with this training have found place in government service along lines related to their specialty but how many I could not say.

Teachers may very profitably emphasize the features of parasitism that afford examples of biologic adaptation and in medical and agricultural applications and this should serve to aid in the application of the bureau results.

I believe a very useful aid in this work would be for the bureau to furnish to the laboratories, willing to cooperate, a condensed manual for the more essential technique in the preparation of material for study and keys for identification of species most commonly met with in laboratory work.

The laboratory guides of Braun & Lühe: Stitts; and Herms, and Pratt's indispensable "Manual of Invertebrates" are of course available and are no doubt very generally used but they are more likely to fit into special or advanced courses and a simple hand-book, in mimeograph form if desired, available for use in some of the more general courses would, I believe, help to stimulate interest.

Possibly an outline of a course in parasitology arranged by a conference between representatives of bureau and university teachers might help especially if such outline indicated what special problems could be worked to advantage in any particular locality. Also the employment of advanced students in the routine duty of collecting or preparing material for bureau use might be possible. A circular letter from the bureau to university departments suggesting work that might be done would be helpful, and I believe that suggestions to teachers as to the matter and form for best presenting to students and thereby to a larger public, the results of the bureau work might be of advantage.

Specific training of specialists for the bureau service might be facilitated by an understanding as to probable employment of men willing to enter the field as their life work.

I do not understand that the demand is wide enough, for the immediate future at least, to warrant many schools making a specialty of the subject but certainly a few schools with proper facilities might very profitably offer distinct courses preparing for such work and prospective students in this line could then be steered to such schools from other departments not emphasizing this phase of zoology.

Another thing which, speaking from the university side, seems to me worth considering would be the preparation of a moderate number of representative species of parasites for demonstration purposes in classrooms or laboratories or even the accumulation of certain abundant forms sufficient for laboratory dissections or study. The bureau doubtless has a large accumulation of duplicate material from which it would be possible to supply material where desired with perhaps the agreement that the department so supplied should contribute other material as it might become available.

While it often happens that a quantity of specimens of some particular species is found in great abundance I believe we will all agree that the securing of such material in condition and quantity for laboratory purpose is more difficult than for most other groups.

Perhaps my suggestions may seem to be rather one-sided, involving mostly assistance from the bureau to the university laboratories, but I believe that the bureau will find the university men ready and willing to cooperate and that they will welcome definite suggestions as to ways and means by which such cooperation may be established.

Herbert Osborn

Ohio State University

THE THREATENED EXTINCTION OF THE BOX HUCKLEBERRY, GAYLUSSACIA BRACHYCERA

The box huckleberry (*Gaylussacia brachycera*) is a rare and beautiful American shrub which is in process of extinction. It is declared by Mr. Harlan P. Kelsey, the well-known landscape architect, of Salem, Massachusetts, that for many woodland situations it is the most beautiful native evergreen ground cover known to him. The biological problem is to preserve the wild plant from extinction and at the same time to bring it into horticultural use.

Two years ago the writer, desiring to ex-

amine the plant in its wild state, sought to find out its known localities by consulting the larger American herbaria. He was surprised to find specimens from only two localities, one in Perry County, Pennsylvania, the other in Sussex County, Delaware. The original locality assigned to the plant by Michaux in 1803, namely, near Winchester, Virginia, is almost certainly a mistake, and its occurrence at the localities in Bath County, Virginia, Greenbrier County, West Virginia, and Polk County, Tennessee, in which it is alleged to have been found, appears not to be substantiated by specimens in any American herbarium.

On July 13, 1918, under the guidance of Mr. Kelsey, the writer visited the Pennsylvania locality. The plant is confined to a single patch extending for a distance of over 400 yards along the slope and shoulder of a timbered west-facing hill. It occupies an area of about eight acres. The soil is a loam of buff-gray color, weathered from an underlying shale of similar color. It has no other supply of water than direct rainfall. Overlying the loam is a layer of upland peat a few inches in thickness, such as commonly characterizes an area of acid-soil dry-land vegetation.

The character of the vegetation is indicated by the following list of its commoner plants.

