Book Reviews

An Annual Survey of Oceanography

Progress in Oceanography. vol. 1. Mary Sears, Ed. Pergamon, London, 1963; Macmillan, New York, 1964. viii + 383 pp. Illus. $15.

The volume is a collection of unrelated articles by experts in several phases of oceanography. It is reminiscent of the editor's earlier volume, *Oceanography,* which contained a collection of invited lectures presented at the International Oceanographic Congress held in New York in 1959. In *Progress in Oceanography,* Mary Sears has attempted to bring together some outstanding articles that are too long for publication in the usual journals but too short for publication as monographs. She is to be congratulated for rescuing some meaningful contributions from the obscurity of manuscript reports or "house" organs. The articles are not of equal quality or uniform general interest, and it may be that the variety of topics is too great for one volume. However, the one article of interest to each kind of oceanographer is worth the purchase price. The enforced association with other aspects of oceanography is a dividend.

"Geological investigation of nearshore sand transport: Examples of methods and problems from the Baltic and North Seas," by Eugene Seibold, is a long and rather rambling account of the author's personal observations in the immediate vicinity of Kiel. The principal study is in the Baltic foreshore region where the tides are small and the fetch is too short for the winds to create sand dunes but adequate to create ripple patterns on the bottom. The geology, mineralogy, and grain size of the sands and their movements are treated exhaustively. Particular attention is given to the orientation of elongate quartz grains in the ripple structure on the shallow bottoms.

The paper may be of interest to the shallow water geologist, but it lacks the organization necessary to hold the interest of those in other areas of oceanography. There are too many filler paragraphs and repetitive statements of the obvious, too much emphasis on difficulties and too many descriptions of hopefully better methods that were not used. There is a notable lack of generalized conclusions with respect to bottom behavior in such situations. Editing and proofreading could have been more stringent.

"The electrification of the atmosphere by particles from bubbles in the sea," by Duncan C. Blanchard, is essentially a Ph.D. thesis, with full detail and discussion of the erudite measurements, procedures, and conclusions.

When a sea-foam bubble breaks, the outer, negatively charged surface collapses and a particle from the inner, positively charged surface is projected at high speed into the atmosphere and becomes aerosol. This phenomenon is suggested as the source of a 160-ampere positive current from the world oceans. There are maxima of the space charge over the oceans in the latitudes of maximum bubbling, which are also the latitudes of maximum convection. Whether the bubbling or the convection is responsible for the distribution of the space charge is discussed thoroughly.

This is the best and most complete article on this topic, which is of interest to both meteorologists and oceanographers concerned with the interaction between air and sea. After completing the thesis in full and wordy detail, it is probable that Blanchard was too exhausted to rewrite it in reduced form for general consumption.

"Suspended organic matter in sea water," by T. R. Parsons, is an orderly, complete, and readable review of the state of knowledge of the subject. Excellent tables define the character and distribution of composition by species and region, and the tables are supported by comprehensive references and intelligent discussion. This paper is suitable for both biological and physical oceanographers.

"The salinity problem," by Roland A. Cox, reviews the origin, history, and use of the terms *chlorinity, salinity,* and *conductivity* as measures of the salt content of sea water. Cox shows that each is a precise definition of a related property but that they are not interchangeable. He proposes that they can be related empirically by reference to *Copenhagen Standard Sea Water.*

This timely, concise, well-written article is readable as well as historically interesting, and the information that it contains is prerequisite for any oceanographer.

"Gulf stream '60," by F. C. Fuglister, contains the data, the cruise procedure, and a discussion of the results of a multiple ship survey. It shows the correspondence between the stream lines, computed from temperature and salinity data, and the current pattern deduced from direct current observations. It also shows that in the northern part of the Gulf Stream the *meanders* are fairly stable features that move some 2 to 4 miles per day.

This is probably the first complete description of a multiple ship survey published in the open literature. It is of considerable value in that it shows how such things are done, what data may be obtained, and how the data are analyzed. The brief, lucid description of the behavior of the Gulf Stream can be appreciated by any marine scientist.

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Introductory Textbook

Principles of Astronomy. Stanley P. Wyatt. Allyn and Bacon, Boston, 1964. xii + 561 pp. Illus. $8.95.

This unusual textbook, which is intended for college freshmen, is difficult to evaluate objectively. Stanley Wyatt is a master of exposition—to use his own vernacular, he has the gift of gab. His book abounds in excellent and provocative analogies. I have never read a text in which so many questions are

asked, or one in which so many sentences begin with: "Let us imagine a . . ." or "Imagine that . . ." Slow-moving electrons are called "slowpokes"; high-velocity stars are "high-speed renegades"; the highly improbable becomes an "extremely long shot"; stars are "fellows"; meteors are "fragile flakes" that "ram" the earth's atmosphere; planets "spin" and rotating stars are "spinners"; cooling white dwarfs are on their way to becoming "cinders"; charged particles "run back and forth" in a "cage" created by a Jovian magnetic field; and cepheids "roam" in the galactic disk.

