



Are Haptics Really *Necessary?*

A headlong blind
(and hopefully amusing)
dash into the abyss of one of the most
fundamental questions of our field

Why is this important?

- I ♥ haptics, but...
- Simulators with haptics are: (order of magnitude)
 - More complicated
 - Force generation at 1000Hz vs display at 30Hz
 - Correct force replication and validation is difficult
 - Higher repair rate
 - More expensive
 - Cost of haptics hardware
 - Cost of extra computing power

Key issue: is it better to have fewer, more expensive haptically-enabled simulators, or more, lower-cost non-haptic simulators?

Why am I asking this?

- Personal history:
 - Forces off, it's still useful!
- Current surgical training:
 - Unsuspecting fruits, veggies, and poultry
- Recent research:
 - Forces in real surgery more to do with trocar
 - Robotic surgery may not need forces



Is surgical *replication* important, or is it merely surgical *rehearsal*?

The Panel

- Two Camps:
 - Pro-haptics – use the Force
 - The Rebellion



Each Camp

- Four individuals:
 - Two Clinicians
 - Simulation experience/
clinical perspective
 - Two Engineers
 - Simulation experience/
technical perspective



Pro-Haptics Camp

- Immersion Medical: Bill Lewandowski
- Intuitive Surgical: Chris Hasser
- Simquest: Howard Champion
- MGH: Steve Dawson



The *Rebellion*

- University of Washington: Blake Hannaford
- USUHS: Mark Bowyer
- AMTI/Beth Israel: Butch Rosser
- Energid/MIT: Srini Srinivasan

