Video
MEDIA SPOTLIGHT

Catching the Biggest Wave
Surfers and wave prediction

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http://education.nationalgeographic.com/media/catching-biggest-wave/

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For surfers, a great day on the water is dependent on the size of waves coming ashore. Most of the waves they catch are caused by wind transferring energy from the air to the water. The energy moving through the water causes the disturbance that is seen, felt, and sometimes heard, as a wave. The size of a wave depends on several factors. First, the strength of the wind affects wave formation. Stronger winds generally lead to larger waves. Second, the duration of the wind or how long it blows. The longer the wind blows consistently, the better chance that there will be larger wave heights. The third factor is the area of open sea over which wind can blow, known as fetch. Larger fetches tend to lead to larger waves.

A wave begins to break when it moves into shallow water where the depth is less than half of its wavelength. The wave’s energy is now compressed into a smaller area of water, causing it to become steeper and eventually toppling over. In the ocean, there are two major types of breaking waves: plungers and spillers. When waves encounter a steeply sloped bottom, they crash violently, forming plungers. On more gently sloped coastlines, waves tend to pour over themselves, forming spillers. For surfers, riding a spiller provides a long, smooth ride but riding a plunger results in a fast and exciting, but often more dangerous ride.

To catch a wave, surfers typically paddle out from the beach through the breaking waves to the surf line. There, they wait for a good wave to rise beneath them. When they select the wave they want to ride they lay down on their boards and paddle with their hands until they catch the wave pop up onto their feet and ride the wave towards shore. Most surfers chase waves that range from 3-6 meters (9-20 feet) high. Big wave surfers, however, can catch waves more than 21 meters (70 feet tall). Big wave surfers often have jet skis or small boats tow them safely out past the breakers and into rising swell helping them catch high velocity waves. This technique is called tow surfing.

Modern technology and wave prediction has changed the sport of surfing allowing surfers to watch their computers to know when it is time to head to the beach for the best surf. Surfcasters, such as Sean Collins, take wind speed, wind duration, and fetch into consideration when they make predictions. They also consider geographic factors, the direction the beach faces, and interference from nearby islands or other landforms and the bathymetry or depth of the seafloor near possible surf sites. Features such as sandbars or reefs might cause predictable places where waves crash called surf breaks. Surfcasters use data from satellites and buoys near and off shore to examine wind
and weather patterns. Computer models process data and make predictions about what future surfing conditions will be like days to weeks ahead of time.

**QUESTIONS**

- Sean Collins founded Surfline, which predicts surfing conditions in various places around the world. What tools does Surfline use to make surfcast predictions?

  Surfline uses **satellite data**, **buoy measurements**, and **computer models** to make predictions about future surf conditions.

- What are some hazards associated with surfing?

  The **waves** are extremely powerful, bringing millions of tons of force, which can crush surfers who do not catch waves “just right.” Additionally there are hazards of **ocean life** and **seafloor features**, including **jellyfish stings** and **sharp coral reefs**.

- Why are the waves in Teahupoo Tahiti so big?

  The wind blowing over the world's largest ocean basin, the Pacific, provides a **huge fetch** over which the **wind energy from far away storms can build**. That energy is transferred to the water. In addition, the **seafloor rises sharply** and the **water becomes extremely shallow due to a submerged nearshore reef**. These features concentrate the wave’s energy, making it extremely strong and fast.

**FAST FACTS**

- In May 2012, Garrett McNamara set the record for surfing the largest wave, measuring more than 23 meters (77 feet) off the coast of Portugal. In early 2013, McNamara claimed to have broken his own record, surfing a wave of nearly 30 meters (100 feet). Officials from Guinness World Records have yet to verify this feat.

- Olympic gold medal-winning swimmer Duke Kahanamoku is credited with bringing the sport of surfing to both the United States mainland and Australia. Duke was inducted into both the Swimming and Surfing Halls of Fame.

- Surfing is thought to have begun more than 1000 years ago by the Polynesians. Sailors on Captain James Cook’s expedition to the Hawaiian Islands described how the Native Hawaiians rode the waves on small canoes. The ancient Hawaiians called the art of surfing he’e nalu, or “wave sliding”.

**VOCABULARY**

<table>
<thead>
<tr>
<th>Term</th>
<th>Part of Speech</th>
<th>Definition</th>
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</thead>
<tbody>
<tr>
<td>bathymetry</td>
<td>noun</td>
<td>measurement of depths of bodies of water.</td>
</tr>
<tr>
<td>big-wave surf</td>
<td>verb</td>
<td>to ride waves more than 6 meters (20 feet) tall on a surfboard.</td>
</tr>
<tr>
<td>buoy</td>
<td>noun</td>
<td>floating object anchored to the bottom of a body of water. Buoys are often equipped with signals.</td>
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<tr>
<td>communication</td>
<td>noun</td>
<td>instrument that orbits the Earth to connect devices such as cell phones, GPS units, and television broadcasts.</td>
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<tr>
<td>satellite</td>
<td></td>
<td></td>
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<tr>
<td>fetch</td>
<td>noun</td>
<td>the length of open water over which wind is generating waves.</td>
</tr>
<tr>
<td>surf break</td>
<td>noun</td>
<td>underwater obstacle that causes waves to break, causing waves that can be surfed before eventually crashing.</td>
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wave height  

*noun*  
the distance between a wave’s trough and crest.

wavelength  

*noun*  
the distance between the crests of two waves.

For Further Exploration

**Articles & Profiles**
- Surfline: Surf Mechanics
- NASA: The Science of Surfing

**Websites**
- Surfrider Foundation
- National Geographic: Alien Deep
- National Geographic Education Encyclopedic Entry: Surfing

**Funder**

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