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## Does Dark Energy Spring From the 'Quantum Vacuum?'

By Mike Wall, Senior Writer | March 27, 2014 06:57am ET

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Observations of Planck and other satellites help to solve the equation of the state of dark energy.

Credit: ESA

The mysterious dark energy that's driving the universe's accelerated expansion may have its roots in the background "vacuum energy" that pervades all of the cosmos, a new study suggests.

"What we think is happening is a dynamic effect of the quantum vacuum, a parameter that we can calculate," co-author Joan Sola, of the University of Barcelona in Spain, said in a statement. "Nothing is more 'full' than the quantum vacuum since it is full of fluctuations that contribute fundamentally to the values that we observe and measure."

Though dark energy constitutes about 75 percent of the universe, scientists don't know exactly what it is. They've developed several different ideas, including the theory of "quintessence," which proposes a sort of anti-gravitating agent that repels rather than attracts. [[The History & Structure of the Universe \(Infographic\)](#)]

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Another concept posits the existence of a "phantom field" whose density continues to increase with time. This theory predicts an accelerating expansion so powerful that it will eventually break apart the bonds that hold atoms together, [tearing the universe apart in a "Big Rip"](#) about 20 billion years from now.

The quintessence and phantom field hypotheses are based partly on data gathered by NASA's Wilkinson Microwave Anisotropy Probe (WMAP) and the European Space Agency's [Planck satellite](#)— spacecraft that have studied the cosmic microwave background, the ancient light that began saturating the universe 380,000 years after the Big Bang.

In the new study, Sola and lead author Spyros Basilakos of the Academy of Athens in Greece analyze the same spacecraft observations and find less support for either quintessence or the phantom field idea.

"Our theoretical study demonstrates that the equation of the state of [dark energy](#) can simulate a quintessence field, or even a phantom field, without being one in reality," Sola said. "Thus, when we see these effects in the observations from WMAP, Planck and other instruments, what we are seeing is a mirage."

Basilakos and Sola instead suggest that dark energy is a type of dynamic quantum vacuum energy — something different than [Einstein's cosmological constant](#), which describes a static vacuum energy density and is another possible explanation of dark energy's nature.

Basilakos and Sola acknowledge there are some issues with the quantum vacuum energy theory but say it's a promising idea.

"However, quintessence and phantom fields are still more problematic; therefore the explanation based on the dynamic quantum vacuum could be the more simple and natural one," Sola said.

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ender of a prior quantum satellite communication experiment, which utilized the Matera Laser Ranging Observatory telescope

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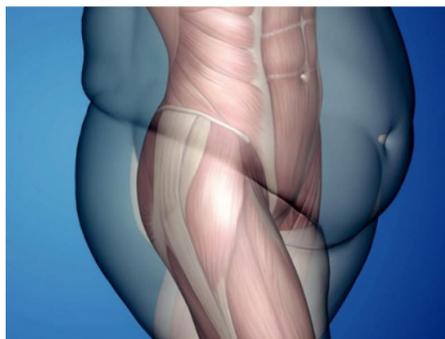
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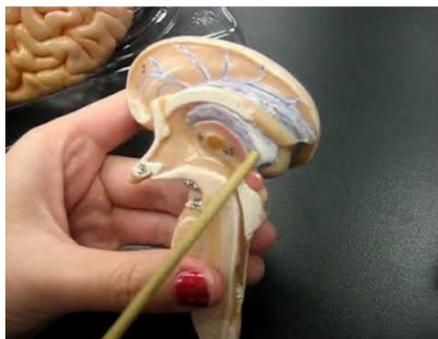
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Michael was a science writer for the Idaho National Laboratory and has been an intern at Wired.com, The Salinas Californian newspaper, and the SLAC National Accelerator Laboratory. He has also worked as a herpetologist and wildlife biologist. He has a Ph.D. in evolutionary biology from the University of Sydney, Australia, a bachelor's degree from the University of Arizona, and a graduate certificate in science writing from the University of California, Santa Cruz. To find out what his latest project is, you can follow Mike on [Google+](#).

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