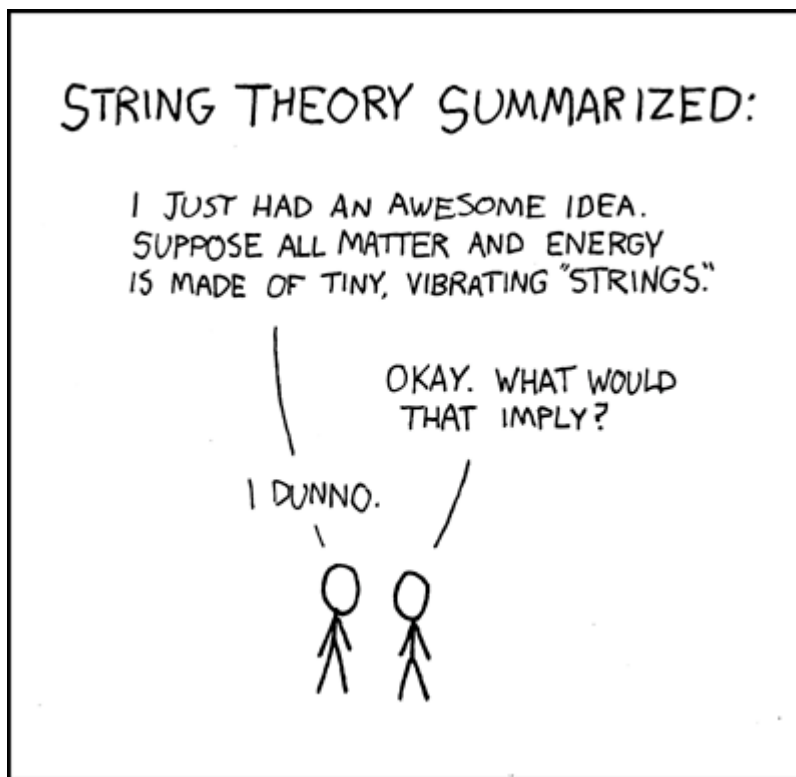


## Quantum Physics Questions

- Time Travel using electromagnetism?
  - Forward time travel isn't difficult if you can approach the speed of light
  - Using an electromagnetic pulse? No, you can't travel forward/backward with that
  - Could travel to the past as long as you do something about the speed of light
  - Wormhole: Shorter distance between two hugely separated points by holes in space/time
    - Two different paths connecting the same point in space/time
    - Not possible due to the amount of energy/gravity required (black holes don't hold a candle to it)
    - Need macroscopic (at least human-sized) wormhole (it would destroy you)
    - Microscopic wormholes probably exist. Traveling in time is easy if you're an electron
- Electron beam in the Electron microscope?
  - Electron beams: heat a metal, apply a forward electric potential, it will grab electrons and accelerate them
    - Want electrons to have a single wavelength, monochromatic, similar to a laser
- Throw a ball on a ship traveling very close to the speed of light. What happens?
  - If you're in the space ship, nothing will look different because your reference frame is moving as fast as the space ship.
  - Length contraction would make everything look flat to an outside observer to whom the ship is traveling close to the speed of light.
  - Won't pass the speed of light due to the infinite energy needed
- Were atoms known before quantum mechanics or was it vice versa?
  - The idea of the atom was around before quantum mechanics
  - Quantum mechanics filled in the fine details
  - Originated about the same time
- Quick and dirty of string theory?
  - According to string theory, fundamental objects are not point particles. They are loops and strings that vibrate and give us particles
- Electron Orbital shape? (see Sound question)
- Post nuclear explosion effect?
  - Falls off with time due to irradiated particles
  - Biggest danger is immediately afterwards, as in weeks and months
  - Largest radiation burst comes with the explosion
  - Chernobyl – radioactive materials got into the ground water and the soil
- Trap alpha, beta with magnetic field?
  - Alpha and beta are charged particles
  - Can be deflected with a magnetic field
  - But they are deflected less if moving fast
  - More cost effective to use a block of lead
- Sound and Quantum mechanics
  - Higher orbitals are higher “harmonics” for electrons
  - Just about anything that you can do in acoustics you can do in quantum mechanics

- Except in acoustics, you just deal with Real numbers instead of Complex numbers
- How can photons have zero mass but have energy?
  - Photon has zero “rest” mass; but they are never at rest
  - $E = \gamma mc^2$
  - For a photon  $E = pc$
- Radiometric dating, are the rates constant?
  - Half-life of isotopes are constant
  - Nucleus distance is  $10^{-15}\text{m}$
  - Atom distance is  $10^{-10}\text{m}$
  - Can affect half-lives by extreme compression of materials, so their nuclear wavefunctions start having more overlap.



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