The author is in error when he states that nearly all of the methods of estimating great distances are based ultimately on information supplied by the method of annual (trigonometric) parallaxes. Trigonometric parallaxes are easy for the beginner to understand, and historically they came first and thus achieved early fundamental importance. But today, almost all very large distances are based on cepheid luminosities derived from the equation that distance $D = T/4.74\ \mu$, where T is the tangential velocity in kilometers per second and μ is the proper motion in seconds of arc per year. Whenever T can be evaluated, so can the distance, provided μ has been measured to the required accuracy. This happens in a number of ways when *radial* velocities (V, in km/sec) are known. In a moving cluster, for example, the geometry is sometimes precisely known, thus giving the relation between T and V. The Hyades and other moving clusters form the backbone of the zero-age main sequence from whence accurate cepheid luminosities from cepheids in clusters can be derived. The geometry is also known between T and V in the case of an expanding shell of gas about a nova or supernova (for example, the Crab nebula).

For groups of stars, T can be related to the backward drift of stars due to the sun's peculiar motion (the upsilon method, which has given independent evaluation of cepheid luminosities); or T can be related to the average absolute value of the peculiar radial velocities of groups of similar stars (the tau method). One can also use the *total* proper motion and assume an individual star has an *average* tangential velocity. This crude and unsophisticated method gives no negative parallaxes; it is as good or better than trigonometric parallax measurements for stars 50 parsecs distant and is useful for distances up to about 1000 parsecs. When more precise proper motions become available in the next 10 years, the total proper motion method should be good to distances of nearly 2000 parsecs. For example, if one adopts an average tangential velocity for an individual nearby star, the distance so computed will be accurate within a factor of two about two-thirds of the time; for one of the kinematically more homogeneous "brightest" stars the result is somewhat more accurate, and of course is very much more accurate when applied to groups of stars.

The book is well and profusely illustrated, although some of the diagrams are too small and a few of them need to be rotated through 90 degrees. I wish the author had provided diagrams of the interstellar reddening curve, the color-color curve, galactic rotation curves for observed radial velocities, the numbers-flux density relation for distant radio sources, and brightness contour diagrams of double radio sources (for example, Cygnus A and Centaurus A). A better discussion is needed for the spectacularly luminous quasistellar sources, the importance of the Crab nebula polarization needs emphasis, precision methods for evaluating the color excess and total absorption should be given, as should the binary nature of novae and dwarf novae. There are very few real mistakes—for example, Tycho's star of 1572 is incorrectly placed in Sagittarius.

The problems given at the end of each chapter are often truly excellent. Whether or not a college professor adopts this text for use in his beginning astronomy course, he will find it most worthwhile to study in some detail Wyatt's techniques of explaining things. The nonmathematical discussion of the nature of 21-centimeter radiation is the best I have seen, and this is true of many other subjects treated in the book. This text requires of the student a knowledge of only high school algebra and geometry, and within this limitation would seem to be, by a clear margin, the best book of its kind now on the market. And books of this type are ever more important as a growing percentage of our population becomes associated with the expanding space programs.

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Czech Science Today

Science in Czechoslovakia. Vladimir Slamecka. Columbia University Press, New York, 1963. xii + 175 pp. Illus. $6.

This book describes the organization of scientific research, the training of personnel and the publication of technical literature in Communist Czechoslovakia. The material is drawn exclusively from official sources; the prose style of the explanatory parts conforms to the subject matter. Numerous statistical tables deal with indices of industrial production, output of scientific workers, and the like. Organizational charts are displayed. Appendices list the names and addresses of institutes and other scientific organs and provide a bibliography of Czech technical publications together with their location in U.S. and Canadian libraries.

Part of the book deals with the planning of research. The Five Year State Research Plan specifies 16 broad "complex research tasks" covering the gamut of economic and social activities. The orientation is exclusively practical; basic research is included as the necessary foundation for later applications. The comprehensiveness of the research, as it is outlined discipline by discipline in chapter 5, is truly staggering. It is distributed among 129 installations of the Academy of Science and 200 industrial laboratories, not to mention 10 universities and 14 technical colleges. Despite recent efforts to coordinate work in different Communist countries, the Czechs seem reluctant to abandon the goal of research self-sufficiency.

The author explicity avoids a critical or comparative approach to his subject. The question of scientific progress and technical achievement under the Czech system is not systematically treated. Nor are the morale, working conditions, or remuneration of scientific workers discussed. That research output has greatly increased is evident from the expansion of Czech journals. It is therefore surprising to discover that in spite of deepest official concern, scientific manpower is increasing only by 1.7 percent annually, compared with 4.5 percent for the U.S. and 10 percent for Russia.

Slamecka has also provided a companion volume *Science in East Germany* (Columbia Univ. Press. 134 pp., $5).

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