Trees:
- Scarlet oak (*Quercus coccinea*),
- White pine (*Pinus strobus*),
- White oak (*Quercus alba*),
- Chestnut (*Castanea dentata*),
- Chestnut oak (*Quercus montana*),
- Red maple (*Acer rubrum*),
- Black gum (*Nyssa sylvatica*),
- Dogwood (*Cornus florida*).

Shrubs:
- Box huckleberry (*Gaylussacia brachycera*),
- Laurel (*Kalmia latifolia*),
- Wintergreen (*Gaultheria procumbens*),
- Dry-land blueberry (*Vaccinium vacillans*),
- Trailing arbutus (*Epigaea repens*),
- Lowbush blueberry (*Vaccinium angustifolium*),
- Juneberry (*Amelanchier canadensis*),
- Pink azalea (*Azalea nudiflora*),
- Sweet fern (*Comptonia peregrina*),
- Pipsissewa (*Chimaphila umbellata*),
- Spotted pipsissewa (*Chimaphila maculata*),
- Witchhazel (*Hamamelis virginiana*).

There is no indication from the soil, moisture conditions, exposure or accompanying vegetation that there are any special conditions on this area, different from thousands of other areas in the Apalachian region, to explain the presence of the box huckleberry in this particular spot.

Over the whole area the root mat of the box huckleberry is practically continuous. Only one isolated piece was seen outside the main patch, and that was on a steep grassy slope immediately north of the main area, where farm cultivation had been begun but later abandoned. This plant is undoubtedly a piece of the original patch, cut off from the rest by the cultivation but left alive because the cultivation had been discontinued.

The abrupt termination of the patch, unaccompanied by any change in the soil, and the absence of isolated patches were most amazing. In the two hours we spent at the place we sought for the explanation, and I think we have it. But before it is outlined, let me present additional evidence of the completeness of the plant's isolation. On the north and much of the east and west sides the patch is bordered by cultivated fields and a road. The natural extension of the patch in these directions is therefore impossible. On the south end, however, the present margin of the patch is located amid natural surroundings. It runs through the timber in a sinuous but definite line which coincides with no topographic or other natural barrier. All along this line the patch is actually progressing and extending by sending out rootstocks which throw up new stems at the end of each year's growth.

For a distance of 125 yards at the southern end of the west side of the patch, the mat ends abruptly at the bottom of the hill at a natural barrier, a slender woodland streamlet, so low at the time of our visit that in several places no water was flowing over its wet gravel bed. For much of the distance the brooklet has slightly undercut the hill, so that the edge of the root mat hangs suspended a few feet

above the water. At some points, however, the root mat comes down to the water's edge, but although suitable ericaceous soil occurs in many places on the other side of the brooklet, sometimes no more than three paces away, and other ericaceous plants occupy both banks, the box huckleberry has never jumped this tiny barrier.

The theory I advance is that the whole patch has spread by the root from a single plant. If this theory is correct the plant is undoubtedly more than a thousand years old. If it started in the middle of the present area and grew at an average rate of six inches a year, a liberal estimate judging from the observed length of its annual rootstock increment, its advance to its present front-line position would have required 1,200 years. The widely heralded but half legendary thousand-year-old rosebush of Hildesheim is easily outlived.

As additional evidence that the whole of the eight-acre patch consists of a single plant I may say that notwithstanding the most painstaking search we found no seedlings. Many small tufts were examined, but every one proved to be attached by a rootstock to an older piece. The base of the hill on which the patch occurs had been undercut for more than 250 yards by a public road. The steep bank between the road and the hill, formed many years ago in the grading of the road, furnishes at several points good germination beds for the seeds of the overhanging plants. In a careful search along the whole bank not a seedling of the box huckleberry was found, although the bank did bear seedlings of the closely related plants, laurel, dry-land blueberry and trailing arbutus.

The plant was in fruit at the time of our visit, the delicate light blue berries being particularly charming in their setting of dark green box-like foliage. A resident of the neighborhood told us that the plant fruited every year. Why then are there no seedlings?

