OUR ASTRONOMICAL COLUMN.

COMET 1907*d* (DANIEL).—The following set of elements and an ephemeris for comet 1907*d* have been computed by Herr H. H. Kritzinger, of Berlin, from places observed on June 15 and 24 and July 4, and are published in Circular No. 98 from the Kiel Centralstelle :—

Elements.

T = 1907 Sept. 4·168 (M.T. Berlin)

$\omega = 293^\circ\ 49'\cdot16$
$\Omega = 143\ \ 2'\cdot45$ 1907·0
$i = 8\ \ 56'\cdot37$
$\log q = 9\cdot71590$

An extract from the ephemeris is given below :—

Ephemeris 12h. (M.T. Berlin).

1907	α (true) h. m.	δ (true) ° ′	Brightness
July 24 ...	3 20·7 ...	+13 37·1	
26 ...	3 37·5 ...	+14 21·5 ...	9·84
28 ...	3 54·8 ...	+15 2·5	
30 ...	4 12·8 ...	+15 39·4 ...	11·81
Aug. 1 ...	4 31·4 ...	+16 11·3	
3 ...	4 50·1 ...	+16 37·5 ...	13·81

The brightness at the time of discovery is taken as unity, and it is very probable that the comet will become an easy naked-eye object during August. On July 18 it was easily seen by Dr. W. J. S. Lockyer, at South Kensington, with a small telescope of about 1¼ inches aperture and 11 inches focal length, the brightness on that date, according to the above ephemeris, being 6·38.

According to the ephemeris, the comet on August 1 will be 47s. east and 18′ 8″ north of Aldebaran, and will rise four hours before the sun.

ANOMALOUS REFRACTION.—No. 18 of the Miscellaneous Scientific Papers of the Alleghany Observatory contains a note by Messrs. Schlesinger and Blair on the effects of anomalous refraction on meridian-observation results. They show, from a discussion of the results obtained at the international latitude stations, that, at a properly chosen station, the effect is far less than the errors of observation in the best work that can at present be done. Incidentally, their computations indicate very strongly that the Kimura term in the latitude variation is real, and is not due, as has been suggested, to anomalous refraction.

ITALIAN OBSERVATIONS OF THE TOTAL SOLAR ECLIPSE OF AUGUST, 1905.—The various reports which have from time to time appeared in the *Memorie della Società degli Spettroscopisti Italiani*, dealing with the results of the Italian eclipse expedition to Alcalà de Chivert in August, 1905, are now collected into one volume as the complete "Rapporto della Commissione Italiana . . ." With photographs of the instruments in position, reproductions of the solar photographs obtained, and the full discussion of the astronomical and meteorological results, the volume is a valuable addition to eclipse records. Prof. Riccò discusses the colours of the prominences, the heights of the "reversing layer" and of the chromosphere, the white prominences, the corona, the spectra, &c., whilst the discussion of the meteorological results is due to Dr. Chistoni.

MICROMETER MEASURES OF JOVIAN FEATURES.—In No. 4190 of the *Astronomische Nachrichten* (p. 225, July 11) Dr. H. E. Lau gives the results of the observations of Jupiter made at the Urania Observatory, Copenhagen, during the opposition of 1906–7. The measurements of the five bands are first given, and are followed by the dimensions and positions of various "spots" in each band, the longitude and the motion of each feature, at a definite epoch, being appended. For the middle of the Great Red Spot Dr. Lau found the value of μ to be $+0^\circ\cdot071$.

JULY AND AUGUST METEORS.—Some valuable hints to meteor observers are given in the July number of *Knowledge and Scientific News* (vol. iv., No. 7, p. 150) by Mr. Denning. The article deals principally with the Aquarid and Perseid showers, both of which should now be active. The former apparently form a fixed radiant point, near to δ Aquarii, from about July 23 to August 23, but this needs substantiating by further careful observations. Mr. Denning suggests that observers should record, very carefully, the exact data for each individual object, and afterwards seek to determine the radiant points quite independently. For the Perseids, and for the Aquarids at their maximum during the last few days of July, the radiant should be obtained separately from each night's observations.

For the minor showers the radiants have never been adequately studied, and many more observations are desirable, whilst even in regard to the Perseids it is probable that a number of important features yet remain to be detected or confirmed. No moonlight will interfere during the maximum of the present apparition.

