internal or external agent which could affect particular constituents, nuclear or otherwise, of the somatic cells should, on the face of things, be able to influence homologous elements in germ-cells.

My own experiments in this connection, with immune sera, have already been laid before this society and I shall not subject you to the tedium of recounting them again. All I wish to say at present is that the experiments both on the effects of lens antibodies and on transmission of induced immunity are being repeated, this time with inbred stocks, and in the case of the lens work, with individual lens proteins. A small though sufficient number of successes are being secured from time to time to keep me encouraged and of the same opinion as that expressed in my earlier work. I still believe that the serological reactions of the body afford one means of breaking in upon the germ.

What apparently would have to happen to have an acquired become an inherited character would not be the germinal creation of the capacities for its appearance—these must already exist or it could not appear—but some sort of germinal fixation that establishes it as part of the more habitual expression of the germ-plasm. We commonly conceal our ignorance of the matter, to be sure, by talking about the "plasticity" of the organism, but this very plasticity must have genic implications, for the fact remains that the organism has the inherent capacity for acquiring the somatic modification.

That profound shifts in the organization of the germinal protoplasm may occur, particularly in the order of the appearance of characters in individual development compared with the order of their evolutionary acquisition, is evident when one regards the frequent precocious appearance of an adaptive mechanism far in advance of the conditions under which it is to operate. The eye of the unborn mammal, for example, develops long before it encounters the external agent light upon which it depends for its very significance. Yet, if our conceptions of evolution mean anything, the vertebrate eye must originally have developed in some functional cooperation with light, no matter whether we regard light as a causative or merely as a selective agent. Likewise the mammalian placenta, though among the latest of acquisitions in phylogeny, is one of the first things established in ontogeny. The point I would make is that, as time goes on, adjustments do come to pass in germ-plasm which may alter the chronological relations of hereditary acquisitions, and that this indicates that germ-plasm is not a fixed, inadaptable thing.

It would seem not improbable that any acquired adjustment, based on the casual potentiality of the genes of the organism, repeated generation after generation, would foster successive adapted generations of individuals until such casual reactions of the genic complex became its customary reaction. Obviously both types of potentiality must reside in germinal protoplasm. At present I see no explanation of how casual potentialities of the germ-plasm which permit of the somatic acquirement of characters become ingrained in the mechanism which underlies the more independently recurrent characters called hereditary, unless it is to be found in the quantitative changes in genes or of genic potencies. Evidence of such changes seems to be slowly accumulating. Once concede that the constitution of the gene can wax or wane and the way is open to the conception of how this might be induced through nutritive, toxic or functional means. It may be that when we learn more about the protoplasmic basis of ordinary hypertrophy, atrophy and habit-formation we may also see our way toward an understanding of the origin of inherited adaptations. Until we do so possibly we shall remain in ignorance of this most elusive attribute of all living things.

THE NATIONAL ARBORETUM[1]

By Dr. FREDERICK V. COVILLE
ACTING DIRECTOR

THE National Arboretum is an institution for the increase and diffusion of knowledge concerning trees. The National Arboretum Act, approved by President Coolidge on March 4, 1927, states that the purpose of the arboretum is research and education concerning tree and plant life and that in order to stimulate research and discovery the National Arboretum shall be under scientific direction.

To study the living tree, to breed new kinds, to select the best among them, to develop methods of propagating them, to show to what soils and to what situations and to what special purposes they are best adapted, such is the field of experiment and discovery to be occupied by the National Arboretum. The human race has bred sheep and cattle and horses, but not elephants. The elephant is too big, too wild, too long-lived. The human race has bred wheat and potatoes and apples, but not timber trees. They also have seemed too big, too wild and too long-lived. But the time has come to begin.

