

advanced telepresence technologies
to reduce passenger transportation

jason.rugolo@doe.gov
program director, arpa.e





8 hours = 4 months



~4000 kWh roundtrip from west coast to DC
total US air travel => 72 GW (about 2 quads/year)



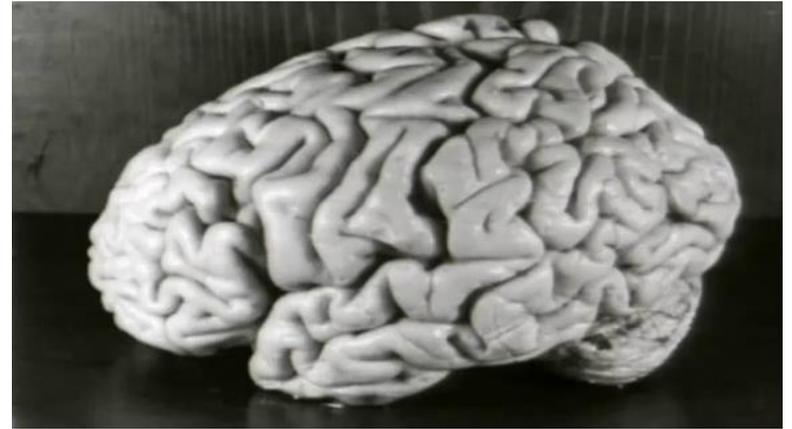
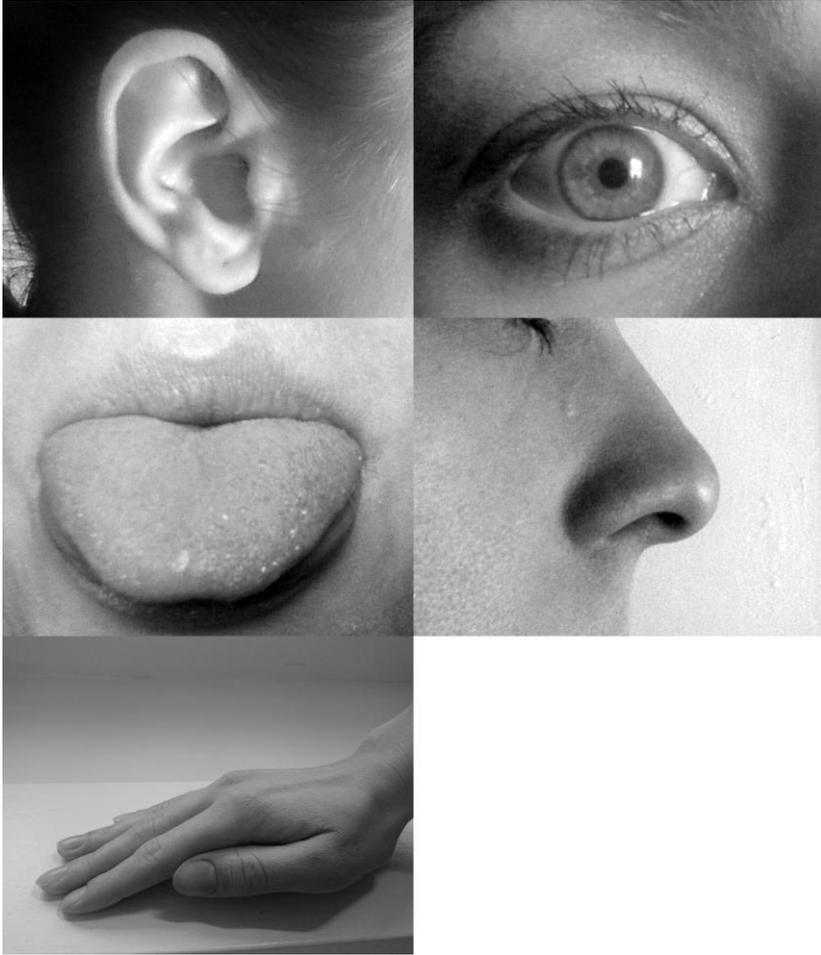
7 quad/yr,
245 GW



8 quad/yr,
275 GW



why?



what does **technology** have to say?



eye-related developments

- camera sensors
- high resolution screens
- projector technologies
- 3D displays
- HMDs, VR, AR



ear-related developments

- microphones
- speakers
- noise cancellation
- 3D audio



touch-related developments

- haptic feedback
- physics engines

trends

massive **computational power** for cheap

high bandwidth **internet** everywhere

game and movie **rendering, physics** engines

consumer adoption of **virtual interaction**



passenger transportation trichotomy

we transport ourselves with the objective of:



communication

to convey or consume info



labor

to physically affect environment



experience

predominantly to "experience"

passenger transportation trichotomy

we transport ourselves with the objective of:



8 quads/yr



5 quads/yr



5 quads/yr

communication

to convey or consume info

labor

to physically affect environment

experience

predominantly to "experience"

someday, we will only travel when we want to.

(and transportation energy will plummet)

but we must travel today
to communicate, because solutions lack:

simultaneity

eye contact, gaze

3D sight

depth of field

changing focus

resolution

3D hearing

sound clarity

timbre of voice

posture

hand expressions

body language

interpersonal distance

microexpressions

eye roll, etc

side glances

immersion (v. skype window)

commitment (showing up)

flattering light, angles, etc



second life



the "uncanny valley"





digital avatar "turing test"





advanced telepresence

jason.rugolo@doe.gov
program director, arpa.e