

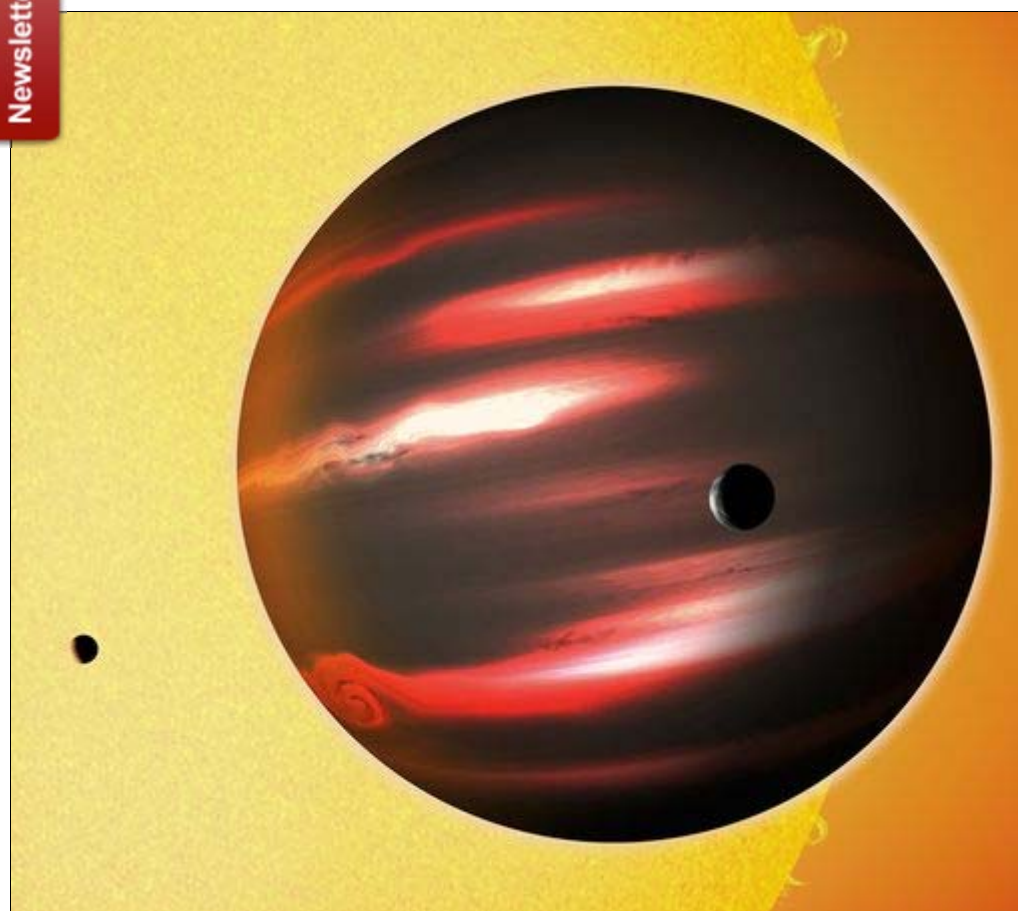
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National Geographic Daily News

Darkest Planet Found: Coal-Black, It Reflects Almost No Light

Newsletters >> The newfound world is off-the-charts dark—and the cause is a mystery, experts say.



The newfound gas-giant planet TrES-2b is black with a slight red glow, experts estimate.

Illustration courtesy David A. Aguilar, CFA

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It may be hard to imagine a planet blacker than coal, but that's what astronomers say they've discovered in our home galaxy with NASA's Kepler space telescope.

Orbiting only about three million miles out from its star, the Jupiter-size gas giant planet, dubbed TrES-2b, is heated to 1,800 degrees Fahrenheit (980 degrees Celsius). Yet the apparently inky world appears to reflect almost none of the starlight that shines on it, according to a new study.

"Being less reflective than coal or even the blackest acrylic paint—this makes it by far the darkest planet ever discovered," lead study author David Kipping said.

"If we could see it up close it would look like a near-black ball of gas, with a slight glowing red tinge to it—a true exotic amongst exoplanets," added Kipping, an astronomer at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts.

(Related: "Earth Farthest From Sun on Fourth of July—So Why So Hot?")

NASA's Planet Detector

The **Earth**-orbiting Kepler spacecraft was specifically designed to find planets outside our **solar system**. But at such distances—TrES-2b, for instance, is 750 light-years from us—it's not as simple as snapping pictures of alien worlds.

Instead, Kepler—using light sensors called photometers that continuously monitor tens of thousands of stars—looks for the regular dimming of stars.

Such dips in stellar brightness may indicate that a planet is transiting, or passing in front of a star, relative to Earth, blocking some of the star's light—in the case of the coal-black planet, blocking surprisingly little of that light.

(Related: "Five New Planets Found; Hotter Than Molten Lava.")

Black Planet Spurs Dimmest of Dimming

When a planet passes in front of its star, the world's shaded side faces Kepler. But as the planet begins orbiting to the side of and "behind" its star, its star-facing side comes to face the viewer. The amount of starlight grows until the planet, becoming invisible to Kepler, passes fully in back of its star.

Watching TrES-2b and its star, Kepler detected only the slightest such dimming and brightening, though enough to ascertain that a Jupiter-size gas giant was the cause.

The light reflected by the newfound extrasolar planet, or exoplanet, changed by only about 6.5 parts per million, relative to the brightness of the host star.

"This represents the smallest photometric signal we have ever detected from an exoplanet," Kipping said.

What's more, as the coal-black planet passed in front of its star, the starlight's dimming was "so small that it's like the dip in brightness we would see with a fruit fly going in front of a car headlight."

(Also see "Six New Planets: Mini-Neptunes Found Around Sunlike Star.")

The Dark Mystery of TrES-2b

Current computer models predict that hot-Jupiter planets—gas giants that orbit very close to their

stars—could be only as dark as Mercury, which reflects about 10 percent of the sunlight that hits it.

But TrES-2b is so dark that it reflects only one percent of the starlight that strikes it, suggesting that the current models may need tweaking, Kipping said.

Assuming the new study's measurements are sound, what exactly is making the new planet's atmosphere so dark?

"Some have proposed that this darkness may be caused by a huge abundance of gaseous sodium and titanium oxide," Kipping said. "But more likely there is something exotic there that we have not thought of before.

"It's this mystery that I find so exciting about this discovery."

TrES-2b may even represent a whole new class of exoplanet—a possibility Kipping and company hope to put to the test with Kepler, which has so far detected hundreds of planets outside our solar system.

"As Kepler discovers more and more planets by the day, we can hopefully scan through those and work out if this is unique or if all hot Jupiters are very dark," Kipping said.

Meanwhile, the very darkness of the new exoplanet suggests perhaps a catchier moniker for TrES-2b, Kipping said. "Maybe an appropriate nickname would be Erebus"—ancient Greece's god of darkness.

The coal-black planet study has been accepted for publication in the Monthly Notices of the Royal Astronomical Society.

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