Coral Biomimicry

Science Film Festival Knowledge Through Entertainment

KEY OBJECTIVES

Turning to nature to help solve our challenges

INTRODUCTION

Life has been dealing with all sorts of challenges for billions of years. As a result we can find all sorts of wonderful solutions to diverse problems by looking closely at how plants and animals are built, grow, move, and defend themselves. These natural solutions are often wonderfully efficient, and work in ways human engineers and designers might not have thought to try. Copying and applying these solutions is called biomimicry.

One example comes from studying how corals make such strong structures. The main ingredient of the coral structure is a form of calcium carbonate (chalk). Which we know is very soft, and brittle. A large coral in the ocean would soon be snapped apart by waves and currents if it was just made of chalk.

Studies have found that corals carefully mix a little protein in with the calcium skeletons. Proteins are what we use to form much of our muscles, and hair. These proteins are laid down in a very specific way, and add great strength to the skeleton even though they are only a very small part of the overall structure.

We will see how this approach works using some wax and cotton wool to simulate how the coral's skeleton is made.

KEYWORDS

Biomimicry | calcium carbonate | corals

LEVEL

Primary & Secondary School

TIME FOR ACTIVITY

25 min

GUIDING QUESTIONS

How is the coral skeleton produced? ?

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MATERIALS & PREPARATION

- **Candle wax (2 large candles per group)**
- **Several balls of cotton wool, though other strong light fibers could be tried (flax, beaten grass fiber, etc.)**
- **A hot water bath**
- **Some molds to remake the candles. These can be made from sand in a tall glass.**

TASKS & PROCEDURE

1. To start, take one candle (per group), add it to a heat proof container and float in the hot water bath to melt the candle wax. Remove the wick.
2. Once the wax has melted, pull small tufts of cotton wool off the cotton wool balls and mix into the hot wax. Add one or two cotton wool balls worth of cotton to each melted candle. Stir to ensure all the cotton wool is mixed and coated with wax.
3. To remold a candle shape, take the other normal candle and press into some slightly wet sand in a tall can or glass, pack the sand around the candle, and then gently remove the candle to leave the mold.
4. Let the melted wax cool a little until it seems to be starting to skin or set, carefully pour the wax/cotton wool mix into the mold making sure all the cotton goes in and is well mixed.
5. Let it cool for 10 minutes, and carefully remove from the mold - let it cool completely.
6. Feel the two candles - How do they differ in weight and density. Try to bend each candle, slowly using more force. Which one breaks first, how do they behave when they do break?

POSSIBLE EXTENSIONS

This type of reinforcing of a brittle material is what we do in our large concrete buildings. It saves us from using a great deal of extra concrete to make them strong enough.

The way corals use their reinforcing material is even more efficient than our simple experiment, and is being studied to see how we might apply it.

If we can reduce the amount of concrete we use in buildings we will save a great deal of energy, carbon emissions and raw resources.

SOURCES

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