

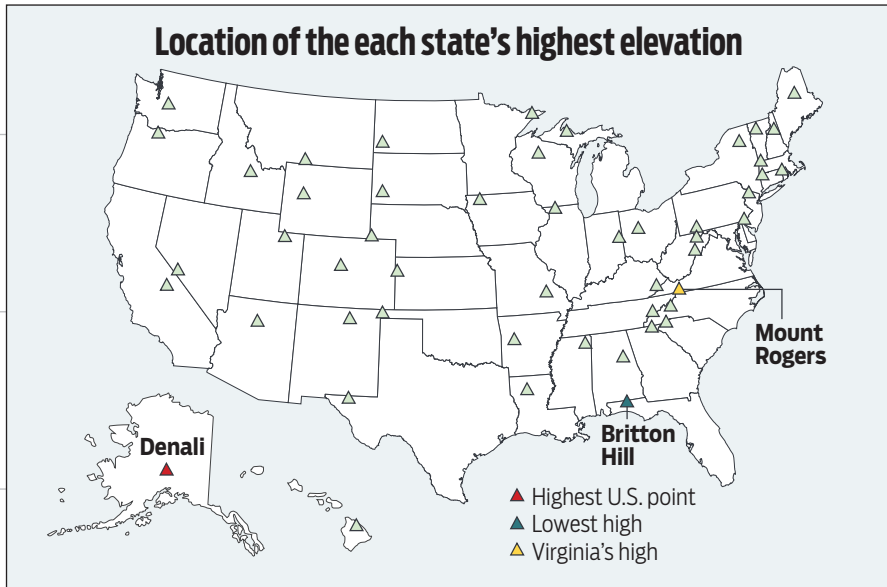
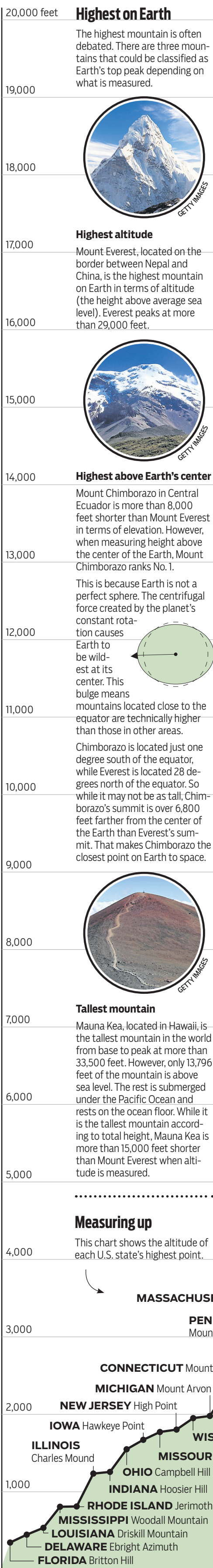
INSIGHT



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ON HIGHER GROUND

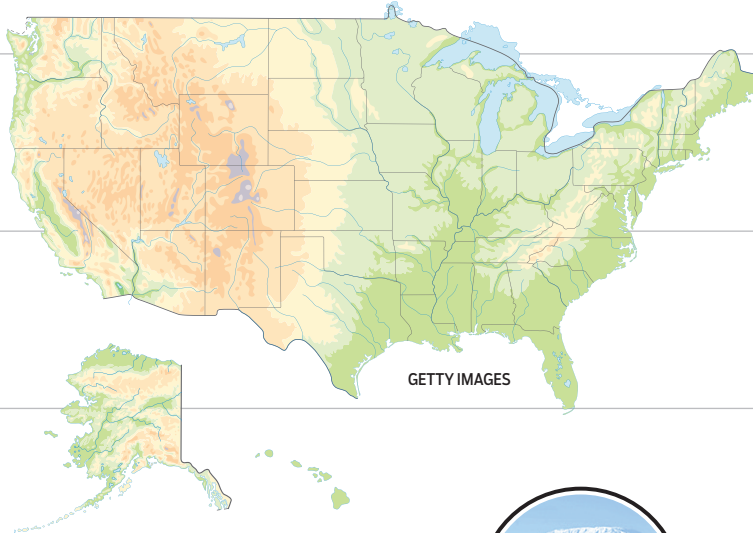
Comparing the top elevations in each U.S. state and a look into the tallest points on Earth



High points and topography of the U.S.

