

2014年上海高校示范性全英语教学课程



MARINE ECOLOGY



College of Marine Sciences Shanghai Ocean University

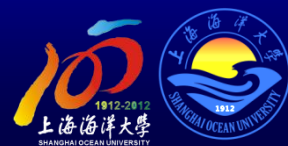
2018

任课教师信息



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答疑和讨论时间安排



- 1..辅导答疑时间确定
- 2..辅导答疑时间确定

考试形式



成绩评定	总成绩比 %		平时成绩比 %						
	期末	平时	出勤	作业	实验	实习	讨论	测验	其它
	50	50	10	20			20		

1. 1份翻译作业，期末考试的时候交(8周)
2. 作业为两篇文章任选其一进行翻译

<http://www.liyunkai.net>

Contents Overview



Part 1: The Ocean Environment

- Chapter 1. Science and Marine Biology
- Chapter 2. Fundamentals of Ecology
- Chapter 3. Geology of the Ocean
- Chapter 4. Water, Waves, and Tides

Part 2: Marine Organisms

- Chapter 5. Biological Concepts
- Chapter 6. Marine Microbes
- Chapter 7. Multicellular Primary Producers
- Chapter 8. Lower Invertebrates
- Chapter 9. Higher Invertebrates
- Chapter 10. Marine Fishes
- Chapter 11. Marine Reptiles and Birds
- Chapter 12. Marine Mammals

Part 3: Marine Ecosystems

- Chapter 13. Intertidal Communities
- Chapter 14. Estuaries
- Chapter 15. Coral Reef Communities
- Chapter 16. Continental Shelves and Neritic Zone
- Chapter 17. The Open Sea
- Chapter 18. Life in the Ocean's Depths

Part 4: Humans and the Sea

- Chapter 19. Harvesting the Ocean's Resources
- Chapter 20. Oceans in Jeopardy

Part 1. The Ocean Environment



Chapter 1. Science and Marine Biology

1.1 Importance of the Ocean and Marine Organisms

1.2 Study of the Sea and Its Inhabitants

1.3 Marine Biology: A History of Changing Perspectives

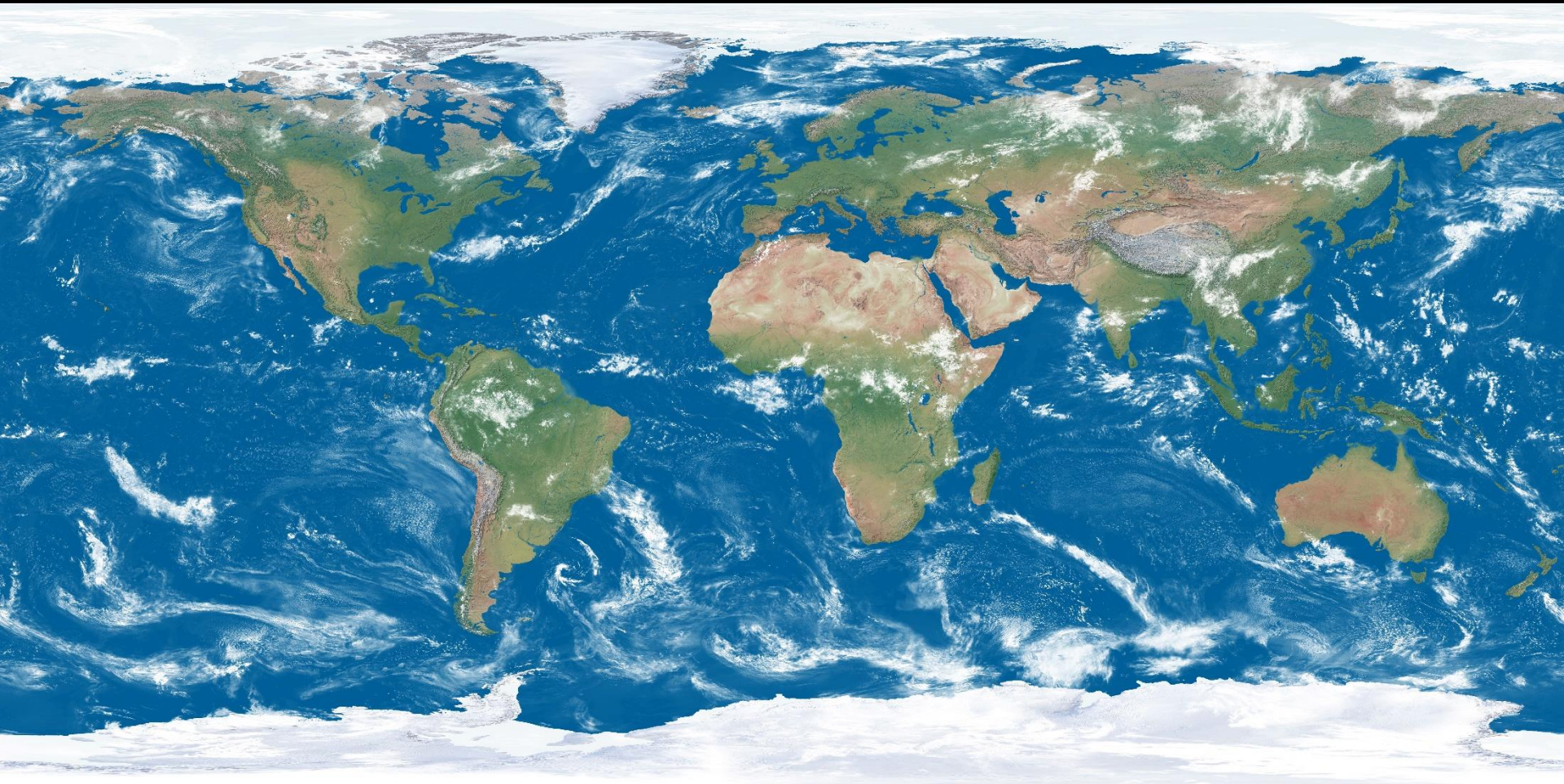
1.4 Process of Science



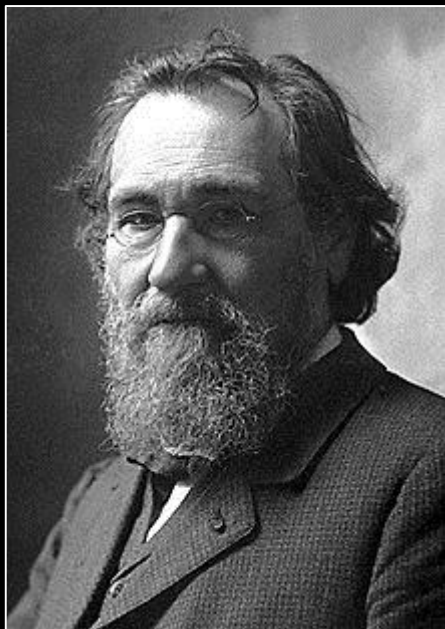
Have You Wondered?

