

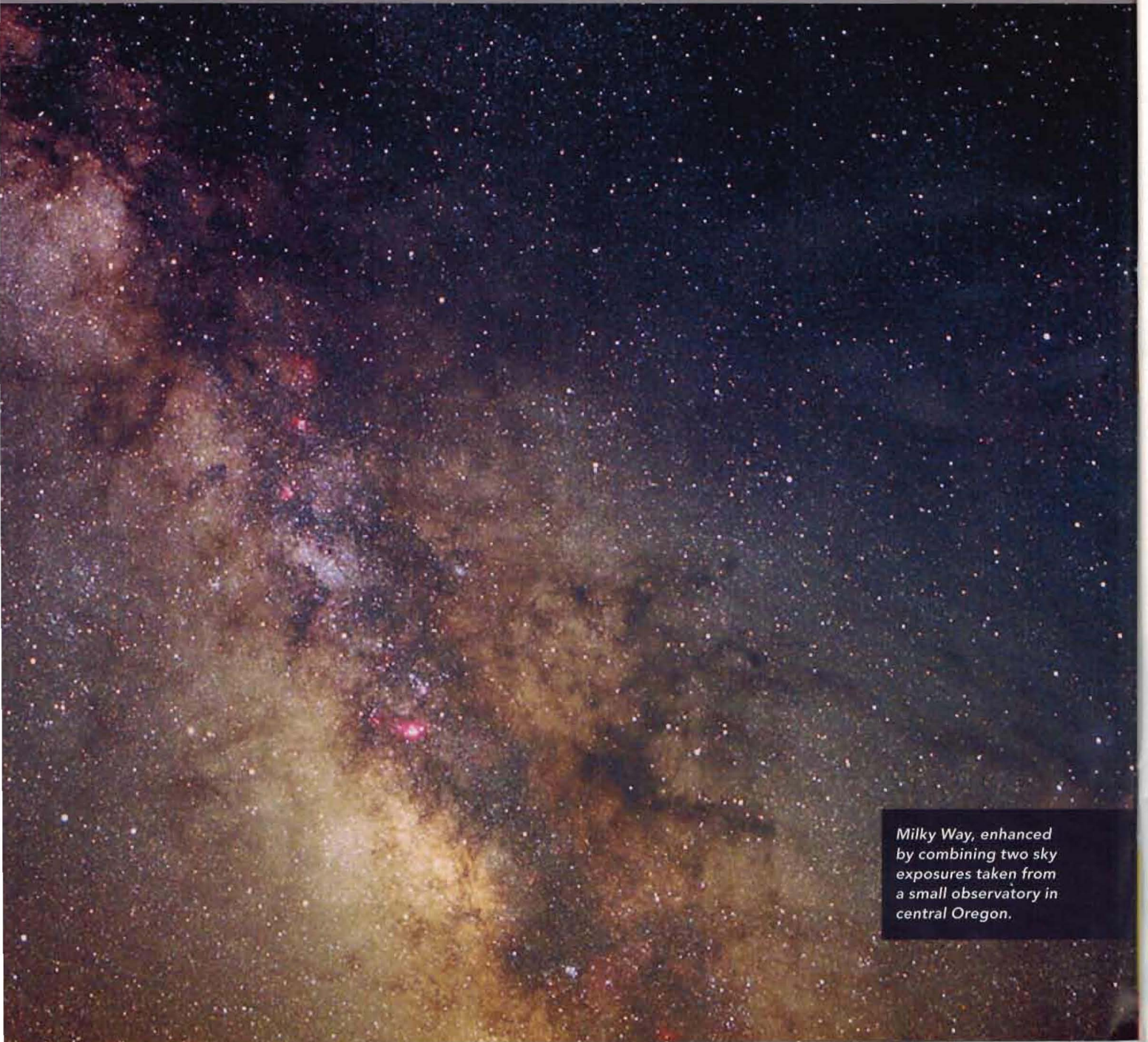
CELEBRATING ASTRONOMY

The Day We Found the Universe:

January 1, 1925

By Marcia Bartusiak

Edwin Hubble's close observation of the Cepheids revealed that our galaxy is not alone.



Milky Way, enhanced by combining two sky exposures taken from a small observatory in central Oregon.

