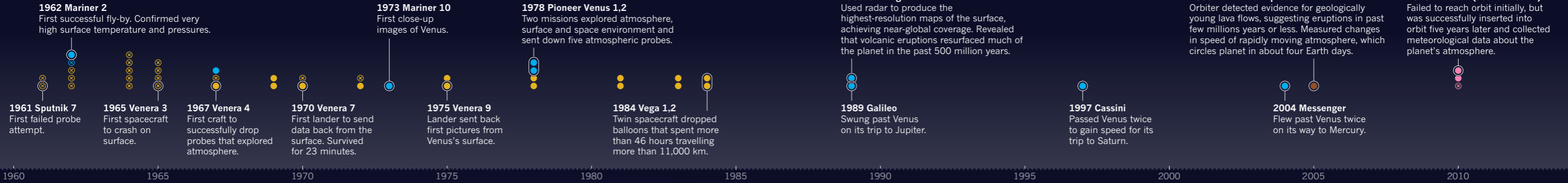


HISTORICAL MISSIONS

● United States ● Soviet Union ● Europe ● Japan ● Successful ⊗ Failed



VISITING VENUS

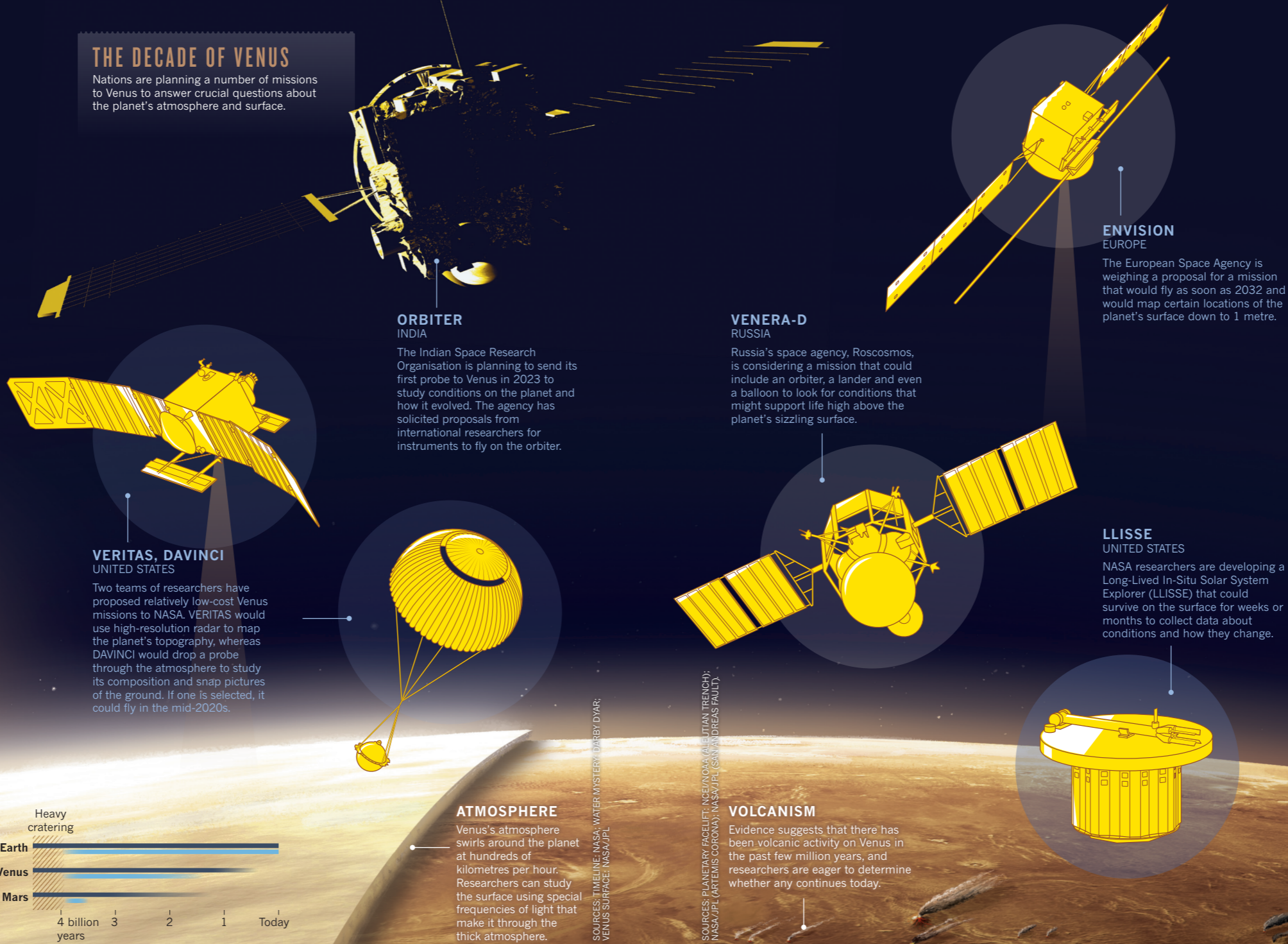
RESEARCHERS ARE EAGER TO FIND OUT WHY EARTH'S SISTER PLANET TURNED INTO SUCH A HELLISH PLACE.