1. What is Marine Ecology?
2. What does a marine ecologist do?
3. Why is it important to study marine ecology?
4. How your action would affect the marine environment?

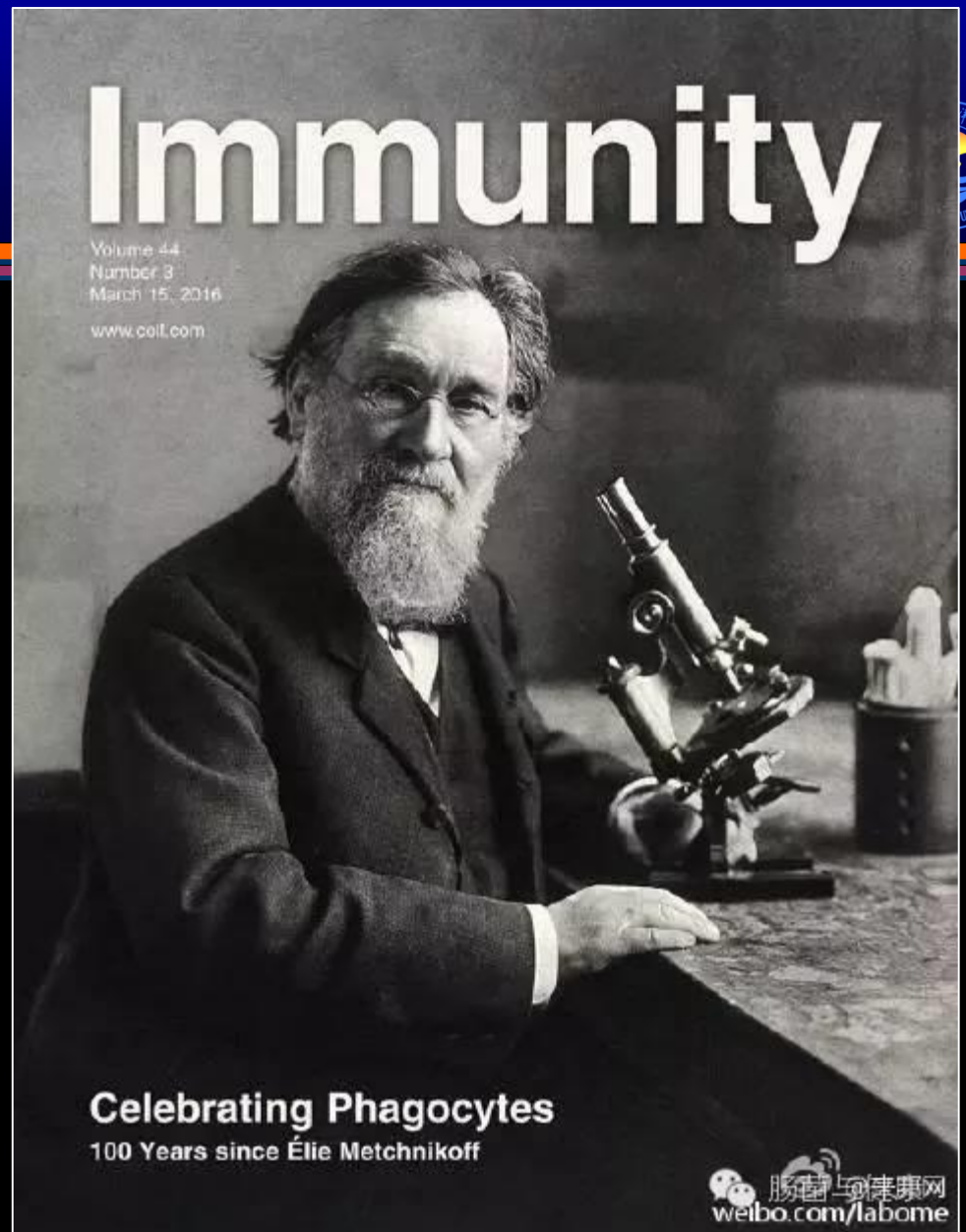
Ocean



Maine Life



Élie Metchnikoff (梅契尼柯夫)
1908 Nobel Prize in Physiology or Medicine



Marine Life



Marine Life

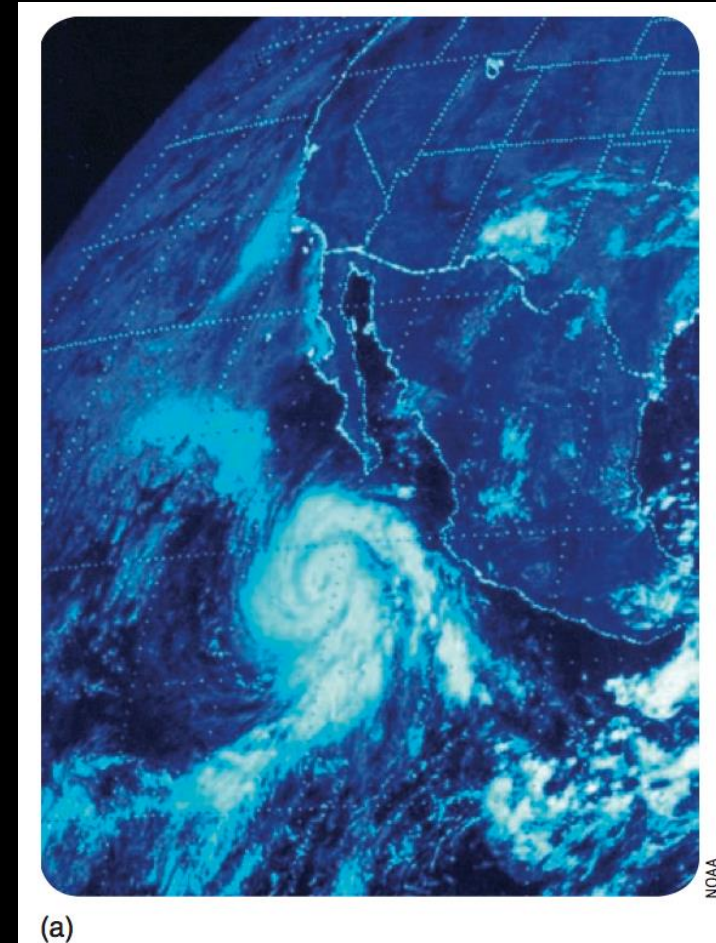


1.Science and Marine Biology



- 1.1 Importance of the Ocean and Marine Organisms
- Affecting terrestrial environment
- El Nino Southern Oscillation (ENSO).

