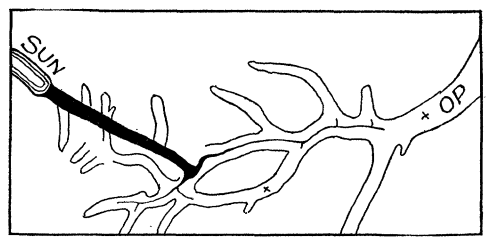
CURRENT NOTES ON PHYSIOGRAPHY.

PHYSIOGRAPHY OF NEW BRUNSWICK.

GANONG continues his 'Notes on the Natural History and Physiography of New Brunswick' (*Bull. Nat. Hist. Soc. New Brunswick*, xix, 1901, 313–340), presenting accounts of the development of several rivers and lakes. The Nepisiguit, for example, is explained as the result of successive captures of portions of three other systems by what is now the lower part of this river. The Negoot lakes, of picturesque outline in a district of primeval forest, are described as resulting from the obstruction of a series of nearly parallel valleys by masses of glacial drift. In the discussion of these problems it is implied that the shores of the Silurian sea are indicated by the present margin of the Silurian strata, that certain existing river courses were determined in pre-Silurian times and that even the valleys of certain rivers and lakes are pre-Silurian; but it is difficult to accept these conclusions on the evidence that is presented. A slight misapprehension as to the meaning of 'monadnock' is indicated in the statement that a hill which rises over the eastern peneplain of Carboniferous strata east of Grand lake is 'not a real monadnock,' for 'it is composed of a ridge of volcanic rocks, and hence remains, not because it is left behind in the general erosion, but because it resists erosion better than the surrounding rock.' It is for such resistant residual mountains and hills that the term monadnock is coming to be generally used.

DRAINAGE CHANGES IN NORWAY.

'THE Sundal Drainage System' in central Norway,' by R. L. Barrett (*Bull. Amer. Geogr. Soc.*, xxxii, 1900, 199–219), is an account of a curious series of changes in drainage lines, whereby the upper valleys of the Opdal system that once discharged northeastward into Trondhjem fiord are now discharged northwestward to Sundal fiord. The Opdal system consisted of numerous broadly open valleys with convergent courses and continuously sloping floors. The Sundal, a canyon-like valley, trenches the highlands in which the upper Opdal branches are opened, and receives the waters of several narrow gorges that are eroded in the mature Opdal floors. As a result the lateral stream courses to-day no longer converge towards their trunk, but enter it in a backhanded or barbed fashion;



Sundal system, solid black. Opdal system, outline.

and while the heads of the Opdal system were well enclosed by the highlands, the head of the Sundal system is separated from the head of what remains of the Opdal system only by a flat divide on the mature valley floor. As the gorges and canyons of the Sundal system deepen downstream through the rising valley floors of the dismembered Opdal system, the main Sundal canyon comes to be 1,000 meters deeper than the highest head valleys that it dissects. In explanation of these curious changes, Barrett concludes that normal headward erosion by the Sundal system is of uncertain and probably small value; westward overflow from ice-dammed lakes that occupied the upper Opdal valleys while the trunk was filled by advancing or retreating glaciers is given more importance; and a still greater share of work is attributed to glacial overflows, when great ice-sheets overwhelmed the region and disregarded the divides that had controlled preglacial river drainage. It is pointed out that the Romsdal, next southwest of the Sundal, exhibits a similar barbed relation between its branch and trunk streams, thus suggesting an interesting field of study for a summer month in Norway.

THE ASSAM EARTHQUAKE OF 1897.

A THOROUGH 'Report on the Great [Assam] Earthquake of 12th of June, 1897,' has been made by R. D. Oldham (*Mem. Geol. Surv.*, India, XXIX., 1899. Pp. xxx + 379 + xviii., 41 pl., 3 maps). This earthquake is said not to have

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 débris 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.* xlvi, 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.