

been surpassed for violence and extent by any of which there is historic record. An area of 150,000 square miles was laid in ruins, all means of communication interrupted, the hills rent and cast down in landslips, and the plains fissured and riddled with vents from which sand and water poured out in most astounding quantities, causing floods in rivers, while a surrounding area of 1,750,000 square miles felt an unusual shock. The earthquake wave is estimated to have traveled at the rate of 120 miles a minute. The amplitude of wave motion near the epicenter was probably 14 inches, and the velocity of wave motion was probably 14 feet a second. It is suggested that the shock may have been caused by a slight movement on a thrust plane, thus accounting for the compression indicated by kinks in railways, and by a slight diminution of north-south distances indicated by a revision of former triangulation. Two hill stations seem to have been lifted by about 20 feet over their former altitude. A number of surface faults are described and figured, one of which had a throw of 25 feet and a length of 12 miles, and another a throw of 10 feet and a length of two and one-half miles. The greater fault produced a waterfall in the Chedrang, and obstructed the Krishnai so as to form a lake several miles in extent, flooding a village and killing a forest of not less than 50,000 *sal* trees. At a certain point in the Himalayan foothills, the steep slopes have been stripped bare by landslides from crest to base, the valley bottoms being piled up with debris and broken trees, producing a scene of indescribable desolation. At this point the landslides usually left a sharp and bare ridge-line, but the crest of one ridge retained a narrow strip of its old forest, although the trees were all broken down by the violent oscillations that they suffered. Many streams, that once consisted of a succession of deep pools and rocky rapids, have been so charged with sand from landslides that their valleys are aggraded and they now flow in broad, shallow, sandy channels. A narrative account of the earthquake has been published by H. Luttman-Johnson (*Jour. Soc. Arts.* xlv, 1898, 473-493).

W. M. DAVIS.

BOTANICAL NOTES.

TREES OF THE NORTHERN PLAINS.

A RECENT preliminary list of the seed-bearing plants of North Dakota, by Professor Bolley and L. R. Waldron, throws some light on the woody vegetation of the northern portion of the Great Plains. An examination of this interesting list confirms the supposition hitherto entertained that the species of trees are fewer in number as we go north from the central region, there being but twenty-eight, or possibly twenty-nine, different species in the region covered by it. A closer study of the list shows that of these twenty-nine species of trees less than twenty attain to such dimensions as to make them important timber trees, viz.: basswood, sugar maple (a doubtful native species), red maple (more probably silver maple), box elder, red ash, green ash, white elm, red elm, hackberry, western red birch, ironwood, bur oak, black willow, almond willow, American aspen, large-toothed aspen, balsam poplar, cottonwood and red cedar. The other trees are wild red plum, Canada plum, wild red cherry, choke cherry, buffalo berry, two hawthorns, speckled alder, low bur oak and sandbar willow. Of the timber trees, constituting the first list, box elder, red ash, green ash, white elm, hackberry, cottonwood and probably black willow and almond willow occur throughout the State; basswood, both maples, red elm, ironwood, both aspens and balsam poplar are found only in the eastern counties; bur oak in the eastern half of the State; western red birch in the Turtle Mountains (along the Canadian border), and red cedar in the foothills of the southwestern portion of the State. The absence of locusts, sycamores, hickories, walnuts, white oaks, red oaks and pines is a notable feature of the arborescent vegetation of this portion of the plains.

SHRUBS OF THE NORTHERN PLAINS.

THE preliminary list referred to above shows that there are in North Dakota forty-four species of shrubs, a small number when compared with areas of approximately equal extent elsewhere in the United States or Canada. Thus in Nebraska, which is but very little greater in area, there are eighty-six species of shrubby plants.