A strange case of the superiority of an individual

[1] Address delivered on January 17, in Washington, D. C., before a meeting of the American Society of Landscape Architects.

tree has recently come to light, in a most unexpected way. One of the soil chemists of the Department of Agriculture, Mr. W. O. Robinson, amuses himself at home by making bows and arrows and shooting them. He has made bows of every kind of resilient wood the world affords, so far as he has been able to obtain it. One of the very best woods for bows is yew, which our own ancestors in western Europe used when they were savages, and which the Klamaths, Modocs and other Indian tribes of our northwest coast used until we brought them the rifle. But a yew bow is not durable. It loses much of its elasticity and strength after a few years of alternating heat and cold. There is another American wood, however, from which are made bows of such superiority and such lasting qualities that in the old Indian days they were handed down from father to son. This wood is the Osage-orange, the *bois d'arc* of the early French trappers, corrupted into *bodark* by Mississippi Valley frontiersmen, and made into a scientific name *Toxylon,* or bow wood, by one of the early botanists. The best commercial supply of Osage-orange comes from Texas. With this wood Mr. Robinson has made many bows of remarkable performance, a typical bow of forty-nine pounds pull weighing 25.1 ounces. Last year Mr. Robinson made the discovery that from an Osage-orange tree in an old hedge on the farm of a friend near Rockville, Maryland, he could get equal strength and elasticity with little more than half the usual weight of wood. From this tree he made a bow weighing 17.7 ounces, which has a pull of sixty-two pounds. With this bow he shot an arrow 341 yards, a far greater distance than any authentic American record up to that time. No one knows how far, in the hands of a more expert bowman, this Osage bow will shoot.

The stump of this tree is still alive. At the arboretum we shall try to propagate and perpetuate it, by cuttings or by grafting, and if we can find another Osage tree of equal superiority we will cross-breed the two and develop a whole population of these tree aristocrats. One can not foretell the possible industrial uses of such a wood. It is suggested, however, by way of warning, that if golf sticks are ever made from the Rockville Osage, it may become necessary for golf clubs to double the length of their holes.

The search for superior trees of every kind and the making of experiments with them will occupy, undoubtedly, a large part of the arboretum's activities in future years. The beautification of American homes and the beautification of parks for purposes of outdoor relaxation and recreation is dependent largely on trees. Every one knows the beauty of the Japanese flowering cherries in Potomac Park. Even in Japan, last spring, I saw no more impressive display of cherry blossoms than is afforded by the mile stretch of Yoshino cherries around the borders of our Tidal Basin, that most gracious gift from the City of Tokyo.

These Japanese cherries have set us thinking about the little-appreciated beauty of some of our own wild trees. Two or three years ago I suggested to Colonel Grant the desirability of preparing for our public parks an extensive display of our American sweet-scented wild crab. This is the tree that the good Lord evidently intended for our national flower, but we have been slow to appreciate the divine gift and to provide for it the place of honor it deserves. Our wild crabs are of several species. They extend from New York to Minnesota and southward to Florida and Louisiana, and they are beloved by all who know them. At the National Arboretum we not only shall give them a place of honor, but we shall select the most outstanding individuals among them, and these we will cross-breed, making selections again among the progeny until we have developed a wide range of varieties, more beautiful even than the wild trees and more fully adapted to the purposes of landscape art. I can not believe, however, that we shall ever develop a cultivated crab more fragrant than the wild ones.

For some reason which is unexplained, Providence did not allow the wild crab to enter New England, the home of our early poets. In consequence its beauty and its fragrance long remained unsung, but ask the man from Des Moines or from Tallahassee if he knows the wild crab, and you will get a new lesson in the appreciation of nature.

Although many of the botanical experiments and discoveries made at the arboretum will be of value chiefly to horticulture and to landscape art, the most important work of the arboretum will find its application in forestry. In a recent address in New York, before the Garden Club of America, I made a statement which I may be permitted to repeat here:

> It is well known to American foresters that our original stands of timber are fast disappearing. White pine is already gone. At the present rate of cutting, the original stand of southern longleaf pine is expected to last eight years. The irregular process of natural reseeding will replace, ultimately, some of the timber that we have cut. We shall be compelled, however, before long to grow trees as a crop, just as we grow corn or wheat or potatoes. When we begin to plant trees as a timber crop, should we plant wild seedlings or should we plant improved strains, just as we now plant improved strains of corn, wheat and potatoes? There can be but one answer. When we go to the expense of growing trees as a crop we shall plant improved kinds just as soon as we have the improved kinds to plant. It is the primary function of the National Arboretum to

develop improved kinds of timber trees, by selection, by hybridization and by comparative tests of wild seed, selected seed and hybrid seed. We have every confidence in the outcome of such research and experimentation, for the tree is only a plant and that kind of experiment has succeeded with every other plant to which it has been scientifically applied. A white pine so improved in its rate of growth that it will reach in fifty years or in sixty years the size that now requires eighty years would repay the cost of the National Arboretum for a generation.

