

by Margaret Milne

**A**stronomers were shocked in 1998 when they realized the universe was dominated by a mysterious energy that was forcing galaxies apart from each other. Four years later, the nature of this “dark energy” is still unknown, but Dr. Chris Pritchett of UVic’s physics and astronomy department hopes to change that.

Pritchett is coordinator of the UltraDeep Survey, based at the Canada France Hawaii Telescope (CFHT) on Mauna Kea, Hawaii. For 202 nights over the next five years, the telescope will take pictures of more than 2,000 supernovae—the powerful explosions that herald the death of stars. Analysing these supernovae will allow Pritchett and his international collaborators to make the first precise measurement of the nature of dark energy.

Understanding dark energy will help astronomers better understand why and how mass and energy exist.

Although no one is sure what causes dark energy, astronomers know what it does—it fills the universe and exerts a repulsive force, making galaxies travel faster and faster as they move away from each other with the expansion of the universe. The existence of dark energy was first noticed by astronomers studying far-off supernovae.

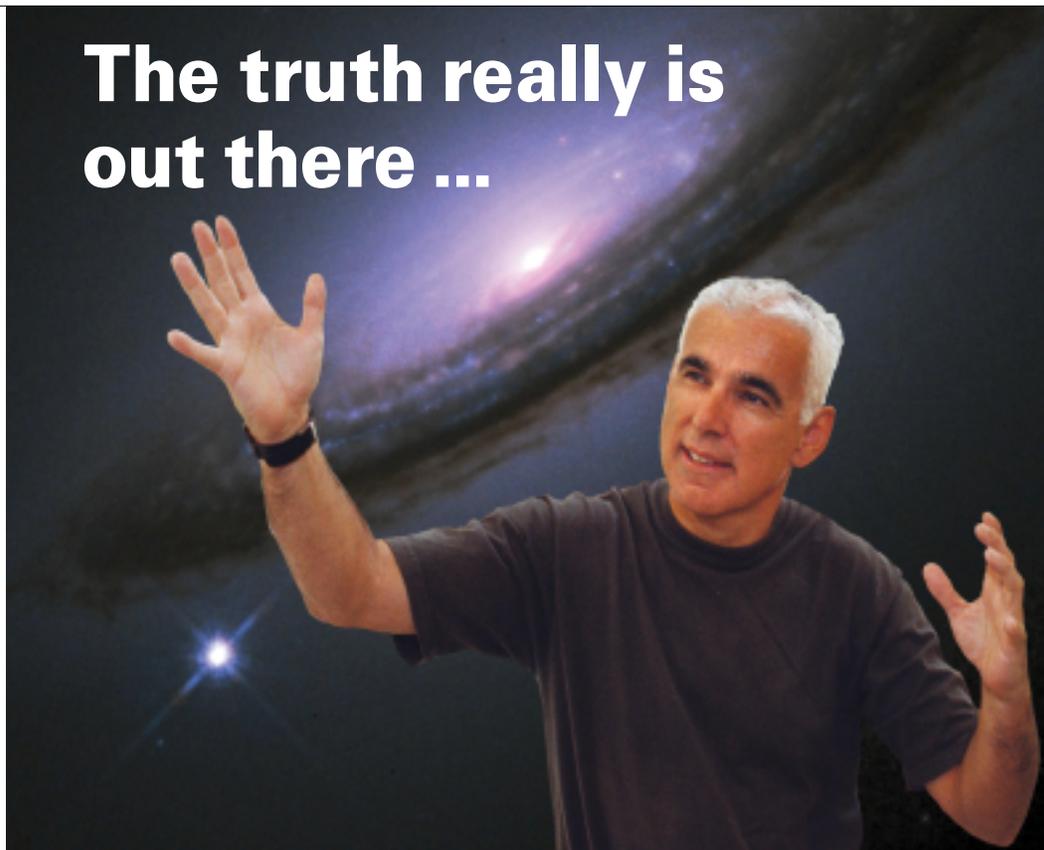
“The very distant supernovae were fainter than they should be,” says Pritchett. This showed that distant objects were further away than expected—they had been forced away by dark energy.

The UltraDeep Survey will take pictures of supernovae as distant as 30 billion light years, and create the world’s largest sample of supernova observations. With so many supernovae to examine, astronomers can search for subtle patterns in the data that will allow them to choose between competing theories for the cause of dark energy.

One reason the UltraDeep Survey is unrivalled is that it will use MegaCam, the world’s largest digital camera. “It’s just like the digital cameras you can buy at a store, but a thousand times larger,” says Pritchett. MegaCam will be attached to the CFHT telescope, renowned for images of exquisite quality. “With this combination,” says Pritchett, “we’re miles ahead of everyone else.”

To automate the search for supernovae, the UltraDeep Survey team will use a series of

## The truth really is out there ...



Pete Challis, Harvard Univ. / Peter Bashill

Pritchett and Supernova 1994D, seen here below a galaxy called NCG 4526.

computer programs known as a pipeline. “The input to the pipeline is data from the telescope,” says Pritchett. “The output is a list of potential supernovae.” One of his jobs as coordinator is to design the pipeline.

Pritchett will be working with Dave Balam, a research associate in UVic’s astronomy group. Graduate students and post-doctoral fellows will also have a chance to contribute. “They see we’re excited about this project, and that

excitement trickles down. After all, we’re working on the largest scale of all—the origin and evolution of the universe. You don’t get any larger than that.”

He points to a cartoon on his door, where a white-coated scientist wonders if there’s more to life than unlocking the secrets of the universe. “There’s not,” says Pritchett. “There are various ways to do it—poetic, spiritual, scientific. We’ve chosen the scientific approach.”

### facts from the **EDGE**

- Pritchett and his collaborators are going to take a lot of pictures. The CFHT Legacy Survey project, which includes the UltraDeep Survey, will create about 2,000 images, and each image will need nearly one gigabyte of memory to store. In total, they’re going to produce the equivalent of more than 200,000 filing cabinet drawers full of information.
- The task of dealing with all this data falls to the Canadian Astronomy Data Centre (CADC). Inconspicuously tucked away on the slopes of Little Saanich Mountain, the CADC is one of the world’s major astronomy data clearinghouses.
- The CADC started in 1986 as one of three world-

wide centres for distributing images from the Hubble Space Telescope. It now archives all the scientific data produced by CFHT, as well as providing access to many other international astronomical databases.

- In addition to storing and distributing data, the scientists of the CADC also develop computer programs to help astronomers access information more easily and intelligently.
- The head of the CADC is Dr. David Schade, a UVic alumni. Other UVic graduates also work for the CADC, and co-op students have spent work terms at the centre.

## The UltraWide Survey may seem like an ambitious project...

But actually, it’s only one part of a larger undertaking. For the next five years, Canadian and French astronomers will spend 450 nights at the Canada France Hawaii Telescope (CFHT), taking images for the Telescope Legacy Survey.

The project has three related components. The UltraDeep Survey will use supernovae to study dark energy. The Deep Survey will make maps of invisible “dark matter” by studying how it bends the light of distant galaxies. And the UltraWide Survey will find more than 1,000 Kuiper Belt Objects, the leftovers from the formation of our solar system.

Every astronomer working in Canada or France will have the opportunity to join the project and use the data. A steering group will oversee the operation of the project. Pritchett is a member of this group; other Canadian members include Dr. Ray Carlberg at the University of Toronto, and Drs. J.J. Kavelaars and David Schade, both based at the Dominion Astrophysical Observatory in Victoria.

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