving weeks of uninterrupted service.

With tests made thus far we have produced typical Jacksonian attacks from stimulation of the motor area in the monkey; a condition of somnolence after stimulation of the hypothalamic region; contraction of the tongue from implantation of the electrode on the hypoglossal nerve; a copious flow of highly acid gastric juice, and violent peristalsis, from stimulation of the vagus on the lower esophagus of a dog. The implanted coils are covered with collodion, and some of these have now remained in place for as long as seven months without evidence of irritation of tissue or of cyst formation.

It is hoped that this apparatus will make possible the study of functions which do not yield to stimulation of short periods but which may respond during experiments in which the excitation simulates the character of that function and goes on, day and night, without disturbing in any way the habits or activity of the animal. It should be particularly useful, therefore, in the study of the nervous control of autonomic functions such as sleep, sugar and water metabolism, menstruation, blood pressure, normal and possibly abnormal digestive activity and temperature control.

A complete report of this apparatus is in preparation and will be published shortly.

RICHARD U. LIGHT
YALE UNIVERSITY SCHOOL OF MEDICINE
E. L. CHAFFEE
HARVARD UNIVERSITY

A SECOND METHOD OF CONTRACTION IN THE STRIATED MUSCLE OF SOME VERTEBRATE ANIMALS

THE visible structure of the contraction pattern in striated muscle, with its regularly arranged and equidistant M stripes, N stripes and Z stripes, is too well known to need description here. Also, some of the changes which take place in this pattern during contraction and relaxation have been extensively studied and described from living and dead material, from stained sections and under the polariscope.

Some time ago the writer cut bits of somatic muscle from the tail region of a still living torpedo or crampfish (Tetronarcine) captured at Woods Hole, Mass., and fixed them in several media. Sections were then cut parallel to the muscle fibers and their myofibrillae and stained for class demonstration in several staining fluids, iron haematoxylin proving the best.

The striation, as in most vertebrate muscle, was very fine, finer than most, but fairly plain. The fixation was very good and gave a true picture. The tissue was apparently caught by the fixation in a state of moderate relaxation. The individual myofibrils were large and plainly distinguishable in the fibers, which were very large and showed more cytoplasm than is usually seen in vertebrate muscle.

The peculiar features noted were broad and narrow areas running irregularly across the fibers approximately at right angles to these muscle fibers and showing considerable branching. A close examination showed that these areas or lines consisted of enlarged portions of successive contiguous myofibrils, these portions being swollen to a thickness greater than that of the rest of the myofibril and very much denser and deeper staining.

In fact, these areas presented exactly the picture seen in McGill's description and figures of the contraction areas in smooth muscle, and it was realized that we were dealing with a fully developed, voluntary striated muscle that was capable of contracting either by means of its highly specialized striated mechanism or, allowing this striated mechanism to lie idle, could contract in the same manner that a vertebrate smooth muscle does.

A close study with high power showed that these smooth muscle contraction areas bore no relation whatever to any part of the striations. The narrowest areas were narrower than a single unit of striation (from Z stripe to Z stripe). The broader ones included more than three or four of the striation units. As already indicated the linear areas formed bands that branched and they were disposed in an irregular fashion, which nevertheless enabled them to cover the field with some regularity.

It was noted that the fish and its tissues were still living when the material was cut out and fixed. Also that it was giving off electric shocks. The writer and Mr. George Meneely secured some living dogfish and skate material and tried to produce this condition experimentally. Muscle was exposed and subjected to electric stimulation, and, while contracting, cold and hot fixatives were applied. Some of these tissues when sectioned and stained showed the same condition. Mr. Meneely later got the same result with gastrocnemius muscle from the frog. Experiments are under way to see if it can be produced by drugs and by traumatic means. Also to study the innervation.

It is suggested that we have in these muscles a double innervation, from the central nervous system and the autonomic centers and that this second method of contraction occurs under the local influence of the

autonomic nervous system during various electrical and chemical conditions. It possibly is the cause of the condition known as cramp in human physiology and of other involuntary rigors seen in poisoning, etc.

ULRIC DAHLGREN

PRINCETON UNIVERSITY

A NON-BITTER VARIETY OF MELILOTUS[1]

ONE of the chief disadvantages of sweet clover (Melilotus) as a forage plant is its lack of palatability. This is attributed to cumarin and closely related compounds of a phenolic nature which impart to the tissues an intensely bitter and stinging taste. Ever since the plant assumed economic importance a non-bitter form has been an object of search by sweet clover breeders.[2] It may be anticipated that the development of more palatable varieties will greatly enhance the agricultural usefulness of this recently domesticated but already widely cultivated plant.

