NATIONAL SCIENCE EDUCATION STANDARDS

A. Science as Inquiry
Abilities necessary to do scientific inquiry
Understanding about scientific inquiry

B. Physical Science
5–8
Motions and forces

- The motion of an object can be described by its position, direction of motion, and speed. That motion can be measured and presented on a graph.
- If more than one force acts on an object along a straight line, then the forces will reinforce or cancel one another, depending on their direction and magnitude. Unbalanced forces will cause changes in the speed or direction of an object's motion.

G. History and Nature of Science
K–4
Science as a human endeavor

- Science and technology have been practiced by people for a long time.
- Although men and women using scientific inquiry have learned much about objects, events, and phenomena in nature, much more remains to be understood. Science will never be finished.
- Many people choose science as a career and devote their entire lives to studying it. Many people derive great pleasure from doing science.

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Publishing services by South Pacific Press
Designed by ThinkSpace Design
Art Director: Moonhee Pak
Editorial Director: Stacey Faulkner

Published in the United States of America by

Creative Teaching Press Inc.
P.O. Box 2723
Huntington Beach, CA 92647-0723
www.creativeteaching.com

ISBN 978-1-59198-715-4

CTP 5744

Printed in the United States of America.

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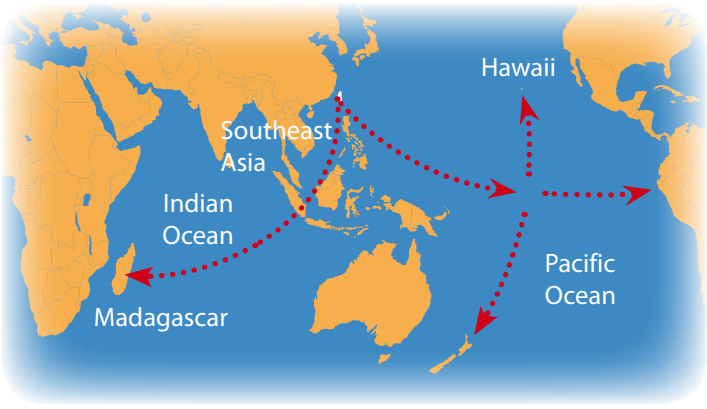
COME ABOARD



An amazing thing happened 3,500 years ago. Some Austronesian people from Southeast Asia sailed across the Indian Ocean to Madagascar. Others sailed out into the **vast** Pacific Ocean. No one had ever sailed so far before. At last, human beings were exploring the largest ocean on earth. Their **descendants** would eventually discover Hawaii.

Now scientists explore the world's oceans in marine research vessels. The science and technology they use is a mixture of the modern and the very old.

An early Hawaiian voyaging canoe

One of the reasons a heavy ship can stay afloat is a force called upthrust. When you get in a bathtub, the water rises. In the same way, a ship pushes water out of the way. The water also pushes back on the ship's **hull**. This push is called upthrust. A ship floats as long as the weight of the ship is less than the upthrust.

If you look at the side of a ship, you'll see marks painted on the hull. They're load lines. The crew knows that once the water reaches the line, it's not safe to load any more **cargo** on board.

Find the Load Line

To see how upthrust works, try this experiment.

You will need:

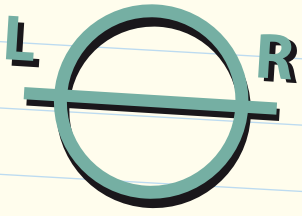
- a sink or a tub of water
- a model boat
- gravel
- a pen

What to do:

1. Fill the sink or tub with water and put the boat in the water.
2. Start filling the boat with gravel.
3. Watch what happens. How much gravel can the boat hold before it sinks?
4. Find where the load line should go on your model and mark it.

