VARIATIONS OF GLACIERS.

TO THE EDITOR OF SCIENCE: At the International Congress of Geologists at Zurich in 1894 a committee, with members representing various countries, was appointed to collect and make observations on the changes which are continually occurring in the length and thickness of glaciers. Much information bearing on the variations of the Alpine glaciers has already been collected, and it is now desirable to know something of the variations of glaciers in other parts of the world, to determine whether these variations are synchronous on different continents and on opposite sides of the equator. To what extent the variations of glaciers are dependent on meteorological changes, and to what extent on the size and shape of reservoirs, etc., is a problem whose solution is hoped for.

Many of your readers will doubtless visit American glaciers this summer, either on the Pacific Coast, in Canada or in Alaska; and I hope they will take sufficient interest in the subject to make observations which will be of value.

The information most desired regarding any glacier is whether it is advancing or retreating. In a memorandum issued by the Alpine Club the following criteria are given:

"When the ice is advancing the glaciers generally have a more convex outline, * * * and piles of fresh rubbish are found shot over the grass of the lower moraines. Moraines which have been comparatively recently deposited * * * are disturbed, show cracks, and are obviously being pushed forward or aside by the glacier.

"When the ice is in retreat the marks of its further recent extension are seen fringing the glacier both at the end and sides * * *; the glacier fails to fill its former bed and bare stony tracts, often interspersed with pools or lakelets, lie between the end of the glacier and the mounds of recent terminal moraines."

For recording the extent of a glacier at the time of one's visit, many methods bave been given. Among the simplest is to measure (or pace) the distance from the end of the glacier to some prominent rock, or to the line connecting two easily recognizable points on opposite sides of the valley. All photographs of the end of a glacier are useful, especially those taken from a station easily accessible and easily described; photographs taken from the same station at a future date will show what changes have taken place in the interval.

Excellent results can be obtained from the following method: Select two stations on opposite sides of the valley a little below the glacier's end; mark and describe them; estimate their distance apart if no more accurate determination can be made; take a photograph of the glacier's end from each of these stations, and determine by compass the angle between the other station and two or three prominent peaks or other features that appear in each photograph. The photographs, the angles and the distance between the stations will be sufficient data to make a rough map of the glacier's end.* All photographs and observations sent to me will be carefully preserved as a part of a permanent record of American glaciers.

Muir glacier, Alaska, is so frequently visited that we should obtain a pretty complete history of its changes. A photograph of the northwestern corner of the inlet, taken from the ship when at anchor, or, better still, from the projecting bluff on the eastern side of the inlet, will greatly help in making the record.

The few observations which have already reached me show that the glaciers about Glacier Bay, Alaska, the Illecellewaet, in the Selkirks, and those on Mt. Rainier, Washington, are retreating.

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BALTIMORE, MD., May 23, 1896.

LIFE HABITS OF PHRYNOSOMA.

PROF. CHAS. L. EDWARDS'S article on the reproduction of *Phrynosoma cornutum* (SCIENCE, May 22, 1896) interested me very much, indeed; but in some respects the article is misleading, as one might suppose from reading it, that Prof. Edwards believes that all the species of lizards of the genus *Phrynosoma* are *oviparous*, as he found *P. cornutum* to be. This is, however, by no means the case, for, as I have pointed out in SCIENCE over ten years ago (September 4, 1885, pp. 185–186), *Phrynosoma douglassii* is strictly viviparous, and its period of gestation

*A fuller account of the desired observations is given in the *Journal of Geology*, Chicago, Vol. III., 1895, pp. 284–288.