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Dark Matter: Vera Rubin's Lessons on Teshuva

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Temple Sinai, Washington, DC

Great news! On this Yom Kippur and the coming year, we can see things that we've never seen before. After two decades of planning and construction, The Vera C. Rubin observatory in the mountains of Chile is operational. Scientist released its first batch of pictures in late June and the observatory becomes fully operational at the end of this month. In its first few nights alone, Rubin discovered over 2,100 new asteroids and provided images of nebulae and galaxy clusters never before seen in such a way. The observatory states, "With Rubin's data we will gain a better understanding of our Universe, delve into the mysteries of dark energy and dark matter, and reveal answers to questions we have yet to imagine."¹ What a fine metaphor for what we are meant to do on Yom Kippur and for how we should approach this new year: delve into our hidden mysteries and answer questions we have yet to imagine.

The observatory is not just an amazing scientific advancement or apt high holiday metaphor. Vera Rubin, the scientist for whom it is named, is not a just a pioneering astronomer. Vera Rubin was a long time member of Temple Sinai from the 1960s until she died in 2016. She had quite a life. Dr. Rubin was discouraged from pursuing a career in astronomy because she was a woman and was initially denied access to state-of-the-art telescopes in her day. She not only discovered Dark Matter but she also discovered the women's room at the Palomar Observatory. When they claimed she couldn't have privileges on the telescope because there was no bathroom for her, Dr. Rubin made a sign that said "women," taped it



¹ <https://rubinobservatory.org/>

over the word “Men,” and that was that. A lot of folks think she deserved the Nobel Prize but she never let accolades or obstacles keep her from seeing that the most important things around us might be the things we can’t yet see.^{2 3}

Lesson one for this day and the coming year is to understand that we often fail to see the most important things around us and inside ourselves. The biblical prophets Jeremiah and Ezekiel gave that message, warning that often we are like people, “Who have eyes and see not, and who have ears and hear not.”⁴ One midrash about the Burning Bush says that the bush had always been there mystically aflame but nobody noticed until Moses, who had cultivated a high enough degree of sensitivity, awareness, and curiosity to see what nobody had before. As AI has become more popular this past year, more stories have come out about individuals who struggled emotionally and in other ways and whose families discovered their conversations with AI chatbots only after their loved ones had died, sometimes tragically. Often those families only learned after it was too late about concerns, suffering, and profoundly important things that their loved ones carried daily but were so well hidden from others.⁵

Some scientists believe that 90% of the universe is made of dark matter – stuff we can’t see but exists and has a very real effect on how things move and develop. That might not be the same percentage for us in our lives but I suspect there is a lot more hidden than we realize and its discovery will change our lives and the lives of those around. Yom Kippur is a call to seek those things hidden in ourselves and others and recognize them and their power.

² Katrina Miller, “Vera Rubin’s Legacy Lives On in a Troubled Scientific Landscape,” *The New York Times*, June 22, 2025. <https://www.nytimes.com/2025/06/22/science/vera-rubin-women-astronomy.html> and “Vera Rubin Scientists Reveal Telescope’s First Images,” NYT, June 23, 2025.

<https://www.nytimes.com/2025/06/23/science/vera-rubin-telescopes-first-images.html>

³ Obituary, <https://carnegiescience.edu/news/vera-rubin-who-confirmed-%E2%80%99Cdark-matter%E2%80%99D-dies>

⁴ Jeremiah 5:21; Ezekiel 12:2

⁵ Laura Reiley, “What My Daughter Told ChatGPT Before She Took Her Life,” *The New York Times*, Aug. 24, 2025, online at <https://www.nytimes.com/2025/08/18/opinion/chat-gpt-mental-health-suicide.html>; and Callie Holtermann, “Grief Fuels a Mother’s Mission,” *The New York Times*, September 28, 2025, online at <https://www.nytimes.com/2025/09/23/style/subway-surfing-death-nyc-tiktok.html?searchResultPosition=1>

The second lesson is to upgrade your equipment. In Rubin's case, it is the largest digital camera ever made with 3.2 billion pixels. Rubin is able to capture more in a single image than ever before possible - 3.5 degrees of the sky per shot. Here's a fun fact: the first ten images captured by Rubin contain approximately as much data as all the words that The New York Times has published since it was founded 175 years ago.⁶ In our case, it's about using Jewish spiritual practice, including the rituals of Rosh Hashanah and Yom Kippur, to cultivate hearts and minds attuned to see, hear, or sense what is actually around us and within us.