(a) The exchange of heat energy between the atmosphere and the oceans is responsible for creating the weather patterns that affect terrestrial habitats. The white area in this photo is a tropical storm developing in the Pacific Ocean.



1. Science and Marine Biology



- Ocean productivity is the amount of food produced by marine organisms, and the number of organisms the ocean can support.
- 80 million metric tons of marine fish and shellfish (molluscs and crustaceans) are harvested annually.

b) The oceans supply a significant amount of food in the form of fish, shellfish, and seaweeds.





1.2 Study of the Sea and Its Inhabitants



- **Oceanography** is the study of the oceans and their phenomena, such as waves, currents, and tides.
- The study of the living organisms that inhabit the seas and their interactions with each other and their environment is **Marine biology**. These two areas of study are not completely distinct from each other, and they frequently overlap. It is necessary to combine elements from both fields to form a complete picture of the ocean and its inhabitants.

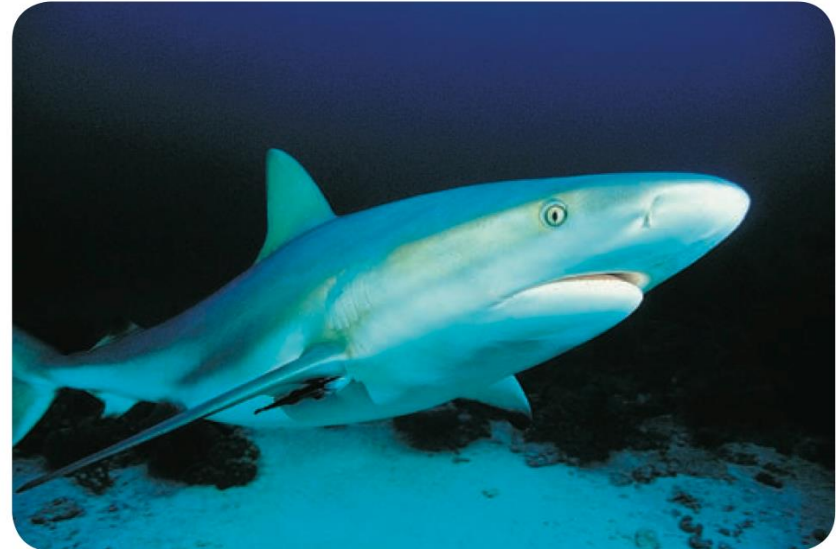
1.2 Study of the Sea and Its Inhabitants



Daniel Gotshall/Visuals Unlimited

Figure 1-2 MARINE BIOLOGY.

The marine organisms in this tidal pool interact with and are influenced by each other and their physical environment. The study of marine organisms and these interactions is the science of marine biology.



Stuart Westmorland/Stone/Getty Images

Figure 1-3 MARINE ORGANISMS AND MEDICINE.

The cartilage that makes up the skeletons of sharks is an important source of antiangiogenesis factor, a chemical that prevents tissues from establishing a blood supply. This chemical may be useful in the fight against cancer by depriving tumors of blood, thus killing them.

Summary



- The science of **oceanography** is the study of the oceans and their phenomena.
- **Marine ecology** is the study of the organisms that inhabit the sea, their interrelationships, and their interactions with their environment. A basic knowledge of marine ecology is necessary to understand how marine organisms relate to us and how human activities affect the marine environment. A basic knowledge also helps conscientious citizens make prudent decisions about activities that involve and affect the sea.

Marine studies

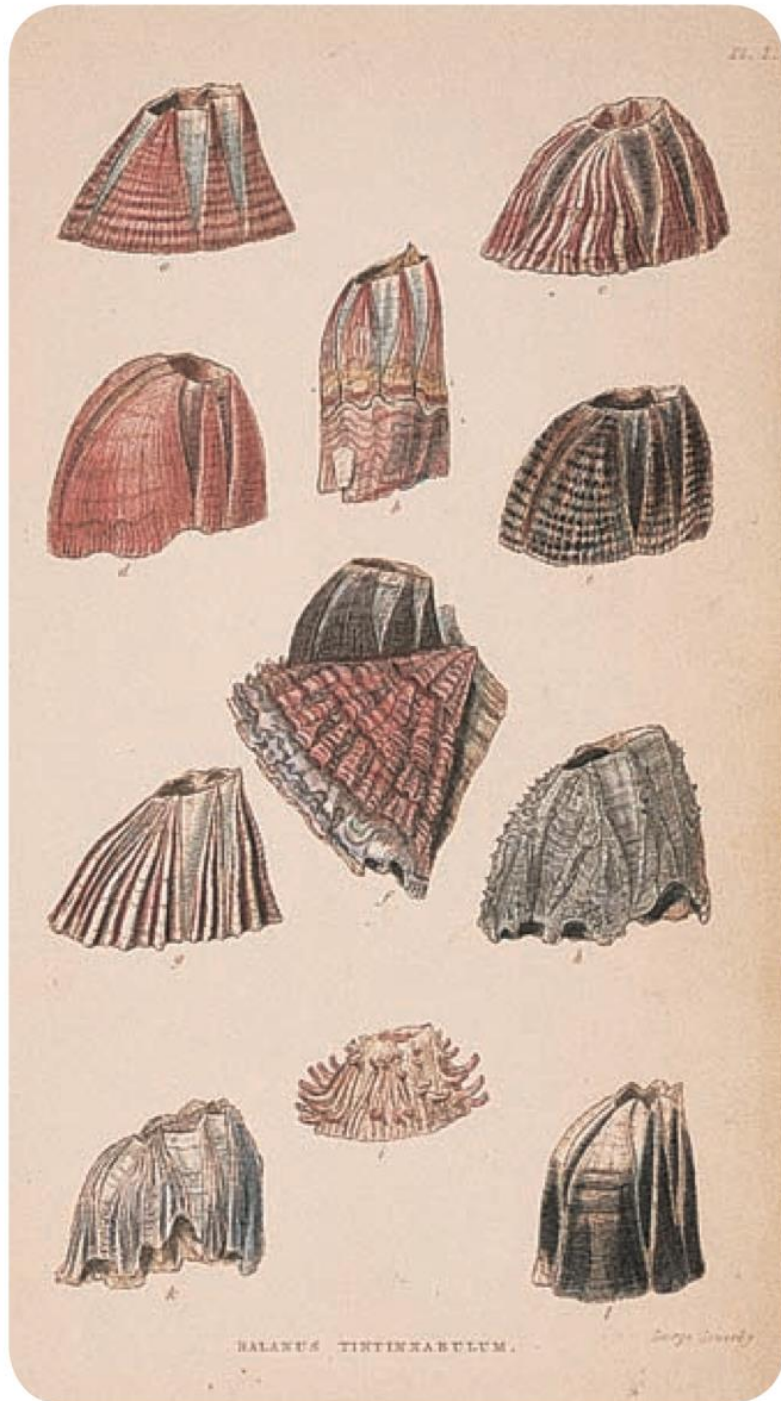


A History of Changing Perspectives



- The Greek philosopher Aristotle :
The ladder of life and Anatomy of cuttlefish
- Pliny, the Roman naturalists: 37-volume <*Natural History*>

