OUR ASTRONOMICAL COLUMN.

COMET 1913*f* (DELAVAN).—The following is a continuation of the ephemeris of Delavan's comet (1913*f*) as given by Dr. G. van Biesbroeck in *Astronomische Nachrichten*, No. 4739 :—

	R.A. (true) h. m. s.	Decl. (true) ° ′ ″	Mag.
July 23 ...	5 39 42 ...	+36 2 16 ...	6·6
24 ...	42 19 ...	21 24	
25 ...	45 0 ...	40 39	
26 ...	47 43 ...	37 0 2 ...	6·5
27 ...	50 29 ...	19 32	
28 ...	53 18 ...	39 9	
29 ...	56 10 ...	58 54	
30 ...	5 59 6 ...	+38 18 44 ...	6·3

OBSERVATIONS OF HALLEY'S COMET.—The June number of the *Astrophysical Journal* (vol. xxxix., No. 5) contains a communication by Prof. E. E. Barnard on the visual observations of Halley's comet in 1910, made by him at the Yerkes Observatory. Numerous fine illustrations from photographs accompany the text. In the first instance he points out that Halley's comet at its return in 1910, though a brilliant and interesting object to the naked eye, especially in May, was nevertheless a disappointment when considered from a photographic point of view. Photographically its light was relatively slow, and there were few or no remarkable phenomena. After mentioning the probable encounter of the southern branch of the tail with the earth on or about May 18 or 19, he directs attention to the presence of the double tail overlooked by observers in the northern hemisphere. Observations made with the 40-in. are next described, and special attention is directed to the long mass in the tail receding from the head. The appearance is beautifully shown in three photographs taken in June at Yerkes, Honolulu, and Beirut. Prof. Barnard then brings together all his visual observations made from the first to the last appearance of the comet, for he was determined, as he says, "to prepare as faithful an account as possible of its appearance to the naked eye for the benefit of observers at future returns," since he was much disappointed "at the meagreness of the records" at its appearance in 1835, when he was seeking published information concerning its appearance.

REPORTS OF INDIAN OBSERVATORIES.—A recent publication gives the report of the Director-General of Observatories of the Observatories of Kodaikanal, Madras, Bombay, and Alibag for the year 1913, and this includes the reports of the individual directors. As regards Kodaikanal, Dr. G. T. Walker states that the output of this observatory is at present limited by the amount of measuring that can be accomplished, and this is being altered by the training of the new assistants. He also makes the important statement that when Mr. Evershed was in Srinagar in Kashmir in 1913 he found that the air there was extraordinarily good for solar and stellar work, and it is now being considered whether the observatory at Kodaikanal should be totally or partially removed there. The only drawback, apart from the question of cost, is the chief disadvantage of the small amount of sunshine in January and February, the months when other solar observatories are labouring under disadvantages, while at Kodaikanal the seeing is at its best. As the chief astronomical work at the Madras Observatory is the determination and distribution of time this will now be closely associated with the distribution of the time by the new powerful radio-station that is to be erected in India, forming a link between Aden and Singapore. The idea is for the radio-station to be equipped with two good clocks, and to send special time signals to Madras, so that the clock-errors can be determined and wired back to the radio-station previous to the distribution of the general time signals. The usual routine observations were carried out at Bombay (Colaba and Alibag), but damp, and white ants, caused great anxiety regarding the walls for the self-registering variation instruments at Alibag.

RECENT PHYSICAL INVESTIGATIONS IN THE NORTH ATLANTIC OCEAN.

TWO recent publications summarise more or less thoroughly our present knowledge of the physical features of the waters of the North Atlantic Ocean. One gives an account by Dr. Fridtjof Nansen of recent researches carried on especially by the Norwegians, and the other, by Prof. Otto Pettersson and Commander C. F. Drechsel, urges united international effort to carry on further research in these waters.[1]

Dr. Nansen gives a detailed account of oceanographical investigations in the north-eastern part of the North Atlantic Ocean made in July, 1910, on board the Norwegian gunboat, *Frithjof*, under the command of Capt. Caspar S. Erlandsen.

Dr. B. Helland-Hansen and Dr. Nansen had noted that "variations in the temperature of the Atlantic current from one year to another, were followed by corresponding variations in the winter climate of Norway, and also by variations in the fisheries of the North Sea and at Lofoten, etc." The question was as to whether the observed annual variations in the volume and temperature of what Dr. Nansen terms the Norwegian Atlantic current "were due to variations in the physical conditions of the North Atlantic, south of the Wyville Thomson Ridge and the Faeroe-Iceland Ridge, or to other causes, *e.g.* variations in the East Icelandic Arctic current."

