BOOKS IN REVIEW

ANNALES HYDROGRAPHIQUES

(Hydrographic Annals)

Series 4, Vol. 7, Year 1956

410 pages; plates and figures; 24 × 18 cm
Service Hydrographique de la Marine, Paris

Volume 7 (1956), series 4, of the *Annales Hydrographiques* (Hydrographic Annals) issued by the French Navy Hydrographic Office was published during the latter part of 1957.

As in previous years, the present issue contains hydrographic survey reports by survey heads and technical notes.

Among the survey reports should be mentioned those submitted by the West Africa Coast Survey and Madagascar Survey.

The same pattern has been followed throughout the reports : each area surveyed is covered by sections devoted to triangulation, tides, soundings, topography, hydrographic information, and as necessary, to miscellaneous topics such as oceanography, magnetism, etc. Various lists accompany the reports : rectangular coordinates of points in the triangulation, tidal benchmarks, limits of areas surveyed, and sketches of signals and marks.

The Bureau has attempted to note in these reports new methods used and those which may serve as valuable hints to hydrographic surveyors.

(1) *West Africa Coast Survey* (1952-1953)

(*a*) Off the coast of Mauritania, in the region of Tanit, the survey was unable to make tide-gauge observations according to the conventional method, owing to the prevailing high swell.

Accurate heights were nevertheless obtained by means of level sights on a staff, the base of which was flush with the smooth surface of water contained in a tube. The tube was submerged at an appropriate depth and communicated with the water through a filter base which completely overcame the effect of the swell.

(*b*) The height of the swell was measured by means of a graduated Warluzel wire strung over a pulley at the end of one of the ship's booms. A fish lead maintained the lower end of the wire on the bottom, and a lighter ballast at the other end, plumb with a second pulley attached to the same boom, kept the wire taut. The direction of swell was measured by compass.

(*c*) Off Pointe-Noire, soundings were taken between 1900 and 0300, since visibility by daylight was inadequate and no radio aids were available. The surveying vessel's position was fixed from three points ashore, to which groups were assigned for taking sights. Each group took theodolite sights on a crown of 12 lights fixed to the mast head. Accuracy in timing was ensured by switching the lights on and off and checking by radio telephone. Angles were reported to

the ship by radio telephone in a specified order. Changes in direction and orders were radio telephoned or signalled by projector.

Stations were immediately computed on the bridge, enabling allowance for current and close adherence to the prescribed course.

During daylight, service by automobile ensured the collecting of records, battery replacements, repairs to radio sets as needed, victualling, etc.

(*d*) Numerous measurements of magnetic elements were obtained : declination, inclination, and horizontal components at various points along the coasts of West and Equatorial Africa. All values of previous measurements in these areas were investigated to enable plotting the secular variation curves of each element. These curves are reproduced in the report.

(2) *Madagascar Survey (November 1952-May 1954)*

(*a*) Soundings off shore were taken along straight-line courses fixed by Wild T3 theodolite sights. This method, in addition to convenience of operation (subject to good radio telephone connections), had the advantage of providing a network spaced in proportion to the distance from the coast (corresponding to a continuous scale variation between 1/25 000 at the limit of coastal soundings to 1/100 000 at greater depths).

(*b*) In the Comoro Islands, it was noted that measurements of the dip of the horizon carried out at a specified point in various azimuths varied by considerable amounts. These islands are very sheer, rising to a height of 2 360 m (Grand Comoro), and are located on an insular shelf in 3 500-metre depths. The result is a very pronounced deviation from the vertical. Measurements of dip at three or four points on each island, in successive 30-degree azimuths over a wider than 180° horizon (say 240°), would be a simple method of obtaining absolute deviation from the vertical.

(*c*) The report countains a morphological study of the submarine relief of certain points of Madagascar and its dependencies, including a description of the submarine canyons south of Ile Sainte Marie, the coral shelf of Juan de Nova and Europa Islands, and the barrier reef of Mayotte.

