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| **Vera Rubin**  **Born 1928 - Died 2016**  Vera Rubin was born in 1928 in Philadelphia and grew up in Washington, D.C. She always had an interest in the night sky, looking up at the stars with her cardboard **telescope** when she was a child.  At the time she was ready to earn her master’s degree, Princeton University would not admit women to their graduate **astronomy** program, so Vera went to Cornell University instead. At the age of 22 she made headlines and shocked scientists with her **theory** that the universe was rotating. Scientists today are still debating this question, though most evidence points to Vera being correct.  After earning a PhD from Georgetown University, Vera started work at Carnegie Institution of Washington, where she met Kent Ford. He invented a new **spectrometer** that could be used to see light from distant stars like never before and measure the Doppler effect of stars in galaxies.  Vera used his spectrometer to start her work on spiral rotating **galaxies**. The theory was that galaxies spin the same way solar systems do. The farther away from a gravity point, the slower an object would move. Just like the different speeds of the planets circling the sun.  Vera studied over 60 different spiral galaxies. In every single one, she made the same observation: everything rotated at the same speed! What unseen form of gravity was causing this? Vera connected her findings with Fritz Zwicky’s theory about undetectable “dark matter”. Dark matter was creating a gravitational pull that affected how objects moved in the universe.  Although most astronomers did not believe that this invisible matter existed, Vera’s findings could not be ignored. Vera’s clear-cut calculations and observations could be explained only by the presence of an undetectable mass acting on it, making her findings the strongest proof of dark matter’s existence. Dark matter makes up most of the universe, but it is still a mystery to scientists today.  Vera made important observations on many galaxies throughout her career and was always willing to mentor fellow female astronomers. |

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| **Vocabulary Word Bank**  **Telescope**: Scientific instrument used for studying objects in space.  **Astronomy**: the study of stars, planets, and space.  **Theory**: Idea believed to be true, that is used to explain something.  **Spectrometer**: Scientific instrument used to detect, measure, and record light.  **Galaxies**: an area of billions of stars held together by gravity. |