The cruise of the *Frithjof* lasted fifteen days, leaving Belfast on July 6, 1910, Seydis Fiord, Iceland, was reached on July 13, and Bergen on July 21. On the basis of these observations, which are duly tabulated, five sections have been drawn. These observations were taken with carefully selected instruments supplied by Dr. Nansen. The automatic insulating water-bottle seems to have been at times untrustworthy, but otherwise the instruments gave satisfactory results. Dr. Nansen suggests that it is very desirable always to use two thermometers for the determination of deep-sea temperatures. All water samples were collected in rubber washered bottles with lever fastening, holding 200 c.c. and 500 c.c. each. Titrations were carried out by Dr. Helland-Hansen, or under his supervision at Bergen. The titrations were checked in the ordinary way by "normal water" from the International Bureau in Copenhagen.

The observations made resulted in showing that vertical convection currents reached depths of 600 metres. Dr. Nansen is of opinion that this vertical circulation is of great importance in heating the atmosphere of this region during the winter. It was estimated that direct absorption of heat from the sun's rays may be felt to a depth of 100 metres.

In the region traversed by the *Frithjof* precipitation is greater than evaporation, not only in winter, but evidently also on the average during summer. From the observations of Mr. Donald J. Mathews, as well as those of the *Frithjof*, it appears that in this region the sea-surface has its maximum salinity at the end of the winter or in the spring, and its minimum salinity at the end of the summer or in the autumn. Prof. Martin Knudsen has found similar seasonal variations. Knudsen suggests that the most probable

[1] (1) "The Waters of the North-eastern North Atlantic." By Fridtjof Nansen.
(2) "Mémoire sur des Recherches dans l'Atlantique avec programme By O. Pettersson and C. F. Drechsel.

explanation of this periodical variation would be, that the Gulf Stream has a maximum velocity in the spring and a minimum period in the autumn, but Dr. Nansen is of opinion, that it is self-evident that the dilution of the surface water due to the precipitation during the summer in connection with vertical circulation during the winter, gives the simplest explanation of this seasonal variation.

Krummel has termed that part of the Gulf Stream passing Section I. of the *Frithjof* cruise across the Rockall Channel and the Rockall Bank, the "Irish current." Its waters are easily distinguished by the comparatively high salinities and temperature. "The section proves that the greater part of the water-masses, carried north-eastwards by the Irish current, passes through the Rockall Channel, between the continental shelf off Iceland and the Rockall Bank, while only a small portion of the water with the highest salinities (above 35·30 per cent.) occurs west of the Rockall Bank, and seems to have no distinct northward movement." It is obvious that it is a continuation of this current through the Rockall Channel which flows through the Faeroe-Shetland Channel. Amundsen's observations in June and July also bear this out. These important recent Norwegian observations are confirmatory of the *Porcupine* observations of 1869. Dr. Nansen states that the Scottish series of salinity observations in August, 1910, from the Faeroe-Shetland Channel, taken in the same month, have often some "inaccurate values," and may be too high. Authority for this statement would have been desirable and also for the further criticism of the Scottish stations 19 C and 14 A of May, 1910, for it does not always follow that even "very great irregularities" indicate erroneous observations, however inconvenient they may be to our theories.

It is a fashion of the present day to attempt to obliterate the general term "Gulf Stream," and Dr. Nansen follows this plan, but the fact remains that there is a continuous movement of the surface waters of the sea which is capable of carrying an object from the West Indies to Spitsbergen, and "Gulf Stream" remains a useful name for this continuous flow of water, called by recent investigators by different names in different regions. There is no doubt that the "Gulf Stream" is due to many factors, and not solely due to that initial impulse the waters have as they leave the Gulf of Mexico, but why not continue to use this useful term which defines this remarkable series of phenomena as a whole, at the same time recognising the different factors that cause it to exist. The statement that the Gulf Stream off western British coasts "is to a very great extent a current coming from the south, along the continental slope west of Europe," is by no means new, and does not obliterate the main phenomenon referred to. The point of interest in the Norwegian observations is not that the current described by Rennell in 1793 flows northward, but that this current flows at quite a considerable depth, and not only at the surface, a very important addition to our knowledge of the Rennell current; also, that it seems to consist very largely of Mediterranean water.

