

BIG GLACIAL RIVERS

TORRENTS FROM MELTING ICE
DRAINED THROUGH GREAT
LAKES TO THE STREAMS.

OLD BOUNDARIES ARE TRACED

Expert Wright Tells Where the Work
of the Prehistoric Period Orig-
inated and Ended—Bodies
of Water Enlarged.

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riod," Etc.)

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Ice is a rock. At any rate, so long as it lasts it performs all the functions of rock. As one steams up the Yukon river he will often see ahead of him a forest growing upon a high bank with precipitous face which at first sight would seem to be the enduring rock of the region. But upon near approach it will turn out to be an ice cliff covered with a few feet of soil which has been washed out upon it in sufficient quantity to support vegetation. Large forests are growing upon the Malaspina glacier in Alaska, several miles back from its front, and where the ice is 1,000 feet thick under it. In numerous places in the vicinity of existing glaciers large streams of water may be found running both upon the surface of the ice and along a high elevation between the ice and the adjoining highland or mountain chain which hems it in. Large lakes of water are also found at high elevations where they are held in by ice barriers. Where these barriers suddenly burst through, as they sometimes do, tremendous floods of water devastate the valley below. The Mattmark See, in Switzerland, and other bodies of water held up behind alpine glaciers have been a menace.

But great as are the direct effects upon the drainage, of ice of existing glaciers, those brought to light by study of the glacial period in North America surpass them all in wonderful measure. Naturally the accumulation of ice during the glacial period began at the north, and early clogged up the great lines of drainage which lead in that direction, while, after the ice had reached its farthest limit and began to melt back, the northerly direction of the drainage could not be resumed until the ice had all melted away. Thus for long periods the drainage of the great lakes, which now passes down the St. Lawrence river, was turned over to swell the volume of the Susquehanna and the Ohio rivers, while all the drainage that now enters Hudson bay was turned over into the valley of the Missouri and the Mississippi. This, anyone can see from a slight study of the map, must have been the case. It has been a most interesting work to geologists to find these actual outlets of glacial drainage, and to trace the effects of this great addition of volume to the south-flowing streams of the north.

In general the effects of this great increase of the volume of the water poured into the valleys of the Connecticut, Hudson, Susquehanna, Allegheny, Ohio, Mississippi and Missouri rivers are evident in the extensive gravel terraces which line the banks of all these streams and of their northern tributaries.

The terraces of the Connecticut river have long been famous, consisting of deposits of gravel and sand rising upon either bank of the river from 50 to 100 feet or more above present high water mark. In the Hudson valley they exist as brick clays, extensively worked in various places above New York city, but spreading out into extensive gravel deposits where the Hudson river comes out from the Adirondack mountains. The sandy plains of Saratoga were spread out during that stage of the glacial period,

while immense streams of water were turned over into the Hudson valley through Lake Champlain and Lake George. The Champlain canal has appropriated a portion of this glacial channel, and passes from the lake to the Hudson river with a lockage of less than 50 feet.

Before the ice had melted from the Mohawk valley there was an enormous amount of glacial drainage carried off through the Finger lakes and over the higher passes leading into the Susquehanna valley. The stream passing through Seneca lake over the site of Watkins and entering the Susquehanna at Horseheads was specially noteworthy; while the marks of the glacial floods in the Susquehanna valley are clearly seen at Harrisburg and other places farther down.

Before the ice had melted from central New York the drainage of the great lakes was held up to the level of the passes from Lake Erie and Lake Michigan leading over into the valley of the Mississippi. At first, before the ice had melted off from northern Michigan, where the lakes are united, there were several independent outlets. These can be easily traced from Lake Chaufauqua down Conewango creek into the valley of the Allegheny, and down French creek to a similar desti-

proaching each other from Ohio and Michigan, two gravel ridges come nearly together at Fort Wayne, leaving there an opening from the Maumee into the Wabash river about a mile wide, revealing an abandoned river channel, which is still almost as distinct as when the mighty current of Niagara, made its exit to the sea.