In examining the list of North Dakota shrubs one is struck by the fact that but five are distinctly western, viz.: skunk bush (*Rhus trilobata*), Western sand cherry (*Prunus besseyi*), Western wild cherry (*Prunus demissa*), Western Juneberry (*Amelanchier alnifolia*), and the silver berry (*Elaeagnus argentea*). These western species may be supposed to have moved from the western mountains out upon the plains, or to have originated here. All the other shrubs are more or less common eastern species which may be assumed to have pushed out from the body of eastern vegetation as has been observed elsewhere on the plains. Among these familiar eastern shrubs are prickly ash, bittersweet, wild grape (*Vitis vulpina* L.), Virginia creeper, smooth sumach, sweet sumach, poison ivy, red raspberry, wild roses (four species), wild gooseberries (four species), cornels (three species), wild honeysuckles (three species), hazels (two species), willows (three species), and junipers (two species). The meadow sweet (*Spiraea salicifolia*), and choke berry, common shrubs of the Eastern States, appear to have entered these northern plains from Minnesota, the Canada buffalo berry from the northeast, and the shrubby cinquefoil from the Rocky Mountains:

NEW EDITION OF THE PHYTOGEOGRAPHY OF
NEBRASKA.

THE greater portion of the first edition of the 'Phytogeography of Nebraska,' by Pond and Clements, having been destroyed in the fire which occurred in the publisher's establishment, the Regents of the University of Nebraska authorized a new edition, which has now appeared as a volume of the publications of the Botanical Survey. As the edition is small the distribution of copies is necessarily limited. One hundred copies only have been placed on sale, and when these are sold the edition will be exhausted. The disbursing agent is the University Publishing Company, Lincoln, Nebr. A review of this new edition will appear in a future number of SCIENCE.

BOTANY AND AGRICULTURE.

THE 'Proceedings of the Twenty-first Annual Meeting of the Society for the Promotion of Agricultural Science,' just at hand, is a neatly-printed pamphlet of nearly two hundred pages.

An examination of its contents shows that botany as one of several sciences (chemistry, zoology, entomology, meteorology, physics), having relation to agriculture, occupied an unusually large place in the discussions in the New York meeting last June. There were twenty-four papers presented, and exactly one half of these were botanical. Four of the papers had a distinctly horticultural bearing, two were in the domain of plant pathology, two dealt with the chemical aspects of certain plant problems, one discussed weeds, one was in the field of agricultural engineering, and two were devoted to botanical pedagogics. These papers all appear to be more than ordinarily valuable, but those which interest us most are Dr. Trelease's discussion of 'The Botanic Garden as an Aid to Agriculture,' and Mr. Galloway's 'Twenty Years' Progress in Plant Pathology.' It is not within our province to make note of the non-botanical papers, among which are a number of promising titles. The volume is well worth the perusal of every scientific man who is interested in the applications of science to the problems in agriculture.

FIELD ECOLOGY IN THE ROCKY MOUNTAINS.

THE Department of Botany, of the University of Nebraska, offers a course in Field Ecology, to be given in the Rocky Mountains about Pike's Peak during the coming summer. The headquarters of the party will be at Minnehaha, at an altitude of 8,300 feet, from which the plains, foothill, sub-alpine and alpine regions are easily accessible. The work will be under the charge of Dr. Frederic E. Clements, and will begin the first of July and close the first of September. It will consist of a study of the floristics of the various regions, as an introduction to the investigation of the plant formations with respect to their structure and distribution. The special object of the course, however, will be to interpret individual and vegetational adaptations in the light of a thorough examination of the physical factors present, and to determine by experiment in the field the efficient factors in alpine vegetation. A microscopical laboratory with the usual accessories will be fitted up at Spruce Ridge Cottage. There are no fees in connection with the course,

except a registration fee of two dollars for those desiring university credit. The probable expense for the two months, excluding railway fare, will be about fifty dollars.

CHARLES E. BESSEY.

THE UNIVERSITY OF NEBRASKA.

THE NATIONAL BUREAU OF STANDARDS.

THE bill establishing a National Bureau of Standards which, as we have already noted, was passed by Congress at the end of the session is as follows :

Be it enacted, etc., That the Office of Standard Weights and Measures shall hereafter be known as the National Bureau of Standards.

