

What's Across the Ocean?

Have you ever sat on a beach and wondered what's across the ocean?

It seems like this question should be easy enough to answer by looking at a map. In reality, the truth is more complex, and surprising, than you might imagine.

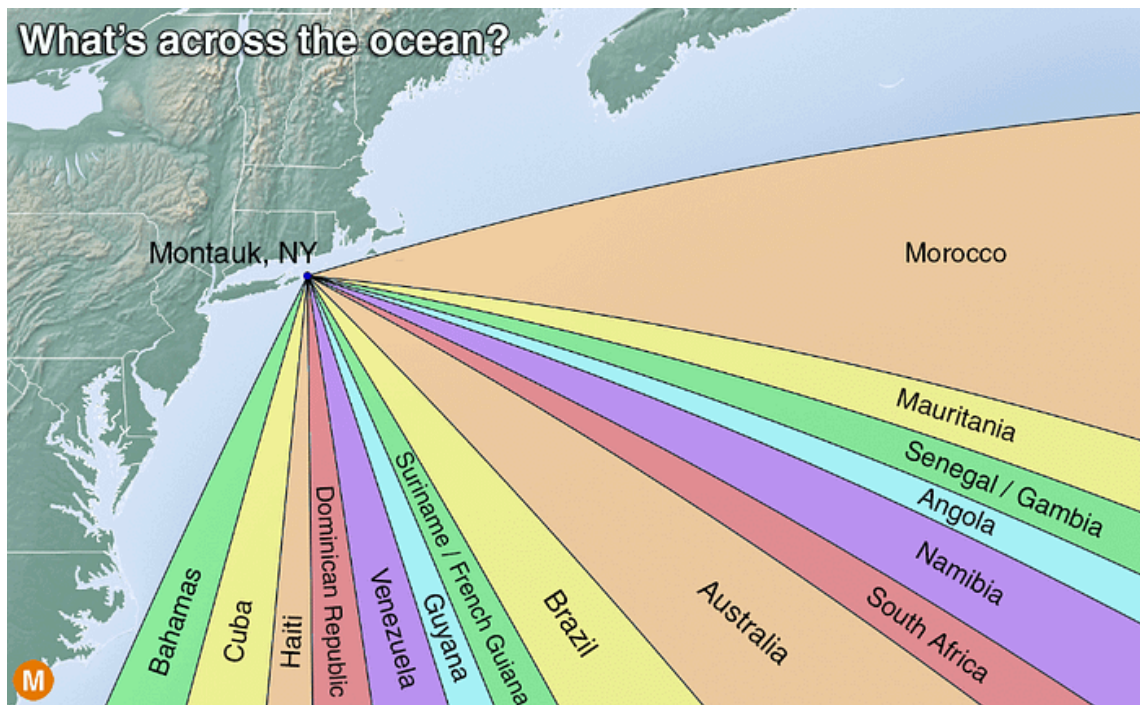
To ask the question more concretely, ***what's across the ocean from New York?*** It doesn't really matter what beach in New York you choose, but just to be specific, let's go with Montauk, NY. It is at the tip of Long Island and has a clear, unobstructed view of the Atlantic ocean.



To answer this question, the first thing you might do is take out a map, follow a straight line eastward, and conclude that the answer is **Europe**, or more precisely **Portugal**.

Of course there is not just one answer. When looking out across the ocean, there are any many directions you could choose, each of which would lead you to a different location. But in this case, surprisingly, **Portugal is not one of them**.

Europe is not across the ocean from New York... but Australia is



When you stare across the ocean from a beach in Montauk, or anywhere in [New York](#), this map shows what's on the other side (excluding some smaller countries that unfortunately did not fit).

No matter which direction you look, you're not facing Europe.

That's partly because the coast of Long Island is angled southward. But there is also something else going on.



If you stand on the beach and turn your head all the way to the left, the direction you're facing is north east. Common sense would seem to dictate if you sail in that direction (north east), you should end up somewhere north east of where you began. Namely, you should end up in Europe.

In reality, if you were to point your ship north east from New York and sail straight ahead without turning, you would land in **Morocco**, which is to the *south* of New York.