(*d*) In the Cape Ankarana area, no triangulation could be carried out by conventional methods : no triangles with points inside could be constructed owing to a uniformly flat hinterland, grown over with baobab or mangrove forests. The survey carried out a geodetic traverse in this area by taking Wild T3 theodolite sights of the ship simultaneously from three stations, the coordinates of two being known (see *Annales Hydrographiques*, 1954, page 83). The accuracy obtained by this method reached 1/250 000.

The most interesting technical note is one entitled *The Concordance Method and Harmonic Analysis by Approximate Constants*, by Ingénieur Hydrographe Principal Marc Eyriès (*).

(*) See *International Hydrographic Review*, Vol. XXXIV, No. 1, May 1957, page 127.

COURS D'OPTIQUE

(Optics Course)

by Ingénieur en Chef Géographe CRUSET
(Course given at Training School of French Navy Hydrographic Office)

400 pages; figures; 28 × 24 cm
Service Hydrographique de la Marine, Paris

The French Hydrographic Office has continued to publish the courses given at the Training School (Ecole d'Application), the latest being a course in optics for student hydrographers of the first division.

Other courses issued to date include material on astronomy, hydrography, tides, photogrammetry, radio and underwater acoustics, and port installations. As each course appeared it was reviewed in the International Hydrographic Bulletin.

The volume on optics is mainly concerned with the optics of sighting instruments, particularly instruments for long-range observations. The mechanical aspect and the devices which give the observational instrument the added character of measuring apparatus are however treated in the instruments course. Since the eye of the observer — or both eyes in the case of binocular instruments — obviously play an essential part in the concept of instrumental optics (designed to make up for deficiencies of the naked eye) and their application, a considerable section of the course is devoted to studying the characteristics of sight, or physiological optics. Three lectures are given up to photography, an applied science insufficiently studied in France. In view of the limited number of lectures, a maximum effort has been made to avoid repeating subject-matter on optics given in higher mathematics courses.

The course may be of interest to hydrographers in charge of testing observational instruments acquired by hydrographic offices, and of investigating instrumental development.

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The course is divided into six sections each consisting of two or more chapters.

Part I chiefly discusses the features of physical optics, including :

(1) properties of *physical media* used in optics, both in the mass and near the surface;

(2) properties of *light rays,* or of rays adjacent to the visible spectrum, traversing physical media, and refracted or reflected from the surface;

(3) properties of *receptors,* particularly the human eye, on which the rays, affected in varying degree by the traversal of optical media, produce a certain effect. Among optical media, the most important by far in instrumental design is optical glass. An entire chapter is devoted to this subject.

Part II describes the *ideal instrument :* a sort of standard for evaluating actual instruments. The theory of this ideal instrument is dealt with in an individual chapter, and the subject treated as a whole, rather than by stages, from the plane mirror to the spherical, the flat plate to the spherical lens, or the single surface to the centred system, such as in higher mathematics manuals. An instrument is necessarily limited. The consequent *diaphragming* of light rays has extremely important results, and a treatise on optics might almost be based on this consideration alone. The chapter on this subject essentially covers diaphragming in the ideal instrument. The final section on the ideal instrument contains a chapter on *photometry.* Although much of the material is known

already to student hydrographers, photometry calls for so many definitions that a considerable amount of information previously learned has often been forgotten.