BY RICHARD MONASTERSKY AND SHANNON HALL
DESIGN BY JASIEK KRZYSZTOFIK

From a distance, Venus looks a lot like Earth. It's about the same size and density, and is our closest planetary neighbour. But when people first started exploring Venus using robotic probes, they found that it was hostile — fiendishly hot with an oppressively heavy, acidic atmosphere. Not the sort of place to bring the family. Yet the differences are what intrigue scientists. They want to find out what made the greenhouse effect on Venus go into overdrive and turn the planet toxic.

THE DECADE OF VENUS

Nations are planning a number of missions to Venus to answer crucial questions about the planet's atmosphere and surface.



ORBITER INDIA

The Indian Space Research Organisation is planning to send its first probe to Venus in 2023 to study conditions on the planet and how it evolved. The agency has solicited proposals from international researchers for instruments to fly on the orbiter.

VENERA-D RUSSIA

Russia's space agency, Roscosmos, is considering a mission that could include an orbiter, a lander and even a balloon to look for conditions that might support life high above the planet's sizzling surface.

ENVISION EUROPE

The European Space Agency is weighing a proposal for a mission that would fly as soon as 2032 and would map certain locations of the planet's surface down to 1 metre.

VERITAS, DAVINCI UNITED STATES

Two teams of researchers have proposed relatively low-cost Venus missions to NASA. VERITAS would use high-resolution radar to map the planet's topography, whereas DAVINCI would drop a probe through the atmosphere to study its composition and snap pictures of the ground. If one is selected, it could fly in the mid-2020s.

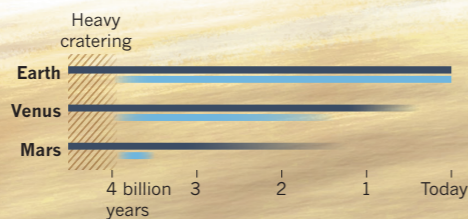
LLISSE UNITED STATES

NASA researchers are developing a Long-Lived In-Situ Solar System Explorer (LLISSE) that could survive on the surface for weeks or months to collect data about conditions and how they change.

WATER MYSTERY

Earth, Mars and Venus all had liquid water on their surfaces after a period of intense bombardment by meteorites in the early Solar System. Whereas Mars lost its water early, Venus probably kept its supply for a long stretch of its history before the water boiled away. Researchers want to decipher when that happened and why.

■ Volcanic activity ■ Liquid water



ATMOSPHERE

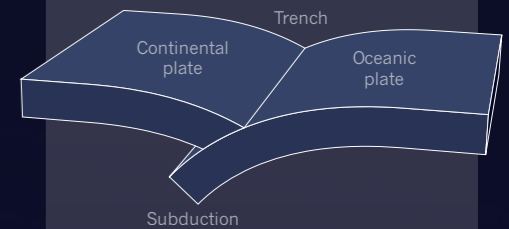
Venus's atmosphere swirls around the planet at hundreds of kilometres per hour. Researchers can study the surface using special frequencies of light that make it through the thick atmosphere.

VOLCANISM

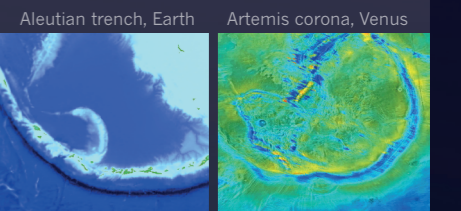
Evidence suggests that there has been volcanic activity on Venus in the past few million years, and researchers are eager to determine whether any continues today.

PLANETARY FACELIFT

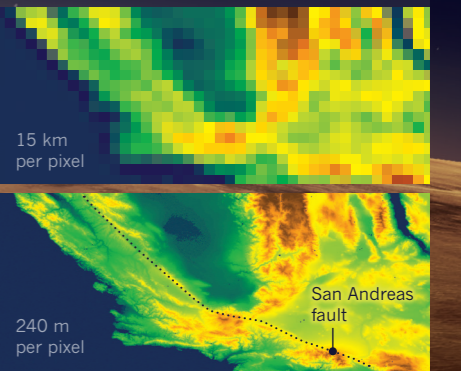
One major question about Venus is whether it has plate tectonics — the process that describes how a planet's outer shell is broken into big pieces that shift around and regularly reshape the surface. On Earth, plate tectonics helps to regulate the planet's temperature.



Subduction happens when one plate rides up over another, forcing the lower plate to dive into the interior. Researchers suggest that a curved feature on Venus known as Artemis corona resembles the Aleutian trench, which is a site of active subduction on Earth.



If plate tectonics is happening on Venus, we might not be able to spot the signs in the best available images of the planet. The San Andreas fault, for example, would not be visible in topographic radar data that have been degraded to the same resolution as the images captured by the Magellan spacecraft. But the fault does appear clearly on topographic radar images taken at a resolution that could be achieved in a future Venus mission.



SOURCES: TIMELINE: NASA; WATER MYSTERY: DARBY DYAR; VENUS SURFACE: NASA/JPL

SOURCES: PLANETARY FACELIFT: NCEI/NOAA/ALEUTIAN TRENCH; NASA/JPL; ARTEMIS CORONA: NASA/JPL; SAN ANDREAS FAULT: NASA/JPL