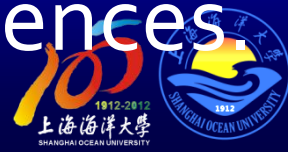
- Darwin engaged in a detailed study of the barnacles that inhabit the rocky coasts of England and produced a monograph on the subject that is still used today



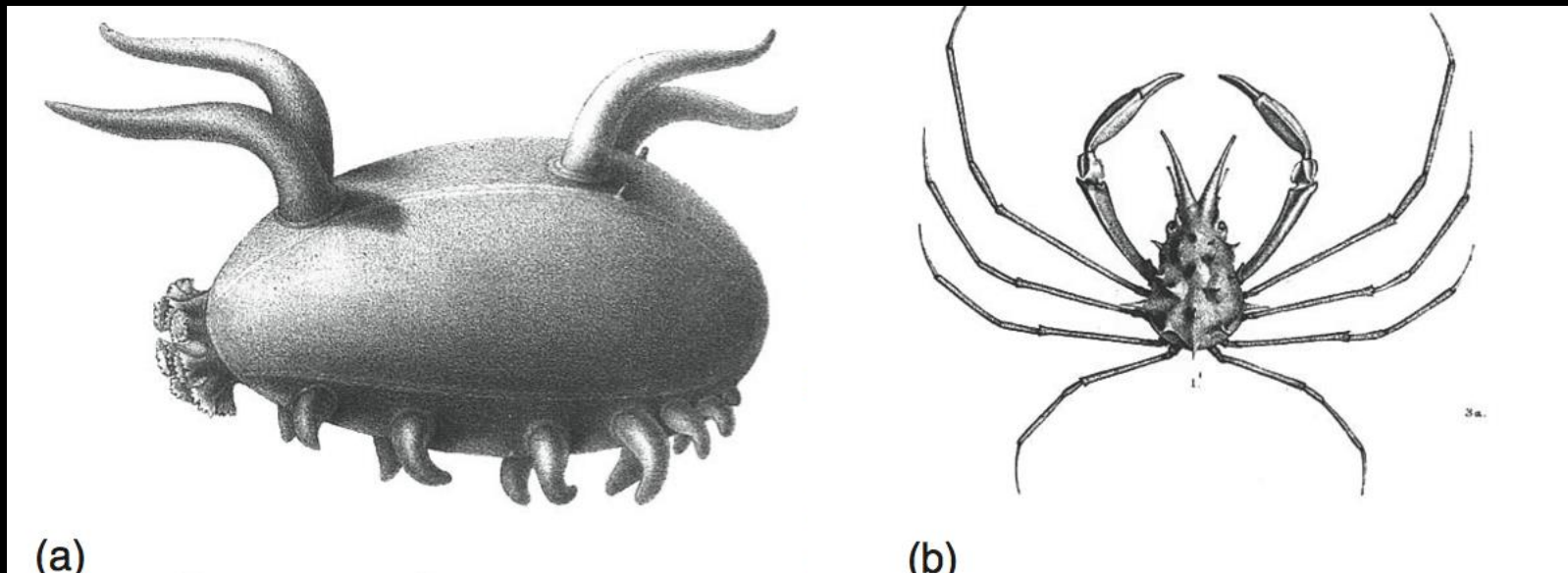
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Figure 1-4 DARWIN'S MONOGRAPH. Although better known for his theory of evolution by natural selection, Darwin was an accomplished marine biologist. This page is from Darwin's monograph on barnacles, a reference work that is still used by marine biologists today.

Beginning of the modern marine sciences



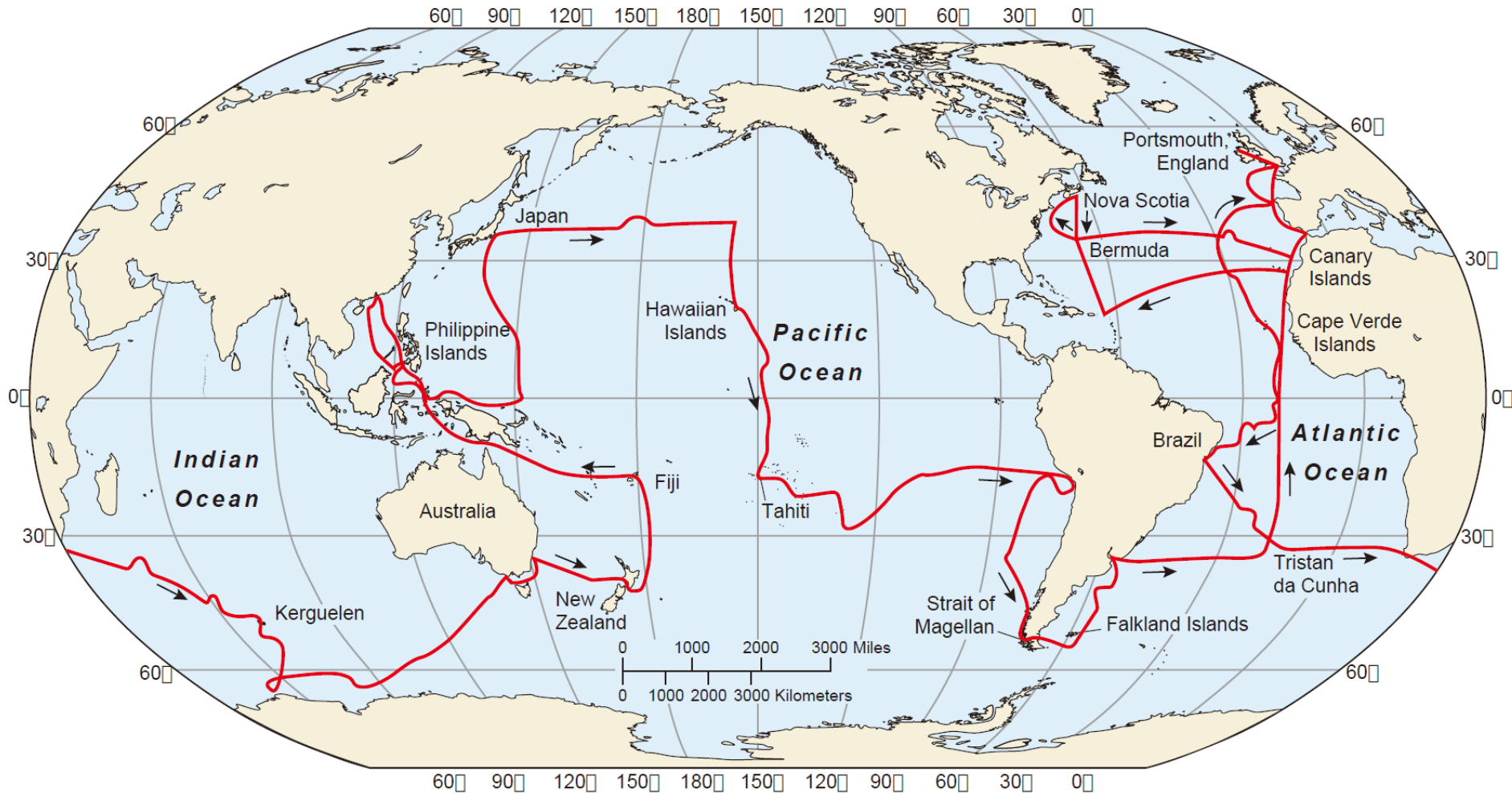
- During *Challenger's* expedition, more than 4,700 new species of marine organisms were collected and described. Many of these new species were dredged from great depths.