ORBITS OF BINARY STARS.—No. 5, vol. xxv. (June), of the *Astrophysical Journal* contains discussions of the orbits of κ Cancri and β Arietis by Mr. N. Ichinohe and Herr Ludendorff respectively.

From the discussion of twenty-five plates taken at the Yerkes Observatory, the former observer found the period of κ Cancri to be 3·393 days, whilst the eccentricity of the orbit is 0·149, and the length of its semi-major axis 5,890,000 km.

Seventy-six plates of β Arietis were examined by Herr Ludendorff, but only two lines on each, Mg λ 4481 and Hγ, could be employed in the discussion. The duplicity of the Mg line could not be detected on seventy-four plates, although, as mentioned in a previous paper by Dr. Vogel, it certainly does appear double on the other two. The writer of the present paper suggests that this doubling may be due to special disturbances in the atmosphere of the star. The results of the investigation show that the period of this binary is 107·0 days, the length of the semi-major axis of the orbit is 22,880,000 km., the total mass of the system, assuming that the masses of the components are equal, is 0·34 that of the sun, and that the eccentricity of the orbit has the extraordinarily large value 0·88. No other known spectroscopic binary orbit has an eccentricity greater than 0·55, although the values for several visual binaries exceed 0·80, but in these cases the periods are very much greater.

SCIENTIFIC WORK IN THE SEA-FISHERIES.[1]

IN the first lecture the earlier history of the pre-scientific period was alluded to, from the third century onward, and even in those early times fears as to the permanence of the sea-fisheries were prevalent, as shown by regulations as to meshes of nets, small or immature fishes, and other features. Indeed, ever-recurring fears as to the decline of these fisheries have been conspicuous. Inquiries and commissions were numerous, and in the seventeenth century many protective Acts were passed, and companies floated to encourage the struggling sea-fisheries, whilst in the eighteenth century the bounty system was instituted and was only abolished in 1830.[2] The Commission of 1833 reported that the fishes of the British Channel had declined since the peace of 1815, and that the fishermen and their families were dependent on the poor-rates for support. It is clear that at that time the finny wealth of the Channel was unknown. The Commission of 1866, on the other hand, came to the conclusion that the supply of sea-fishes was increasing, and admitted of progressive increase. Then the United States Fish-Commission came into existence, from the complaints as to the diminution of the fishes on the American fishing-grounds, and artificial hatching of sea-fishes commenced in 1878. In Britain, again, a commission of two reported in 1878 much as that of 1866 had done.

Lord Dalhousie's Commission of 1883–5 was due to the complaints of the liners against trawling, and it introduced scientific investigation into the subject for the first time. This investigation was made by the same eye and the same hand on sea and on land; a method of dealing with the fishes was adopted, and subsequently followed

[1] Abstract of two lectures delivered at the Royal Institution on May 4 and 11, by Prof. W. C. McIntosh, F.R.S.

[2] An interesting historical account of the sea-fisheries, by D. Fulton, from which part of the foregoing is taken, was given in the *Fish Trades' Gazette* for 1893.

in the case of the *Garland's* work under the Scotch Fishery Board. This scientific report gave an account of beam-trawl fishing; the kinds and proportions of saleable and unsaleable fishes; the proportions of the living and the dead and of the immature fishes; the development and growth of the food-fishes; and the universal presence of floating eggs in all the ordinary food-fishes, except the herring and the wolf-fish. It showed that no noteworthy destruction of the spawn of food-fishes occurred, and that the small or immature fishes from the deeper waters consisted chiefly of dabs and long-rough dabs. It gave the distribution of the food-fishes on the various grounds, and the relative condition of the districts; a list of unsaleable fishes (chiefly frog-fishes); the fauna of the trawling grounds—surface and bottom; the food of fishes; temperature of the air; temperature of the surface and bottom water, and other points, including the satisfactory condition of the fishes themselves, and the effects of frequent hauls of the trawl on the same ground. It demonstrated that the inshore was dependent on the offshore for the supply of eggs and young of various fishes; that a gradual passage of the eggs and young shorewards, and of the growing fishes at a later stage seawards, took place. Further, that in a bay like St. Andrews Bay, constant and long-continued trawling did not exhaust the fishes, and that the men invariably kept the same line (by fixed land-marks) in their operations, a feature which at once disposed of the fears as to "trawling out." No interference with well-conducted modes of fishing was suggested.