The high points in each state of the country range from Alaska's Denali, which peaks at 20,310 feet, to Florida's Britton Hill, which has a rise of just 345 feet.

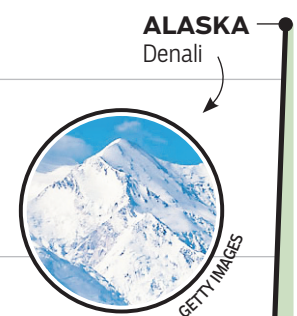
The topography of the U.S. is diverse. The eastern regions consist of hills and low mountains, while the central interior is a vast plain. In the west, there are high mountain ranges. So it is no surprise that virtually all of America's tallest peaks are in the west, while most of the lowest high points are in the midwest and the deep south. Eight of the state high points are found in national parks.



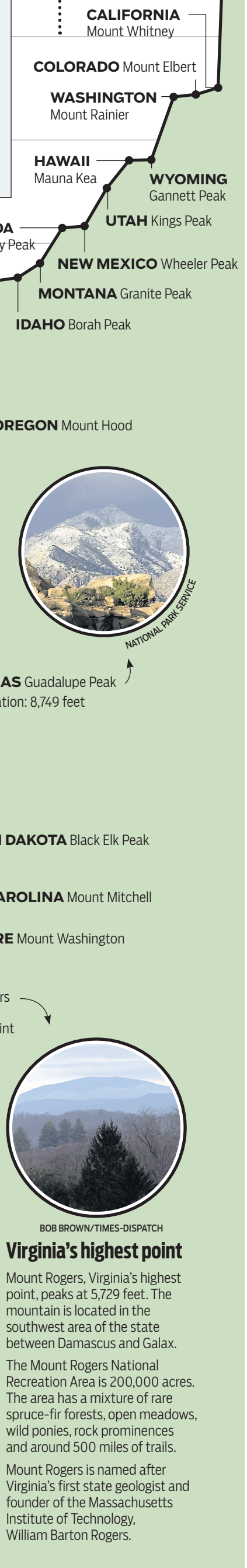
Tallest peaks on each continent

The Seven Summits represent the tallest peaks on every continent. Roughly 500 people worldwide have climbed all seven mountains. There are several variations of the list because of controversy over continent boundaries; however, the Messner list is considered to be the most challenging.

Messner list of the Seven Summits: Mount Everest in Asia, Aconcagua in South America, Denali in North America, Kilimanjaro in Africa, Elbrus in Europe, Vinson in Antarctica and the Carstensz Pyramid in Australia



Highest point in the U.S.
Standing at 20,310 feet, Denali is the tallest mountain in the United States and North America. It is located in Alaska, and more than half of the mountain is permanently covered with snow. Formerly known as Mt. McKinley, the mountain's name was officially changed to Denali in 2015.



INSIGHT

Though Earth is the only known place that supports life, it isn't the only world that has liquid water — one of the key ingredients for life. Scientists have found that oceans exist in diverse forms on moons and dwarf planets across our solar system.

OCEAN WORLDS

EARTH TERRESTRIAL PLANET

Earth is the only planet in our solar system that has liquid water on its surface. This is due to its unique position in the solar system. Earth is the third planet from the sun, located about 93 million miles away, or 1 Astronomical Unit (AU). It is the only known world inhabited with living things. Called the ocean planet, 71% of Earth's surface is covered in water.

Ocean world status: ACTIVE

CALLISTO MOON OF JUPITER

Callisto is Jupiter's second-largest moon and the third-largest moon in our solar system. It is located 5.2 AU from the sun and has an icy surface covered by craters. Data from NASA's Galileo spacecraft in the 1990s revealed Callisto may have a salty ocean beneath its surface. Scientists estimate it may be located 155 miles below the surface. The ocean is thought to be at least 6 miles deep.

