nervous symptoms; and (3) those which run a chronic course and end fatally between the sixth and twelfth days after poisoning. In these, histological examination shows a well marked primary degeneration of the cells of the central nervous system, and to this the fatal issue is due.

The venom of the krait was found to be much less toxic than that of the cobra or of the daboia, and, unlike the former, has only a slightly destructive action on the red blood corpuscles. It, however, markedly increases blood coagulability, and may cause extensive intravascular clotting. Cobra and tiger snake anti-sera possess no neutralising action for the krait venom. The use of anti-sera, the only efficient antidotes for snake bites, must, therefore, unfortunately be limited, for it is necessary to have an anti-serum for the venom of every species. R. T. HEWLETT.

CURRENTS AROUND THE COASTS OF NEWFOUNDLAND.[1]

IN the course of the investigations described by Dr. Bell Dawson, a number of points were met with which are of general interest, as they probably characterise the currents on the margin of any large or oceanic area under similar conditions.

The currents in the above regions were examined last season from May to September, under the personal supervision of Dr. Dawson, the engineer in charge of the Tidal and Current Survey. Special attention was given to the question of indraught into the larger bays on the south coast, and to the behaviour of the Polar current which follows the eastern coast. For this work, the D. G. S. *Gulnare* was equipped with appliances for deep sea anchorage, and apparatus of a modern type, in some ways specially devised for the purpose. At anchorages carefully chosen, which were made in all depths up to 100 fathoms, the speed of the currents was measured, and the direction noted every half hour, day and night. The observations also included the under-current, the density and temperature of the water, the mileage and direction of the wind, and a continuous record of the tide on a self-registering gauge placed in a harbour in the region, for comparison with the set of the current.

The behaviour of these currents is very varied, and they were found to be so weak as to be readily influenced by the wind; but by a systematic reduction of the results, Dr. Dawson has prepared a report which describes the currents as concisely as possible, while avoiding technicalities. The report is divided into two parts; the first deals with the currents met with on the steamship route, which follows the south coast for 180 miles, and the question of indraught into the larger bays; and the second part describes the character of the Polar current on the east coast, and its possible change of direction when disturbed. The report is illustrated by nine diagrams and maps, which represent the results graphically. From this report, the following descriptions and explanations are culled, which are of general interest from a hydrographic point of view. References to the local geography are omitted as far as possible, as they might be inconvenient to follow without the map which accompanies the report.

Nature of the Currents.—The currents were almost invariably less than one knot. As a rule, they veered widely and were irregular in direction; and with so low a speed they were readily influenced by the wind. There were three elements to distinguish:—(1) Any general tendency to set in one direction more than in others. (2) Any tidal influence, which might show itself either as a marked change in the direction of the set, or as a period in which a variation in velocity would recur. (3) The influence of the wind in disturbing the usual behaviour of the current. From the observation, the effect of any storms which occur during the summer season seldom extends to a greater depth than 5 or 10 fathoms; and it was therefore found that the behaviour of the under-current at 15 to 30 fathoms afforded a most valuable indication of the normal character of the current. In these currents, the tidal element is almost invariably present in some form, more or less distinct; and this is almost always combined with a tendency to make on the whole in some one direction. It is not therefore possible to maintain an arbitrary distinction between "constant currents" and "tidal streams"; but the only natural distinction is to use the term *current* for all horizontal movements of the water, and *tide* for the vertical movement from high to low water.

The following features in these currents will be interesting for comparison with the behaviour of currents elsewhere, on the open coast of the ocean:—(1) When more than five miles from shore, there are no currents at any time throughout the season which exceed one knot in any direction. The only exception to this is the Polar current, in which a maximum speed of 1·15 knots was observed. (2) On the south coast, when within four or five miles of the shore, the current is chiefly governed by the tide, and sets in the two opposite directions alternately; but the farther out the point of observation, the greater the tendency for the direction of the current to veer completely around the compass. (3) The Polar current sets very constantly to the south-west, for a width of thirty or forty miles off the eastern coast. During times of disturbance, it may set south-eastward, or even be reversed, on the surface. When such disturbance occurs, it is usually for part of a day immediately before a gale comes on.

