Science & Technology

Could a Giant Helium Balloon in Antarctica Help Find Dark Matter?

A particle detector deployed by Columbia scientists is looking for traces of antideuterons in the atmosphere.

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The launch of the Columbia-led General AntiParticle Spectrometer (GAPS) mission on December 15. (Kazutaka Aoyama / JAXA)

After twenty years in development, a high-tech particle detector whose design and construction was overseen by Columbia scientists was deployed in Antarctica this past winter, carried aloft by a gigantic helium balloon. The van-sized instrument rose twenty-two miles above the ice and then drifted for nearly a month on stratospheric winds that circle the continent. As it floated, its thick silicon sensors

recorded the impact of hundreds of millions of protons, electrons, and other particles raining down from space. Within the data the sensors collected, the scientists hope to also find the footprints of an antideuteron — an exotic particle that has not yet been observed outside of experimental conditions and could provide a telltale signal of dark matter.

“Dark matter is the invisible material that’s holding the universe together, meaning that it’s creating gravitational interactions,” says Kerstin Perez ’05CC, a Columbia physics professor who is leading the project alongside fellow physics professor and principal investigator Chuck Hailey ’83GSAS. “And it’s eighty percent of the mass in the entire universe . . . So the positive detection of dark matter would be a fundamentally transformative discovery for twenty-first-century physics.”

The Columbia team, which is collaborating on the project with scientists from several other institutions in the US, Japan, Italy, and China, will be analyzing its data for several months and expects to release its findings next year.

Learn more about the project in Columbia News.

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