Ocean world status: LOCKED (trapped ocean)

GANYMEDE MOON OF JUPITER

Located 5.2 AU from the sun, Ganyমেদে is the largest moon in our solar system. It is even bigger than the planet Mercury. NASA's Hubble Space Telescope found evidence of a large, underground saltwater ocean on Ganyমেদে. The ocean is estimated to be 60 miles deep and is thought to have more water than all the water on Earth's surface. Ganyমেদে could also have several layers of ice and water between its crust and core.

Ocean world status: LOCKED (trapped ocean)

TITAN MOON OF SATURN

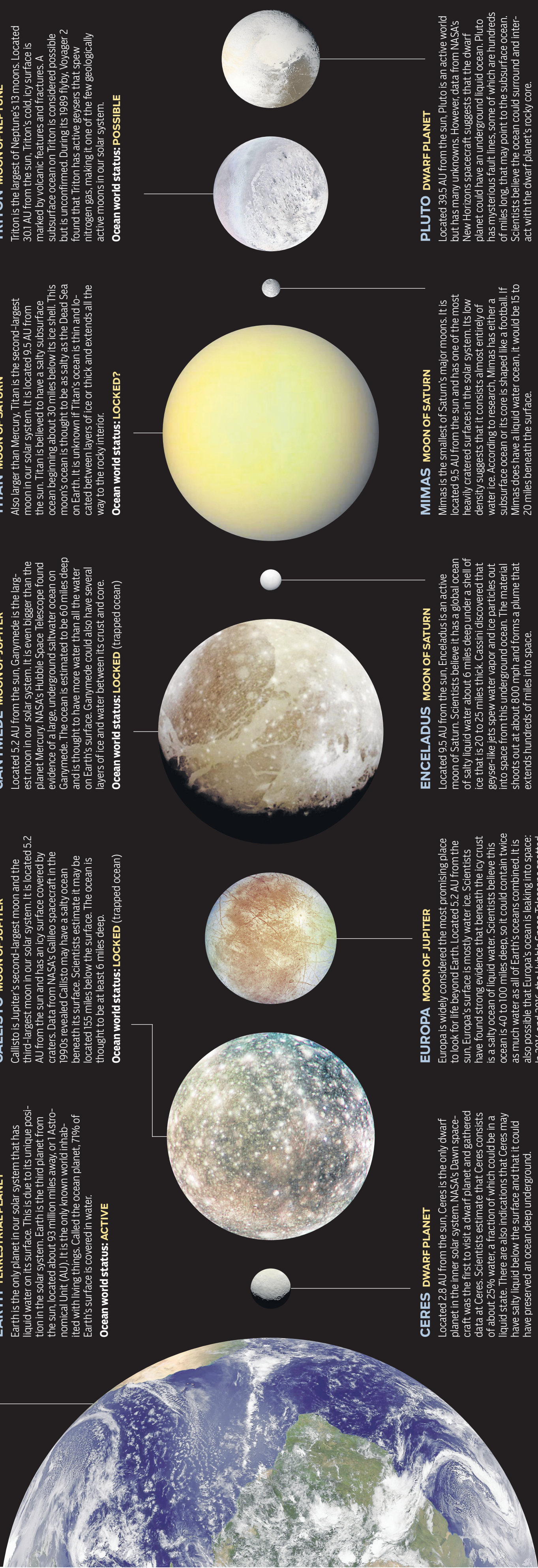
Also larger than Mercury, Titan is the second-largest moon in our solar system. It is located 9.5 AU from the sun. Titan is believed to have a salty subsurface ocean beginning about 30 miles below its ice shell. This moon's ocean is thought to be as salty as the Dead Sea on Earth. It is unknown if Titan's ocean is thin and located between layers of ice or thick and extends all the way to the rocky interior.

Ocean world status: LOCKED?