Part III discusses the optical defects of *actual instruments,* i.e. differences between actual instruments and the standard represented by the ideal. These defects are of three types :

— those due to imperfections of instrument construction, flaws of curvature, in the distance between glasses, centering, etc. Instruments being the imperfect product of man and of the machines he has created, such defects are generally mechanical. They are ascertained and partially corrected by checks and adjustments. These questions are not covered in the course;

— defects due to the nature and composition of light, and affecting the quality of the instrumental image. These include *chromatism* and *diffraction,* which are chiefly studied in relation to the ideal instrument, and to a lesser extent in regard to the actual instrument. The reason for the summary treatment of diffraction in the course is twofold : a complete survey is a long and arduous task, and observational instruments used as measuring instruments generally show, for various reasons, residual geometric aberrations, the far more important effects of which mask those of diffraction;

— defects known as *geometric aberrations,* which are a direct result of the laws of geometrical optics, i.e., the propagation of light in a straight line and obedience of the laws of Descartes at the surface of separation of two media. The study of geometric aberrations is not unduly stressed by the course; only the main features are outlined, and the fact is brought out that geometric aberrations of the third order, extensively discussed in higher mathematics courses, are not as significant as such courses would lead one to believe.

A few hints on the *computation of optical combinations* and the study of a number of *unusual lenses* enable the hydrographer making use of an instrument to evaluate the individual importance of its component parts.

Part IV consists of information on *physiological optics :* eye measurement system; ametropia; quality of retinal images; a brief account of comparatively recent work on vision when brightness and contrasts are low; the Stiles-Crawford effect, invalidating certain conclusions of conventional instrumental photometry; colour vision; and the reconstitution of relief through binocular vision.

Part V contains general information on the optics of *long-range observation instruments,* the most important type for the students attending the course. There are two chapters : one on instrument *characteristics,* i.e. magnification, brightness, resolving power, and field; the other on instrument *components,* i.e. objectives, eyepieces, rectification and deviation systems, and micrometers. Owing to their minor importance in surveying technique, instruments used for observations at short range, such as magnifying glasses and microscopes, are not discussed.

Part VI, the concluding section, consists of a condensed survey of *photography.* The first chapter discusses its *geometrical, optical* and *mechanical* aspects : the composition and characteristics of objectives, which constitute the essential elements of photographic apparatus; and the properties of the emulsion film base. Chapter two describes the *physical* and *chemical problems* of photography : the manufacture and structure of photographic emulsions; and, in brief outline, the theory of latent image formation and of development, the laws which govern darkening, sensitometry, various effects, etc. Chapter three deals with the various aspects of *subject rendering :* the resolving power of the « objective-sensitive surface » combination; the theory and practice of optimum time-exposures; the conditions that should govern the examination of photographic paper and the selection of appropriate paper for a given negative; contact printing and enlarging; and various processes of colour photography.

LES OCEANS (The Oceans)

by Jules ROUCH

216 pages; 14 figures; 17 × 11 cm
Librairie Armand Colin, Paris

Captain J. Rouch (Ret.), a distinguished oceanographer and Honorary Director of the Monaco Oceanographic Institute, has published in the Armand Colin Scientific Collection (No. 320, Physics Section) a précis on physical oceanography entitled : *Les Océans* (The Oceans).

This volume is an extremely complete, revised condensation of a treatise on physical oceanography (*Traité d'Océanographie physique*) in three volumes by the same author. Although not intended for specialists, they will find it useful as a handbook.

The work is divided into three sections : section one describes observational methods used in physical oceanography; section two the principal results obtained to date; and section three deals with applied oceanography.

TERRE ADELIE — MAREES — 1950-1952
(Tides in Adèlie Land - 1950-1952)

by François TABUTEAU, Mario MARRET, and Bertrand IMBERT

83 pages; 34 figures, 3 plates; 31 × 24 cm
Expéditions Polaires Françaises, Missions Paul-Emile Victor
Paris, 1956

The « Expéditions Polaires Françaises » (Missions Paul-Emile Victor) have published a work on tidal investigations carried out in Adélie Land during the three Antarctic expeditions of 1950-1952.

Part I covers tidal observations by Messrs. Tabuteau and Marret at Port Martin, Pointe Géologie and Rock X. Such observations are invariably difficult when operating on the coast of an ice-bound ocean, and a few details on methods used may be of interest.

