size of the break in the smallest circle successfully identified was scored, the sum of 14 points being the total score. The 90° points were generally too weak to have scoring value. The reciprocal of the total score was used for percentage determinations. One hundred subjects selected at random were tested to determine the norm. The average of all scores was arbitrarily chosen as 100 per cent. On this basis 87 males scored 102 per cent. and 13 females 91 per cent. The best subject scored 364 per cent. and the worst 43 per cent. The peripheral acuity thus measured was found to be an independent factor: it did not correlate accurately with age, sex, central acuity or color vision. There was a positive correlation with central acuity of .39, yielding no practical reciprocal predictive value. Although the youngest group was the best, the peripheral acuity did not decline steadily with age. The oldest of four groups (40–70 years) was the second best age group. Eight color-blind individuals scored an average of 92 per cent. The test showed a .91 reliability.

Of the original group of one hundred, 30 were males from 18 to 27 years of age inclusive, who had normal or better central vision, normal color vision and no astigmatism; the requirements for aviation cadets. Their average score was 115 per cent., the best scoring 210 per cent. and the worst 52 per cent. These latter two represented the 2nd and 99th in degree of peripheral acuity of the original group of 100.

A shortened version of the test taking from 12 to 14 minutes (as compared to from 40 to 60 minutes for the original) was run on another group of 113 subjects and was repeated in from 8 to 10 weeks. The second scores showed an average of 6 per cent. improvement. Twenty of the original group of 100 were retested and showed an average of 16 per cent. improvement. The improvement was roughly proportional to the amount of time taken by the test. In two test groups out of three the second eye tested better than the first.

This investigation has revealed great spontaneous variability in peripheral visual acuity, incidentally always without the individual's awareness. It shows such acuity to be an independent visual factor. The evidence indicates that peripheral visual acuity can be trained. Experiments in testing, training and correlation are being continued.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

A MACROCHEMICAL REACTION FOR THE DETECTION OF PEACH MOSAIC[1]

SINCE the beginning of the program for the eradication of peach mosaic in western Colorado, difficulties have been encountered in the detection of symptoms of the disease in certain horticultural varieties of peach which did not show constant symptom manifestations.[2, 3] Because of these difficulties, the possibility of using a differential color reaction as a supplementary aid in the detection of the malady was investigated. Hutchins[4] in 1933 was the first to use a chemical color reaction as an aid in the identification of a virus disease of peach, the phony disease. Rawlins and Thomas[5] described a microchemical reaction for another virus disease present in peach, the buckskin disease of cherry and other stone fruits.

The Elberta peach variety was used for the test herein described because it showed symptom manifestations of the strains of the peach mosaic virus[6] throughout the entire growing season. The Elberta trees used were grown upon "natural" peach seedling rootstocks. The thinnest possible complete free-hand sections about ¼ inch in diameter were cut from healthy and diseased roots and stems. Sections were placed in a watch glass and a drop of a saturated solution of phloroglucinol in 100 per cent. methyl alcohol was added to each section. After this solution evaporated to dryness, a drop of a solution of nitrophenolic acid in methyl alcohol was placed on each section and allowed to evaporate to dryness. This solution was prepared as follows: Fifty ml of concentrated nitric acid were added to ½ gram of C.P. phenol and allowed to stand over night. An equal volume of water was added the following day and the solution allowed to stand for about 18 hours. Three drops of this solution were placed in 25 ml of 100 per cent. methyl alcohol.