TRITON MOON OF NEPTUNE

Triton is the largest of Neptune's 13 moons. Located 30.1 AU from the sun, Triton's cold, icy surface is marked by volcanic features and fractures. A subsurface ocean on Triton is considered possible but is unconfirmed. During its 1989 flyby, Voyager 2 found that Triton has active geysers that spew nitrogen gas, making it one of the few geologically active moons in our solar system.

Ocean world status: POSSIBLE



CERES DWARF PLANET

Located 2.8 AU from the sun, Ceres is the only dwarf planet in the inner solar system. NASA's Dawn spacecraft was the first to visit a dwarf planet and gathered data at Ceres. Scientists estimate that Ceres consists of about 25% water, a fraction of which could be in a liquid state. There are also indications that Ceres may have salty liquid below the surface and that it could have preserved an ocean deep underground.

Ocean world status: POSSIBLE

EUROPA MOON OF JUPITER

Europa is widely considered the most promising place to look for life beyond Earth. Located 5.2 AU from the sun, Europa's surface is mostly water ice. Scientists have found strong evidence that beneath the icy crust is a salty ocean of liquid water. Scientists believe this ocean is 40 to 100 miles deep, so it could contain twice as much water as all of Earth's oceans combined. It is also possible that Europa's ocean is leaking into space; in 2014 and 2016, the Hubble Space Telescope spotted possible water plumes erupting off the moon's surface.

Ocean world status: ACTIVE?

ENCELADUS MOON OF SATURN

Located 9.5 AU from the sun, Enceladus is an active moon of Saturn. Scientists believe it has a global ocean of salty liquid water about 6 miles deep under a shell of ice that is 20 to 25 miles thick. Cassini discovered that geyser-like jets spew water vapor and ice particles out into space from this underground ocean. The material shoots out at about 800 mph and forms a plume that extends hundreds of miles into space.

Ocean world status: ACTIVE

MIMAS MOON OF SATURN

Mimas is the smallest of Saturn's major moons. It is located 9.5 AU from the sun and has one of the most heavily cratered surfaces in the solar system. Its low density suggests that it consists almost entirely of water ice. According to research, Mimas has either a subsurface ocean or its core is shaped like a football. If Mimas does have a liquid water ocean, it would be 15 to 20 miles beneath the surface.

