

Contents

	PAGE
PREFACE.	V
CHAPTER	
I. INTRODUCTION.	1
II. THE EARTH AND THE OCEAN BASINS	8
Figure and size of the earth. Distribution of water and land. Relief of the sea floor. Major features of topography. Terminology of submarine topography. Bottom configuration of the oceans. Bottom configuration of the Arctic and Antarctic regions. Bottom configuration of adjacent seas. Submarine canyons. Shorelines. Bibliography.	
III. PHYSICAL PROPERTIES OF SEA WATER.	47
Salinity and chlorinity. Units of temperature, salinity, and pressure, and their ranges in the sea. Density of sea water. Thermal properties of sea water. Colligative and other properties of sea water. Properties of sea ice. Transmission of sound. Absorption of radiation. Eddy conductivity, diffusivity, and viscosity. Bibliography.	
IV. GENERAL DISTRIBUTION OF TEMPERATURE, SALINITY, AND DENSITY	98
The heat budget of the earth as a whole. The heat budget of the oceans. Evaporation from the sea. Salinity and temperature of the surface layer. Theory of the periodic variations of temperature at subsurface depths. Distribution of density. Subsurface distribution of temperature and salinity. The water masses of the oceans. Basins. Bibliography.	
V. THEORY OF DISTRIBUTION OF VARIABLES IN THE SEA. . .	153
Scalar fields. Relation between the distribution of properties and the currents in the sea. Distribution of conservative concentrations in the sea. Distribution of nonconservative concentrations. The principle of dynamic equilibrium. Bibliography.	
VI. CHEMISTRY OF SEA WATER.	165
Constancy of composition. Units used in chemical oceanography. Composition of sea water. Elements present in sea water. Preparation of artificial sea water. Dissolved gases in sea water. The carbon dioxide system. Solubility of salts in	

VI.	CHEMISTRY OF SEA WATER (<i>Continued</i>)	
	sea water. The oxidation-reduction potential of sea water. Inorganic agencies affecting the composition of sea water. Geochemistry of the ocean waters. Bibliography.	
VII.	ORGANISMS AND THE COMPOSITION OF SEA WATER.	228
	Chemical composition of marine organisms. Interrelations between elements whose distribution is affected by biological activity. Distribution of phosphate, nitrogen compounds, and silicate in the oceans. Factors influencing the distribution of nutrient elements. Compounds of carbon, nitrogen, phosphorus, and silicon in the sea. Bibliography.	
VIII.	THE SEA AS A BIOLOGICAL ENVIRONMENT.	267
	Physical and chemical characteristics of the marine environment. Other characteristics of the environment. Classification of the marine environment. General character of populations of the primary biotic divisions. Development of life in the sea. Bibliography.	
IX.	POPULATIONS OF THE SEA.	286
	Plant Groups of the Sea: Thallophyta; Blue-green algae (Myxophyceae); Green algae (Chlorophyceae); Brown algae (Phaeophyceae); Red algae (Rhodophyceae); Yellow-green algae; The higher plants in the sea. The Animal Population of the Sea: Synopsis of the more important systematic groups of marine animals; Reproduction and life cycles in marine animals. Bibliography.	
X.	OBSERVATIONS AND COLLECTIONS AT SEA.	331
	Oceanographic Vessels and Their Facilities: Vessels; Winches; Wire ropes and accessory fittings; Shipboard laboratories. Observations and Collections: Positions at sea; Sonic soundings; Wire soundings; Bottom-sampling devices; Temperature measurements; Water-sampling devices; Treatment and analysis of serial observations; Observations of tides; Deep-sea anchoring. Current Measurements: Drift methods; Flow methods; Current meters; Analysis of records of currents. Collection and Analysis of Biological Samples: Collection of benthic organisms; Collection of nekton; Collection of plankton; Interpretation of plankton observations. Bibliography.	
XI.	GENERAL CHARACTER OF OCEAN CURRENTS.	389
XII.	STATICS AND KINEMATICS.	400
	Statics: Units and dimensions; The fields of gravity, pressure, and mass; Significance of Sigma-T surfaces; Stability. Kinematics: Vector fields; The field of motion and the equation of continuity; Representations of the field of motion in the sea. Bibliography.	
XIII.	DYNAMICS OF OCEAN CURRENTS.	431
	The hydrodynamic equations. Currents related to the field of pressure. Friction. Wind currents. Conclusions as to currents on the basis of tongue-like distribution of properties. Thermodynamics of ocean currents. Bibliography.	

