# $400,000 Gift Brings UC San Diego Closer to Funding Telescope for Unique Look Back at the "Big Bang"

*Proposed "POLARBEAR" telescope will—for the first time—use gravitational waves to allow physicists to better understand how the universe began*

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The POLARBEAR telescope will enable physicists to peer back to conditions at the inception of the universe.

The University of California, San Diego Division of Physical Sciences has received a $400,000 gift toward funding a proposed $1 million telescope and observatory that will allow physicists-for the first time-to measure the "gravitational waves" that emanated from the universe during the first moments of its creation.

Initial funding for constructing the telescope, known as "POLARBEAR" for Polarization of Background Radiation, comes from the James B. Ax Family Foundation with the goal of advancing new areas of scientific research. The POLARBEAR telescope allow scientists to get a backwards glance to the birth of the universe-less than a billionth of a nanosecond second after the Big Bang-by capturing an imprint of primordial gravitational waves on 3K cosmic microwave background radiation.

Pending the completion of funding, the telescope is expected to be built in 2008 at a site east of California's Sierra Nevada mountain range near the Owens Valley. A team of scientists from UC San Diego, UC Berkeley, Lawrence Berkeley National Laboratory and the University of Colorado is collaborating on the project. UCSD and UC Berkeley are heading up fundraising efforts for the telescope, which will be property of the University of California.

The POLARBEAR telescope will be composed of a 3.5 meter diameter aluminum mirror, which focuses radiation onto an array of 320 microwave-sensitive detectors capable of detecting the imprint of gravitational waves-the minute ripples in space-time predicted by Albert Einstein's theory of general relativity-on the cosmic microwave background.

"Einstein's unique insight was that space-time is not a static component of the universe, but rather, dynamic and influenced by matter and the propagation of energy," said Brian Keating, Ph.D., an assistant professor of Physics at UCSD and one of the leaders of the collaboration.

"Gravitational waves are distortions of space-time which propagate at the speed of light, and can penetrate 'through' matter-like an x-ray. The impressions of the waves are captured by the POLARBEAR telescope to give scientists a unique view back to the universe's beginning."

Until now, astronomers have used electromagnetic radiation, such as light or microwaves, to probe the Big Bang. NASA's Cosmic Background Explorer (COBE) satellite allowed physicists to see the faint ripples of cosmic microwave background radiation 400,000 years after the birth of our universe, an experiment which earned one of Keating's colleagues, George Smoot of UC Berkeley, the 2006 Nobel Prize in Physics. Because gravity

is a weaker force of nature than electromagnetic radiation, gravitational waves can penetrate all matter in the universe.

Keating said that the telescope's detection of gravitational waves in the first moments of the universe's creation should increase physicists' understanding of perhaps the most vexing question in all of science: how did the universe begin?

"The answer to this question will impact countless fields from astrophysics to high-energy particle physics and beyond. Diverse fields, such as metaphysics and philosophy will participate in this revolution of our understanding of the cosmos, its origin and our place in it," Keating added.

Further background on this innovative telescope, its capabilities and other fundamental questions can be found at *http://physics.ucsd.edu/~bkeating/polarbear.htm*. With $600,000 yet to raise for the POLARBEAR telescope and observatory, those interested in supporting the project may contact Melanie Cruz Walsh in the UC San Diego Physical Sciences Division by calling (858) 822-3258. Gifts contribute to the $1 billion fundraising goal of The Campaign for UCSD: *Imagine What's Next*.

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