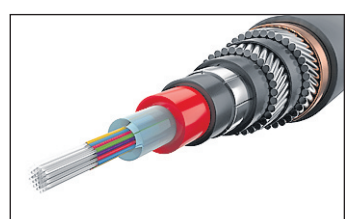
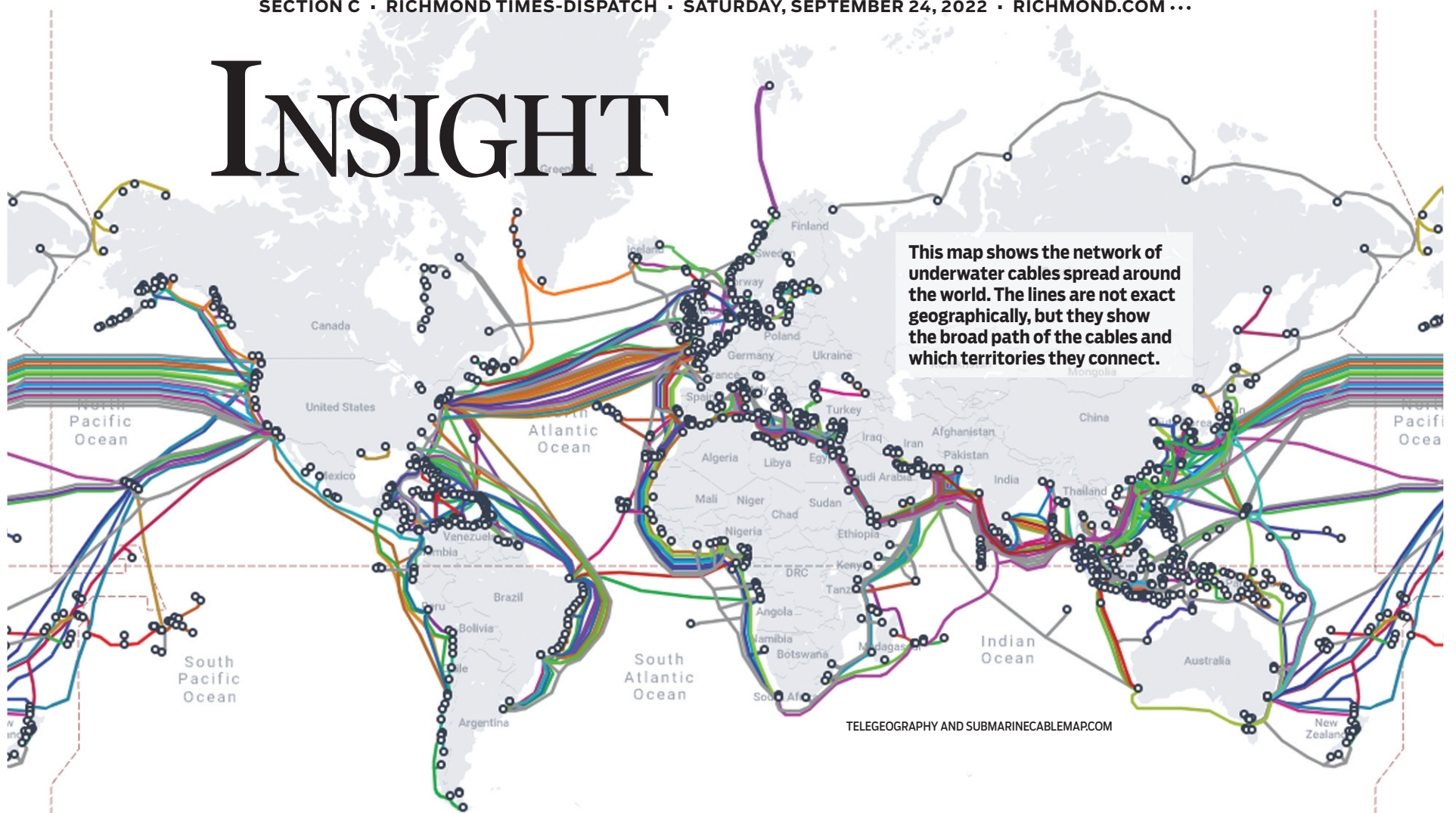
Ocean world status: POSSIBLE

PLUTO DWARF PLANET

Located 39.5 AU from the sun, Pluto is an active world but has many unknowns. However, data from NASA's New Horizons spacecraft suggests that the dwarf planet could have an underground liquid ocean. Pluto has mysterious fault lines, some of which are hundreds of miles long, that may point to the subsurface ocean. Scientists believe the ocean could surround and interact with the dwarf planet's rocky core.

Ocean world status: POSSIBLE

INSIGHT



Subsea cables

WHAT ARE THEY?

Though many may think global connectivity is made possible by satellites, there is actually a physical network connected on land and under the ocean.

Nearly all international connectivity — voice, data and internet — travels through underwater cables. These cables, known as submarine or subsea cables, lie along the sea floor. Closer to shore, they are buried for added protection.

The cables are laid along the safest path underwater, avoiding fault zones, fishing zones, anchoring areas and other dangers.

Some cables are short, like the 81-mile cable between Ireland and the United Kingdom, while others are incredibly long, like the 12,427-mile Asia America Gateway cable that runs across the Pacific Ocean.

Nearly all countries that have a coastline are connected to subsea cables, and anyone accessing the internet has the potential to use them.

99.7%

of all intercontinental data is carried via subsea cables



MAREA cable installation

HOW DO THEY WORK?

Modern subsea cables use fiber-optic technology. Lasers on one end fire at rapid rates down thin glass fibers to receptors at the other end.