But in this connection, it should not be forgotten that about twenty years ago Buchan pointed out that the influence of the warm undercurrent from the Mediterranean is clearly apparent in the Atlantic Ocean at a depth of 500 fathoms, and that "beyond this depth, its great influence is felt over nearly the whole breadth of the Atlantic to at least about 1000 fathoms." [2]

It is a sweeping statement to say that "most leading oceanographers have taken it for granted that the currents of the surface layers were practically the same, at least as to direction, as those of the deeper strata," and that they study chiefly surface observations, and think "that all oceanic currents are chiefly, if not entirely, created by the winds," that they do not understand the effect of the earth's rotation, and have not appreciated the value of vertical sections of the ocean to elucidate horizontal movements of the water." Carpenter, before the *Challenger* sailed, strongly advocated the doctrine of vertical ocean circulation sustained by opposition of temperature, and while Buchanan used vertical sections so early as 1877 [3] in a paper entitled "Distribution of Salt in the Ocean as Indicated by the Specific Gravity of its Waters," where a vertical section through the Atlantic Ocean from 30° N. to 30° S. is given. Subsequently Buchanan used vertical sections in his report on the specific gravity of ocean water, which was published in 1884 in vol. i. (Chemistry and Physics) in the *Challenger* reports. In the same volume there appears a "Report on Deep Sea Temperature Observations," obtained by the officers of H.M.S. *Challenger*, where there are 258 plates all representing vertical sections. In fact, no efficient oceanographer considers these physical questions without the use of vertical sections; neither would he assert that all oceanic currents are entirely created by wind, nor will he deny that they are very largely created by wind. Wind, specific gravity, temperature, and rotation of the earth are all among the many factors which influence oceanic circulation, both vertical and horizontal, and none of these should be considered apart from the others if satisfactory results are to be arrived at.

Dr. Nansen considers it difficult to draw any certain conclusions as regards the annual variations in the temperature of the Irish current owing to insufficient material of observations from previous years. The observations seem, however, to prove that there have been no great variations in those few years.

The temperature of the Irmiger current to the west of Iceland was warmest in 1896, less warm in 1895, 1904, and 1903. There are also similar variations in the sea south of Iceland, but the conclusions are less trustworthy, because the sea is shallower and the frequent variations in depth may have a great influence upon temperature even at short distances. These variations Dr. Nansen considers have an effect on the climate of Iceland.

There appear to be continually very great changes in the position of the waters of the Faeroe-Shetland channel. Drs. Helland-Hansen and Nansen conclude that great sub-surface boundary waves probably occur in the sea, and that "waves" seen in the many vertical sections of the Norwegian Sea may be due partly to such boundary waves, partly to horizontal vortex movements.

The paper is a useful summary of all the observations taken in these waters, besides those of the *Frithjof* expedition.

Prof. Otto Pettersson and Commander C. F. Drechsel urge systematic hydrographical and biological investigations of the whole of the Atlantic Ocean as one of the most important scientific and practical tasks of the future. As a beginning, synoptical reconnaissances at different seasons down to a depth of 1000 metres, are recommended. The programme is drawn up in two heads:—(1) Investigation of coastal seas; (2) Transatlantic investigation cruises. Simultaneous quarterly cruises are recommended, because this method of investigation has been recommended by recent geographical congresses, and has served as a basis for the investigation of northern seas and the Adriatic, for obtaining a comprehensive view of the

[2] Report on Ocean Circulation. By Dr. Alex. Buchan. (*Challenger* Reports, 1895.)

[3] Proc. R. G. S., March 12, 1877.

conditions of the Atlantic in winter and summer. It is pointed out that the opening of the Panama Canal in 1915 gives a great opportunity for the different countries sending vessels to represent them of taking simultaneously an extensive series of observations from Europe to America. It is to be hoped that the different Governments will be induced to take part in carrying out this important work, and thus mark the union of the Atlantic and Pacific Oceans by a unique effort to add to our knowledge of the sea.

W. S. B.

ORNITHOLOGICAL NOTES.

THE spring number (vol. vi., No. 1) of *Bird Notes and News* is devoted exclusively to the Plumage Bill, and its effect, if passed on workers in the feather-trade in this and other countries. It includes a good report of the debate which took place when the Bill came up for second reading, together with the division-list on that occasion. Individual opinions from various persons on the matter, as well as the views of scientific bodies, are also quoted. It is added that the vast number of bird-skins (many of them representing rare species of the paradise group) offered for sale at auctions in London affords fresh testimony of the need for prohibitive legislation.

The March-April number of *Bird-Lore* records some of the steps which are being taken to enforce the recent regulations of the U.S. Federal Government with regard to the slaughter of game-birds and their transport from one State to another, special attention being directed to the seizures of long guns carrying half a pound of powder and a pound of shot. One of the illustrations shows the costly monument recently erected in Salt Lake City to commemorate the gulls which saved the crops of the first Mormon settlers by devouring the grasshoppers by which they were being devastated. As the gulls had "the time of their lives," it is not apparent why a monument was required.

