of oceanic circulation, the more important of which are: (a) "that the melting of the ice in the Polar seas and the ice-drift from there is increased because the supply of warm water from the tropics northwards and southwards becomes stronger"; and (b) "that the great sea currents pendulate — that is to say, diverge to the right (or else to the left) — when an acceleration of their velocity occurs".

The variations in the vertical tidal force can be calculated from astronomical data, so that the dates when this force attains its periodic maximum values can be readily derived. PETTERSSON shows that such maxima occurred in September 1895 and again in September 1922. He then discusses the ice conditions in the Arctic and Antarctic oceans in the last decade of the nineteenth century, connecting these conditions with the increased value of the vertical tidal force.

In the introductory part of the paper, in which he summarizes the contents, PETTERSSON very scrupulously states that he "has come to occupy an isolated position among the hydrographical and meteorological students of the present day owing to the fact that he has found movements in the hydrosphere of the earth to have their ultimate cause in the variations in the force of gravity." There can be no question that most qualified students of the matter will disagree with PETTERSSON's thesis as developed in this paper, but at the same time will heartily indorse his statement that "the study of such internal movements in the sea ought to be an important task for the marine stations that have been established round the coasts of Europe". H. A. M.

J. W. Sandström. Der Golfstrom und das Wetter. Gerlands Beitr. z. Geophys. Band 32, Köppen-Bd. I. Leipzig, 1931.

The "Gulf Stream" of this paper is the warm current which traverses the North Atlantic and penetrates the Arctic Ocean through the northern North Sea. It is well known that this current has a great effect in ameliorating the winter climate of north-west Europe; this effect is partly direct but it is also partly indirect, through the modifications which it introduces into the general pressure distribution. Hence variations of the Gulf Stream from year to year should result in corresponding changes of weather. SANDSTRÖM describes a special case. In the summer of 1928 the Gulf Stream near Florida was 5° C. warmer than normal. In the following winter this mass of warm water lay south of Iceland and the Icelandic low pressure area increased greatly in intensity and also shifted towards the southwest, while the Siberian anticyclone advanced westward, giving an abnormally cold winter in north-west Europe. By the winter of 1929—30 on the other hand both the warm water and the Icelandic low had moved to the north-east of Iceland, giving a mild winter in Norway. The author considers that these relationships may form a basis for seasonal forecasting.

There is no doubt that variations in the strength of the Gulf Stream do influence the subsequent pressure distribution over the North Atlantic and western Europe, but this is by no means the only factor at work. Two others at least are probably still more powerful, namely, the state of ice in the Arctic Ocean and the pre-existing general meteorological situation over the globe. Moreover all three, Gulf Stream, Arctic ice, meteorological situation, interact and the result is our very complex sequence of seasons. Thus, while the Gulf Stream was no doubt a part cause of the severe winter of 1928—29, it is not likely to have been the sole cause. C. E. P. B.

T. Braarud and **B. Føyn.** Beiträge zur Kenntnis des Stoffwechsels im Meere. Norske Vid.-Akad. i Oslo. 1. Matem.-Naturvid. Klasse 1930. No. 14. Oslo, 1931.

Sea water was filtered free from bacteria and the phosphate, nitrate-, nitrite- and ammonium-nitrogen determined chemically. To one portion an excess of nitrate and to the other an excess of phosphate were added; both were then seeded with a pure bacteria free culture of *Chlamydomonas*. From the increase in number of cells of this alga, the quantity of phosphate and nitrate respectively which had been assimilated during growth were calculated. It had been found that 2.98×10^{-12} gms. nitrate-nitrogen and 0.98×10^{-12} gms. phosphate as P_2O_5 were utilised in the production of each cell of *Chlamydomonas*. The technique was the same as that used by Schreiber. In the case of the three waters examined, the phosphate thus estimated agreed very closely with the chemical determination. The estimate of combined nitrogen by the biological and chemical methods did not agree so closely, but a parallel is shown.

Water from	NO_3' + NO_2'-Nitrogen mg per m³	NH_4'-Nitrogen mg per m³	NO_3', + NO_2' and NH_4' nitrogen	P_2O_5 mg per m³	Nitrogen used by algae mg/m³	P_2O_5 used by algae mg/m³
Oslo Fiord at Dröbak	about 50	57	107	9	77	10
North Sea ...	8	0	8	15	18	18
Oslo harbour .	over 600	450	over 1050	over 150	2378	155

It was found that *Chlamydomonas* grew well in water containing excess of phosphate to which ammonium chloride had been added, while the addition of alanine, glycocoll, asparagine or urea promoted growth to a much less extent than either nitrate or ammonium. It is indicated that amide nitrogen can serve as a source of nitrogen when present in relatively great concentration.

An experiment was made on the growth of a pure culture of *Carteria* in water heavily enriched with phosphate, nitrate, nitrite and ammonium. This showed that the nitrate, and perhaps nitrite, was utilised faster than the ammonium.

The second part of this interesting paper deals with the loss of organic matter from growing algal cells into the surrounding culture medium. Such a loss was found to have occurred at the end of one month's growth of a pure culture of *Carteria* and at the end of two and a half months