The discovery at Madison, Wis., in 1933 of a non-bitter strain of Melilotus is the outcome of a systematic search for a variation of this kind which the author has made during the past five years among wild populations of *M. albus* Desr. and *M. officinalis* (L.) Desr. growing in that vicinity and in numerous stocks of American and foreign origin which have been under test at the Wisconsin Agricultural Experiment Station. All collections from North American sources have been found to be more or less strongly bitter to the taste. Likewise, a rather wide assortment of material from Western Europe was of similar character. Variations between plants in degree of bitterness were frequently encountered, but no individuals occurred in these lots which were inoffensive to the taste.

During the past season an opportunity was afforded of testing a collection of Melilotus made by Dorsett and Morse of the U. S. Department of Agriculture in China, Manchuria and Chosen in 1928. Acknowledgment is due Mr. L. W. Kephart, of the Division of Forage Crops and Diseases, U. S. Department of Agriculture, for kindly furnishing the seed of this collection. Wider variations in flavor were noted in the Asiatic than in the American and European stocks, but with a single exception the Oriental forms were all at least moderately bitter. F.P.I. No. 90753, the seed of which was designated Melilotus sp., proved, however, to be entirely free of the bitter, stinging taste characteristic of the genus. The determination of this unique quality was confirmed by several persons who visited the experimental field. Offspring of the original plants recently tested in the greenhouse were also non-bitter, whereas check samples of common white and common yellow sweet clover developed the usual distasteful flavor at an early stage of growth.

The original seed of F.P.I. No. 90753 was collected in the Botanic Garden near Peiping, China. The non-bitter plants are of annual habit, grow to a height of from 15 to 34 inches and bear small yellow flowers and smooth seeds. While some doubt attaches to the classification of the material, the race unquestionably belongs in the Coelorytis (Eumelilotus O E Schulz) section of the genus, and appears to be a variant form of the typically biennial species, *M. suaveolens* Ledeb. According to Schulz (*Bot. Jahr.*, 29: 660–735), *M. suaveolens* Ledeb. is closely related to *M. albus* Desr., and replaces the latter in Eastern Asia from Manchuria to French Indo-China.

R. A. BRINK

A NEW TYPE OF BROAD BASE TERRACE[1]

TESTS made at the Kansas Agricultural Experiment Station at Manhattan on small terraced and unterraced plats raise some serious questions concerning the value for soil and water conservation on uniformly sloping land of the type of terraces that have been widely used and recommended. Indications are that the principal value of this type of terrace (Fig. 1, A) is the prevention of gullies from cutting down

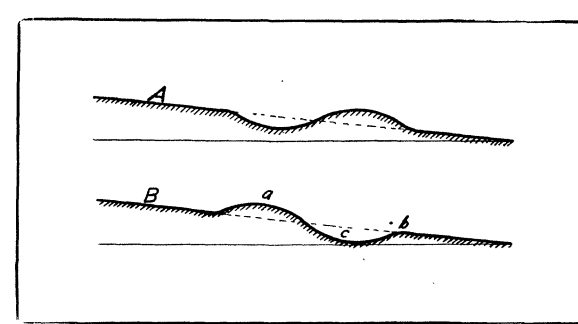

FIG. 1. A. Broad base terrace with channel above terrace. B. New type of terrace built from lower side. This gives no increase in slope above terrace. The water falling between a and b is caught in depression c and there is no run-off from this area.

[1] Papers from the Department of Genetics, Agricultural Experiment Station, University of Wisconsin, No. 173. Published with the approval of the director of the station.

[2] In a recent obituary of Erwin Baur, late director of the Kaiser Wilhelm Inst. f. Züchtungsforschung, München-Berg, Germany, R. R. Gates (*Nature*, 133: 239–240) states that this distinguished leader in genetics, whose untimely death is widely regretted, had found a cumarin-free strain of *Melilotus albus*. No report, other than that of Gates, of this independent and possibly contemporary discovery has been seen. Baur (*Landwirtschaftliche Presse*, August 16, 1933) states, however, that strains very low in cumarin have been found. It is not claimed that these are non-bitter.

[1] Contribution No. 232, Department of Agronomy, Kansas Agricultural Experiment Station.