Is Greenland our Arctic Ice Cap?

THE result of Dr. Nansen's journey across Greenland, establishing, as it practically does, that this Arctic continent is covered by a huge ice cap, promises to be a matter of some interest in several ways.

Among other things it may possibly yield a clue as to the cause of the south polar cap of Mars being so very excentrically placed.

Since the time of the elder Herschel this has been a subject of speculation, and various ingenious suggestions have been put forward by astronomers to account for the presumed anomaly.

Webb, in his "Celestial Objects," p. 147, tells us that Herschel found that the caps were not opposite each other; and says himself that "one would expect that they might have been diametrically opposite."

"Mädler and Secchi found the north zone concentric with the axis, but the south considerably excentric"; and "it has been suggested by Beer and Mädler that the poles of cold may not coincide with the poles of rotation."

Later on, at p. 148, he tells us that "Secchi found the appearances at the poles irreconcilable with the idea of circular caps, and was forced to adopt the supposition of complicated and lobate forms. Schiaparelli alludes to the possibility of a mass of *floating ice*."

Apparently it was taken for granted that the *ice* or snow caps of Mars, should not only be truly circular in form, but centrally placed over the axis of rotation, like the cloud caps of Jupiter and Saturn.

But it seems to me that Dr. Nansen's journey will go a long way towards solving this problem, by demonstrating that Greenland is practically one of our two polar ice caps. On our South Pole we have one, more or less centrally placed over the axis of rotation, and which certainly does not float about, having two large active volcanoes on it. It corresponds fairly well to the northern pole of Mars. But on our North Pole—as far as we can see—there is no large permanent ice cap, and in its place we have an irregular, extensive polar basin.

Roughly speaking, we may say that the character of the Arctic and Antarctic ice bears this out, for in the south we see the immense flat-topped bergs of 2000 feet thickness, and several miles long, which are obviously portions of the southern ice cap broken adrift. In the north we see a preponderance of floe, or thin field-ice, a few flat-topped bergs near Franz Joseph Land (Young), and the angular bergs of the Atlantic, mainly from West Greenland (Greely).

If our Arctic basin is deep and has few islands in it, it stands to reason that a permanant ice cap could not form, or become anchored, there; the floe would be perpetually broken up by storms and tides, carried away, and melted. A floating ice cap would be impossible. The presence of a polar continent—even excentrically placed—would seem to be necessary, as in the case of Greenland. This would indicate the solution for the supposed anomaly, *re* the position, of the south polar cap of Mars, and for the lobate appearances remarked by Secchi in 1858.

If the foregoing remarks are at all likely to be correct, Dr. Nansen's journey may have quite unexpectedly solved for us an interesting astronomical problem, and thereby afforded another clue to the condition of Mars, a proof almost of partial glaciation.

I believe that M. Fizeau regards the so-called "canals" as evidence of the "movement and rupture" of a glacial crust.

But if this crust is formed on, and attached to, any extensive *land* surface (such as Greenland, say), it is not easy to account for such enormous ruptures, and the lateral movement.

If the canals are looked on as huge lanes of open water in a floating ice-pack, they would vary in size and form almost daily.

Sibsagar, Assam, India, September 25. S. E. PEAL.

Globular and other Forms of Lightning.

MR. A. T. HARE'S account in NATURE, vol. xl. p. 415, of a flash of globular lightning seems to illustrate so well the explanation which I gave, many years ago, of the formation of fire-ball lightning, that the following extract from my pamphlet "On Atmospheric Electricity" (London, Hardwicke, Piccadilly, 1863) and the remarks which I have appended to it, may perhaps not be without interest at the present time. The pamphlet is not now on sale. The quotation is from pp. 45-46; I omit a few references:—

"A slip of tin-foil was formed into a hollow cylinder, and thrust tightly into one end of a glass tube which was about $\frac{7}{10}$ inch in external diameter, and the glass was not very thick. A brass ball was fixed to the end of the glass tube, and the tin-foil extended from the ball to the distance of about $12\frac{1}{2}$ inches from it, and all the tin-foil was inside the glass tube. The remainder of the glass tube served for an insulating support to the part which held the tin-foil. On electrifying the ball, the electricity is conveyed by the tin-foil to the inside surface of the lined part of the glass tube; and at the same moment the outside of this part of the tube is electrified inductively, and with the same sort of electricity as that with which the interior of the tube is charged. The part of the tube which held the tin-foil was supported horizontally. There was also a copper hook which could be set on any part of the outside of the lined portion of the glass tube.

"The copper hook was set at a distance of $7\frac{1}{2}$ inches from the brass ball on the end of the tube, and was connected with the outside of a Leyden-jar which was charged so as to be, nearly able to give a spark $\frac{1}{2}$ inch long between two other brass balls each of which was $1\frac{1}{4}$ inch in diameter. The knob of the jar was next brought to the ball on the end of the glass tube; the discharge readily passed over the $7\frac{1}{2}$ inches of the electrified outer surface of the glass tube. Sometimes the spark could pass when the hook was at $8\frac{1}{2}$ inches from the ball. When the hook was placed at a distance of $12\frac{3}{4}$ inches from the ball, the spark passed between the ball and the hook with a much lower charge in the jar than was necessary to produce a spark $\frac{3}{4}$ inch long between the pair of balls before mentioned.

"These experiments show that the length of an ordinary electric spark, can be much increased by causing the spark to pass over an electrified surface. Instances of this are seen in the spontaneous discharge of Leyden-jars, and in the long sparks which flash over the revolving glass of the electrical machine.

"Let a ball be attached to the prime conductor of the electrical machine so that the ball may give electrical brushes to the air. Much longer sparks may be drawn from the ball along the path of the brushes than from the other parts of the prime conductor. The brush discharge electrifies the air in the neighbourhood of the ball, and the spark is longer because it passes near to, or through, a mass of previously charged particles.

"It is well known that atmospheric electricity not unfrequently forms an electric fire-ball which moves but slowly, and which, on striking an object, explodes and produces all the usual effects of a flash of lightning. Sir William Harris writes:—'Now, it is not improbable that, in many cases in which distinct balls of fire of sensible duration have been perceived, the appearance has resulted from the species of brush or glow discharge already described, and which may often precede the main shock.' And Dr. Noad says of the electrical fire-ball that 'it is no doubt always attended by a diffusely-luminous track; this may, however, be completely eclipsed in the mind of the observer by the great concentration and density of the discharge in the points immediately through which it continues to force its way.' A more perfect explanation can, as I suppose, be given by the aid of the experiments of this chapter.

"A thunder-cloud may produce both the electric glow and the electric brush, at the end of one of its cloudy branches. And since electricity passes freely along a charged surface, therefore the glowing discharge by electrifying the air in front of the aërial conductor, adds continually to the length of the conducting column, and so the electrical fire-ball advances. Little drops of water, or any other conductive matter which the column finds in its course, must facilitate the transmission of the electricity to the fire-ball; and without doubt, too, the electricity of the column continues to spread laterally, and so it increases the conductive capacity of the column. The electricicity travels through the electrified column as a series of luminous disruptive discharges; but the light is brightest at the head, because there the diameter of the column is least, and the discharge is most closely packed; and because there the air is unelectrified, and consequently opposes so great resistance to the passage of the electricity. As soon as the fire-ball has arrived at a conducting mass on the earth, the aërial conductor has been completed, and a flash of lightning may instantly follow along the path of the fire-ball."

Since the Leyden-jar, with a charge somewhat less than that required to give a spark $\frac{1}{2}$ inch long between the $1\frac{1}{4}$-inch brass