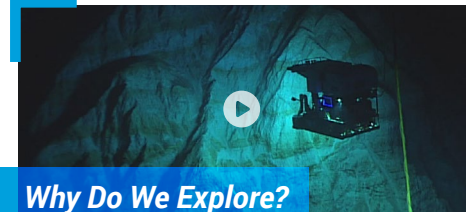




# Why Do We Explore the Deep Ocean?

Despite the fact that the ocean covers approximately 70% of Earth's surface and plays a critical role in supporting life on our planet, our understanding of the ocean remains limited, with most of it still largely unexplored.

Ocean exploration is about making discoveries, searching for things that are unusual and unexpected. As the first step in the scientific process, the rigorous observations and documentation of biological, chemical, physical, geological, and archaeological aspects of the ocean gained from exploration set the stage for future research and decision-making.



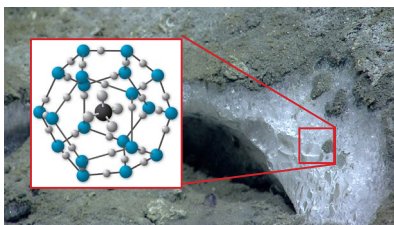
Exploration is key to increasing our understanding of the ocean, so we can more effectively manage, conserve, regulate, and use ocean resources. *Video courtesy of Schmidt Ocean Institute.*

## Modern Reasons for Ocean Exploration



Things humans depend upon and value — water, energy, transportation, wildlife, agriculture, and human health — are all experiencing the effects of a changing climate. *Image courtesy of NOAA.*

**Climate Change** — Climate change refers to any significant change in the measures of climate for extended periods of time. This includes changes in temperature, precipitation, ocean heat, wind patterns, sea level, sea ice extent, and more. The exact relationship between the deep ocean and climate change is not fully understood. One potential impact of global climate change includes weakening of large-scale ocean circulation, or thermohaline circulation (THC), which plays an important role in transporting heat, dissolved oxygen and nutrients, species distribution, and trade routes. Ocean exploration provides some of the essential knowledge about ocean-atmosphere interactions that is needed to understand, predict, and respond to these impacts. [Learn more about the impacts of climate change.](#)



Methane hydrate forms a clathrate structure, where water molecules form a lattice around a methane molecule, without actually bonding to it. *Image courtesy of NOAA Ocean Exploration.*

**Energy** — Ocean energy resources include non-renewable sources such as oil and gas, as well as renewable sources, such as the energy of offshore winds, waves, and ocean currents. Ocean exploration can reveal new energy sources, and help protect sensitive environments where these resources are found. Methane hydrate, a relatively stable, ice-like substance that is created in deep-ocean sediments and under conditions of low temperature and high pressure, has a unique chemical composition and structure that makes it a research interest for energy officials, climate scientists, and ecologists alike. [Learn more about methane hydrates.](#)



This sponge in the genus *Spongosorites* makes the compound topsentin, which is used as an anti-inflammatory. *Image courtesy of Amy Wright.*

**Human Health** — Our ocean and coasts affect us all—even those of us who don't live near the shoreline. A healthy ocean and coasts provide us with food, recreation, climate regulation, and even medicine! Almost 50% of the medicines we use today come from “natural products,” or chemical compounds produced by living organisms. Medicines like morphine and penicillin are chemical compounds made by plants or microorganisms (bacteria and fungi) that treat pain or fight infection. Several animals discovered in deep-sea habitats have been found to be promising sources for new antibiotic, anti-cancer and anti-inflammatory drugs. [Learn more about natural products in the deep sea.](#)

# Why Do We Explore the Deep Ocean?

## Modern Reasons for Ocean Exploration



In the U.S. Pacific Northwest ocean acidification is impacting the shells and sensory organs of young Dungeness crab. *Image courtesy of NOAA.*

**Ocean Health** – The ocean is the largest habitat on Earth, supporting numerous organisms and unique ecosystems. Ongoing ocean monitoring efforts reveal that many species and ecosystems are threatened by stressors such as increased pollution, overfishing, rising water temperatures, and decreasing ocean pH (ocean acidification). However, it is difficult to fully assess how severe some of these changes in conditions have been, as scientific data records for many of these conditions only date back so far. Ocean exploration helps to fill gaps in our basic understanding of the marine environment, which helps to protect ocean health, sustainably manage our marine resources, and better understand our changing environment. [Learn more about NOAA's mission to better understand and predict changes in ocean health.](#)



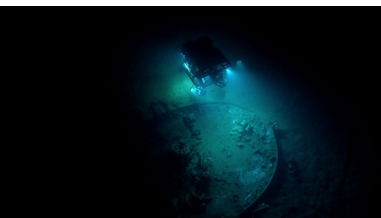
Video data of mid-water and deep-sea environments are archived and made publicly available after an expedition. *Image courtesy of NOAA Ocean Exploration.*

**Research** – Expeditions to the unexplored ocean help focus research into critical areas that are likely to produce substantial benefits. These expeditions collect baseline data on the shape of the seafloor, characterize deep-sea habitats, and capture video and imagery of life in the deep. Ocean exploration expeditions are carefully planned with input from scientists, local resource managers, and other stakeholders to ensure that each expedition maximizes its data collection potential and serves many audiences. Researchers use this preliminary data to generate hypotheses and plan follow-up expeditions to conduct subsequent, more detailed investigations in the area. All data collected during federally funded expeditions are carefully curated, archived, and made available to anyone that is interested! [Learn more about the ocean exploration data.](#)



Woods Hole Oceanographic Institution's robot, *Mesobot*, can autonomously follow ocean animals to study their behavior. *Image courtesy of Ocean Exploration Trust.*

**Innovation** – To map, explore, and characterize the unknown ocean, explorers venture to some of the most remote and difficult to reach areas in the sea. The challenges of working in the extreme environments of the deep ocean are an ongoing stimulus for technological innovation and engineering. Advancements in ocean exploration tools and equipment are rapidly changing the field, making it easier, more efficient, and more economical to explore the ocean than ever before, not only expanding where and how we explore, but also greatly expanding who can participate in ocean exploration. [Learn more about ocean exploration technology.](#)



Remotely operated vehicle *Deep Discoverer* explores "Wreck 15377," an unknown shipwreck in the Gulf of Mexico. *Image courtesy of NOAA Ocean Exploration.*

**Underwater Cultural Heritage:** Marine archaeology involves the study of ancient human objects, such as shipwrecks, found beneath the water's surface. Studying underwater cultural heritage sites can help us understand the past, connect us to our ancestors, and teach us lessons on how the environment and human error can impact each other. With the shared wisdom of all, fully exploring our cultural heritage informs our future and affects wise decision-making. With time, physical artifacts at underwater cultural heritage sites become structures for marine life to settle and grow, forming new ecosystems that are great places to study the impacts of human stewardship and climate change. [Learn more about underwater cultural heritage exploration.](#)



The University of Miami hosts local students for "Ocean Explorers Day," an immersive field trip to learn about ocean careers and research. *Image courtesy of Shannon McDonnell.*

**Ocean Literacy** – Ocean exploration can help inspire new generations of youth to seek careers in science, technology, engineering, and mathematics, and offers vivid examples of how concepts of biology, physical science, and Earth science are useful in the real world. Similarly, the challenges of exploring the deep ocean can provide the basis for problem-solving instruction in technology and engineering. Ocean exploration also provides an engaging context for improving ocean literacy, understanding how the ocean influences our lives, and how we influence the ocean. An ocean literate citizenry is increasingly vital as we confront issues such as ocean health and climate change. [Learn more about Ocean Literacy.](#)