CHAPTER

XIV.	WAVES AND TIDES.	
	Introduction. Surface waves. Long waves. Tides. Tidal currents. Effect of friction on tides and tidal currents. The semidiurnal tide of the Atlantic Ocean. Internal waves. Bibliography.	
XV.	THE WATER MASSES AND CURRENTS OF THE OCEANS. . .	605
	Antarctic Circumpolar Ocean. The South Atlantic Ocean. The equatorial region of the Atlantic Ocean. The adjacent seas of the North Atlantic Ocean. The North Atlantic Ocean. Adjacent seas of the Indian Ocean. The Indian Ocean. The South Pacific Ocean. The equatorial region of the Pacific Ocean. The North Pacific Ocean. The adjacent seas of the North Pacific Ocean. The water masses of the oceans: A summary. The deep-water circulation of the oceans. Bibliography.	
XVI.	PHYTOPLANKTON IN RELATION TO PHYSICAL-CHEMICAL PROPERTIES OF THE ENVIRONMENT	762
	Methods of Flotation. Factors of Phytoplankton Production: I: Direct primary factors of reproduction and growth; Direct and indirect secondary factors influencing population density. Factors of Phytoplankton Production: II: Photosynthesis of phytoplankton; Plant nutrients and vertical circulation of water; Horizontal ocean currents; Temperature. Bibliography.	
XVII.	ANIMALS IN RELATION TO PHYSICAL-CHEMICAL PROPERTIES OF THE ENVIRONMENT	799
	Ecological Groups and Some of Their Adjustments and Conditions of Life: Benthos, animals of the sea floor; Nekton, the swimming animals; Zooplankton, the floating animals. Relations to the Physical-Chemical Properties of the Environment: Light; Salinity; Temperature; Ocean currents; Oxygen. Bibliography.	
XVIII.	INTERRELATIONS OF MARINE ORGANISMS.	879
	Natural Associations of Organisms. Nutritional Relationships: The significance of micro-plants; The significance of micro-animals; Plankton and filter feeders; Detritus feeders and scavengers; Littoral browsers; Preying animals. Biological Factors Influencing Movements and Concentration of Organisms: Phytoplankton-zooplankton; Nekton; Benthos. Marine Bacteria and Their Role in the Biological and Chemical Cycles in the Sea: Structure and reproduction; Bacterial modes of life; The nitrogen cycle; Phosphorus, carbon, and sulphur cycles; Bacteria and bottom deposits; Distribution of bacteria in the sea. Bibliography.	
XIX.	ORGANIC PRODUCTION IN THE SEA	925
	Phytoplankton production. Zooplankton production. Commercial production. The production in different regions. Bibliography.	

XX.	MARINE SEDIMENTATION.	946
	Introduction. Constituents of Marine Sediments. Transportation of Sedimentary Debris: Transportation of sediment to the sea; Transportation of sediment in the sea. Mass Properties of Marine Sediments. Classification of Recent Marine Sediments. Distribution of Pelagic Sediments. Mass Properties of Deep-Sea Sediments. The Environment of Deposition. Calcium Carbonate: Factors which determine accumulation and deposition of calcareous material; The distribution of calcium carbonate. Organic Matter: Quantity and character of organic matter in marine sediments; Distribution of organic matter. Shallow-Water and Nearshore Sediments. Elements Concentrated on the Sea Bottom and Authigenic Minerals. Rates of Sedimentation. Summary of Factors Determining Character of Marine Sediments. Bibliography.	
APPENDIX.	TABLES FOR COMPUTING GEOPOTENTIAL DISTANCES BETWEEN ISOBARIC SURFACES.	1051
	Contents. Symbols and definitions. Explanation. Bibliography.	
INDEX.		1061