

Reviews.

Verhandlungen der Ozeanographischen Konferenz anlässlich der Hundertjahrfeier der Gesellschaft für Erdkunde zu Berlin, 24—26 Mai, 1928. — Ergänzungsheft III z. Zeitschrift der Gesellschaft f. Erdkunde z. Berlin — pp. XIV + 156 with 86 text figures and 3 tables. Berlin. 1928.

The Gesellschaft für Erdkunde zu Berlin celebrated its centenary on the dates May 24th—26th, 1928, and the volume under notice constitutes a special supplementary number of the Society's Journal devoted to the papers read at the two day oceanographical conference which fitly marked the occasion. Naturally from the German side, the methods and results of the Meteor Expedition constituted the chief theme, and Dr. BÖHNECKE had arranged an exhibition of oceanographical instruments. The organisation of the conference was in the hands of a "Presidency" comprising Staatsminister Dr. SCHMIDT-OTT (President), Admiral ZENKER, Staatssekretär Dr. HEINRICI, Vize-Admiral DOMINIK, Professor Dr. DEFANT (organising Secretary), Professor Dr. E. v. DRYGALSKI, and Professor Dr. A. PENCK (President of the Gesellschaft).

In his foreword to the volume, the Editor records that the chief motive in inviting the various lecturers, was the desire to provide a medium for authoritative accounts of expeditions recently carried out, or shortly to be carried out. Apparently lateness of receipt prevented the publication of two papers sent in. The publication of the volume was rendered possible by a considerable subvention from the Notgemeinschaft der Deutschen Wissenschaft. There is printed an opening address given by Dr. SCHMIDT-ORR; in it he referred to the achievements of the great ocean research expeditions of the past, both German and non-German, and said that such work always aroused general interest no matter by what nation it is carried out. He touched upon the pleasant associations which his official duties had given him with preparations for such marine research expeditions as concerned the Reich. The Meteor Expedition he said, had had the inestimable boon of co-operative assistance from the Notgemeinschaft der D. W. and the German Navy. They had placed the Meteor Expedition in the forefront at the conference with the result that other expeditions perhaps "took a back seat", but they trusted that this would not be taken as a sign that they over-valued their own work. The position of precedence was a grossly inadequate recognition of the courage, endurance, and complete devotion to duty of the scientists,

ships' officers and men. What particularly distinguished the Meteor Expedition was the scheme of operations drawn up by their never to be forgotten friend ALFRED MERZ. By the exercise of admirable care and forethought, MERZ had been able to include in the scheme of work, an abundance of apparently irreconcilable activities. The speaker had, when he met the Meteor at Tenerife on her home-coming, been astounded to note with what precision MERZ had foreseen even what bulk of records would be amassed. The systematic accomplishment of the entire project surely offered a specially valuable stimulus to future ocean research voyages and, in consequence, they had made very special efforts to accelerate the publication of the results accomplished; all would be published within five years.

Before an audience including some 130 delegates from geographical and allied societies all over the World, Professor A. DEFANT gave an address upon "Die Systematische Erforschung des Weltmeeres". This paper is not printed in the book under review as it had already appeared in a special jubilee volume of the Society's journal along with a very important paper by WÜST upon "Der Ursprung der Atlantischen Tiefenwässer". Professor DEFANT said that MERZ's Meteor Expedition had as its prime task, the prosecution of a systematic physico-chemical exploration of a large ocean area and the production thereby of a large mass of material which marine research in all oceans needed to-day for its further development. This expedition typified the change over from the more qualitative grasp of oceanographical facts. The speaker showed how meagre were the hitherto available data which could usefully serve to elucidate the deep water circulation of the oceans; — in the Indian Ocean only two and in the Pacific Ocean only sixteen stations had been worked at over 3000 metres. In the Atlantic, prior to the Meteor Expedition, the available data merely sufficed to permit one to draw a far from reliable section along 30° W. The southern Atlantic is known now thanks to the Meteor Expedition, but there remain many ocean areas hardly explored yet. Professor DEFANT sets up some very interesting analogies between the physics of the atmosphere and the hydrosphere; we read of marine analogies of troposphere, of stratosphere, of centres of action, and of polar fronts. These analogies are far reaching but are of enantiomorphic application. The warm troposphere extends down to some 1300 metres and under it occurs the oceanic stratosphere whose waters are homothermal having weak currents only — due to local salinity differences. The disturbance zone is the upper 200 metres layer of the troposphere. Under the hypothesis of an enclosed hydrosphere, theoretical ideas as to the position of the junction surfaces between tropo and strato-spheres are worked out. A further step is the deduction of ocean currents and it is found that deduction and practical knowledge accord remarkably well. The currents of the troposphere are in the main conditioned by the effects of radiation and wind on the uppermost layers within the oceanic polar fronts; those of the stratosphere on the other hand result from precipitation, ice melting, and radiation to the sea surface polewards of the polar front.

