

THE PLAUSIBILITY OF

STAR TREK



FASTER-THAN-LIGHT TRAVEL

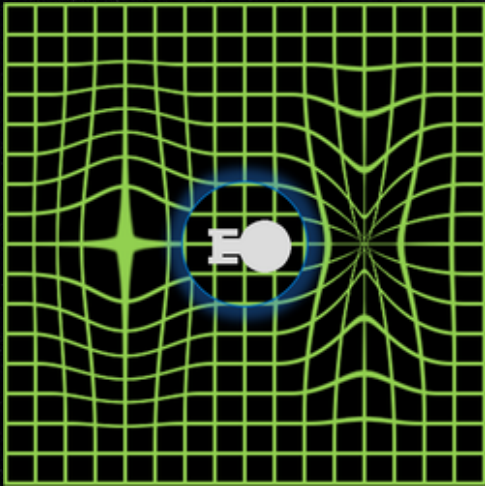


SO, WHAT IS IT?

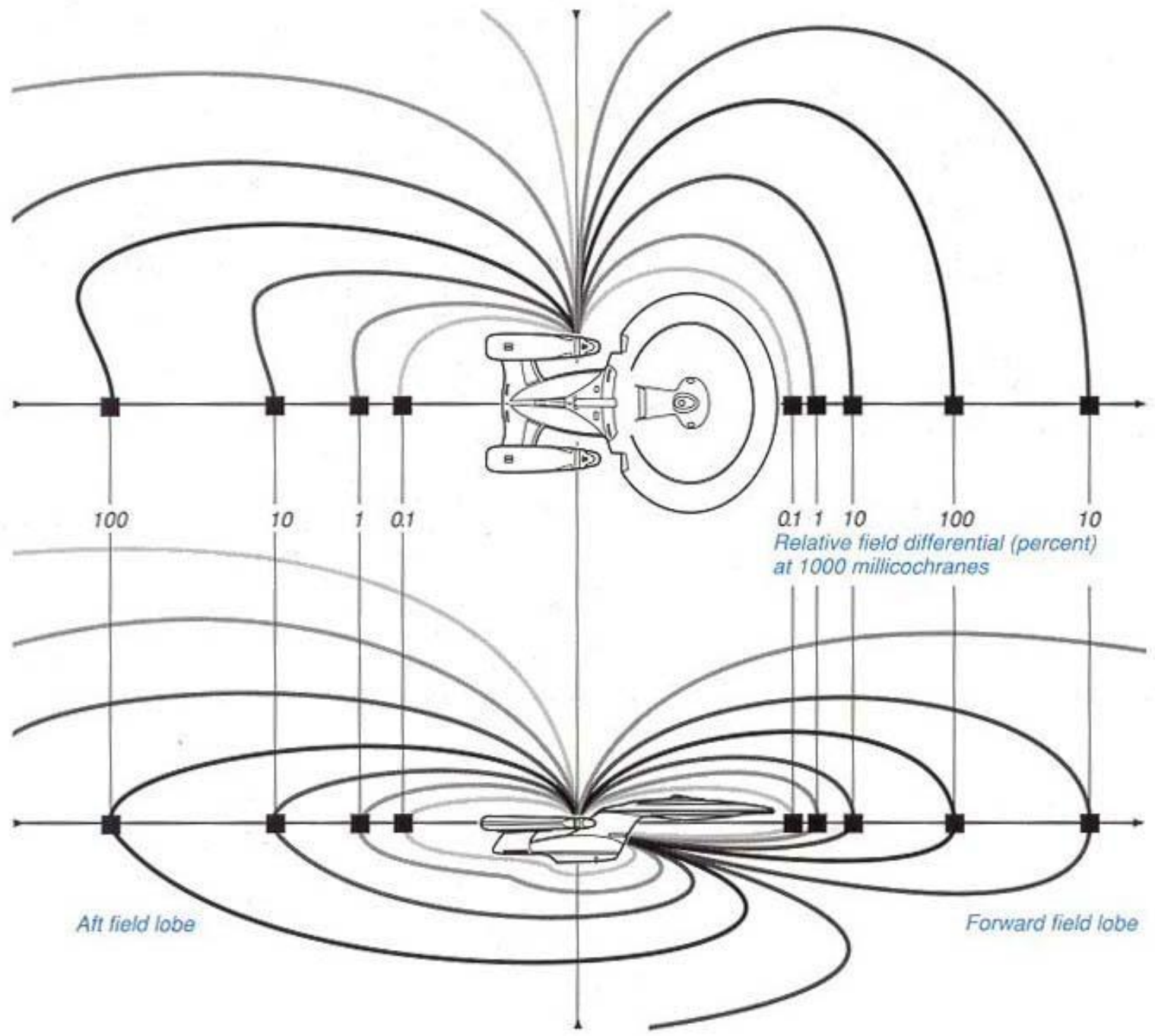


- FTL travel is integral to the interstellar Trek universe
 - At warp 4.5, you can go to Neptune and back in six minutes
- The humans were not the first civilization to discover warp travel (the Vulcans were an interstellar civilization by the 9th century, and had coleopteric warp drive capabilities by ~1947)
- Zefram Cochrane's invention of the "hyperdrive" in 2063 revolutionized warp travel across many civilizations
- First contact with the Vulcans occurred after the *Phoenix's* first trial, arguably leading to a unified world government and, later, the United Federation of Planets
 - First Contact Day -- April 5th! No school!

HOW DOES IT WORK?



- Big problems: time dilation, alternate dimensions
- Cochrane's solution: warp space, allowing the vessel to "surf the spacetime wave"
- Since it is spacetime, vs. the vessel, that is accelerating, passage of time inside the vessel is unchanged relative to outside the "bubble"
- Another (Romulan approach): black hole propulsion drive, which creates dozens of small quantum singularities



WHEN CAN WE LEAVE?



"There is hope."

Harold "Sonny" White, NASA

- Could theoretically achieve 10x the speed of light with Treknology
- Problem: a warp drive would require energy equal to the mass-energy of Jupiter... at a minimum
- Energy needs can be reduced by rounding the "donut", and oscillating warp intensity
- The White-Juday Warp Field Interferometer at the Johnson Space Center is trying to create micro-instances of space-time warping



TRANSPORTERS

Beam me UP, SCOTTY!

- Basic idea: deconstruct a person into an energy pattern, beam it to a target, and rematerialize the bits into matter
- Canonically invented in the early 22nd century
- Devised since the alternatives were too expensive
 - Roddenberry: "Compromise forced us into creative thought."
- The retro "transporter effect" was done by turning a slow-motion camera upside down and photographing some backlit, shiny grains of aluminum powder that were dropped between the camera and a black background