Chasidic masters use Noah's ark as a model for spiritual practice. They teach that God's commandment to Noah to build an ark echoes metaphorically for us today. They point specifically to studying Torah, doing acts of loving kindness, and worship, especially Shabbat observance, as ways to "build an ark" – a shelter from the storm and sometimes overwhelming pressure upon us – the flood. Shabbat, for example, is a space in time that we make so we have a safe refuge into which we can withdraw (*histalkut*) from the swirling challenges around us all week long.⁷

The third lesson is to involve other people. When Vera Rubin, the person, confirmed Dark Matter, she had been working closely with her colleague at the Carnegie Institute, Kent Ford, and building on theories proposed decades early by other scientists. Rubin the observatory uses an open source model and its own special software to make its data easily accessible in order to foster global collaboration and enable custom data analysis and increase scientific breakthroughs.

That is also a good model for teshuva, especially for *heshbon ha-nefesh* (self examination) and for getting back in touch with our deepest selves and having compassion for ourselves and others. The Torah describes Moses as unique among all prophets with a connection to God unlike anyone else ever had, and he needed and used help from other

⁶ Jonathan Corum and Kenneth Chang, "The Earth's Largest Camera Takes 3 Billion-Pixel Images of the Night Sky," *The New York Times*, June 19, 2025. <https://www.nytimes.com/interactive/2025/06/19/science/rubin-observatory-camera.html>

⁷ R. Yehuda Leib Alter of Ger, *Sefat Emet, Rosh Chodesh Marcheshvan* and R. Shalom Noach Barzovsky, *Netivot Shalom, Noah*, The Function of Noah's Ark for Future Generations (trans. By Rabbi Jonathan Slater). IJS CLP5 Retreat 1, Monday Texts, Jan. 22, 2023.

people. Moses survives the Pharaoh's oppression with the help of his sister, Miriam, his mother, and Pharaoh's daughter. He confronts Egypt only with Aaron at his side and his spokesperson and high priest, and he navigates the challenges of the wilderness with Yitro's help, his Midianite father in law. Rabbi Aaron Roth describes the kind of *chaver* friend or group of friends who can do this for us. He urges us to find people and develop relationships that he calls "*ner me'ir*" glowing lights that stir us from a sleep like state, spiritually speaking, and "*moreh derech*" – teachers of the way. These are the kinds of people with whom you are able to share very difficult things, not because they always pump you up and smooth over your rough edges but people who can be trusted to safeguard painful things for you and show you where you can do better.



Lesson four is to return and return again to the work we are doing. Once Rubin finishes its scan of the entire sky, it goes back and starts all over, and does that again and again. Every three to four days, Rubin captures the entire Southern Sky and it will do that over and over for at least ten years. This too is an essential component of *teshuva*.

Yom Kippur asks us not to take simply one day for self reflection and change but to make our *teshuva* a living and ongoing process. This is important because we will become distracted as school, work, or personal things get busy or we will think we have achieved *teshuva* today and we're done. The sages of our tradition taught that a person should do repentance every day and remain aware of the possibility for renewal at all times. Our morning liturgy, *yotzeir or*, encourages to offer this mantra-like verse every day as we start out in the world, saying: "*u'v'tuvo m'chadesh b'chol yom tamid, ma'aseh b'reishit* - In God's goodness, the entire world is renewed every day, constantly." You're not off the hook for Yom Kippur, you're already here. But, you don't have to do it all today and you shouldn't leave here thinking this was your one and only chance. Be like Rubin and keep coming back around to the work of seeing what's needed and what you should do with your life.

In a few moments we will read the Torah portion for Yom Kippur which encourages us to look to the heavens and draw our inspiration and to make the heavens our partner in

teshuva and choosing good lives. I only got to meet Vera Rubin in person a few times when I first arrived at Sinai. Sadly, I really got to know her legacy through her family, friends, and colleagues in the context of her funeral. Thankfully for all of us, with Dr. Rubin's namesake observatory up and running, her legacy is as alive as ever. She looked to the heavens as an astronomer and saw things nobody else could see. It's no coincidence that when she looked at life down here, as a woman in a field of nearly all men, she also saw things nobody could see. And now, with that telescope, Rubin continues to look to the heavens as our witness and our inspiration. There is a whole universe of things you cannot see but should. They are not always easy to find but with *teshuva* and some help from Vera Rubin, we can do it. *Gamar Hatimah tova*, may that inspiration lead us to *teshuva* and to be sealed in the book of life for good.