THE CHALLENGER EXPEDITION.

These drawings from the Challenger reports show two organisms, (a) a sea cucumber (*Scotoplanes globosa*) and (b) a crab (*Anamathia pulchra*), that were first discovered by the expedition in dredgings from more than 1,000 meters deep in the Pacific Ocean off the Philippine Islands.

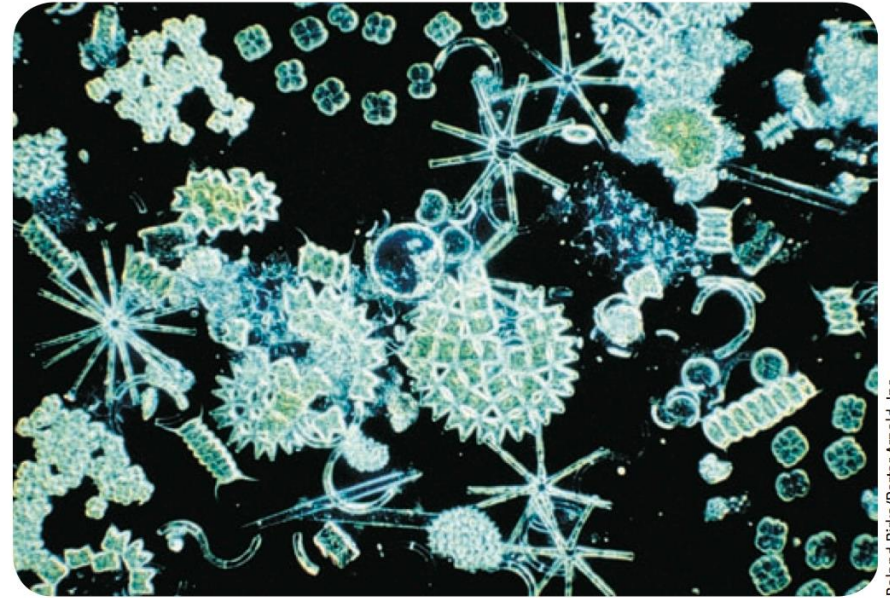
Challenger's expedition



1.5 The route of the *Challenger* expedition, which from 1872 to 1876 undertook the first systematic survey of the world ocean.

Points

- *Plankton* is the term applied to any organism that floats or drifts in ocean currents.
- These tiny organisms are at the base of the ocean's complex food webs, and only in the last 60 years have marine biologists started to understand the specific roles that these organisms play.



Roland Birke/Peter Arnold, Inc.

PLANKTON.

Some examples of marine plankton, organisms that float or drift in the sea's currents. Charles Wyville Thomson, the chief scientist of the *Challenger* expedition, was one of the first scientists to seriously investigate the role of plankton in marine communities.

Copyright President and Fellows of Harvard College/Museum of Comparative Zoology

ALEXANDER AGASSIZ.
Alexander Agassiz was one of the foremost U.S. marine biologist of the nineteenth century. He is pictured here in his laboratory with jars containing some of the marine specimens that he collected during his many expeditions.

Marine Scientists



- He theorized that the colors were related to the absorption of different wave-lengths of light at different depths, a theory later proved correct.
- He also noted a great deal of similarity in the deepwater organisms on the east and west coasts of Central America and hypothesized that the Pacific and the Caribbean were at one time connected.
- Agassiz spent much of the latter part of his life studying the structure and formation of coral reefs.

Marine Biological Laboratory



Figure 1-8 MARINE BIOLOGICAL LABORATORY AT WOODS HOLE.

Scripps Institution of Oceanography in California,

Rosenstiel School of Marine and Atmospheric Science in the University of Miami

The Harbor Branch Oceanographic Institution in Florida,

The Friday Harbor Laboratories, University of Washington,

Marine Laboratory in Duke University

Marine Biology in the 20 and 21th Century



- Early in the 20th century, expeditions were mounted to study the Arctic and Antarctic seas. Collected information and organisms from these two areas.

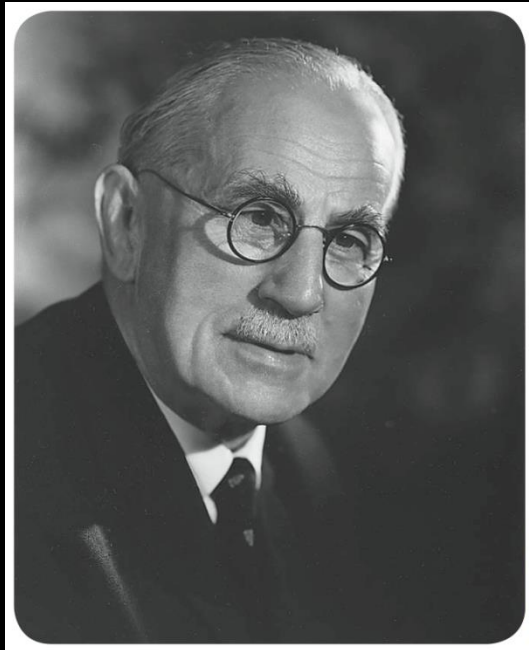


Figure 1-9 SIR ALISTAIR HARDY.