The members of the American Society of Landscape Architects here present may with propriety be asking for what purpose is this address delivered before this society, for although much has been said about the relation of the arboretum to forestry and to horticulture, little has been said about its relation to landscape art. I must confess that at the present time I am chiefly concerned not with what the National Arboretum can do for landscape art but with what landscape art can do for the National Arboretum.

The arboretum is still in the land-purchase stage. Its actual operation has not yet begun. The secretary of agriculture has purchased, or is in process of purchasing, 268 acres. He expects to make additional purchases which, with other land already owned or claimed by the government, will make a total of approximately the thousand acres originally planned for the arboretum. The site contains several elements of great dignity and beauty: Mount Hamilton, covered with a growth of mature hardwood timber and overlooking the city, with an excellent view of the Capitol, the Washington Monument and the Arlington hills in Virginia; Hickey Hill, with fine views up the Anacostia River and down it to the Potomac; the curve of the upper Anacostia, bordered with wild-rice and sweeping around to the old deer lick at Licking Banks, and the waterlily gardens at Kenilworth, one of the most beautiful sights in the city of Washington.

The National Arboretum is to be an outdoor laboratory for scientific research on trees. The materials for research are the trees and shrubs that will be planted in the area. It is planned to bring there every kind of tree that will thrive out of doors under this climate. There will be buildings, greenhouses and nurseries. Broad highways will border the arboretum, and it is expected that one of the principal entrances to Washington will pass through it. The parts of the arboretum in contact with these principal streets, or in view from them, should be developed with all the natural beauty that the situation affords. The greenhouses, the nurseries, the experimental plantings in straight lines and the every-day work with spades and hoes should be secluded from the main highways.

In the development of the National Arboretum the secretary of agriculture already has the hearty cooperation of the Garden Club of America, the American Association of Nurserymen and many scientific organizations. He would greatly appreciate the cooperation and advice of the American Society of Landscape Architects.

OBITUARY

JULIUS BUEL WEEMS

DR. JULIUS B. WEEMS, chief chemist of the Agricultural Department of the State of Virginia, died suddenly on Saturday morning, January 25, at his home in Ashland, Virginia.

Dr. Weems had been with the state for fifteen years and was widely known as a chemist. His contributions to scientific journals, in the form of articles on agricultural and chemical problems, added to the reputation which he had as a consulting and analytical chemist, and a student of farm questions before he came to the Department of Agriculture.

He was born in Baltimore, August 27, 1865, the son of Edwin Dawson Weems and Rosetta Norman Weems. Following his graduation from Maryland Agricultural College in 1888, he studied at Johns Hopkins University for two years. In 1894, while a fellow in chemistry at Clark University, he received his degree of Doctor of Philosophy. For the next ten years he was professor of agricultural chemistry and chemist of the experimental station at Iowa College.

Dr. Weems was a member of the Society of American Bacteriologists, the American Chemical Society, and a fellow of the American Association for the Advancement of Science.

W. C. J.

AUGUST TOBLER

THE death is announced on November 23 of Dr. August Tobler, the director of the Geological Section of the Natural History Museum, Basel, Switzerland. Dr. Tobler was a geologist of international reputation. He did much work in the Netherlands East Indies, his principal publication on that region being "Djambi-Verslag," which consists of a volume of 585 pages of text and 19 plates and an atlas of 9 geological maps, structure sections and a table of the different geological formations. Dr. Tobler also made studies of the geology and paleontology of northern South America, especially Venezuela and Peru. The high quality of Dr. Tobler's work is recognized by every one familiar with it. Besides the respect due him because of his scientific attainments, he endeared