A REPULSIVE DISCOVERY

BY TOMMY NEWTON

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Dr. Louis-Gregory Strolger

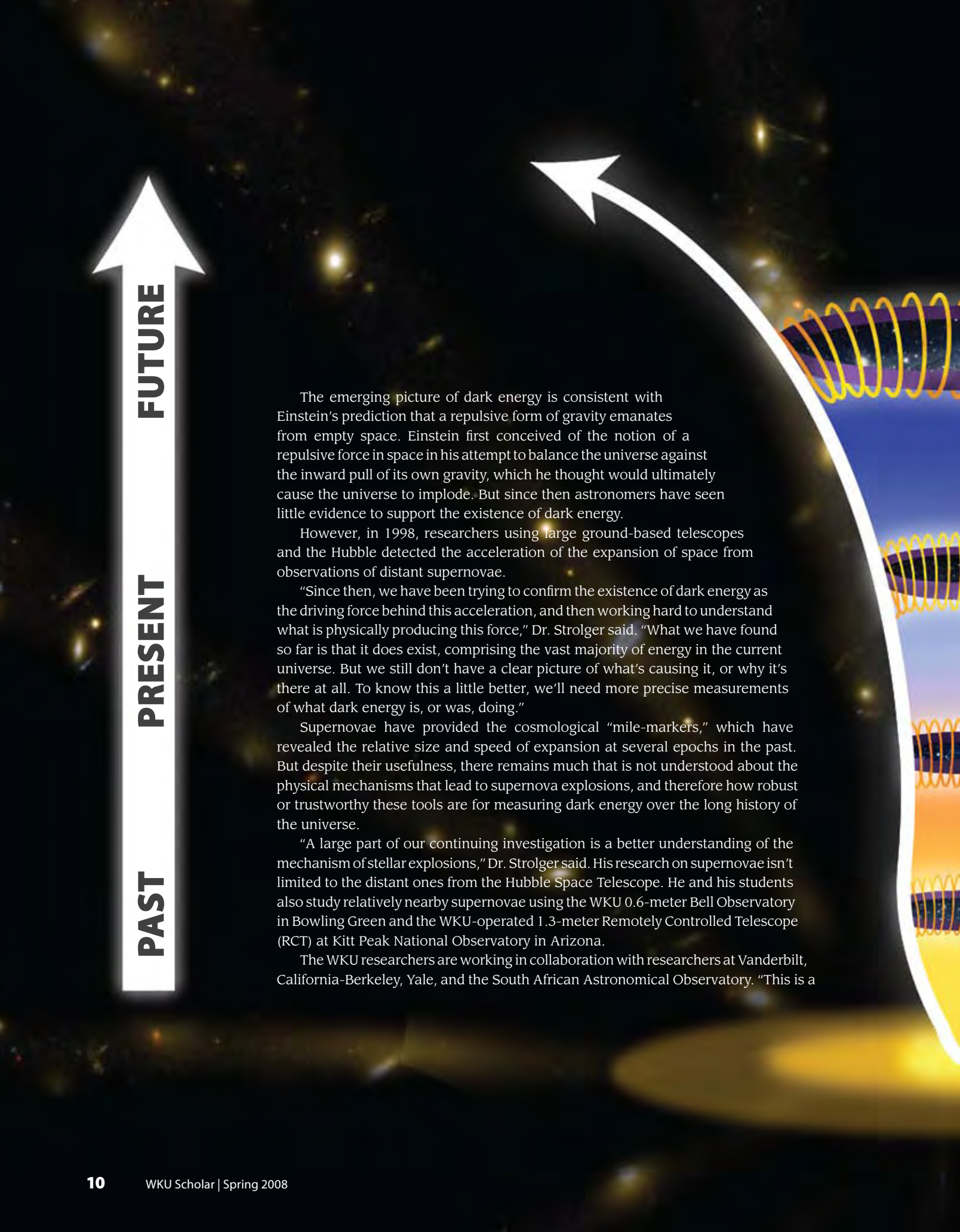
TO THE UNTRAINED OBSERVER, THE IMAGE ON THE COMPUTER SCREEN IN A WESTERN KENTUCKY UNIVERSITY PHYSICS AND ASTRONOMY LAB LOOKS LIKE A SERIES OF BLURRY WHITE DOTS ON A BLACK BACKGROUND.