In the Polar current the influence of the tide was distinctly marked by a fluctuation in velocity, the current being 24 per cent. stronger during flood tide on the average. The under-current had the same general direction as the surface current. It set constantly to the south-westward, even at times when the current on the surface was most disturbed by the wind, judging from numerous observations at 40 fathoms, or about one-half the total depth of the water. The fluctuation in velocity with the tide was even more marked in the under-current than on the surface. During the flood tide, the strength from 15 to 40 fathoms was unusually constant, and at 40 fathoms it was always as strong and often stronger than on the surface. During the ebb tide it slacked below, as it did on the surface, and was usually weaker at the greater depths. When slackest, at about half-ebb, it fell below one-fourth of its greatest strength during flood tide, but even then the movement was distinctly felt to a depth of 60 and 75 fathoms.

Off the south shore, at an anchorage at an offing of seventeen miles, the behaviour of the current was very variable. During a period of nine days in June, when 158 hours of continuous observations were secured, a variety of weather conditions obtained, although the wind did not ever exceed twenty-one miles an hour. To understand the nature of the current, careful comparisons with the tides and winds are undoubtedly required; but the continuity of observations, taken every half hour day and night, affords a good basis for the comparison, and with an anemometer on board, the wind observations are much better obtained than by comparison with an observatory on shore.

The most evident change in the behaviour of the current is that sometimes the direction veers completely round the compass, and at other times it veers backwards and forwards between limiting directions. This change is evidently due to the variation in the amount of tidal influence with the springs and neaps. The veer completely around the compass occurs at neap tides, this being well marked at the moon's quarters on two different occasions. The veer is then continuously to the right, and the period in which a complete revolution occurs is just about sixteen hours. This period is quite definite, as deduced from six complete revolutions which were observed. It appears to result from a combination of the tidal period with a general movement of the water to the westward. This appears to be the only possible explanation, in accordance with the principles of rotary movement. This sixteen-hour period has been met with at other stations during the season, as well as in other regions in former years. At other times in the month, when the tidal influence is stronger, the current veers to the right and left through a range which varies from eight points to half a circumference. The complete period in which it veers and backs is from ten to fourteen hours. It is not impossible that this veer would be found to correspond with the tidal period if an average were taken which would be sufficiently long to eliminate other disturbing causes. On the other hand, at

[1] "The Currents on the South-eastern Coasts of Newfoundland. From Investigations of the Tidal and Current Survey in the Season of 1903." By Dr. W. Bell Dawson.

the neap tides, when the tidal element has the least influence, the sixteen-hour period throws the direction of the current entirely out of correspondence with the time of the tide.

Wind Influence.—It would be quite erroneous to suppose that the wind always causes a drift in its own direction. On the contrary, the set is primarily due to the nature of the current, and if it has any definite direction of its own, owing to the tide or other causes, it takes a strong wind a considerable time to overcome this, even with currents such as these, which do not exceed one knot.

A set of the current towards the point from which a wind is about to come is in accord with the universal testimony of the fishermen throughout these regions. Of all the signs of bad weather, it is the one which they appear to find the most trustworthy. In the summer, bad weather usually comes from the south-east and "blows itself out" from that direction; but later on, in the autumn, the wind chops round to the north-west before the storm is over. Along the south shore, it is only during ebb tide that there is a weak set to the south-east. Any strong set to the south-east or south is a sign of bad weather. The fishermen regard this as an unfailing indication, and at once run for shelter. The main feature is the fact of the current setting "into the weather," as they express it, and it is difficult to give a satisfactory explanation for this. The actual direction of the current is necessarily modified by local conditions and guided by the trend of the shore, but the greater scope and freedom the current has, the more directly it appears to set towards the coming wind. And further, it will set in either direction in accord with the expected wind. If this behaviour is due to difference of barometer, it is not easy to understand why the water should be the first to feel a change, before the wind itself begins to blow.

Density and Temperature of the Water.—Extended observations of density and temperature were taken during the season. This was done in the hope of tracing the movement of the water, as this method had proved so serviceable in the Gulf of St. Lawrence. The density of the water was taken at the surface only. The variation did not prove sufficient, however, to be relied upon as an indication of direction of movement. The temperature was taken to a depth of 30 fathoms, and more was expected from the temperature than from the density, as it was hoped it would serve to trace the course of the Polar current. The depth of 30 fathoms was found sufficient, as the water was there at the freezing point throughout the region examined, both south and east of Newfoundland, during the whole season from May to September. All the change which took place during the progress of the season or from other causes was between the surface and 30 fathoms. The change of the temperature of the water also afforded an interesting valuation for the amount of wind disturbance, and the depth to which it extended, under given conditions.