The tide at Port Martin was recorded during a total period of 13 months by means of a gauge set up on shore during summer and on the sea ice in 15-metre depths the rest of the time (see figure 1 for the coastal arrangement). Operation of the tide gauge was on the whole accurate in open water from 20 January to 6 March 1951. In calm weather, however, ice plugs formed in the sheet-iron pipe used as a well, interfering with the motion of the float, and requiring frequent flushing by the application of small doses of sodium and ferrosilicon supplied by the meteorologists.

Figure 2 shows in diagrammatic form the tide-gauge arrangement on the ice during the winter months. The gauge was located about 50 metres from shore. This distance proved adequate for keeping the gauge well out of the zone of crevasses caused by the tide. The ice supporting the gauge took the place of the float, thus reversing the direction in which heights were recorded. The fixed

point consisted of an iron pig placed on the rocky bottom in about 14 metres of water. One end of the cable was attached to the pig, and the cable then traversed the ice through an oil-filled aluminium tube of 3-metre length and 5-centimetre diameter before reaching the gauge shelter. The length of tubing

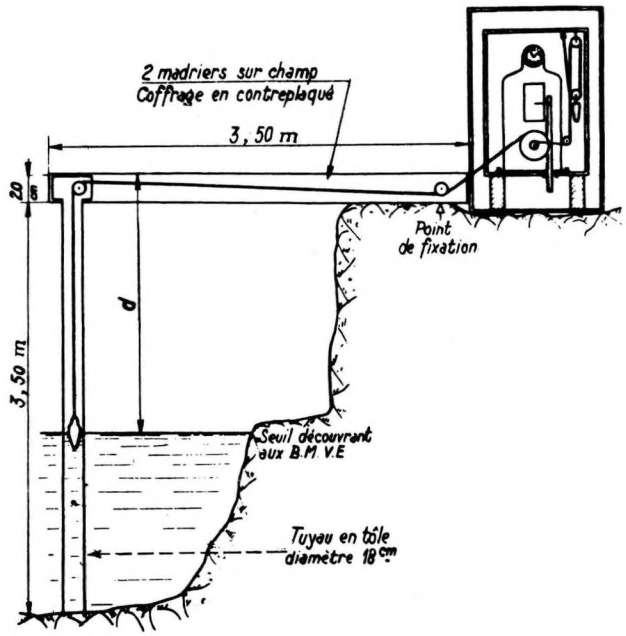

FIGURE 1

was determined beforehand by extrapolating to a considerable extent the speed of thickening of the ice as observed in May and June 1950. An « exterior » counterweight in the shelter supported the weight of the steel cable under water.

The tide gauge was operated on the ice from 1 July to 1 December 1950 and from 18 April to 1 November 1951. Performance was satisfactory.

The tide at Pointe Géologie was observed by placing the gauge on the ice at a depth of 20 metres, from 1 to 31 May 1952 and from 5 August to 12 September 1952.

A brief series of observations during 24 hours was finally carried out from 1 to 2 December 1952 at a point on the coast designated as Rock X, located about 140 km west of Pointe Géologie at 66°20′ S by 136°42′ E. These observations were made by an Australian geodesist and observer, R. Dovers.

The following method was used : a bamboo pole was fixed in the sea ice 133 m from the spot ashore in which a Wild T1 theodolite had been set up. The angle of depression was read off every half-hour by averaging three readings. As the sun's rays tended to unbalance the theodolite and cause the tripod to sink into the ice, a reading was also taken of the top of an iron bolt fastened to a rock and used as a bench mark.

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Part II describes the procedure followed in analyzing the observations and the results obtained.

Ingénieur hydrographe principal Imbert rejected the conventional harmonic analysis method and adopted the least squares method, using an electronic computer. The method selected by Imbert is not new, and is used in Germany.