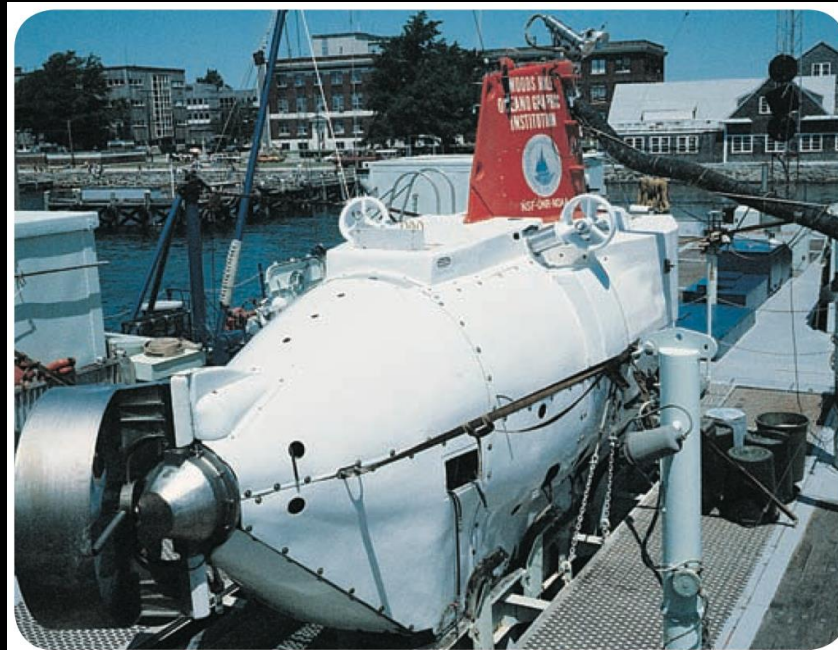
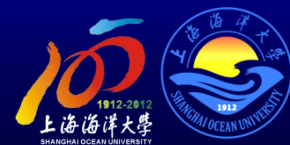


Figure 1-10 THE SUBMERSIBLE ALVIN.

SHOU



SHOU



SHOU



Points: Dead Zone



- Nitrogen is a major nutrient that supports the growth of algae in aquatic ecosystems
- A major source of the nitrogen-containing chemicals entering the ocean is agriculture runoff that flows into rivers that drain into the sea.
- Studies show that 51% of the nitrogen entering the ocean from land comes from commercial fertilizer, 30% from animal manure, 5% from sewage treatment, and the remainder from other sources.
- The U.N. Environment Program lists more than 150 dead zones around the world.

According to the Pew Oceans Commission report, nitrate runoff pollution from the northern and Midwestern Mississippi River watershed is one of eight major threats to ocean wildlife, polluted beaches and collapse of commercial fishing in U.S. waters. Such pollution has contributed to a growing “dead zone” in the Gulf of Mexico where the Mississippi meets the ocean. Pollution drains oxygen from the ocean ecosystem, causing fish kills and depletion of ocean wildlife.

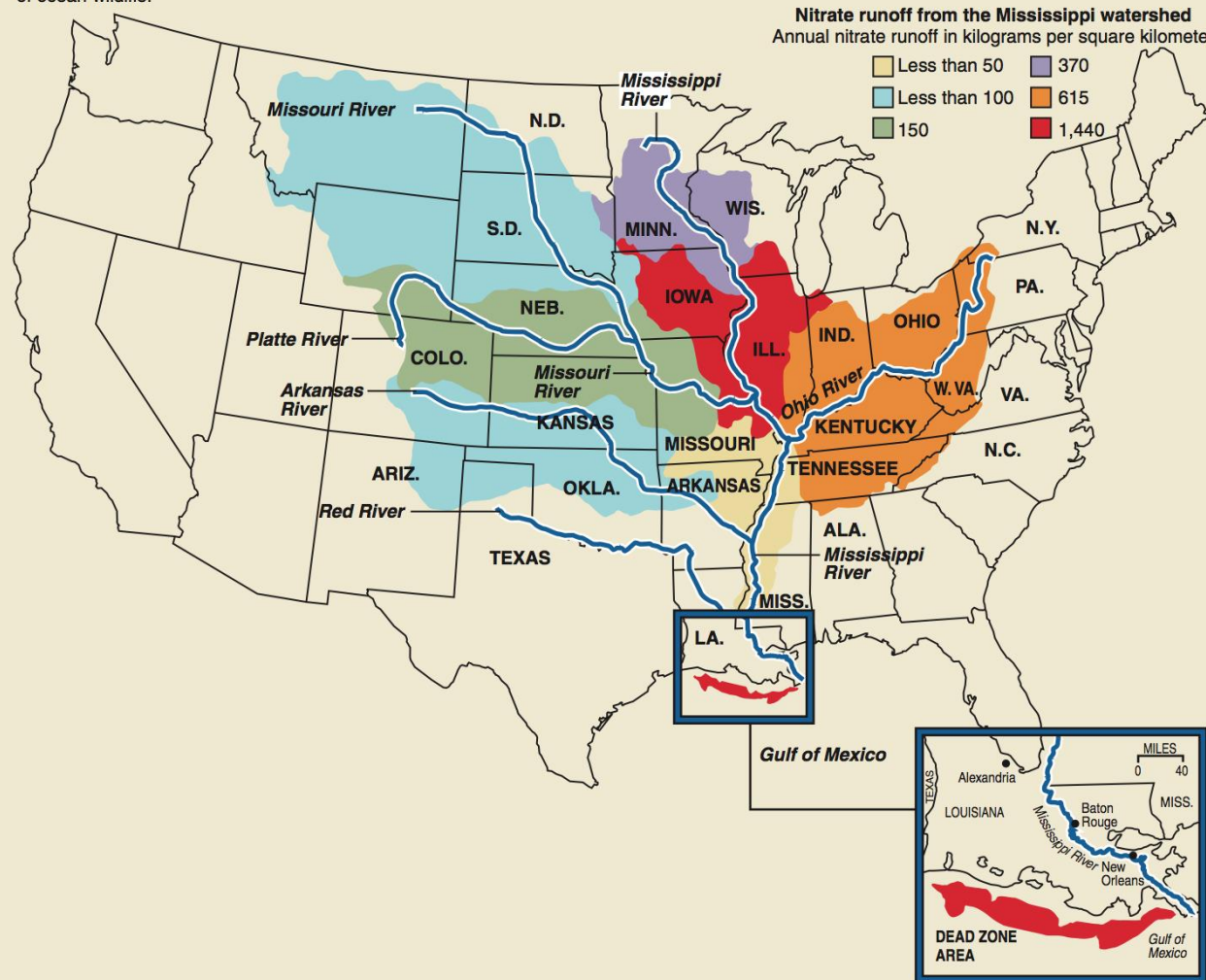


Figure 1-A HYPOXIC ZONE. Agricultural nutrients draining into the Gulf of Mexico have contributed to the depletion of oxygen in an area off Louisiana referred to as the “dead zone.”
(Reprinted with permission from the St. Louis Post Dispatch, © 1997.)