The scientific report further recommended the establishment of experimental sea-fish hatcheries, the closure of certain areas for experiments, and the keeping of records by all fishermen of the ground, weather, depth, and nature of the fishes. Statistics were put on an improved footing in Scotland. The Fishery Board for Scotland received increased powers and funds, and carried out the trawling experiments in the closed areas, but it did not follow the advice given as to ship, staff, apparatus, and regularity of work. The Board proceeded further to close other areas, such as the Moray Firth, but upon data which science rejects. The Parliamentary Committee of 1893 followed, but the scientific evidence as to diminution was founded on data supplied by the Scotch Fishery Board, and, unfortunately, the faulty method of handling the statistics misled all as to the supposed decrease of flat-fishes. Carefully checked subsequently, the work of the Board's ship *Garland* showed that no increase of fishes had occurred in the closed areas, that the fish-fauna at the end of the ten years' experiments stood very much as at the beginning, and that, on the whole, the marine food-fishes were able to withstand man's interference. Other committees, such as that on the "Immature Fishes Bill" and the "Ichthyological Committee," were also dealt with. Sea-fish hatching was shown to be inconclusive up to date, whilst the enormous numbers of young fishes in the sea rendered the procedure of doubtful advantage.

The whole history of the subject, including the most recent work and statistics in America, Canada, Japan, Newfoundland, Norway, St. Andrews Bay, and elsewhere, showed that it was neither scientific nor practical to doubt the permanence of the British marine food-fishes or the marvellous resources of nature in the sea. Even the lobster (a form supposed to be diminishing) had been shown by Prof. Prince, of Canada, to be able to hold its own in the most rigorously fished district of western Nova Scotia. If such a species can do so, how much more the food-fishes, which survive notwithstanding the distrust of the public and the fishermen, and the fears of the learned as to man's upsetting the balance of nature.

LECTURE II.

In taking a broad survey of the reasons which prompted our country to join in the International Investigation of the Sea, it would appear that the main object was the prospective benefit to the British fisheries, though the testing of the antagonistic views, viz. of the "Resources of the Sea" and the "Impoverishment of the Sea," may have influenced the decision. The lines upon which such work should be carried out had been laid before the Ichthyological Committee, and subsequently published.[1] It is difficult to ascertain what the British investigators expected to discover, but, briefly, one of their tasks was to find out "whether the quantity and consumption of fish taken from the North Sea and neighbourhood are in proper proportion to the production." To this the observers added the exploration of the small fish grounds. The ambiguity on the subject is apparent from the mention of the "publication of annual results," of "discoveries of practical importance to the fisheries," and of "recommendations for international action."

One department, viz. hydrography, made itself prominent from the beginning, but a study of its work in the German ship *Pommerania* in 1872, of the efforts to connect temperatures with the captures of fishes in 1884, of the observations of the Scotch Board in the eastern and western waters of North Britain, of the International Survey of the North Sea (in which the same Board joined) in 1893–4, gave reasons for reserve. The present results of hydrography in connection with the fisheries in the international investigations emphasise this reserve.

We now turn to the work of the senior naturalists whose efforts were to be directed to the elucidation of fisheries' problems, such as the present condition of the food-fishes of the North Sea, and to prove the "impoverishment of the sea." Briefly, the Marine Biological Association, in the southern area of the North Sea, announces that "facts have been obtained upon which a proper understanding of the yield of the sea must in future be based," and that this pregnant statement rests on the results of experiments with marked plaice. From the numbers subsequently captured three important conclusions are drawn, viz.:—"(1) the migrations of the species, (2) the rate of growth, and (3) the intensity of fishing." Marking of plaice has long been carried out by the Scotch Board, by the Americans with cod, and by the Germans and Dutch in the international work also on the plaice. A simple method of tattooing is suggested as more likely to place the fishes (plaice) on a normal footing than the present somewhat rough one of silver wire and buttons. The data are yet too few and the time too short for a trustworthy conclusion, and British and German observers disagree. The second head has long been studied, and the present observations relate rather to the proportional rate of growth in connection with locality. Thus plaice transplanted from the Horn reef to the Dogger shoal grew faster than would have been the case had they remained, but this increase was exceeded in the Scager Rack. Transplantation is thus suggested by Dr. Garstang, as the Danes have done for some years in the Lim Fjord. So far as experience goes, however, there is little fear of suitable areas off our open shores being left unoccupied by such fishes as the plaice. The third head is apparently considered important by the Marine Biological Association, the percentage captured in the offshore waters being 20 and in the inshore 10, so that it is concluded that a limit has been reached in sea-fishing, and that it is no longer an uncertain pursuit (in the hands of the association). But this conclusion is not supported by long experience in St. Andrews Bay, nor by the history of the plaice-fishery of the Cattegat, nor by the work on the old trawling grounds on the east coast. The international observers, again, differ amongst themselves, the number experimented with being too few for a conclusion so important.