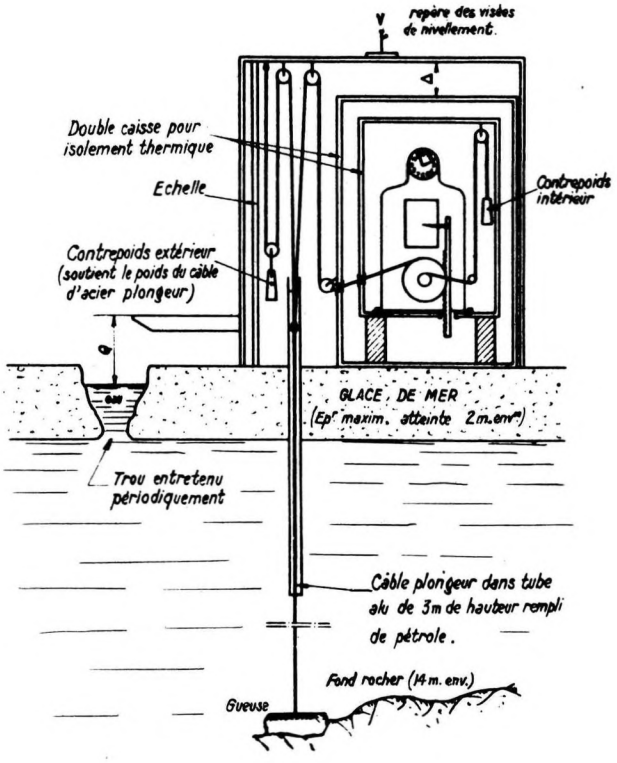

FIGURE 2

It is more expensive than the conventional method unless applied on a large scale. Errors affecting observations and results can be determined, however.

In order to separate constituents of largely similar angular speed, Imbert has made use of a graphic method based on the construction of the resultant of several sinusoidal movements of identical angular speed according to Fresnel's rule.

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A knowledge of harmonic constants has enabled Imbert to show the type of tide in the area and to plot cotidal lines of the semi-diurnal lunar tide on the basis of previous tidal observations at St. Paul Island and the Kerguelen Islands.

Imbert has also studied variations in mean sea level at Port Martin based on available weather information. He was able to explain their essential characteristics and show that sea level in Adélie Land is affected in a purely static manner by local variations in atmospheric pressure. He also investigated the influence of wind and shows that wind action on mean level is stronger during periods of high pressure.

VEREFFENINGSMETHODEN BIJ HYDROGRAFISCHE OPNEMINGEN
(Methods of Adjustment in Hydrographic Surveys)

xi + 304 pages; 38 figures; plates and normograms; 24 × 17 cm
Ministry of Marine, Hydrographic Department — The Hague, 1957

The Netherlands Hydrographic Department has published this book on methods of adjustment in hydrographic surveys. Personnel engaged in such surveys are normally confronted with the inaccuracy and the errors of the applied methods. Therefore this book starts, in the introduction, with a consideration of the requirements for hydrographic surveys.

In subsequent sections, the frequency distribution and the least squares method for the adjustment of observations according to the Gaussian theory are discussed. This discussion is carried out in a rather extensive manner and is accompanied by many examples to give the reader a real understanding of the application of these methods, to which often too little regard is given. The second half of the book deals with the application of the methods of adjustment of triangulation and base measurements as well as with test methods.

The different formulae, which are clearly derived and explained, are accompanied by many numerical examples, reproduced in every single detail, so that the reader can easily follow every step of the calculation. This is an advantage, especially for persons with a limited mathematical knowledge and gives the book a certain scholastic character. At the same time, the many diagrams, calculating schemes and function tables included make of this publication a guide in the practice of hydrographic surveying. In general, the book is simply written, deals very widely with methods and does not require advanced knowledge of the subject. Consequently it is very suitable as a teaching book as well as a technical reference book.

