

THE PLAUSIBILITY OF

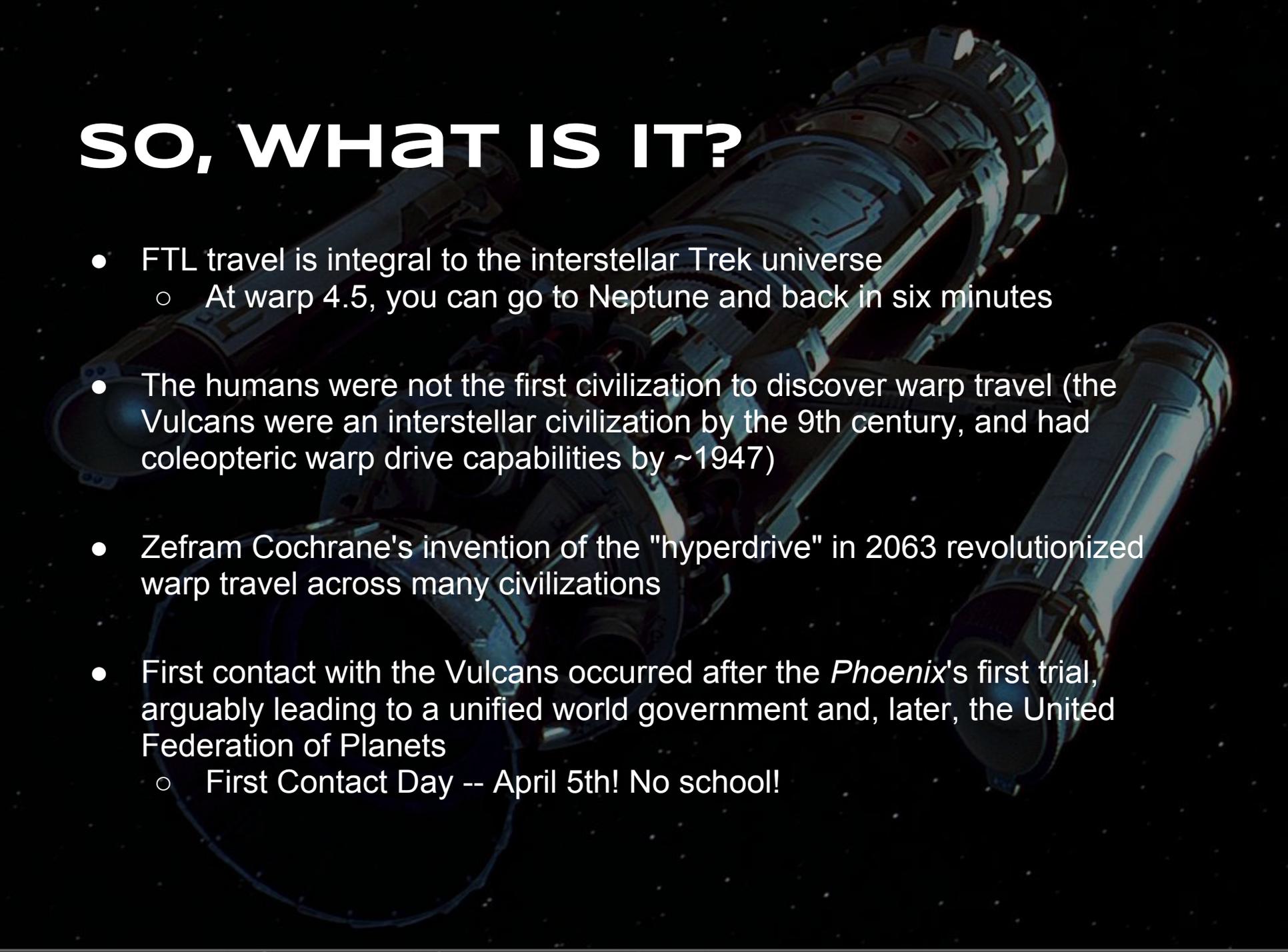
STAR TREK



FASTER-THAN-LIGHT TRAVEL

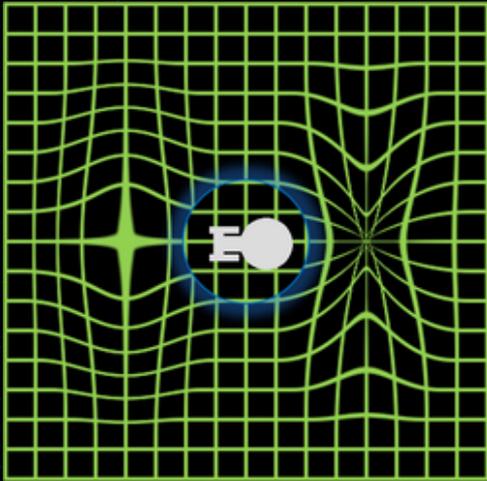


SO, WHAT IS IT?