In the northern section hydrographical work is again too prominent, and surprise was felt that a new and original series of fisheries' investigations, based on a well-considered plan, was not forthcoming. The statistics of commercial trawling vessels and their treatment have little real bearing on the present inquiry, even though they are portioned out in Fulton's squares, yet it is asserted "that by these methods, if we only had statistics enough, we should mark down accurately for each fish the time of the coming at every position in the North Sea, and then weaving all the facts together show the route followed in the migration of any species." A tribute may be paid to this enthusiasm, but the importance of all these pages of tables and curves is doubted.

A contribution of a different type is that of the Scotch

[1] "A Second Decade of the Sea-Fisheries," 1903.

Board on "The Distribution and Seasonal Abundance of the Flat-fishes in the North Sea," by Dr. Fulton. This is also largely a statistical paper, and somewhat overlaps Henking's work in the North Sea and the Cattegat, and Dr. Heincke's, so far as flat-fishes are concerned. A main point is the "complementary and compensatory fluctuations" in the statistics, *e.g.* the "witch" or pole-dab in square xiv., near the Fair Isle, taking, during the winter, the place of dabs, lemon dabs, and plaice. Uncertainty, however, exists, as no other method of fishing than trawling was used on the same ground to make sure the other forms were not there. This condition is well known to fishermen. In regard to the maximum of the captures in each fish, it is found that it corresponds to the spawning season. While this paper likewise does not deal directly with the great question handed over to the Scotch Board to solve, it indirectly supports the "Resources of the Sea" in so far as the total average of lbs. per hour of fishing was greater (in flat-fishes) in 1903 than in 1901.

One of the most important papers is that of Dr. H. M. Kyle, who shows that the quantity of fish of all kinds landed in the North Sea ports, and especially of flat-fishes, was greater in 1903 than in 1902. This is clearly substantiated by Johansen's observations on Danish plaice. Hjort's work, again, removes any fear of diminution of round fishes for the supply of the North Sea.

While, therefore, the work of the British international observers up to date does not show an answer to the fundamental question submitted by the Government, yet it inadvertently supports the "Resources of the Sea," and is fairly compatible with the safety of the fishes in the North Sea. Finally, a separate English Fisheries Board, as Lord Dalhousie recommended, was suggested.

NEW ZEALAND PETROGRAPHY.[1]

THE first volume of this work was reviewed in NATURE of January 4, 1906, vol. lxxiii., pp. 234, 235. We noticed in that place the reasons which led to these Cape Colville rocks being selected for special study, and also the circumstances which made it necessary to call in extraneous aid for the descriptive part of the work. Of the volume now before us, the first two-thirds, to which alone the title of the book is properly applicable, completes the account of the volcanic rocks of the Cape Colville Peninsula. As before, the petrographical descriptions are by Prof. Sollas, and the notes relative to locality and occurrence by Mr. McKay, who also furnishes a clear geological map of the district. The details of mineralogical composition and micro-structure do not include much that is new, though we may mention the occurrence of a felspar of the anorthoclase type in some of the rhyolites, the frequent association of hornblende (or its pseudomorphs) with hypersthene in the andesitic rocks, and the presence of olivine in certain basic hypersthene-andesites or hypersthene-basalts. The interest of this collection of Tertiary andesites, dacites, and rhyolites lies, not so much in any novelty which they present, as in the close resemblance of the whole assemblage from this "petrographical province" to familiar types from better-known areas, such as Hungary and the Great Basin of North America.