Professor HABER of Berlin gave a paper on "Das Gold im Meere". Estimations existed pointing to a gold content in sea water ranging from

3 to 60 mg. per tonne and the speaker had wondered whether extraction on a paying commercial scale were not possible. The analysis made use of depends upon the production of a metallic bead by the ignition of a precipitate of lead sulphide in which the gold was thrown down. From 186 Meteor stations spaced over ten lines of stations, about 1400 sea water samples were analysed satisfactorily and the gold content, expressed as a grand mean worked out at 0.004 mg. per tonne — a result about $\frac{1}{1500}$ of that previously accepted. Professor HABER finds it perfectly impracticable to make paying commercial extraction. A very important result is his proof that gold is present in suspension — a fact known earlier but now more certainly established for a wide area. The surface waters are richer in gold than are the waters of the depths, and Professor HABER finds reason to explain the variation in gold content at different depths and in different areas as due to actual gold transporting powers of the various members of the plankton.

Professor BJØRN HELLAND-HANSEN spoke on “Meeresforschung mit kleinen Forschungsschiffen”. His chief theme was the great value of small research vessels in enabling one to fill in the details of oceanographical pictures only roughly blocked out by the necessary initial big ship expeditions. We are given an impressive account of the work done from small Norwegian research vessels, and are reminded that in many areas a very closely spaced widely spread net of stations must be worked since often great differences are observable at short distance intervals. Small vessels are much more economical to run and many small ship expeditions are immeasurably preferable to a few large ship expeditions. Nowadays theory tends to lead practice in oceanography, thanks to such mathematical processes as those available for the deduction of convection currents. Details of the 57 ton “Armauer Hansen” and an account of some of her achievements are given. Particularly interesting is Professor HELLAND-HANSEN’s showing that apparent submarine seiches may sometimes be due to the lateral movement of sloped discontinuity surfaces.

Professor JOHAN HJORT next spoke on “Die Pläne der Internationalen Meeresforschung”. After insisting upon the debt which modern oceanography owes to the venturesome sea-captains and whale-fishers of old, he led up to the initiation of modern quantitative marine research with its investigation of the inter-dependence of plankton and manurial substances. A specially interesting point is his query as to whether the great equatorwards going movement of polar water at depths of 500—1000 metres (as now demonstrated by the Meteor results) does not explain the previously known presence there of the sperm whale’s food — via the fundamental plankton link provided by a rich plankton content of this polar water. Professor HJORT gave a brief review of some of the fishery research work done by the Council’s adhering countries.

The next speaker was Director VAN RIEL who gave an account of “Die geplante niederländische Expedition in die Meere des ostindischen Archipels”. A review of the meagre available oceanographic data is given and it is stated that geology, physics and chemistry will figure chiefly in the work to be done. One important task is to assess the water exchange between the two oceans via the Straits of the Archipelago. Details of the

1050 tons research vessel "Willebrord Snellius" are given. The expedition will last about 15 months in all. The vessel is fitted with two types of echosounder.

A paper by Messrs. J. A. FLEMING and J. P. AULT follows, entitled "Program of scientific work on Cruise VII of the Carnegie — 1928-1931". The present cruise will add some 110,000 miles to the handsome total of 290,000 miles already covered in all oceans. Thanks to improvements in instruments which have cut out the necessity of carrying duplicates and of duplicating many routine observations, it has been possible to include a programme of oceanographical work. The work done aboard this specially designed "non-magnetic" yacht, makes very interesting reading indeed. She is a veritable mass of instruments and all of these seem to have been brought after long use and experiment, to a high pitch of perfection. Little save trawling seems to be left out of the ambitious scheme of work.