The cables are typically as wide as a garden hose. The filaments that carry light signals are extremely thin — roughly the diameter of a human hair. These fibers are then wrapped in a few layers of insulation and protection.

530

Total number of active and planned subsea cables as of 2022

WHO OWNS THEM?

Cables were traditionally owned by telecom carriers that would form a consortium. In the late 1990s, private cables began being built. Both models still exist today.

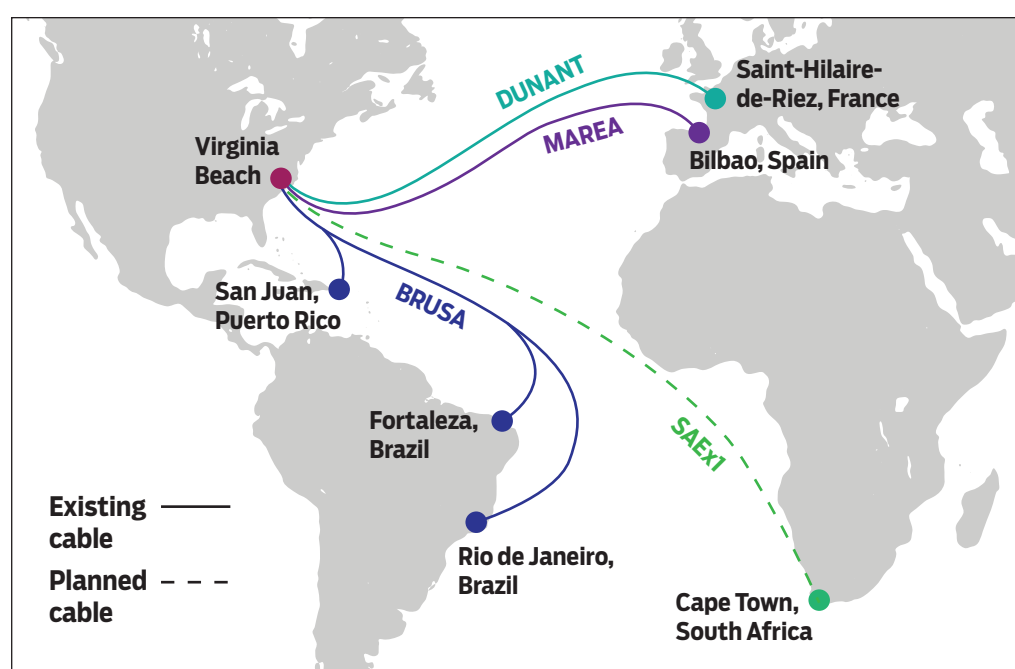
Content providers such as Google, Facebook, Microsoft and Amazon are major investors in new cables and own or lease more than half of the global undersea bandwidth.

VIRGINIA'S DIGITAL CONNECTION TO THE WORLD

Just five years ago, all of the subsea cables along the U.S. Eastern Seaboard landed in New Jersey-New York or Florida. But in 2012, Hurricane Sandy caused so much destruction to the New York coastline that it prompted the development of a third East Coast landing site in Virginia Beach. The area is now home to three international cables, and another one is in development. These cables come ashore in Virginia Beach and end in Henrico County at the Meta (Facebook parent company) data center and the QTS data center next door.

Virginia Beach's international cables

Three subsea cables come ashore in Virginia Beach and connect the U.S. to France, Spain, Puerto Rico and Brazil. These cables are among the most modern, highest-capacity routes in the world. A fourth cable, SAE1, is currently under development, and construction is expected to begin in 2025. When completed, it will be the first and only cable to directly connect the U.S. with South Africa. As a result of the subsea cables, demand is increasing for locating data centers in Virginia Beach with nearly 1,000 acres available for data center and cable landing station facilities.



