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### • **Oct 14, 2023 Annular Solar Eclipse**

<https://solarsystem.nasa.gov/eclipses/2023/>

School year 2023–24 is the year of the eclipse, with two great North American viewable solar eclipses in fall and spring (4 April, 2024). The NASA eclipse website includes details on local times, safety, animations and simulations, and more.

### • **Chilled-out Math and Physics Video Fun and Conjecture with Tibeas**

<https://www.youtube.com/@tibeas>

<https://tobyhendy.com/>

[https://en.wikipedia.org/wiki/Toby\\_Hendy](https://en.wikipedia.org/wiki/Toby_Hendy)

<https://en.wikipedia.org/wiki/Flatland>

<https://cdn.openai.com/papers/gpt-4.pdf>

I first became aware of mathematical physicist Toby Hendy's YouTube videos with her series of "Flatland"-like videos discussing 2D creatures living in a 2D world and how we 3D folk might mess with them, and how in turn we might be messed with by 4D creatures. The application of such reasoning to "relative fundamental force strengths" is also hinted at. I next enjoyed her charming "Bob Ross"-style ultramellow Zen-like introduction to imaginary numbers, logarithms, and calculus (imagine a yoga cooldown monologue from a mathematical physics professor). She also has a nice collection of short discussions of famous mathematicians' and physicists' exam scores, report cards, dissertations, and other artifacts (e.g., Einstein's divorce papers) thoroughly establishing that failure is part of life, even for (perhaps especially for) famous historical figures. Tibeas is particularly strong at gently and comically humanizing the study of physics and mathematics and reassuring the watcher. Also, Tibeas presents a rich collection of exams from around the world, and I particularly enjoyed her discussion of how ChatGPT was doing with exam taking, including her reference to a report on how GPT-4 did on the AP Physics and Calculus exams (we need to both proctor and strongly rethink the purpose and design of such exams).

### • **Practical Engineering Does Power Distribution System Grounding**

<https://youtu.be/jduDyF2Zwd8>

<https://www.youtube.com/@PracticalEngineeringChannel>

<https://tinyurl.com/WS-returnground>

<https://www.youtube.com/@EngineeringMindset>

Civil engineering YouTuber Grady Hillhouse treats us to a discussion, analysis, and a demo experiment on ground conductance and power distribution systems in his 20-minute video "Where Does Grounded Electricity Actually Go?" He discusses basic design of both ungrounded and (standard) grounded three-phase distribution systems, as well as the reaction to, detection of, and impact of ground faults. He carries out a nice demo creating an electrical ground path

through a box of sand (salt water was necessary to get significant current flow) and discusses the geometry of ground soil resistance near ground fault locations (hopping away from a downed wire is a survival strategy; striding away not so much—another demonstration with an action figure). Grady mentions the old-school rural single-wire Earth return systems around 12:50. Then extensive modern tech high-voltage DC transmission line grounds are shown, and a physics discussion on the impacts of (both natural and manmade) ground currents and the grid on the environment and metal infrastructure like telecom, rails, and pipes. Lightning is touched upon, and the physics in the video ends with a nice analogy: In many locations, questioning what power plant your electricity comes from is akin to asking what biological plant your oxygen comes from—things are pretty commingled on the grid, though strong probabilistic analysis is possible. A related discussion of power distribution system and household wiring grounding is found in a series of electrical power engineering grounding videos from The Engineering Mindset.

### • **Engineering with Rosie**

<https://www.youtube.com/@EngineeringwithRosie>

<https://tinyurl.com/WS-minetrain>

[https://en.wikipedia.org/wiki/Fortescue\\_Metals\\_Group](https://en.wikipedia.org/wiki/Fortescue_Metals_Group)

<https://tinyurl.com/WS-pumpedwater>

[https://en.wikipedia.org/wiki/Robert\\_Moses\\_Niagara\\_Power\\_Plant](https://en.wikipedia.org/wiki/Robert_Moses_Niagara_Power_Plant)

<https://www.youtube.com/@EngineeringwithRosie/videos>

Australian YouTuber and clean energy technology consultant, Dr. Rosie Barnes has developed a channel dedicated to assessing and discussing the mainly mechanical engineering of clean energy technologies in an approachable manner. Her 70+ videos are quite positive and hope-inspiring and provide up to date exemplars of simple calculations appropriate for introductory physicists looking for applications of green energy technologies. One of my favorite videos in her collection is a simplified calculational case study of a proposed gravity-powered Fortescue "Infinity Train"—an Australian electrical train transporting iron ore downhill from a mine to a seaport riding regenerative braking, then returning uphill on battery power empty to the mine to reload. She includes comparison of the train to a battery-powered giant mining dump truck. Another topical video is "Pump It Up ..." discussing pumped hydro (I live near Niagara Falls with a huge hydro storage system) and comparing pumped water and lithium ion battery storage technologies, including ethical and societal impacts. Her extensive discussion of wind turbine technologies is noteworthy, and she has green technology videos addressing decarbonizing cement, greener steelmaking, geothermal energy, ocean energy storage, photovoltaic power, nuclear power, and hydrogen storage.