Tell a friend:

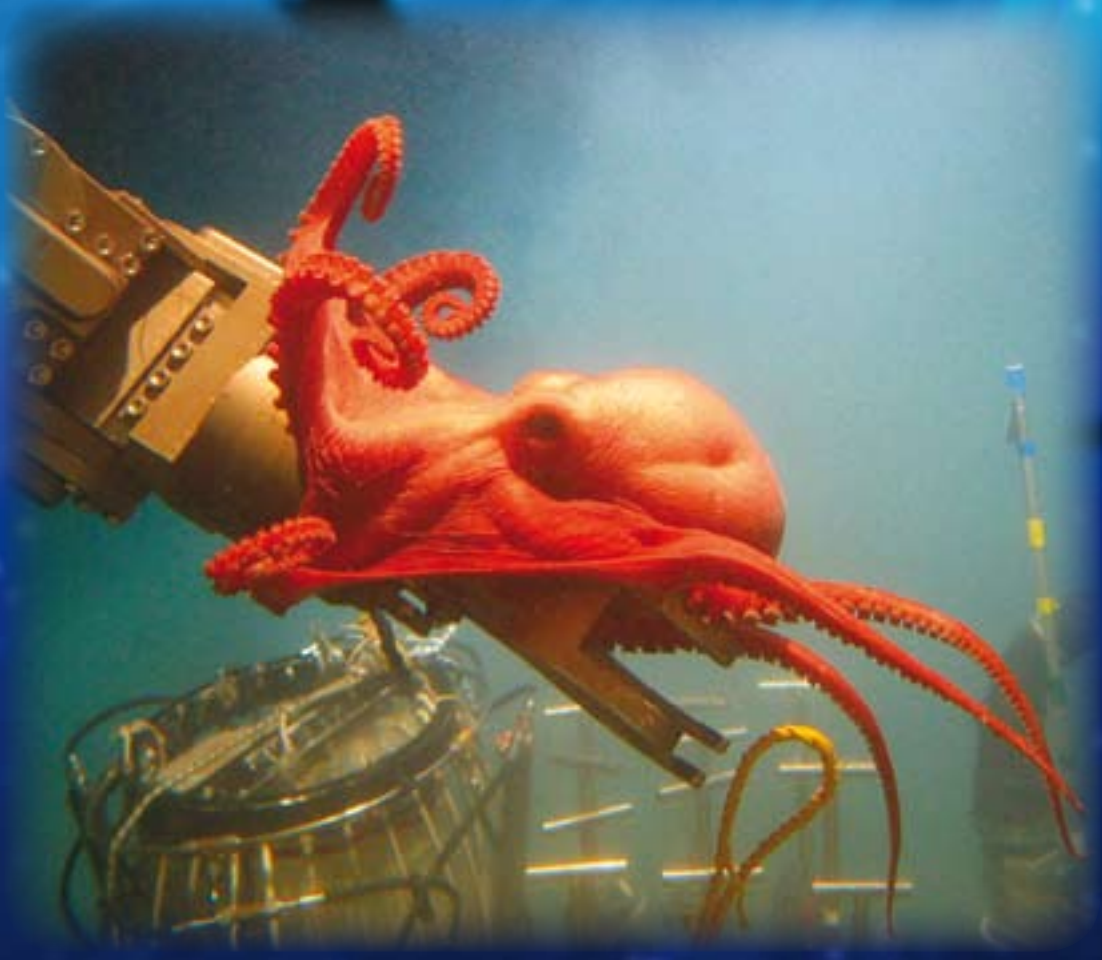
Invite a friend to load your model boat. Show them how the load line works.



A Plimsoll line

Samuel Plimsoll's Unseaworthy Shipping Bill (1876) was a law that forced ship owners to paint load lines on ships' hulls. They are now called Plimsoll lines in honor of him.

It's so dangerous down there that we're going to use a remotely operated vehicle (ROV), a special kind of submersible.



In the Gulf of Mexico, an octopus explores the manipulator arm of an ROV.

Marine scientists also track the movements of animals such as whales, turtles, and sharks. They attach satellite tags to the animals so that they can follow their movements.