

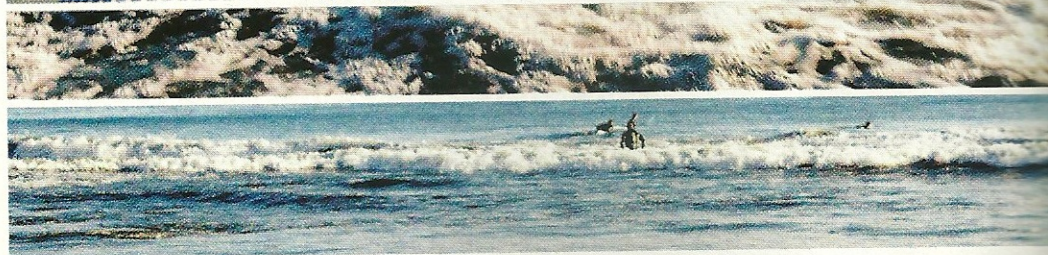
The big splash

A local scientist tries to get a grip on the rogue-wave phenomenon. Mavericks, anyone?

Imagine you're on a boat in gently rolling waters. As you wait for a nibble on your line, you start to doze. Quietly, a shadow blots out the sun—and the next thing you know, you're underwater.

Half a century ago, so-called **rogue waves** (aka freak waves, killer waves, or monster waves) were known mostly to salty sea captains who described huge walls of water that appeared out of nowhere on the open ocean. Skeptical scientists responded by placing the existence of these waves on a spectrum somewhere between mermaids and the four-armed Kraken in *Clash of the Titans*.

It wasn't until 1995 that scientists had unequivocal proof that rogue waves existed. That year, an 85-foot wall of water was measured thumping into an oil rig on the North Sea. Researchers like Tim Janssen, an ocean modeler at San Francisco State University (and a sometime surfer), have been working to understand these rare and occasionally lethal phenomena with little real-world data. This past August, Janssen published a paper that combined two competing theories about how such waves might form, using advanced statistics and modeling. The trick, he says, is to think of rogue waves not as individual entities but as part of a widespread, chaotic system in which anything can happen. Bay Area boaters, beware. ■ ERIK VANCE



I looked up *rogue wave* on YouTube and saw giant waves crashing over ships in a storm.

Is that what we're talking about? That's hard to say. Say it's very energetic that day, and there are many very large waves. Then a wave comes that is just a little bigger than everything else. That wouldn't qualify as a rogue wave. One of the problems is that we have a pretty loose definition of what a rogue wave is—that is, a wave several times the height of the surrounding waves...

...that goes crashing across huge sections of the ocean? No, that would be more like a tsunami.

So we must be talking about a wave that's quite a bit larger than normal size, traveling across a relatively short distance. Basically, that's what it is.

Up until the 1960s, these things were considered the stuff of tall tales. This happens a lot in science: We don't understand something, so we try to say it doesn't exist.

As I understand it, a rogue wave can form out of the randomness of the ocean. But you argue that there may be areas where they're more likely to form. When there is a calm ocean—with the waves propagating across the water in a normal way—you could still have a rogue wave, but

the chances are small. Now, if there is an area where those statistics are different—if there is strong "focusing" as a result of refractive sea-floor topography or opposing currents—you could have a much greater likelihood.

Mavericks, the famous surf break near Half Moon Bay, is relatively flat most of the year but has massive waves on a few special days. Is that similar to the focusing of a rogue?

Absolutely. The principle is exactly the same. You see these waves coming in, and they are pretty big, but when they hit the reef, they suddenly just jack up. The problem there is that they are very close to the shoreline.

So if Mavericks were far out to sea, that could be like a seed for the occasional rogue wave. Should Bay Area sailors be concerned? For

boaters, rogue waves could be important. Outside the San Francisco Bay itself, wave-current focusing is there, no doubt. Wave topography is there also. Whether or not it actually changes the stability of the the waves is impossible to say without actually measuring them—which I hope to do in the near future.

Have you surfed Mavericks? No, no—I'm not that kind of surfer. Not even close.