DUNANT

Ready for service: January 2021
Length: 3,977 miles
Owner: Google

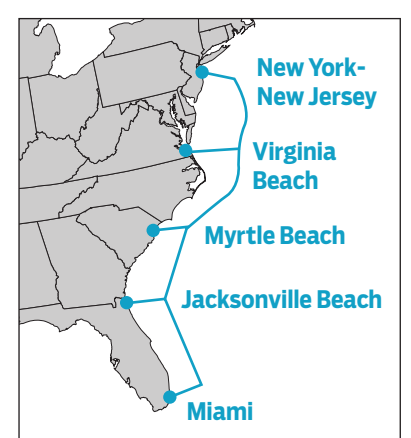
MAREA

Ready for service: May 2018
Length: 4,104 miles
Owners: Meta, Microsoft, Telxius

BRUSA

Ready for service: August 2018
Length: 6,835 miles
Owner: Telxius

Confluence cable

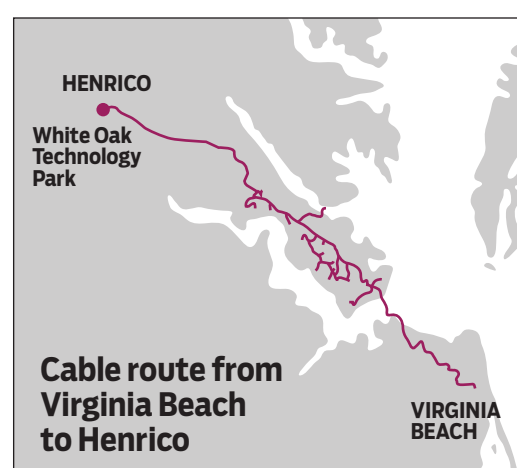


Virginia Beach also has full permits in place for four more subsea cable conduits that will accommodate further cables including the Confluence cable coming from New York-New Jersey and connecting to Virginia Beach; Myrtle Beach, S.C.; Jacksonville, Fla.; and Miami.

The Confluence-1 is the first subsea cable system dedicated to linking strategic global communications nodes on the U.S. East Coast. The infrastructure for the Sandbridge area of Virginia Beach is scheduled to start in November.

CONFLUENCE-1

Ready for service: 2023
Length: 1,598 miles
Owners: Confluence Networks



Henrico data centers

Virginia's subsea cables come ashore in Virginia Beach and end in Henrico County, connecting to two massive data centers: Meta (the parent company of Facebook) and QTS.

Meta is investing more than \$1 billion to build a 2.5 million-square-foot data center campus in the White Oak Technology Park. The first phase opened in 2020.

QTS, which acquired a former semiconductor plant in 2010 and turned it into a 1.5 million-square-foot mega data center, is expanding its operations. The facility — the world's fourth-largest data center — provides access to more than 20 network providers. QTS acquired an



Meta built this new data center at White Oak Technology Park in eastern Henrico.

additional 200 acres next to its existing center, and construction is underway to double the size of its campus.

Learn more about how the megaregion from Richmond to Hampton Roads is working to become a Global Internet Hub at www.globalinternethub.org

How fast data travels

In the blink of an eye, data can transmit back and forth from Henrico to Spain twice.

From Henrico to:	Latency (milliseconds)
Virginia Beach	2.74
Madrid, Spain	72.74
Marseille, France	79.27
Frankfurt, Germany	82.74
London, UK	85.49
Sao Paulo, Brazil	108.24

History

While fiber-optic data transmission has been a relatively recent invention, subsea cables have been around for more than 160 years. The first transatlantic telegraph cable was laid in 1858, between Ireland and the province of Newfoundland in Canada.

Prior to this cable, the only way to transmit a message across the Atlantic was by boat, which took 10 days. After the cable was laid, it took only a matter of minutes. Repeaters, which are used to amplify the signal along cables, were first introduced in 1956.

Satellites

Satellites can be used to reach areas that aren't yet wired with fiber optics, but the cables can carry much more data at a far less cost than satellites. According to the FCC, satellites account for just 0.37% of all U.S. international capacity.

WIRELESS SIGNALS

When you use your cellphone, the signal is carried wirelessly only from your phone to the nearest cell tower. From there, the data will be carried over land and subsea fiber-optic cables.