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Beach Reading

Bermuda's pink sand beaches are made of tiny pink coral fragments.

Credit: Bermuda Ministry of Tourism & Transport

Here's a great story to read on the beach, but it's not on your summer book list.

Every beach is a mystery. Read the clues right and they'll tell you about the area's ocean floor, sea life, and geology.

You can start with the usual suspects: waves. They make or break a beach.

Gentle slopes and slow-rolling waves produce wide beaches and shallow, sand-rich bottoms extending way off shore.

Steep slopes and tall, angular waves that crash hard rob the beach of sand, keeping it narrow and rocky.

Now scoop up some sand for a closer look.

Fine, rounded grains that look mostly alike mean the beach is made of rocks and minerals from far away, broken down over long time frames as they traveled in rivers or ocean currents.

Pebbly, angular sand grains with lots of diversity come from nearby coastal headlands or fast-moving rivers.

White sand could be quartz, or limestone from nearby cliffs, or ground-up seashells, suggesting an ocean healthy with mollusks and snails.

Pink sand could be ground-up coral, indicating offshore reefs.

Black sand is made of obsidian or basalt, like on some beaches in Spain.

Green beaches mean volcanic rocks are eroding, concentrating olivine in the sand, as you can find in Hawaii.

With a keen eye, there's a great deal to uncover on the beach. For more clues, visit EarthDate.org.

Bureau of Economic Geology

Background: Beach Reading

Synopsis: The warm days of summer bring visions of beautiful coastal beaches. You may take a book to read at the beach, but do you know how to read your beach?

- Seaside beaches form when waves deposit materials along coastlines.
  - Beaches start at berms and dune fields, where extra sand is stored onshore.
  - They cross the swash zone that beachgoers walk along and the breaker zone, where swimmers and surfers frolic in the water.
  - Finally, beaches extend out to offshore bars, where more sand is stored.
- Wave energy, which forms and maintains the shape of a beach, may vary from season to season.
  - Constructive waves build beaches because they are lower-energy and allow the beach particles to settle between waves, resulting in compacted beaches that tend to resist erosion. These types of waves are common in fair weather.
  - Destructive waves occur in rapid succession and don't allow seawater to recede between successive waves, so beach particles stay suspended and are more easily eroded. These waves usually occur during stormy weather, especially in the winter.
  - Dune fields and offshore bars build up in mild weather if enough beach material is available. They are part of a healthy beach environment—after beach erosion during stormy weather, wind and waves replenish the beaches from the dunes and bars.
  - Wave energy and particle size determine the steepness of the beach.
    - Faster-moving water can transport coarser material.
    - Steeper beaches cause more rapid deceleration of energetic waves.
    - Rocky or coarse sand beaches tend to be steeper and occur in areas characterized by higher wave energy.
    - Fine to medium sand beaches usually have long, low slopes that allow waves and tides to travel farther.
- Beach materials come from the local geology: the type and quantity of materials available up-current from the beach determine the composition of the beach.
  - Rocky beaches contain pebbles that come from nearby coastal headlands or from rapidly moving rivers. Rocks and pebbles are worn and rounded by waves and currents.
  - Sandy beaches are made up of smaller grains of rock or minerals that have been broken down over much longer time frames and have traveled long distances in rivers or alongshore currents.
  - Quartz is the most common beach sand because it is more resistant to erosion; feldspar and hornblende are also common.
  - Coral and shells from close by may mix with harder minerals from farther distances, or they may form the entire beach.
  - Beaches may even be muddy down-current from inlets where mud-laden rivers enter the sea.
- Beaches come in all colors, depending on their source.
  - In the tropics, white sand beaches may be completely composed of ground-up seashell and coral. In Bermuda, pink sands come from pink coral grains.
    - Elsewhere, white sand beaches may be made up of quartz and feldspar, or limestone grains if there are limestone cliffs nearby.
  - Iron in the sand makes it tan- or yellow-colored.
  - Black sand beaches occur where obsidian or basalt are exposed to erosion nearby, like at Punaluu Beach in Hawaii and Ajuy Beach in Spain.
  - When volcanic rocks are eroded and winnowed, resistant olivine may be concentrated into beaches, creating green sand, like at Hawaii's Papakolea Beach.

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References: Beach Reading

Science of Summer: Where Does Beach Sand Come From? | LiveScience
Sand | Geology.com
Beach | Wikipedia
Papakolea Beach | Wikipedia

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Background: Beach Reading

Green sand from Papakolea Beach in Hawaii.

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References: Beach Reading

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