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Why Vera Rubin Deserved a Nobel

By LISA RANDALL JAN. 4, 2017

CAMBRIDGE, Mass. — As we look back on 2016, and perhaps fret about 2017, we can take some solace in the remarkable things we know and continue to learn about the universe. In addition to a better understanding of the 5 percent of matter that has been well studied and understood, scientists are unlocking mysteries about the rest — 25 percent of it dark matter, and the remaining 70 percent dark energy.

Dark matter interacts gravitationally the way that ordinary matter does — clumping into galaxies and galaxy clusters, for example — but we call it "dark" because it doesn't interact, in any perceptible way, with light. So 85 percent of the matter in the universe is not familiar matter. It is not made up of atoms and doesn't carry an electric charge.

Observations in the 1980s presented convincing evidence of dark matter, opening a vast field of scientific work. Of all the great advances in physics during the 20th century, surely this one should rank near the top, making it well deserving of the world's pre-eminent award in the field, the Nobel Prize. Yet to this date none has been awarded, and may never be, because the scientist most often attributed with establishing its existence, Vera Rubin, died on Christmas Day.

Even physicists who are now legendary frequently work in obscurity until the Nobel elevates them to global stardom. So many people might not be aware of Dr. Rubin or her work, despite its pathbreaking significance. Had she won the prize, she would have been widely celebrated for her achievements and likely served as an inspiration for aspiring scientists everywhere.

Some physicists who argued against a prize for Dr. Rubin focused on legitimate controversies, like whether her indirect evidence was enough to determine the existence of dark matter, or whether she was responsible for interpreting the overly rapid rotations of galaxies — a phenomenon that she and her collaborators had decisively observed — as evidence for the existence of dark matter.

But similar objections might have been raised about most discoveries that have garnered the Nobel. Arno Penzias and Robert Woodrow Wilson found noise in their radio antenna, which other physicists later explained was actually the discovery of the cosmic microwave background radiation from the time of the Big Bang. But Penzias and Wilson rightly won the Nobel anyway.

In the 1990s, astronomers discovered that the expansion of the universe accelerates rather than decelerates, as they had originally planned to measure, yet no one knows what provides the dark energy that is responsible, or even if it necessarily is a constant energy, which the term “dark energy” implies. High-temperature superconductivity was discovered as a phenomenon, with no one knowing the underlying mechanism. Yet all of these advancements deservedly earned the discoverers their Nobels, too.

Another argument sometimes raised against Dr. Rubin is that many scientists contributed to putting together the picture of dark matter. That is certainly true. Yet her data was for a long time the strongest evidence that something was awry, even if she didn’t yet know what was responsible. (And in any case, she could have shared the award with up to two other scientists.)

She certainly was among the first to get scientists to pay attention. In her words, she “decided to pick a problem that I could go observing and make headway on, hopefully a problem that people would be interested in, but not so interested that anyone would bother me before I was done.” And it worked. She noticed that stuff far out in galaxies rotated at the same speed as stuff near the center — not what you would expect unless there was far more matter in the galaxy than anyone could see.

Dr. Rubin’s insight was revolutionary, and she received other awards in her career; in 1993, President Bill Clinton gave her the National Medal of Science.

The elephant in the room is gender. Dr. Rubin was not alone in having been overlooked for the Nobel. Every major discovery in the Standard Model of particle physics, perhaps the crowning achievement of 20th-century physics, was awarded a Nobel, except one. Chien-Shiung Wu, who showed that physical laws distinguish between left and right, was overlooked, even though two of her male colleagues won for developing the theory behind her work and an even more subtle follow-up symmetry violation later won the prize.

Of the 204 Nobel laureates in physics, only two have been women — and the first and best-known, Marie Curie, was included only because her husband, Pierre, insisted that she, too, be awarded for their joint work. Prizes and awards usually require a judgment call, and there will almost always be some degree of controversy. But it doesn't take a rocket scientist to see that the Nobel numbers are skewed.

Does the prize matter? Of course it does. It is important for individuals, for the sociology of science and for science itself. Dr. Rubin was a strong supporter of female scientists. But imagine how many more people she would have reached if her name was also on the list of laureates.

It's too bad that Dr. Rubin's lack of a Nobel leads to these sorts of conversations, rather than merely recognition of her achievements. When women are included on any list of hires, speakers or awardees, the people responsible often point with pride to their efforts, as if it were a service, no matter how deserving the recipients might be. Yet probably the only list with a gender component is the one that she's not on. Dr. Rubin's work showed that there's a lot more to the universe than we see.

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