Two results were arrived at, which made the temperature observations of little value for the purpose of tracing the movement of the water by its temperature, and which it will therefore be sufficient to mention briefly:—(1) The temperature of the water at 30 fathoms is practically at the freezing point in all parts of this region, from the mouth of Placentia Bay to St. Johns. It varied only from $30\frac{1}{2}°$ to $34°$ F., and there was no change from one month to another, from May to September. (2) The water of the Polar current warms up quite as much on the surface as the surface water elsewhere in this region. The general increase of the surface temperature along the south shore, from St. Pierre to Trepassey, was from $36\frac{1}{2}°$ in May to $50°$ in September, and the surface temperature of the Polar current rose from an average of $34\frac{1}{2}°$ at the end of May to $50\frac{1}{4}°$ at the middle of August. Whether this increase of the surface temperature takes place during the progress of the current southward, or whether this warmer surface water flows over it from elsewhere, we have not sufficiently extended observations to determine. But for the guidance of the mariner, it is evident that the lower temperature cannot be depended on as an indication of the current-belt itself.

A very interesting result was met with, however, on account of the rapid fall in temperature from the surface downwards. The temperature proved to be a valuable indication of wind disturbance. During heavy winds, especially when off-shore, the surface water was driven out to the offing, and the cold under-water came up to the surface. A heavy fall in temperature would thus occur. For example, towards the end of August, the surface temperature over the area from Cape Spear to Cape Race was $50°$. There followed during three days 1312 miles of westerly winds, ranging from north-west to west-south-west, when the surface temperature within three miles of the shore fell to $36°$ and $34°$, and in a belt ten miles wide along the windward shore it was below $45°$. Careful observations and some special runs were made to ascertain the amount of lateral displacement of the current and the depth of disturbance due to a measured mileage of wind. This was done without loss of time, as the weather was then too heavy to carry on work at anchor. Later, when the weather moderated, the temperature again furnished a basis for a very fair estimate of the rate at which the current-belt moved back laterally to resume its usual course.

Ice as an Indication of Current.—To infer the behaviour of a current from the drift of ice with any certainty, the indications given by flat ice and by icebergs must be carefully distinguished. The flat or pan ice runs with the surface current, and is much influenced by the wind, whereas the icebergs indicate the average movement of the body of the water as a whole, and the wind has no appreciable effect upon them. This distinction is well known to sealers, and they habitually take advantage of it. When working against a gale of wind, they will moor their vessel to an iceberg, and lie in its lee while the small ice goes past with the drive of the wind, because, as they express it, the wind takes no hold on an iceberg at all. They thus save a long drift to leeward. It is thus from the icebergs rather than from the flat ice that we can find indications of value.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—The following is the text of the speeches delivered by Prof. Love in presenting recipients of the degree of D.Sc. *honoris causa* at the Encaenia, June 22, in the presence of the Chancellor of the university:—

THE HON. CHARLES ALGERNON PARSONS.

Duobus fere millibus abhinc annis Heron Alexandrinus turbinem quemdam per ludum excogitavit, qui vapore calido actus per tubos inflexos afflante converteretur. Carolus Algernon Parsons inter Hibernos nobilissimus, scientiae etiam laude insignis, ita Heronis vestigiis institit ut, quod ille ludendi causa finxerat, ipse in usum nostrum converteret, quo facilius homines naturae imperarent. Optime sane meritus est de omnibus qui urbes habitant, quibus vias et domos luce electrica hoc invento usus illustravit, neque minus profuit Nerea temptantibus, cum his turbinibus impulsae per altum naves celeritate inaudita ferantur recta semper carina adeo ut navigantium incommoda magna ex parte adleventur.

SIGNOR GUGLIELMO MARCONI.

Hic est ille magus, Gulielmus Marconi, qui modum invenit signorum ab ora in oram, a nave ad navem trans maria immensa transmittendorum. Docuerat quidem Maxwell, civis noster, vim electricam per aethera omnia permeantem quasi fluctibus quibusdam perferri. Accessit etiam Hertz, Germaniae ornamentum, qui ostendit quo modo hi fluctus ita regerentur ut tanquam procella quaedam electrica procul exorta aliis in locis satis longinquis agnosceretur. Marconi tandem, qua erat ingenii audacia, id excogitavit ut his subsidiis usus locos disiunctissimos quasi colloquendi quadam facultate coniungeret. Sollertia igitur maxima, patientia vero admirabili praeditus, singula impedimenta quae spei exsequendae obstabant felicissime pervicit, iamque potest nullo vinculo, nullo filo intercedente, quod vel oculi vel tactio deprehendere possint, super dimidiam orbis terrarum partem signa transmittere.