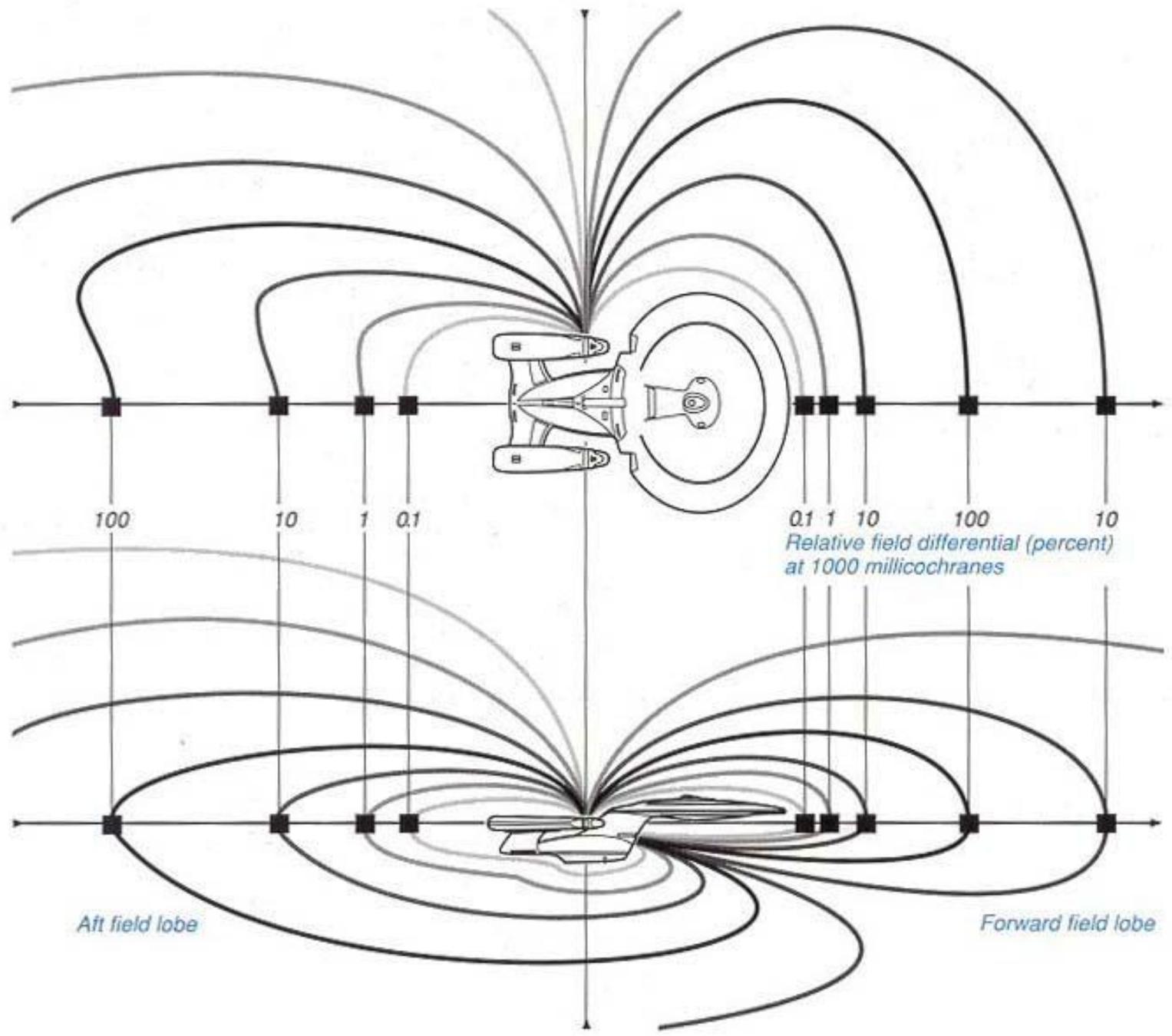


- FTL travel is integral to the interstellar Trek universe
 - At warp 4.5, you can go to Neptune and back in six minutes
- The humans were not the first civilization to discover warp travel (the Vulcans were an interstellar civilization by the 9th century, and had coleopteric warp drive capabilities 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

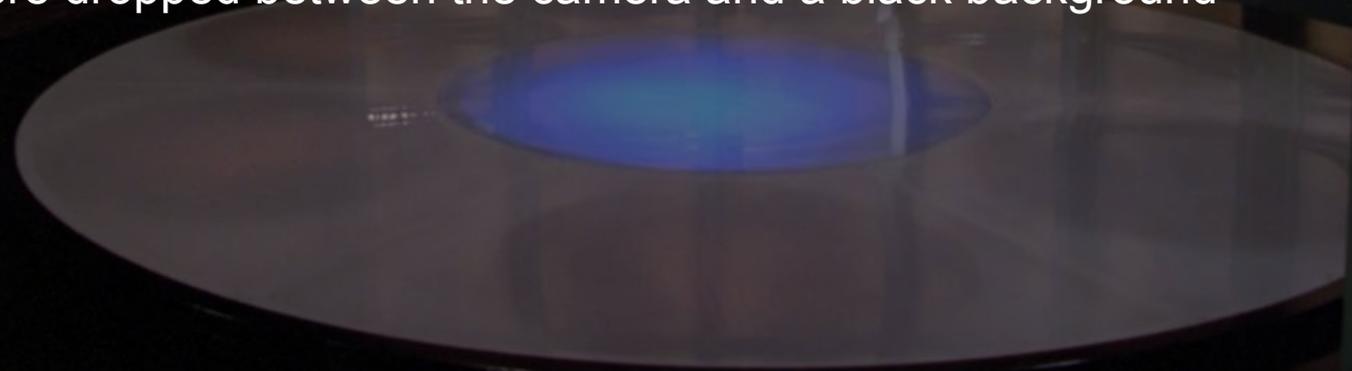
- Could theoretically achieve 10x the speed of light with Treknology
- Problem: a warp drive would require energy equal to the mass-energy of Jupiter... at a minimum
- Energy needs can be reduced by rounding the "donut", and oscillating warp intensity
- The White-Juday Warp Field Interferometer at the 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 background of the slide is a dark, futuristic control room. In the center, a glowing, semi-transparent human figure stands on a circular platform. To the right, a person in a blue uniform is seen from the back, looking towards the glowing figure. In the foreground, the back of another person's head and shoulders is visible, looking towards the center. The room is filled with various control panels, buttons, and screens, some of which are illuminated with a warm, orange glow.

- 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*