Why Study Marine Biology and Ecology



- To dispel misunderstandings about marine life
- To preserve our fisheries and food resource
- To conserve marine biodiversity
- To conserve the marine environment
- To conserve the terrestrial environment
- For medical purposes
- For human health
- Marine organisms are really cool!

1.4 Process of Science



- A particular endeavor of study becomes a **science** when the principles on which it is based can be presented as **hypotheses**, explanations that can be tested by experiments.
- A good hypothesis can **explain** past events and **predict** the outcome of current or future experiments.
- Inductive reasoning
- Deductive reasoning

A *hypothesis* is an explanation for observed events that can be experimentally tested.

Inductive reasoning is a process of reasoning whereby a general explanation is derived from a series of observations.

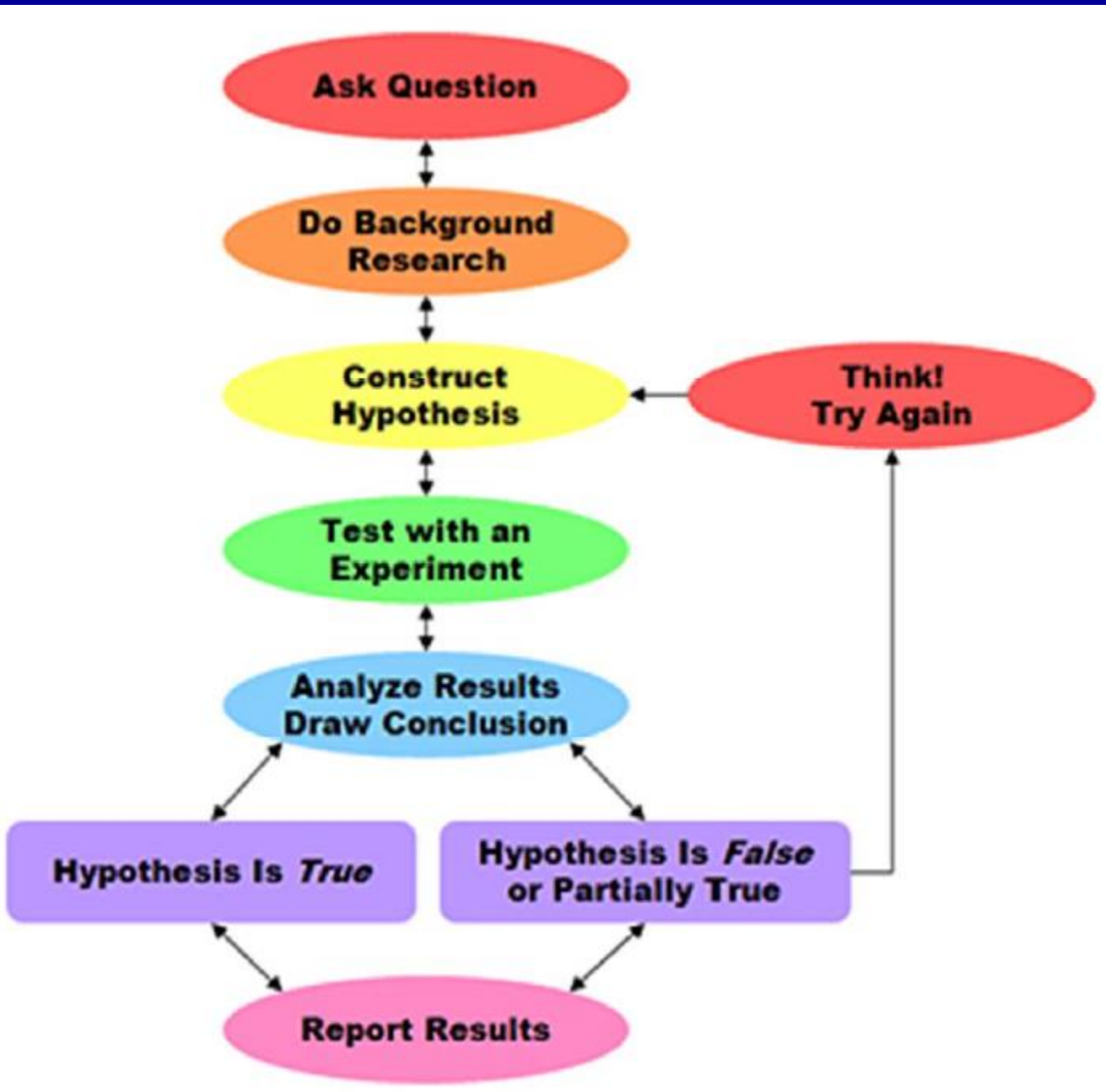
Deductive reasoning is the process of reasoning in which observations suggest a general principle from which a specific statement can be derived.

Scientific method refers to the orderly pattern of gathering and analyzing information in science.

GLOSSARY

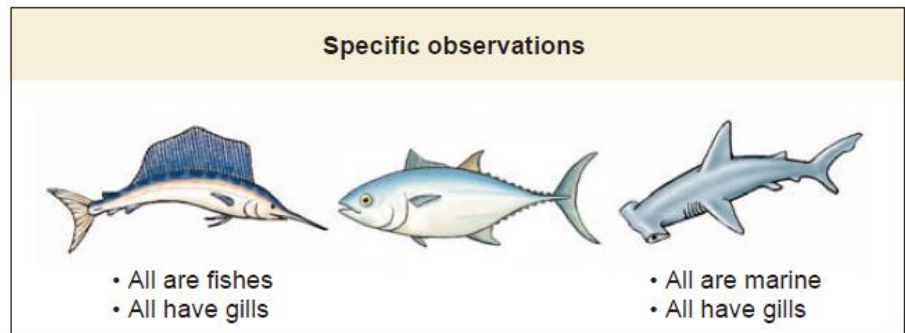
1.