The roseate spoonbill (*Ajaia ajaja*) of tropical America forms the subject of an article, illustrated by a coloured plate, in the issue of *Bird-Lore* for May and June. So long ago as 1858 it appears that the pink curlews, as they are locally called, on Pelican Island, Florida, were the prey of plume-hunters, some of whom are reported to have killed upwards of sixty a day, and from that time to this these beautiful birds have been persecuted by every man who could lay his hands on a shot-gun. Now, however, the National Association of Audubon Societies has succeeded in establishing reservations in Florida, where the spoonbills may breed unmolested.

An article on the stilt and another on the moorhen are among the more noteworthy contents of the April number of *Wild Life*, the former an account of the author's success in photographing such a rare and shy species, and the latter for the beauty of the pictures.

In view of the probable extermination of the species at no very distant date, owing to the introduction of foxes, an article by Mr. J. G. O'Donoghue, in the *Victorian Naturalist* for May, 1914, on the habits of the Victorian lyre-bird has a claim to more than ordinary interest.

A paper by Prof. J. E. Duerden, published in the Agricultural Journal of the Union of South Africa for October, 1913, deals with the mode of development of the feathers of ostriches, and the entire absence of cruelty to the birds in clipping them, at the proper season, for market.

Bird-lovers in South Africa owe a debt of gratitude to Mr. Alwin Haagner for the issue of the first part of a concise descriptive list of South African birds, published as No. 3 of the bulletin series of the publications of the South African Ornithologists' Union. This part includes the ostrich, of which the South African representative is regarded as a distinct species, the penguins, divers, petrels, gulls, and terns, cormorant tribe, ducks and geese, and the plover group.

An article by H. W. Henshaw on birds commonly to be seen in town or country in the United States, illustrated by sixty-four small portraits in colour, forms one of the most attractive features of the May number of the *National Geographic Magazine*. Of more general interest are two pictures, taken by Mr. R. E. Croker, representing a colony of something like 100,000 pelicans on the easternmost island of the Lobos de Afueva group, off Peru. Unhappily this vast colony, which had been unmolested for several years, has not escaped the attention of the guano-seekers, and, on a second visit, Mr. Croker found scarcely any pelicans near the old colony. "It is one of the tragedies," he remarks, "of the guano-industry that this important bird has received so little consideration."

It has been asserted that the Australian short-tailed petrel, or "mutton-bird" (*Puffinus brevicaudus*), takes no fewer than eight weeks to incubate its eggs. According, however, to a a note by Mr. J. Gabriel in the April number of the *Victorian Naturalist*, one out of a clutch of eight eggs placed under a domesticated hen was hatched in forty-six days, the remainder of the clutch being either broken or infertile.

In his annual summary of bird-life in Norfolk, published in the May number of the *Zoologist*, Mr. J. H. Gurney records that spoonbills were seen last year at Breydon Broad at intervals from May 1 to August 16. As the result of a comparison of previous observations, it appears that these birds generally reach Norfolk during the prevalence of north-east winds, which are probably unfavourable to their northward migration.

As the result of an exhaustive study of the extensive series of cuckoos' eggs and the foster-clutches with which they were associated (some three hundred in number) included in the fine collection of eggs recently presented by Mr. R. H. Fenton to Aberdeen University, Dr. J. Rennie, in an article published in vol. xix., No. 5, of the Proceedings of the Royal Physical Society of Edinburgh, arrives at the conclusion that the theory of the existence of different strains of cuckoos, severally characterised by laying eggs of distinctive types of colouring, will not hold good. According to this theory, as enunciated by the late Prof. A. Newton, one of these strains—"hedge-sparrow cuckoos"—generally lays eggs assimilating in colour to those of hedge-sparrows in the nests of that species; while "wagtail-cuckoos" act in an analogous manner in the case of the species from which they take their name, and so on. In the opinion of the author, the clutches in the Fenton collection lend no support to the theory of the existence of such strains, at all events in this country. This conclusion, it is urged, receives further support from the polyandrous habit of female cuckoos, as individual hens may mate at one time with a cock of the "hedge-sparrow," and at another with one of the "wagtail" strain. The author, it may be added, alludes to these supposed strains as "subspecies," which is certainly a misuse of that term.

The remarkable changes in the length and colouring of the beak and in the colour of the plumage undergone by the white ibis (*Guira alba*) during its development from the nestling to the adult stage are graphically illustrated in a coloured plate accompanying an article by C. W. Beebe, forming No. 12 of the first volume of *Zoologica* (New York Zool. Soc.). In the nestling the short beak has dark barrings, and