But to Dr. Louis-Gregory Strolger and his students, this image and thousands more like it might hold the key to unlocking the secrets of the universe. For the past several years, Dr. Strolger has been at the forefront of the study of dark energy, a mysterious repulsive force that causes the universe to expand at an increasing rate.

"We're uncovering the big mysteries," said Dr. Strolger, an assistant professor in the Department of Physics and Astronomy. Those mysteries include the age of the universe (about 14 billion years) and the fate of the expanding universe (30 billion years from now the universe will be very cold and much darker).

Since joining WKU in 2005, Dr. Strolger has continued his research using the Hubble Space Telescope to examine long-duration gamma-ray bursts and supernovae and to track the expansion of the universe over time. "We've been extremely successful so far," said Strolger, who previously worked with the Space Telescope Science Institute. He and his colleagues have identified 130 supernovae, 60 of which are being used to measure the cosmic scale.

In November 2006, Dr. Strolger took part in a NASA press release, which reported that found dark energy was already boosting the expansion rate of the universe as long as nine billion years ago, supporting the claim that dark energy has always been an important constituent of the universe. These discoveries build on theories of cosmic expansion and composition presented nearly a century ago by none other than Albert Einstein.



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However, in 1998, researchers using large ground-based telescopes and the Hubble detected the acceleration of the expansion of space from observations of distant supernovae.

"Since then, we have been trying to confirm the existence of dark energy as the driving force behind this acceleration, and then working hard to understand what is physically producing this force," Dr. Strolger said. "What we have found so far is that it does exist, comprising the vast majority of energy in the current universe. But we still don't have a clear picture of what's causing it, or why it's there at all. To know this a little better, we'll need more precise measurements of what dark energy is, or was, doing."

Supernovae have provided the cosmological "mile-markers," which have revealed the relative size and speed of expansion at several epochs in the past. But despite their usefulness, there remains much that is not understood about the physical mechanisms that lead to supernova explosions, and therefore how robust or trustworthy these tools are for measuring dark energy over the long history of the universe.

"A large part of our continuing investigation is a better understanding of the mechanism of stellar explosions," Dr. Strolger said. His research on supernovae isn't limited to the distant ones from the Hubble Space Telescope. He and his students also study relatively nearby supernovae using the WKU 0.6-meter Bell Observatory in Bowling Green and the WKU-operated 1.3-meter Remotely Controlled Telescope (RCT) at Kitt Peak National Observatory in Arizona.

The WKU researchers are working in collaboration with researchers at Vanderbilt, California-Berkeley, Yale, and the South African Astronomical Observatory. "This is a

very large project spanning five institutions to better understand supernovae," explained Strolger, "and to provide a more concrete base for future dark energy studies." These future studies will likely include another NASA space telescope (to be launched in 2020) completely dedicated to dark energy studies.

WKU and its students are making a strong contribution to the research that could result in new understanding of the fundamental forces of nature, according to Dr. Strolger. "Dark energy is a huge mystery that will shake physics," he said. "We're on the cusp of significant change."

For Dr. Strolger, looking into the past to find clues about the future remains exciting and enjoyable work. "I've always had a love for doing astronomy," he said. As a child, he visited the Smithsonian Air and Space Museum in Washington, D.C., and attended summer camp at the U.S. Space and Rocket Center in Huntsville, Alabama.

He received his undergraduate degree in physics from Earlham College in Richmond, Indiana, and earned his master's and doctorate in astronomy at the University of Michigan. During graduate school, he became interested in stellar explosions.

"Our first impression of how the universe would move is that it would slow down and collapse upon itself," Dr. Strolger said. "When we found that it was speeding up, that was quite startling. When I got on board, we were more certain that the universe was accelerating."

As the research has continued, Dr. Strolger and his colleagues have gathered more clues about dark energy. And he expects dark energy to remain in the news as more discoveries are made. "Sometime in the future, if NASA remains committed to science, we will likely learn a lot about the physical nature of the universe instead of being left with a great mystery." ■

(BIG BANG)