- Step 1
- Step 2
- Step 3
- Step 4



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INDUCTION

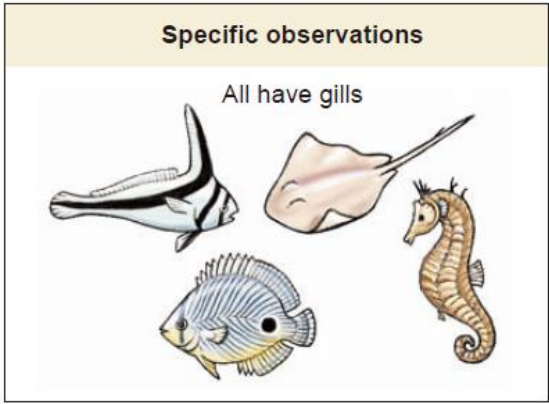
General hypothesis
"All fishes have gills."

DEDUCTION

Specific hypothesis
For each species of fish:
"This fish has gills."

Hypothesis is accepted.

TESTING



INDUCTION

General hypothesis
"All marine organisms have gills."

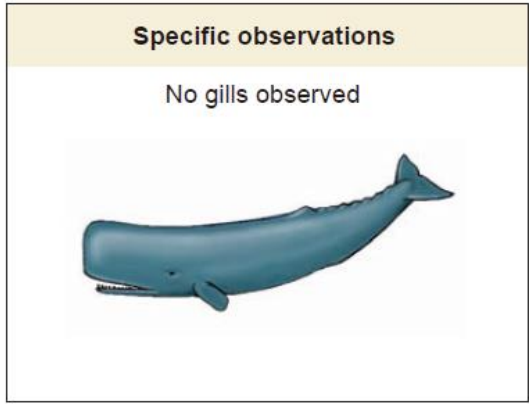
DEDUCTION

Specific hypothesis
"Whales have gills."

Therefore, general hypothesis is false.

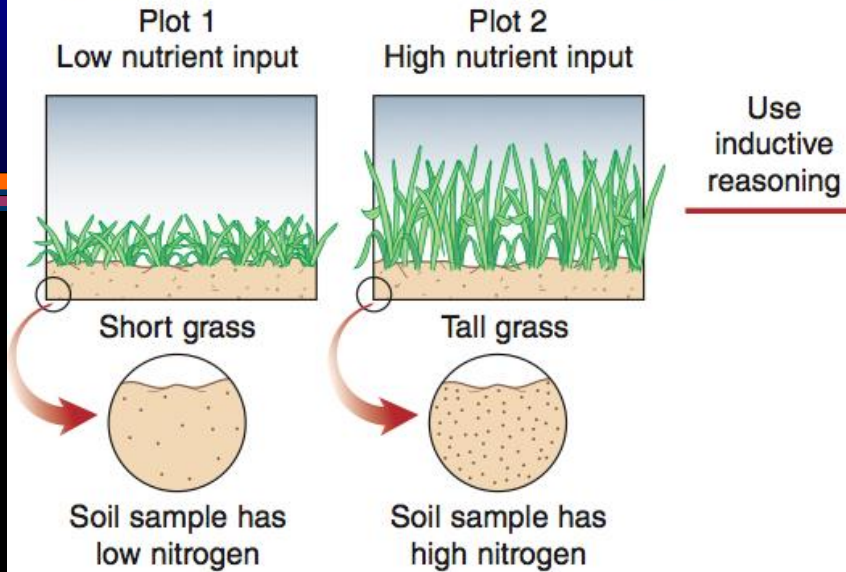
TESTING

Specific hypothesis is false.



1 Make Observations and Ask Questions

Why do salt marsh plants in some areas grow larger?



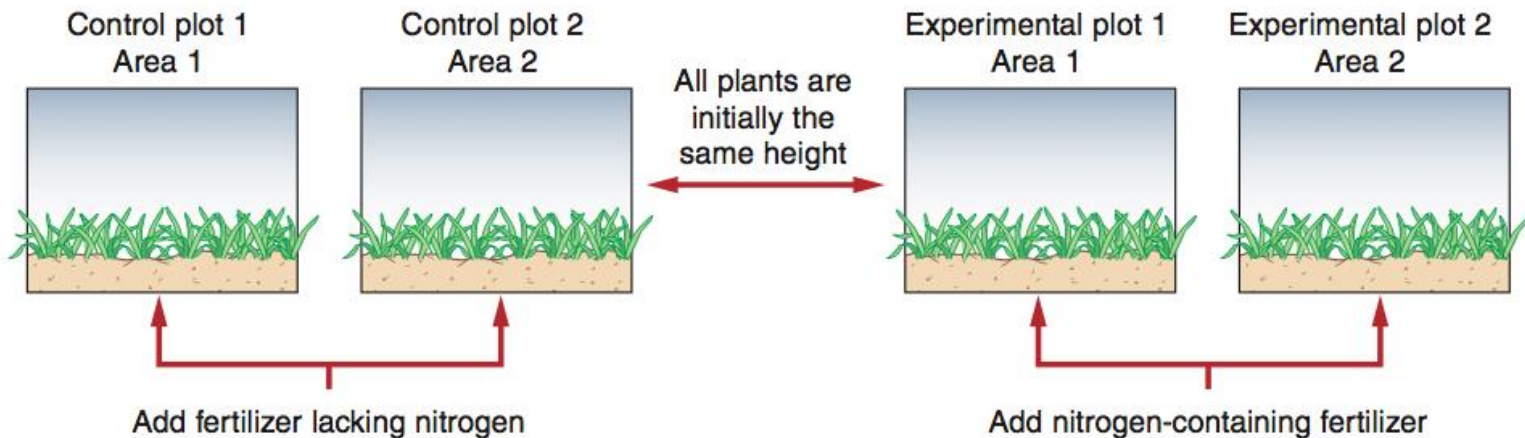
2 Formulate a Hypothesis

Growth of marsh grass is limited by nitrogen availability

3 Use deductive reasoning to make a prediction based on the hypothesis

IF nitrogen is added to the soil, THEN marsh grass will grow larger or faster or both

4 Design Experiments and Do Them



5 Gather Results

Multiple choice



- Publication of Darwin's book *On the Origin of Species by Means of Natural selection* sparked an interest in the study of
 - A. Physical oceanography
 - B. Animal and plant adaptations
 - C. Plankton
 - D. Barnacles
 - E. Polar seas

Multiple choice



- The term *Plankton* refers to
 - A. All kinds of marine plants and algae
 - B. Microscopic animals only
 - C. Organisms that float or drift in the sea's currents
 - D. Animals that are active swimmers
 - E. All of the marine organisms that can produce their own food