The next paper is of very special interest and would merit a very full review were such possible. It is by Dr. GEORG WÜST and is entitled "Ozeanographische Methoden und Instrumente der D.A.E."¹). Dr. WÜST's actual discourse is not all contained in the paper before us. The progress of ocean research is, we read, necessarily bound up with the development of more searching methods and of much improved instruments. MERZ drew up the D.A.E. working plan with this conviction. The D.A.E. marks a break with the time honoured practice of piecemeal working; for such is substituted a systematic survey of an entire ocean. The oceanographical programme was the chief concern of the expedition and its chief goal the elucidation of the deep water circulation *via* temperature and salinity studies. Some 9,000 observations of both salinity and temperature were made from the 310 stations worked; some salinity samples were analysed six times. We are given an impressive account of almost incredibly accurate apparatus, of thermometers correct to $\pm 0.005^\circ$ C. and of salinities determined to ± 0.004 ‰ chlorine. By means of the highly successful employment of special thermometers responding to pressure change, the actual depth from which samples were taken is correct to within 10 metres. Direct current measurements down to 2500 metres were made at anchor stations by means of EKMAN's repeating current meter and the new Merz-Ekman deep sea current meter. The main findings as regards the deep water circulation were given.

Professor HENTSCHEL of Hamburg reports upon "Die biologischen Arbeiten der D.A.E." and his paper is a record of almost herculean labours. Some 1245 centrifuged samples of micro-plankton were quantitatively analysed aboard; micro-plankton from all depth horizons was studied. Recognisable connections between plankton, currents and phosphates are noted. Areas of upwelling (e.g. of Cape Blanco) have a profuse plankton population.

Dr. WATTENBERG's paper on "Die chemischen Arbeiten der D.A.E." follows. Amongst a wealth of interesting things we learn of a connection found between CO₂ tension and chalk content in the water samples.

¹) "D.A.E." is used herein as an abbreviation for Deutsche Atlantische Expedition.

Dr. SCHUMACHER writes on "Die stereophotogrammetrischen Wellenaufnahmen der D.A.E.". Particularly interesting is the statement that the accuracy of the instruments was tested out by photographing Saint Paul's Rocks. It seems that 9 metres was the height of the highest wave measured.

Professor CORRENS writes on "Mineralogisch-geologische Arbeiten der D.A.E.". A remarkably fine scheme of work was carried out; the use of artificial matrices of canada balsam enabled microscopical examinations of ooze sections to be made. Elutrication treatment was given to samples. One finding was that the Congo-Cape basins have lime rich sediments and the Brazilian basin clayey deposits.

Professor Dr. H. MAURER writes on the Meteor's echo sounding work. An area 90 times as big as Germany was covered with soundings; 67,400 soundings were made, an achievement which, by the use of wire soundings would have occupied some 7 years.

Kapitän SPIESS writes about the ship herself and the nautical work and his account is really extraordinarily interesting. We read a striking tale of difficulties due to inadequate propulsion power and of stringent watch upon steam consumption necessitated by exigencies of coal supply. The account of the deep sea anchoring gear is very instructive.

This volume is of very great value indeed as a handy epitome of the work done on the D.A.E. Such notice as it has been possible to give of the many excellent and important papers is almost uselessly "scrappy" but an English summary of the volume has been prepared by the reviewer and could be consulted by anyone interested.

J. N. CARRUTHERS.

J. N. CARRUTHERS. The Flow of Water through the Straits of Dover as gauged by continuous current meter observations at the Varne Lightvessel (50°56' N. 1°17' E.). Part I. Methods employed, with a Preliminary Survey of the Results. — Ministry of Agriculture and Fisheries. Fishery Investigations. Series II. Vol. XI. No. 1. London 1928. 108 pp. 34 charts.

Die Reststromuntersuchungen des Verfassers im Kanal und in der südwestlichen Nordsee, die mit einem für kein Meeresgebiet in nur annähernd ähnlich reichem Umfange vorhandenen Beobachtungsmaterial an Flaschenposten erfolgreich durchgeführt sind, erfahren nun eine wichtige Ergänzung durch Beobachtungen mit dem vom Verfasser obiger Veröffentlichung konstruierten Reststrommesser, über den in dieser Zeitschrift bereits ausführlich berichtet ist.¹⁾ Das Instrument hat, wie die Erfahrungen bewiesen haben, drei grosse Vorzüge; es ist robust genug, um von der Feuerschiffsbesatzung bedient zu werden, auch kann es längere Zeit ($\frac{1}{2}$ —1 Jahr) benutzt werden, ohne dass es reparaturbedürftig wird, und endlich ist der Strommesser auch bei stürmischem Wetter gebrauchsfähig, es ist nicht erforderlich, ihn dann einzuholen.

¹⁾ J. N. CARRUTHERS. A new current measuring instrument for the Purpose of Fishery Research. — Journal du Conseil, Vol. I. 1926, pp. 127—139.