

Simplified Oceanography

SIMPLIFIED OCEANOGRAPHY

A COMPREHENSIVE WORK
FOR UPSC CSE
AND OTHER COMPETITIVE EXAMINATIONS

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GEOGRAPHY OPTIONAL SPECIAL

ABOUT THE AUTHOR

Dr. Krishnanand is highly proficient scholar in the field of research and academics in Geography and environment. He graduated from Shaheed Bhagat Singh College, University of Delhi. He was awarded “best student of the college across all disciplines” in 2009 and “Gold medal” in 2010. He completed his Ph.D from Department of Geography, Delhi School of Economics, University of Delhi. He has a teaching experience of over a decade in the field of Geography for UPSC, State PCS , UGC NET and other competitive examinations.

He is an avid field researcher and photographer with two Geographical Documentaries on YouTube Channel- TheGeoecologist, to his credit - Exploring Ladakh- A Geoecological Perspective and Spiti Valley Project. His areas of interest include Geomorphology, Geoecology, Geotourism, Environmental Geography, Geodiversity, Geomorphosites, Fossil park, Geoparks, Field Work and Documentary Making in Geography, Remote Sensing and Geographic Information System (GIS) and GPS. He has published three books and six articles at National and International levels.

This E-book by Dr. Krishnanand is a Simplified Compilation on OCEANOGRAPHY along with detailed explanations available through his YouTube lectures of the same.



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PREFACE

Oceanography, scientific discipline concerned with all aspects of the world's oceans and seas, including their physical and chemical properties, their origin and geologic framework, and the life forms that inhabit the marine environment. Traditionally, oceanography has been divided into four separate but related branches: physical oceanography, chemical oceanography, marine geology, and marine ecology. Physical oceanography deals with the properties of seawater (temperature, density, pressure, and so on), its movement (waves, currents, and tides), and the interactions between the ocean waters and the atmosphere. Chemical oceanography has to do with the composition of seawater and the biogeochemical cycles that affect it. Marine geology focuses on the structure, features, and evolution of the ocean basins. Marine ecology, also called biological oceanography, involves the study of the plants and animals of the sea, including life cycles and food production. In Physical Geography, climatology is of immediate relevance because of its inherent interest on climate-human inter-relationships.

This E-book aims to facilitate the young and budding **UPSC CSE aspirants** as well as geographers and research scholars especially in the field of geographical studies to understand the conceptual framework of the subject matter of Oceanography in a comprehensive manner.

Dr. Krishnanand

CHAPTER 1

INTRODUCTION TO

OCEANOGRAPHY

INTRODUCTION TO OCEANOGRAPHY

- THE OCEAN IS ONE PART OF **THE EARTH SYSTEM**.
- It mediates processes in the atmosphere by the transfers of mass, momentum, and energy through the sea surface.
- It receives water and dissolved substances from the land.
- And, it lays down sediments that eventually become rocks on land.
- Hence an understanding of the ocean is important for understanding the earth as a system, especially for understanding important problems such as **global change or global warming**.
- At a lower level, **physical oceanography and meteorology** are merging. The ocean provides the feedback leading to slow changes in the atmosphere.

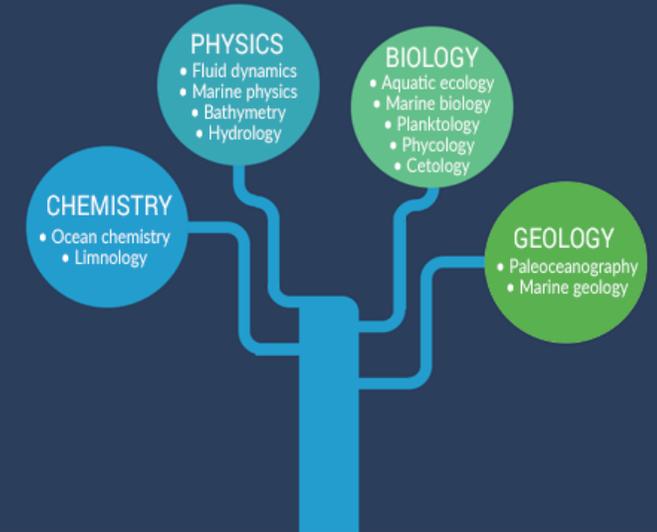
WHY STUDY THE OCEANS?

The answer depends on our interests, which devolve from **our use of the ocean**.

Three broad themes are important:

- 1. We get food from the ocean.** Hence we may be interested in processes which influence the sea just as farmers are interested in the weather and climate
- 2. We use the ocean.** We use the ocean for transport. We obtain oil and gas below the ocean. And, we use the ocean **for recreation, swimming, boating, fishing, surfing, and diving**. Hence we are interested in processes that influence these activities, especially waves, winds, currents, and temperature.
- 3. The ocean influence the atmospheric weather and climate.** The ocean influence the distribution of rainfall, droughts, floods, regional climate, and the **development of storms, hurricanes, and typhoons**.

BRANCHES OF OCEANOGRAPHY



THE HISTORICAL SETTING

Our knowledge of oceanic currents, winds, waves, and tides goes back thousands of years. Mesopotamians (Phoenician) navigators traded over long distances in the Pacific as early as **4000 bc** .

GRECO-ROMAN Era: **Pytheas** explored the Atlantic from Italy to Norway in 325 BCE.

Arabic traders used their knowledge of the reversing winds and currents in the Indian Ocean to establish trade routes to China in the Middle Ages and later to Zanzibar on the African coast.

And, **the connection between tides and the sun and moon** was described in the **Samaveda** of the Early Indian Vedic period extending from about **2000 to 1400 BCE**.

Modern European knowledge of the ocean began with voyages of discovery by **Bartholomew Dias (1487–1488)**, **Christopher Columbus (1492–1494)**, **Vasco da Gama (1497–1499)**, **Ferdinand Magellan (1519–1522)**, and many others.

They laid the foundation for **global trade routes** stretching from Spain to the Philippines in the **early 16th century**.

Slow ships of the **19th and 20th centuries** gave way to **satellites, drifters, and autonomous instruments** toward the end of the 20th century. **Satellites now observe the ocean, air, and land.**

OCEAN RELIEF (PHYSIOGRAPHY)

The oceans are the largest and most prominent feature on Earth.

In fact, they are the single most defining feature of our planet. Oceans cover roughly around **70% of Earth's surface**.

Ocean relief is largely due to **tectonic, volcanic, erosional and depositional processes and their interactions**.

Ocean relief features are divided into **major** and **minor** relief features.