The lack of arrangement and some minor blemishes, on which we will not insist, are drawbacks doubtless incidental to the conditions under which the work was carried out, by the cooperation of a petrologist in England with a field-geologist at the Antipodes. When this investigation was taken in hand, Mr. McKay, we believe, embodied in his own person the Geological Survey of New Zealand, and the work must be considered a notable production in these adverse circumstances. The re-organised Geological Survey, under the directorship of Dr. J. M. Bell, has begun operations with greater advantages, and two important memoirs of the new series have already appeared.

A special feature of the present work is the profusion of plates. This was not, we understand, a part of the original design, but it greatly enhances the value of the book. In the two volumes more than two hundred full-page plates are devoted to the illustration of the volcanic rocks of the Cape Colville Peninsula alone. The thin slices have been photographed with polarised light, usually with an amplification of sixty diameters, and most of the plates are very successful in rendering the micro-structure of the rocks selected. Such a collection of illustrations is welcome independently of the immediate object of the book, and the fact that most of the rocks belong to types of world-wide distribution is, from this point of view, an advantage.

The latter part of this volume is devoted to the description and illustration of various rocks from numerous places in New Zealand. Some of these, from the Kaimanawa Mountains and other localities in the North Island, are volcanic rocks generally comparable with those of Cape Colville. Other descriptions are included here, without regard to relationship, to fill out the volume, and the want of any orderly arrangement gives a somewhat confused appearance to this section. Some remarkable teschenites are described from the east coast of Wellington Province. They appear to occupy the neck of an old volcano, and it is noteworthy that, like the similar rocks from some European localities, they are referred to a Cretaceous age. Special interest attaches to a collection of crystalline schists from Westland Province, on the west side of the South Island. In addition to garnetiferous mica-schists, epidote-amphibole-schists, and other ordinary types, there occurs a series of schistose ultrabasic rocks composed of serpentine, talc, tremolite, calcite, &c. Through the same district there runs also a belt of massive ultrabasic rocks, viz. fresh and altered dunites. The geological relations of these two very interesting groups are only briefly touched in this work, but they are fully discussed in the first Bulletin (new series) of the Geological Survey, already mentioned.

Prof. Sollas's investigations, while devoted mainly to the exhaustive description of one group of rocks, afford also a glimpse of the rich variety of material which New Zealand offers to the petrographer. When we recall further the widely different "petrographical province" of Dunedin, characterised by highly alkaline rock-types, some of which have recently been described by Dr. Marshall, we may expect that a more comprehensive examination of the igneous and crystalline rocks of the colony will result in further important additions to petrological science.

A. H.

UNSOLVED PROBLEMS IN THE DESIGN AND PROPULSION OF SHIPS.[1]

THERE are but few problems in the design of ships, as in most other branches of engineering, that can be exactly or completely solved in the full scientific meaning of the word, and those are of a secondary character. The primary or fundamental problems of safety, strength, speed, and steadiness at sea are far too complicated to bring under anything like general mathematical treatment. The results obtained by the most advanced calculations cannot be applied directly to the real conditions of a ship at sea. After all is said and done, they merely relate to hypothetical cases which are simple in character and are amenable to mathematical treatment. Some of these calculations are very elaborate, and their elaboration may sometimes tend to magnify their importance. The real problem is often very imperfectly dealt with after they are made, and it can only be solved approximately for working purposes by accepting the results of calculation for what they may be really worth, judging of the allowances required for their incompleteness, and using them in a scientific way and a scientific spirit to arrive at safe conclusions. We are obliged to come to a conclusion somehow, because we have to build ships as well as we can, whether we can solve exactly all the problems that arise in their design or not; and we have to take the responsibility of guaranteeing results, however difficult to obtain, or of declining to do so, within the time allotted for the preparation of

[1] "The Rocks of Cape Colville Peninsula, Auckland, New Zealand." By Prof. Sollas, F.R.S.; with an Introduction and Descriptive Notes by Alexander McKay. Vol. ii. Pp. 215; with geological map and 133 photographic plates of rock-sections. (Wellington, N.Z.: J. McKay, 1906.)

[1] Abridged from the "James Forrest" Lecture, delivered before the Institution of Civil Engineers on June 18, by Dr. Francis Elgar, F.R.S.