Stranger still, when you stand on a beach in New York, one of the countries directly across from you is **Australia**.

If you were to sail through the orange *Australia* section in the map above, without ever turning the ship, you would eventually hit Australia's southwestern coast. And as you land, you would be approaching from the *south*.

Sailing from New York to Australia in a straight line

Because we're used to looking at the world on a flat surface, our perception of Earth's geography is distorted in many ways. In this case, it is the concept of *straight lines* that throws us off.

Technically, there are no straight lines on a globe, since the surface itself is curved. The shortest distance between any two points, the closest thing to a straight line, is known as a *great circle arc*.

Over short distances, straight lines on a 2-dimensional map are the same as great circle arcs on a 3-dimensional globe. But over long distances, the relationship breaks down as the Earth's curvature comes into play.

If you've ever followed the path of a long international flight, you already know the shortest distance between two points on the Earth's surface looks curved. The same effect applies here.



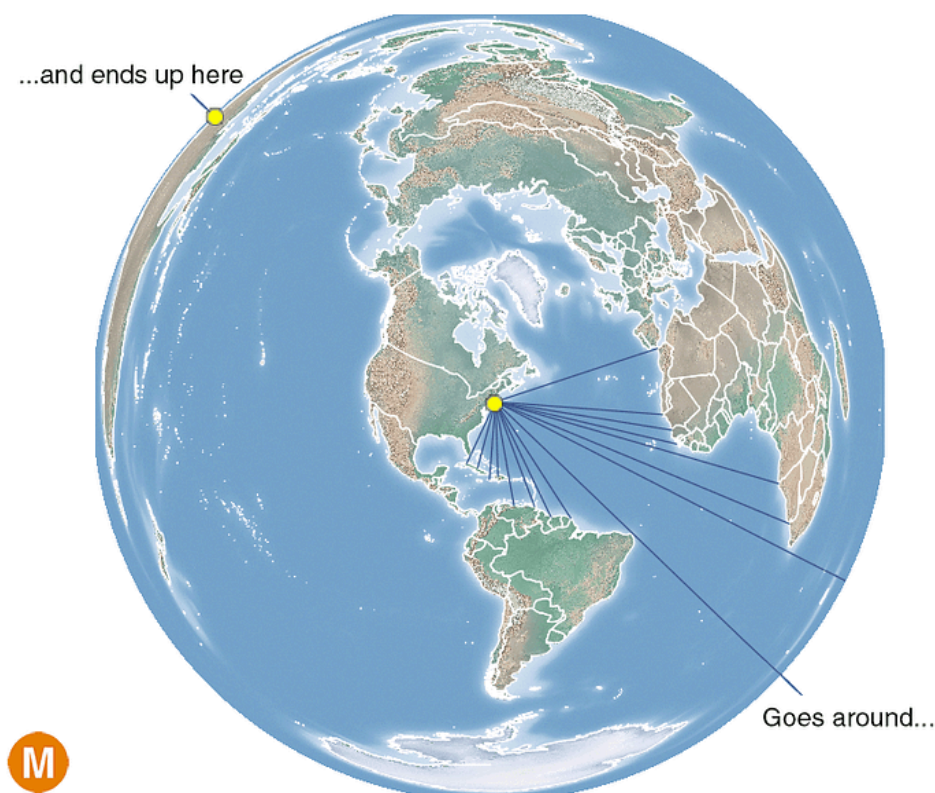
Though the lines in the map above appear curved, all of them are actually straight lines (great circles) on the 3D globe.

Looking at it from a different perspective

I had to spend a good while looking at this on Google Earth to convince myself it was correct.

If you have any doubt whether it's possible to sail from New York to Australia along a straight line, [this video shows what it looks like in 3 dimensions](#).

There is also a 2-dimensional way of looking at these lines that clears up what's really going on. The image below shows the Earth from a top-down perspective, using an *azimuthal* map projection, with New York in the center.



From this view, you can see the lines do appear straight.

You can also see clearly that the U.S. East Coast as a whole does not face toward Europe at all.

What's really across the Atlantic ocean?

If you were to stand on a beach on the U.S. East Coast and look directly east, here's what's really across the ocean.