HOW DOES IT WORK?

- It takes $\sim 10^{45}$ (or 2^{150}) bits to encode an average-sized, U.S., adult male down to the quantum level... $\sim 1.8 \times 10^{32}$ terabytes
- Begins with a coordinate lock (destination), and a transporter lock (subject), which is usually done through the combadge
 - Alternatively, bio-signs or subcutaneous transponders
- The object is broken down into a matter stream, stored in a pattern buffer (to accommodate Doppler shift), transmitted across the subspace domain and reconstructed at the destination
 - Make sure to keep a back up!
- The standard quantum transporter has a range of around 40,000km under good conditions
 - Experimental "subspace transporters" do exist for interstellar distances

WHen can we Leave?

- The general consensus seems to be that we can deconstruct, but not reconstruct
 - Quantum entanglement experiments have allowed physicists to teleport data over 89 miles!
 - "Simple matter" only, however.
- So, maybe we can't teleport people yet... but it might have applications to information transfer!
- Transporters are also rife with philosophical questions ;)





TRANSLATORS

Darmok, Jalad and Beyond

- Originally used in the late 22nd century for the instantaneous translation of Earth languages
 - Likely developed independently, since the Vulcans could communicate on first contact
- Eventually built into the com badges (TNG-era)
- The Trek technical manual: "the UT is an extremely sophisticated computer program which analyzing the speech patterns of a foreign language" based on language samples
 - Bigger corpus = more reliable translation matrix
- No explanation for the disparity between how the physical formation of words can match the translation... :)

WHERE CAN I GET ONE?

- We're actually ahead of schedule!
- Google, VoxOx, all have "pretty good" text-to-speech translators
- The closest so far comes out of Microsoft Research:
 - Presented last October in China
 - Translation is "the easy part"
 - Two-step translation from English to Chinese... *in the speaker's original voice*