A similar abandoned channel exists southwest of Chicago, leading from Lake Michigan into the Illinois river. This too is about a mile in width, with level bottom and sharply outlined sides, through which the glacial drainage poured in even greater torrents than at Fort Wayne. For a while, however, it was merely the outlet of a limited lake at the south end of Lake Michigan. But as the ice retreated from the lower peninsula of Michigan it uncovered a channel from Saginaw bay into Lake Michigan 100 feet lower than that at Fort Wayne. Whereupon the water was diverted from that channel and all carried away by the Saginaw bay. Lake Michigan and Chicago river outlet. The shore line of the glacial lake formed at this stage of glacial recession can be traced as distinctly as a railroad embankment the entire distance from the vicinity of Buffalo around the south and west shores of Lake Erie to the head waters of Saginaw bay, where it opens by a perfectly distinct channel into Grand river. Euclid avenue, in the city of Cleveland, is built upon this shore line. The great drainage canal from



Outlets for Glacial Torrents—Dotted Lines Show Present Lake Boundaries.

nation, and from Grand river in Ohio into the Mahoning at Warren, reaching the Ohio, through Beaver creek, 25 miles below Pittsburgh. The Ohio river all the way down is lined with gravel terraces, frequently rising more than 100 feet above the river, which furnish building sites for the most of the cities along its course. Fourth street in Cincinnati is on one of these terraces, 120 feet above the river.

As the ice was slowly retreating over the area occupied by Lake Erie back to the Niagara escarpment, the main outlet for the ever-increasing glacial lake was through an opening at Fort Wayne, Ind., leading into the Wabash river and thence into the Ohio. This outlet is 200 feet above the present level of the lake. Consequently the water submerged all the land on the south and west sides of the lake below that level. The shore line of this great body of water, to which the name Lake Warren has been given, can be easily traced for hundreds of miles, and, like that south of Lake Ontario, was early chosen for a highway and for building sites. Ap-

Chicago into the Illinois has availed itself of this old outlet, the bottom of which was only about 15 feet higher than the level of Lake Michigan.

Earlier glacial outlets farther west are clearly traceable from Green Bay into the Fox river and from the western end of Lake Superior at Duluth through the Chippewa river into the Mississippi, a little way below St. Paul. The remarkable level gravel terraces high above the lake at Duluth, so convenient for streets and drives, are the shore lines of this temporary lake at the west end of Lake Superior.

On Keeping Happy.

There is no doubt some selfish satisfaction in yielding to melancholy, and fancying that we are victims of fate; in brooding over grievances, especially if more or less imaginary. To be bright and cheerful often requires an effort; and in this respect, as in others, we require to watch over and manage ourselves, almost as if we were somebody else.—Sir John Lubbock.

snelly an' an all-around 'no good pup.'

And Henderson paid the dime.—Los Angeles Herald.

Norway's Versatile Queen.
Queen Maud of Norway has innumerable hobbies and recreations, many of them being of a very useful and practical nature. She devotes many hours to sewing, wood carving and bookbinding, and in regard to the latter work has turned out some really beautiful specimens of the craft.

Like Queen Alexandra, her mother, Queen Maud is very skillful with the camera, while such is her skill in outdoor sports that she is her husband's constant companion when his majesty indulges in skating, skiing, motorcycling and cycling excursions. At billiards Queen Maud can easily beat King Haakon, while King Edward, himself a very skillful player, has confessed that he could not teach his daughter much in regard to the game.

If the Facts Were Known.
Many a shining light has become prominent through shady practices.

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Women and the Suffrage.

The severest criticism of the stupidity and inefficiency of the parliaments of the world is, in M. Marcel Prevost's opinion, the most universal indifference of women on the subject of voting. "Neither the representative nor the voter," says this expert in feminine psychology, "excites their envy. They do not even think about the vote, and if men offer it as a gift they pay no attention, burst out laughing or refuse point blank."

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