SECTION 2. That the functions of the bureau shall consist in the custody of the standards ; the comparison of the standards used in scientific investigations, engineering, manufacturing, commerce, and educational institutions with the standards adopted or recognized by the government ; the construction, when necessary, of standards, their multiples and subdivisions ; the testing and calibration of standard-measuring apparatus ; the solution of problems which arise in connection with standards ; the determination of physical constants and the properties of materials, when such data are of great importance to scientific or manufacturing interests and are not to be obtained of sufficient accuracy elsewhere.

SEC. 3. That the bureau shall exercise its functions for the Government of the United States ; for any State or municipal government within the United States ; or for any scientific society, educational institution, firm, corporation, or individual within the United States engaged in manufacturing or other pursuits requiring the use of standards or standard measuring instruments. All requests for the services of the bureau shall be made in accordance with the rules and regulations herein established.

SEC. 4. That the officers and employees of the bureau shall consist of a director, at an annual salary of \$5,000 ; 1 physicist, at an annual salary of \$3,500 ; 1 chemist, at an annual salary of \$3,500 ; 2 assistant physicists or chemists, each at an annual salary of \$2,200 ; 1 laboratory assistant, at an annual salary of \$1,400 ; 1 laboratory assistant, at an annual salary of \$1,200 ; 1 secretary, at an annual salary of \$2,000 ; 1 clerk, at an annual salary of \$1,200 ; 1 messenger, at an annual salary of \$720 ; 1 engineer, at an annual salary of \$1,500 ; 1 mechanician, at an annual salary of \$1,400 ; 1 watchman, at an annual salary of \$720 ; and 1 laborer, at an annual salary of \$600.

SEC. 5. That the director shall be appointed by the

President, by and with the advice and consent of the Senate. He shall have the general supervision of the bureau, its equipment, and the exercise of its functions. He shall make an annual report to the Secretary of the Treasury, including an abstract of the work done during the year and a financial statement. He may issue, when necessary, bulletins for public distribution, containing such information as may be of value to the public or facilitate the bureau in the exercise of its functions.

SEC. 6. That the officers and employees provided for by this Act, except the director, shall be appointed by the Secretary of the Treasury, at such time as the respective services may become necessary.

SEC. 7. That the following sums of money are hereby appropriated : For the payment of salaries provided for by this act, the sum of \$27,140, or so much thereof as may be necessary ; toward the erection of a suitable laboratory, of fireproof construction, for the use and occupation of said bureau, including all permanent fixtures, such as plumbing, piping, wiring, heating, lighting and ventilation, the entire cost of which shall not exceed the sum of \$250,000, \$100,000 ; for equipment of said laboratory, the sum of \$10,000 ; for a site for said laboratory, to be approved by the visiting committee hereinafter provided for and purchased by the Secretary of the Treasury, the sum of \$25,000, or so much thereof as may be necessary ; for the payment of the general expenses of said bureau, including books and periodicals, furniture, office expenses, stationery and printing, heating and lighting, expenses of the visiting committee, and contingencies of all kinds, the sum of \$5,000, or so much thereof as may be necessary, to be expended under the supervision of the Secretary of the Treasury.

SEC. 8. That for all comparisons, calibrations, tests, or investigations, except those performed for the Government of the United States or State governments within the United States, a reasonable fee shall be charged, according to a schedule submitted by the director and approved by the Secretary of the Treasury.

SEC. 9. That the Secretary of the Treasury shall, from time to time, make regulations regarding the payment of fees, the limits of tolerance to be attained in standards submitted for verification, the sealing of standards, the disbursement and receipt of moneys, and such other matters as he may deem necessary for carrying this act into effect.

SEC. 10. That there shall be a visiting committee of five members, to be appointed by the Secretary of the Treasury, to consist of men prominent in the various interests involved, and not in the employ of the Government. This committee shall visit the bureau at least once a year, and report to the Secre-