Differentiating color reactions were found to be characteristic of the xylem of sections from healthy trees and from trees infected with the severe and medium strains of the peach mosaic virus. Healthy stem and root portions turned a color varying between Persian lilac and Daphne pink,[7] while virus-infected seedling rootstocks and stems of Elberta

[1] Scientific Series Paper No. 155.
[2] E. W. Bodine and L. W. Durrell, *Phytopath.*, 31: 322–333, 1941.
[3] L. M. Hutchins, E. W. Bodine and H. H. Thornberry, *U. S. Dept. Agr. Circ.* No. 427, 1937.
[4] L. M. Hutchins, *Ga. State Ent. Bull.*, 78, 1933.
[5] T. E. Rawlins and H. Earl Thomas, *Phytopath.*, 31: 916–925, 1941.
[6] E. W. Bodine and L. W. Durrell, *Phytopath.*, 31: 4, 1941.
[7] R. Ridgway, "Color Standards and Nomenclature." 43 pp. 53 colored plates. Washington, 1912.

ranged in color from maize yellow to apricot yellow. Color reactions showed greatest contrast when materials were collected in the fall and early spring and tested immediately. They were not distinctive when tests were made during the active growing season. Sections from peach trees affected with other virus diseases, namely the Golden net and the "X" disease, showed no differential coloring.

Further studies are in progress to determine the effectiveness of the reaction in the detection of the disease in seedling rootstocks onto which other peach varieties are commonly budded.

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A METHOD FOR NARCOTIZING HOLOTHURIANS

AT the Marine Biological Laboratory, Woods Hole, various methods have been tried for narcotizing *Thyone briareus*. These sea cucumbers are widely used in invertebrate zoology courses throughout the country, either as live material when available along the Atlantic coast or as preserved specimens further inland. It is highly desirable to find a method of expanding these animals without the waste of a high percentage of the specimens in the treatment.

The Supply Department at Woods Hole has, for many years, obtained expanded specimens of holothurians by treating them in the field. The undisturbed animal with extended tentacles is quickly grasped back of the tentacles before it has time to retract. The oral end is then immediately dipped into a solution of nitric acid and paralyzed. The specimen is then placed directly into a formalin solution. This method is cumbersome and requires much time, especially since *Thyone* is not nearly as common as it once was in the area. It is not at all practical to use this method on the sea cucumbers brought into the laboratory, since only a small per cent. of the animals will normally extend the tentacles in the aquarium.

Dr. T. H. Bissonnette, Trinity College, advised me that a saturated solution of chloretone in sea water had been used during the past few summers in preparing *Thyone* for class use. Fifteen cc of the solution were injected into the coelom of each animal. He also stated that the method was unsatisfactory; many of the specimens did not relax.

During the summer of 1942 while instructing in the invertebrate course at Woods Hole I tried several methods of anesthetizing *Thyone* without success. Several attempts were made, using the saturated chloretone solution for injection and immersion. The animals remained turgid several hours after this treatment. A saturated solution of magnesium sulphate was tried since I had earlier achieved some success in narcotizing the California sea cucumber, *Stichopus*, with this chemical. *Thyone* did not relax when submerged in the solution nor when injected with it.

Ledingham and Wells[1] have successfully narcotized marine annelids with magnesium chloride solution. They used 80 grams of crystalline magnesium chloride dissolved in 1,000 cc of tap water, and immersed the annelids in the solution for a period of 1 to 4 hours for relaxation. I tried the same solution on *Thyone*. The animals remained turgid after being immersed for 12 hours.

The same solution was used as an injection into the coelomic cavity and was successful in 100 per cent. of the trials. Each specimen was injected with approximately 15 cc of the solution and then submerged in a vessel containing the same solution. A relatively fine hypodermic needle should be used since a part of the intestine often escapes through a hole in the body wall made with a coarse needle. The injected animal becomes very turgid for about 15 minutes and then gradually relaxes. After one hour some of the specimens will extend the tentacles without manipulation. In the others the tentacles may be worked out easily by suspending the animal from the aboral end and applying pressure to the bulb of fluid thus formed. Over 100 *Thyone* were relaxed in this manner. About half of them were animals which were regenerating after having evicerated about a month previous to the date of relaxation.

Three of the narcotized sea cucumbers were placed in running sea water and had regained their turgidity after about 48 hours. Time was not available for a longer observation.

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[1] Isabel C. Ledingham and G. P. Wells, *Nature*, 150: 121, 1942.

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