

Close Encounters with Jupiter

by Dr. Tony Phillips

Jupiter and Earth are about to have a close encounter—and it's going to be a good one. In late September 2010, the two worlds were 31 million km (about 19 million miles) closer than at any time in the past 11 years. Soaring high in the midnight sky, Jupiter shone six times brighter than Sirius and looked absolutely dynamite through a backyard telescope.

Planetary scientist Scott Bolton of the Southwest Research Institute isn't satisfied. "I'd like to get even closer," he says.

Bolton will get his wish in July 2016. That's when a NASA spacecraft named "Juno" arrives at Jupiter for a truly close-up look at the giant planet. Swooping as low as 5,000 km (about 3,000 miles) above the cloud tops, Juno will spend a full year orbiting nearer to Jupiter than any previous spacecraft.

The goal of the mission is to learn what lies inside the planet.

Astronomers have been studying Jupiter since the invention of the telescope 400 years ago, but in all that time the planet's vast interior has remained hidden from view. Even the Galileo probe, which dived into the clouds in 1995, penetrated no more than about 0.1% of Jupiter's radius.

"Our knowledge of Jupiter is truly skin deep," says Bolton, Juno's principal investigator. "There are many basic things we just don't know—like how far down does the Great Red Spot go? And does Jupiter have a heavy core?"

Juno will improve the situation without actually diving into the clouds. Bolton explains how. "Juno will spend a full year in close polar orbit around Jupiter, flying over all latitudes and longitudes. We will thus be able to fully map Jupiter's gravitational field and figure out how the interior is structured."

But that's not all. Researchers have good reason to believe that much of Jupiter's interior is filled with liquid metallic hydrogen, an exotic metal that could form only in the high-pressure, hydrogen-rich core of a giant planet. Jupiter's powerful magnetic field almost certainly springs from dynamo action inside this vast realm of electrically conducting metal.

"Juno's magnetometers will precisely map Jupiter's magnetic field," says Bolton. "This map will tell us a great deal about planet's inner magnetic dynamo—what it's made of and how it works."

Finally, Juno will probe Jupiter's atmosphere using a set of microwave radiometers. "Our sensors can measure the temperature 50 times deeper than ever before," says Bolton. Researchers will use that information to figure out how much water is underneath Jupiter's clouds. "Microwave measurements of Jupiter's water content are particularly exciting because they will help discriminate among competing theories of the planet's origin."

Now *that's* a close encounter. Stay tuned for Juno.

Find out more about the Juno mission at http://www.nasa.gov/mission_pages/juno. Play the new Solar System Explorer super game, which includes the Juno Recall mini-game at <http://spaceplace.nasa.gov/en/kids/solar-system>. It's not just for kids!

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Caption:

The Juno mission, arriving at Jupiter in July 2016, will help to solve the mystery of what's inside the giant planet's core.

Editors: You can download a high-resolution version of this image at http://spaceplace.nasa.gov/news_images/juno.jpg.