The twenties were not just roaring, they were blazing. Moviegoers flocked to the cinema to watch Moses part the Red Sea in Cecil B. DeMille's silent epic *The Ten Commandments*. Majestic ocean liners crossed the Atlantic in less than five days, while Clarence Birdseye introduced the public to the novelty of frozen food and a failed artist named Adolf Hitler published *Mein Kampf*.

It was also an era of immense scientific fervor. On December 30, 1924, a record-breaking 4,000 scientists descended upon Washington, D.C., to attend the annual conference of the American Association for the Advancement of Science. Taking advantage of the gathering, the American Astronomical Society held its three-day meeting in the capital at the same time, with nearly eighty astronomers attending from across the United States.

A presentation made on Thursday, New Year's Day, ultimately overshadowed all other events at the meeting. A paper modestly titled *Cepheids in Spiral Nebulae* was presented to the assembled audience. Despite its lackluster title, the paper was no less than the culmination of a centuries-long quest to understand the true nature and extent of the cosmos. January 1, 1925, was the day that astronomers were officially informed that the universe had been discovered.

The author of the paper was thirty-five-year-old Edwin Hubble, a staff astronomer at the Mount Wilson Observatory in southern California. Hubble had aimed Mount Wilson's 100-inch reflector, the largest telescope in its day, toward a pair of celestial clouds known as Andromeda and Triangulum, the only spiral nebulae in the nighttime sky that can be seen with the naked eye. He was able to resolve individual stars in the outer regions of the two mist-like clouds. Some turned out to be Cepheids, special stars that regularly dim and brighten like slow-blinking cosmic stoplights.

By measuring the time between blinks, astronomers can calculate distance, and the Cepheids were signaling Hubble that the Andromeda and Triangulum nebulae were very distant, situated far beyond our galactic borders. The Milky Way, our celestial home, suddenly became just one of a multitude of galaxies residing in the vast gulfs of space. In one fell swoop, the visible universe was enlarged by an inconceivable factor, eventually trillions of times over.

It was the astronomical news of the century, and yet Hubble, astonishingly, was not present at his moment of triumph. He was concerned that he hadn't countered every feasible argument against his finding. Back in California the young astronomer was fretfully asking himself, Could I possibly be wrong?

Indications of the Milky Way's true place in the universe had been cropping up for years, but the evidence was indirect, conflicting, and controversial. Two decades before Hubble's seminal paper, most astronomers didn't have the means to determine cosmic distances with any great accuracy. The existence of other galaxies seemed unimaginable, and so they clung fiercely to what they perceived to be their pivotal place in the cosmos.

Around them, however, astronomy was undergoing a spectacular technological transformation that had started in the waning years of the nineteenth century and that would soon shatter their contentment. Cameras became standard equipment on telescopes, enabling observers to gather light over an entire night. And spectroscopes, devices that separate starlight into its component colors, allowed as-

tronomers to figure out what the stars and other celestial objects were truly made of.

The swift emergence of those improvements, along with textbook accounts, give the impression that Hubble's historic achievement took place overnight. In reality, Hubble stood on the shoulders of a series of astronomers: answers did not arrive in one eureka moment, but only after years of contentious debates over hotly disputed conjectures and measurements. Yet Hubble deserves credit for finally providing the decisive proof, to everyone's satisfaction, of our place in the universe. He even gained enough fame at the time to be joked about: "Professor Edwin Hubble announces that he has found another universe," declared *The Nation* magazine in 1926. "Some people never seem to know when they have enough."

It's difficult to remember that less than a hundred years ago, as far as we knew, there were no quasars, no distant galaxies, no exotic black holes or wildly spinning neutron stars. What was called "the universe" consisted of a single, disk-shaped collection of stars that cuts a magnificent swath across the celestial sky. Known since ancient times as the Milky Way because of its ghostly white visage, our galaxy a century ago was not just the sole inhabitant of the cosmos. It *was* the cosmos—a lone, star-filled oasis surrounded by a darkness of unknown depth.

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In recognition of 2009 being the International Year of Astronomy, this article is the first of several on the events and scientists that have advanced our understanding of the cosmos during the last hundred years. This article was adapted from *The Day We Found the Universe*, by Marcia Bartusiak, © 2009. Reprinted with permission from Pantheon Books. All rights reserved.