CHALLENGER
The Life of a Survey Ship

by George Stephen RITCHIE, Captain, Royal Navy

xxi + 249 pages; 35 illustrations, 15 figures; 22 × 14 cm
Hollis & Carter, London, 1957

No one could have been better qualified than Captain G. S. Ritchie, R.N., in writing the life story of a surveying ship of the Royal Navy from its launching on 1 June 1931 until its last voyage in December 1953 to the breaker's yard of the British Iron and Steel Corporation.

The author takes the reader on a tour of many of the world's remoter spots : Labrador, the Caribbean, the coasts of Africa, Torres Strait, the Persian Gulf, the atolls of the Pacific, Honolulu, Japan, etc.

Intended for the general public, his book also tells the story of the British Hydrographic Department during the past quarter of a century, and describes the methods used in obtaining data required for chart construction. An account is moreover given of the little-known hardships endured by the men responsible for carrying out hydrographic surveys.

As Vice Admiral Sir Guy Wyatt, K.B.E., C.B., Hydrographer of the Navy from 1945 to 1950, points out in the preface, the *Challenger*'s twenty-two years of life mark the passing of the old methods of survey and their replacement by the new techniques of echo sounding and radio position fixing.

A distinguished amateur anthropologist, the author was profoundly interested by the peoples he encountered during the course of his work. To these he has devoted an appreciable number of pages of both text and illustrations, thus increasing the book's attraction for the layman.

ALLGEMEINE MEERESKUNDE

(General Oceanography)

by Professor Günter DIETRICH and Professor Kurt KALLE

viii + 492 pages; 223 figures, 30 illustrations, 4 charts; 24 × 16 cm
Gebrüder Borntraeger, Berlin-Nikolassee, 1957

This book, with the sub-title *An Introduction to Oceanography,* is written with the purpose of introducing students to the wide field of oceanography. However, it is not the student but the scientist who will realize the broad experience and knowledge upon which the book is based. For nearly 500 pages, the various subjects covering oceanography are dealt with in a concentrated but logical and comprehensive manner. The real value of the book, however, lies in the way the various results and aspects are brought together to give an idea of the general oceanic processes. The text is accompanied by a large number of figures, illustrating the observations and conclusions and contributing to the easy understanding of the arguments. These figures, photos and plates, 260 in all, which are well drawn and carefully selected, together with 63 tables, make the study of the book valuable for readers without a knowledge of German.

The first chapter (geomorphology of the ocean bottom) deals with the topography and sediments of the oceans and with the theories concerning their origin, in so far as these topics of marine geology are necessary for general information and for an understanding of oceanographic questions.

In the second chapter (physical and chemical properties), the molecular properties of water are discussed widely and the outstanding role which water plays among the materials forming our earth is emphasized. Further attention is given to the acoustic properties of sea water, which are of considerable importance in echo sounding, and to its optical properties.

The broad description and discussion of oceanographic instruments and measuring methods to be found in the third chapter are fully justified by their importance for all advancements in oceanography. The development of the discussion shows the familiarity of the authors with these instruments, making this chapter of special value. The requirements of accuracy of measurements in the oceans and the difficulties of experimental work on shipboard are clearly demonstrated.

Chapters 4 and 5 (heat balance of the oceans and distribution of temperature, salinity, density and sea ice) give information on the properties of sea water, especially at the surface of the oceans, and on their interactions. Examples demonstrate the reasons for variations and deviations of the different factors and give the reader an idea of the processes governing the distribution of the

different water masses. Our knowledge of the heat balance of the oceans is, however, insufficient and the general problems remain to be solved. Of considerable interest, on the other hand, is the section on ice in the oceans, which to this reviewer's knowledge, has never been formally discussed in such a book, in spite of the fact that our information on sea ice is now fairly advanced and that ice is an important link in the heat and water balance of the oceans and responsible for the formation of certain water masses.