I have recorded elsewhere, in an account of my blueberry breeding experiments, that individual blueberry plants, close relatives of the huckleberries, are partially or completely sterile to their own pollen. The seeds from such a pollination, if any are secured, are sterile, or if they germinate the seedlings are feeble and never develop into strong plants, even under the protecting care of cultivation. If this Pennsylvania box huckleberry patch consists of only one plant its seeds might be expected to be sterile or of feeble germination. And this in fact was found to be true. On examination about 90 per cent. of the seeds proved to be empty shells. Only about 10 per cent. contained endosperms. On November 20, 1918, 1,600 seeds were sowed in eight boxes in a suitable soil of peat and sand and subjected to different temperature treatments. From this sowing only three seeds germinated, and the three seedlings are feeble. From other sowings made on July 20, 1918, a somewhat better but still very poor germination was secured, and the largest of the plants, at the age of six months, are less than an inch high.

Further evidence that the whole patch consists of one plant is afforded by its botanical characters. With the exception of differences in size and vigor, due apparently to differences in the amount of nutrition, the plant is remarkably uniform over the whole area. This uniformity is particularly noticeable in the fruit, which has a curious obovoid-pyriform shape. While individual plants of other species of blueberries and huckleberries sometimes have this shape, a comparison of the fruit of many individuals of any species shows variation to other shapes, such as spherical, or even depressed. The uniformity in the form, and in the color also, of the berries throughout this patch is the same sort of uniformity that one finds in fruits that have been reproduced by cuttings, budding or grafting from a single parent plant.

On the theory that the perpetuation of the species through seeds could be brought about only by finding another plant, for cross pollination, an endeavor was made to relocate the Delaware station. Dr. C. S. Sargent informed me that in company with Mr. William M. Canby, the original discoverer, he had tried several years ago to find the spot, but without success, and he believed the plant had been exterminated. Nevertheless I sent a botanist

in November, 1918, to find the plant if possible, but after two days' search he was unable to locate it.

The situation had become acute, for a firm of nurserymen had taken away a truck load of plants from the Pennsylvania locality in 1918, and the doom of the species in a wild state appeared to be sealed unless we could find another plant, for the Pennsylvania plant was the only one actually known. Therefore when Mr. E. T. Wherry, the chemist, offered to make a further search for the Delaware area I gladly assented. To his acute insight into the soil habits of rare and fastidious plants he added further information that he found in Philadelphia regarding the location of the old Canby station, and after three days' systematic search, in early March of the present year, he found it.

From Mr. Wherry's report of his rediscovery the following paragraph is drawn:

This colony of the box huckleberry is situated on a northwest sloping bank about eight feet high. It covers an area but twenty feet square, the plant forming a practically pure stand in the center but thinning out rapidly in all directions. No seedlings could be found, all the stems apparently being connected with one another by running rootstocks so that really only a single plant is represented. A few stems extend into the wet, peaty material bordering the marsh but most of the colony is growing in dry, sandy upland peat made up of leaves of pine, oak and laurel, on the steep slope. The plants immediately associated, as far as could be determined at the time of the visit, are:

Trees:
- Pond pine (*Pinus serotina*),
- Red cedar (*Juniperus virginiana*),
- Red oak (*Quercus maxima*),
- Holly (*Ilex opaca*).

Shrubs:
- Inkberry (*Ilex glabra*),
- Laurel (*Kalmia latifolia*),
- Sweetbells (*Eubotrys racemosa*).

Vine:
- Greenbrier (*Smilax rotundifolia*).

Only five localities, widely distant, have been recorded for this plant and its existence in only two of these at the present time has actually been confirmed. The question why the species has become so nearly extinct has not yet been answered and perhaps never will be answered conclusively. I wish to call attention, however, to the probability that if these two northeastern patches consist of a single plant each, as it appears they do, it is likely that they were originally chance seedlings from seeds carried by birds beyond the original main range of the species. For if these patches were remnants of a former widespread continuous range, and climatic changes had destroyed the species over the rest of its range, each of these remnants would almost certainly have consisted of more than a single plant. I am impressed also by the possibility that a plant in process of extinction may have been killed over most of its original range by some particularly destructive fungus or insect, and that the reason of the preservation of healthy remnants may be that they were beyond the range of the destructive enemy. Possibly, too, the remnants were immune to the destroying agent. The present ravages of the chestnut blight (*Endothia parasitica*) give an idea of what may have happened to thousands of plant species now extinct or known only from distant remnants.

