those who take an interest in the progress of geography will doubtless think with us that such an exhibition adds one more to the many attractions of Paris; now that the Loan Collection is closed, nothing at all approaching it exists in London.

TEMPERATURES AND OCEAN CURRENTS IN THE SOUTH PACIFIC

IN the *Annalen der Hydrographie und maritimen Meteorologie* (Jahrg. iv., 1876, Heft 6, p. 219), Herr von Schleinitz, a member of the recent expedition in the German corvette *Gazelle*, states his views on ocean temperatures and currents; these are somewhat different from those expressed by Sir C. Wyville Thomson (Proc. Roy. Soc., vol. xxiv.), which are based on the data obtained during the *Challenger* expedition. The *Gazelle*, after leaving Auckland (New Zealand), pursued a course almost due north as far as the Fiji Islands; thence she proceeded to the Samoan Islands, situated at a short distance north-east of Fiji. After a brief excursion to the Tonga group and back, the *Gazelle* (from long. 172° 18′·5 W., and lat. 14° 28′·1 S.) sailed some 2,500 nautical miles in a south-south-east direction (to long. 141° 11′·4 W., and lat. 45° 33′·6 S.), after which she took a due easterly, and later on, a south-easterly course, to Magellan's Straits (long. 80° 30′·3 W., lat. 51° 41′·6 S.). The observations of temperature on the long cruise between the Samoan Islands and the Magellan's Straits are of special interest, as the course taken by the *Gazelle* lies to the south of that pursued by the *Challenger*.

On the first part of the course described, which has a direction nearly coinciding with the meridian, eight series of observations of temperature were made. The bottom profile of this part shows a peculiar absence of elevations, which is all the more remarkable when compared with any similar profile of the same length in the Atlantic.

The conclusion arrived at by Herr von Schleinitz, and based on the results of his observations is, that in the Pacific the arctic deep-sea current crosses the equator in a southerly direction and meets the antarctic current only between lat. 30° and 36° S. This is just the reverse of what takes place in the Atlantic, as it seems highly probable from the observations of both the *Challenger* and the *Gazelle* expeditions, that in the Atlantic the antarctic deep-sea current passes the equator, running northward of the same to a considerable distance.

Herr von Schleinitz concludes from these latter observations, that if the antarctic deep current enters the North Atlantic, even as a current of limited breadth, it must nevertheless carry enormous quantities of water from the South Atlantic to the North Atlantic, as it is certain that the current has a depth of more than 1,000 fathoms on the average. He then asks the question, What becomes of this mass of water? There is no strong surface current in existence which carries it back to the South Atlantic; even the current caused by the south-east trade winds runs more towards the Gulf Stream than towards the Brazilian coast current. There seems only one hypothesis possible, viz., that a great part of the water flows through the Arctic Sea and Behring's Strait into the North Pacific, and that may be the cause of the preponderance of the arctic current of this ocean over its antarctic one.

The natural conclusion drawn from this is that the South Pacific, in order to complete the whole circle, gives a great part of its waters to the South Atlantic, and as a proof of this it might be pointed out that the ice limit does not approach the equator so much anywhere as it does in the South Atlantic.

The following facts may also be mentioned as in favour of the hypothesis of a certain regular circulation taking place in the manner described. A comparison of the air-isotherms as well as the sea-isotherms both of the Atlantic and Pacific Oceans shows that (1) the South Atlantic is colder than the North Atlantic; (2) the North Atlantic is warmer than the North Pacific; (3) the South Pacific is warmer than the South Atlantic.

The higher temperature of the North Atlantic Ocean has hitherto been generally explained by the influence of the Gulf Stream. But a similar current exists in the North Pacific, and yet this is colder. There is no doubt that the Gulf Stream has a warming effect on some European coasts, but it is very probable that considering its comparatively small breadth of about 100 nautical miles, and shallow depth of only 100 fathoms, the stream is far too insignificant to be able to exercise a perceptible influence upon the climate of the whole North Atlantic and of the coasts surrounding this ocean.

On the other hand it does not seem to have been sufficiently appreciated hitherto, that a very large part of the North Atlantic is filled by water, which has crossed the equator, even if at a considerable depth. However trifling the rise in the temperature of this water, as caused by the passage over the equator, may be, when compared to the general temperature of the South Atlantic, it is nevertheless a fact that there is an important amount of heat, which the South Atlantic loses and the North Atlantic gains, on account of the very large extension of the current. Nor can it be objected with regard to this, that the mean temperature of that mass of water is probably below the mean temperature of air in the North Atlantic, because there is no question of absolute heat, but only of difference of temperatures between the North and South Atlantic.

The excess of water in the North Atlantic, which is not carried back into the South Atlantic by the surface-currents, and which passes through the Arctic Ocean (where it loses the heat it possessed) into the North Pacific, causes a decrease of temperature in the latter, and, proceeding southward, *i.e.*, again crossing the equator and thus absorbing heat, produces an increase of temperature in the South Pacific. Finally, the South Pacific gives back to the South Atlantic a part of that water at a very low temperature, which originally flowed from the latter into the North Atlantic perceptibly heated, on account of its passage through the tropics.

This circulation, however, is not to be understood as if the lowest strata of all the oceans took part in it; on the contrary, there are doubtless only single currents in the lower strata which follow it, while others may flow in an opposite direction. Further observations will throw light on these hypotheses; those made up to the present are yet insufficient and at times even contradictory. At the same time it must not be overlooked that a constant exchange of water between the lower and upper strata, *i.e.*, currents flowing in a vertical direction, are proved to exist beyond doubt, particularly in certain zones.

In conclusion Herr von Schleinitz considers the oceanic system of currents to be evidently a very complicated and at present obscure one, upon which the observations made on board the *Challenger* and the *Gazelle* throw but a very faint light.

The second part of the course pursued by the *Gazelle*, as described above, did not differ sufficiently in latitude, and therefore could not furnish any data which would be useful or decisive on the subject in question. However, the observations which were made give results in complete accordance with the hypothesis referred to above.

ON THE MEANS OF PROTECTION IN FLOWERS AGAINST UNWELCOME VISITORS

THE phenomena relating to this subject, which have important bearings on the doctrine of selection, have recently been discussed by M. Kerner in an interesting monograph communicated to the *Festschrift* published on occasion of the twenty-fifth anniversary of the Zoo-