Chapter 6 (balance of compounds in the oceans) presents the complicated processes involved in the inorganic, organic and living cycles in the oceans, such as geochemistry, biochemistry and productivity. This chapter is especially fascinating and should be recommended to those normally engaged on work on physical problems. Professor Kalle, the author of this chapter, deals with the chemical and with some biological problems of the oceans in such a simple and interesting way that the reader becomes really familiar with them.

In Chapter 7 (theory of ocean currents), not only are the theories of currents discussed, but many examples of their actual structure and distribution are also given. Some of the modern theories of oceanic circulation are mentioned and examples of their results quoted. However, it is difficult for the author, within the scope of such a book, to decide which of the most modern theories should be presented.

Chapter 8, on surface and interval waves, on the other hand, appears rather old-fashioned and lacks a discussion of several modern results and problems in this field. Only some observational results are dealt with.

Chapter 9 (long waves and tidal waves), in contrast to the former, is one of the most important chapters of this book. Here the different aspects of tides, tide-generating forces, tidal waves, tidal theories, tidal predictions and geographical distribution are jointly dealt with, so that the reader acquires an understanding of the tides as a general phenomenon. The well-written pages on long waves, tsunamis and seiches, as well as the discussion of tidal currents, should also be noted.

Chapter 10, the last of the book, entitled *Regional Oceanography*, is in fact the corner-stone of the whole work. But because it uses all the former results, it must logically appear at the end. In this chapter, Professor Dietrich first discusses the circulation in the depths of the oceans and then gives a classification of the hydrographic regions of the oceans. This oceanographic classification is based on the character of the circulation and on the structure of its water masses, and enables the reader to compare the geographical distribution of typical oceanographic conditions.

This book is much more than just a textbook for students of marine sciences; it is in fact a most up-to-date review of our present knowledge of the oceans and is of considerable value to the scientific world. For hydrographers, the chapters on the physical properties of sea water and on instruments and oceanographic methods, as well as the excellent chapter on tides, will be of special interest, because they touch closely the hydrographer's field of activities. Besides this, and because of its instructive and understandable style, it must be recommended to everybody interested in the advancement of our knowledge of the seas. The authors can be congratulated on their success.

REPORT ON OCEANOGRAPHIC SURVEYS CARRIED OUT IN THE GULF OF THAILAND DURING THE YEARS 1956-1957

by Commander A. PENYAPOL, R.T.N.
Paper presented at the IXth Pacific Science Congress, Bangkok
November 1957

12 pages; 4 plates, 2 illustrations; 23 × 15 cm
Hydrographic Office, Royal Thai Navy, Bangkok

Commander A. Penyapol, R.T.N., has published a report on the history, organization and execution of oceanographic investigations carried out by the Hydrographic Department of the Royal Thai Navy. In the past years, the activities of this Department were chiefly concentrated on tidal work. In 1955, two oceanographic vessels, especially designed for this purpose and equipped with all necessary instruments, were purchased from Germany. They are both 28 × 5.30 metres in dimension and of 90 tons displacement and have 240 HP diesel engines giving them a speed of 10.5 knots. With these vessels and the temporary assistance of a 400-ton fishing vessel, oceanographic work has also been done at sea. In the meantime, the Hydrographic Department has sent a number of qualified candidates for university studies to the United States and England, so that now full use of these vessels can be made.

The working programme of the years 1956 and 1957 included several oceanographic surveys of the whole Gulf of Thailand, taking temperature and salinity observations at oceanographic stations, bathythermograph lowerings, bottom sampling and occasionally current measurements. Altogether the two vessels made 7 surveys of about one month's duration in 1956 and 4 surveys of about 40 days' duration in 1957. This shows that considerable use is made of them. The processing of the oceanographic data will be done in accordance with methods described by the U.S. Hydrographic Office, so that standardized results can be expected. Results of the surveys are, however, not published with the exception of one chart showing the distribution of surface salinity in the Gulf of Thailand in December 1956.

The considerable efforts made by the Thai Hydrographic Department in developing oceanographic research indicate its interest in the exploration of this little investigated area.