However, the box huckleberry is not extinct, and we are hoping for its rejuvenation through vigorous seedlings. In order that my colleagues may share in the excitement I may add that portions of the Pennsylvania and Delaware plants have been brought together at Washington, cross pollinations have been made, and fruit has set but is not yet ripe.

I trust I shall be pardoned if I add to this article an unessential postcript, the excuse for which is more biographical than biological. In April, 1846, Asa Gray, the most distinguished of American botanists, writing to his colleague, John Torrey, said:

> A Mr. Baird, of Carlisle, Pa., called on me yesterday, evidently a most keen naturalist (ornithology principally), but a man of more than common grasp. He talked about an evergreen-leaved Vaccinium, which I have no doubt is V. brachycerum, Mx., that I have so long sought in vain.!

This was the first meeting between Dr. Gray and Spencer F. Baird, second secretary of the Smithsonian Institution, who at that time, an ardent young naturalist of twenty-three, was professor of natural history at Dickinson College, Carlisle, Pa. The friendship thus begun between Gray and Baird was intimate and lifelong, lasting for more than forty years, and it had great constructive influence in the advancement of natural history in America. It was clearly Baird's discovery of the box huckleberry, the very same patch in Pennsylvania about which I have been writing, that chiefly drew the two men together at their first meeting, and since this charming little thousand-year-old lady of the forest has done so much for American naturalists, the least we can do in return is to try to keep her living forever.[1]

Frederick V. Coville

VINAL N. EDWARDS

Workers in science who are wont to visit Wood's Hole during the summer months will miss the familiar figure and kindly greeting of one who has been identified with every piece of faunistic work that has been carried on at the Fish Commission Laboratory since the time of Baird, and one whose wide range of activity, intimate knowledge absolute reliability and willingness to serve have made him a most valuable source of information and assistance to those connected with the "Marine Laboratory" since the time of its foundation. Vinal N. Edwards, in the continuous service of the government for over sixty years, died on April 5, 1919, and leaves vacant a place in the vital affairs of Wood's Hole that can not be filled.

If a young enthusiast felt that by early rising he might steal an advantage over other collaborators, his arrival at "the commission" found Vinal already hard at work. If a trip was made to the gulf stream, Vinal was the man that knew when, where and how to gain profit out of the expedition. If it were a quiet night, ideal for "skimming," it was Vinal's skiff that was moving silently among the slicks. Throughout the day, in the corridors of the laboratories, on the wharf or at the traps—it made no difference where—probably no sentence was more frequently heard than "I don't know, ask Vinal."

Untaught in the modern conception of the word, courteous in his manner, unmentioned in "Who's Who," unrecorded in "American Men of Science," here was a man remarkably well informed, courteous and friendly in his association with men, well known to a multitude of educators, and one upon whom many of the foremost workers in biological science relied for information and advice. It is probable that hundreds of new species have resulted from his activities as a collector. In Verrill's report on the invertebrates of Vineyard Sound, his name is repeatedly mentioned. Smith's paper on the fishes of the Wood's Hole region would have been impossible without his help, and those who were associated in the preparation and publication of the "Biological Survey of the Waters of Wood's Hole and Vicinity" frequently stated that one of the motives which originally prompted this work was the "desire to incorporate in a permanent form the valuable but unpublished data in the possession of this indefatigable collector and observer."

In order that the life and work of Vinal N. Edwards may not become forgotten, testimonials from several sources have been collected, and bound copies of these will be deposited in the Library of the United States Fish Commission, in the Library of the Marine Biological Laboratory at Wood's Hole, in the Library of the National Museum, the Li-

[1] Gray's first account of the box huckleberry, in which from Baird's specimens he was able to assign the species to its correct genus, Gaylussacia, was published in 1846 in his "Chloris Boreali-Americana," pp. 54–55 (*Mem. Amer. Acad.*, ser. 2, vol. 3). The quotation from the letter to Torrey cited above is from Jane L. Gray, 1893, "Letters of Asa Gray," p. 343, where the date assigned to the letter is October, 1846. By reference, however, to W. H. Dall, 1915, "Spencer Fullerton Baird, a Biography," pp. 132–134, it is clear that the meeting took place, and the letter was written, in April, 1846.