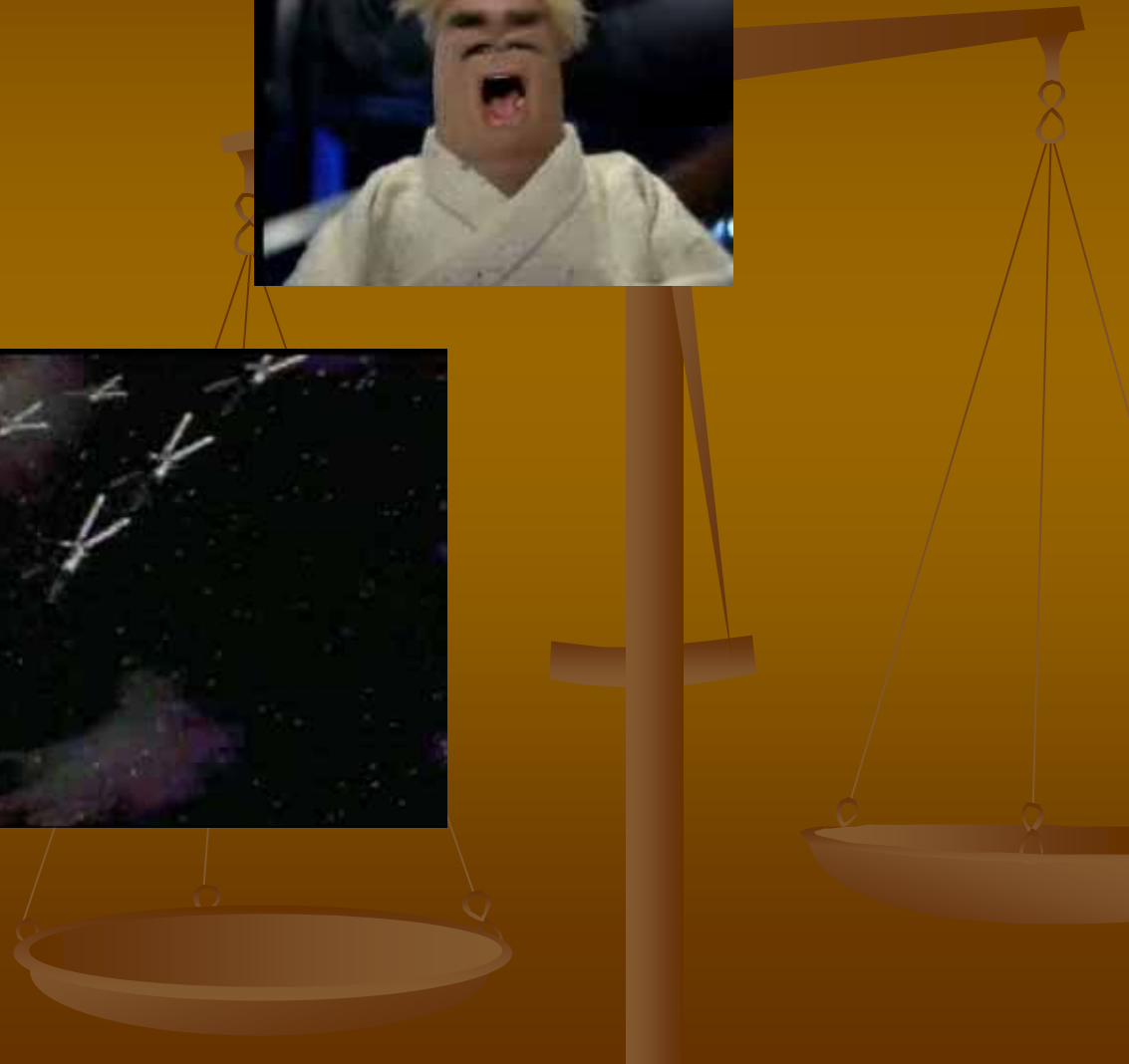


The Key Question

- To Use the Force:
- Or, maybe not...



Parting Wisdom



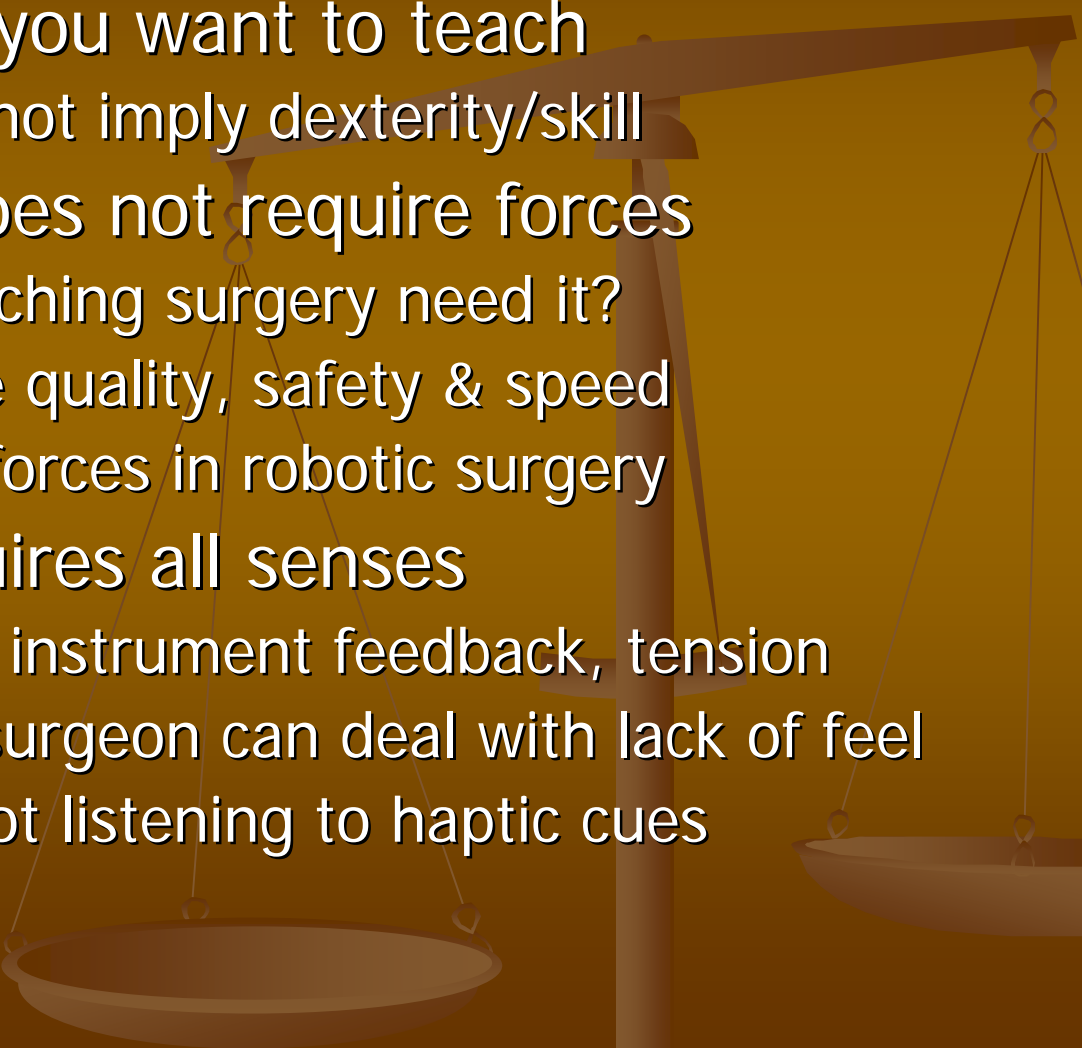
Big Thanks in Advance

- Steve Oedekerk/O Entertainment

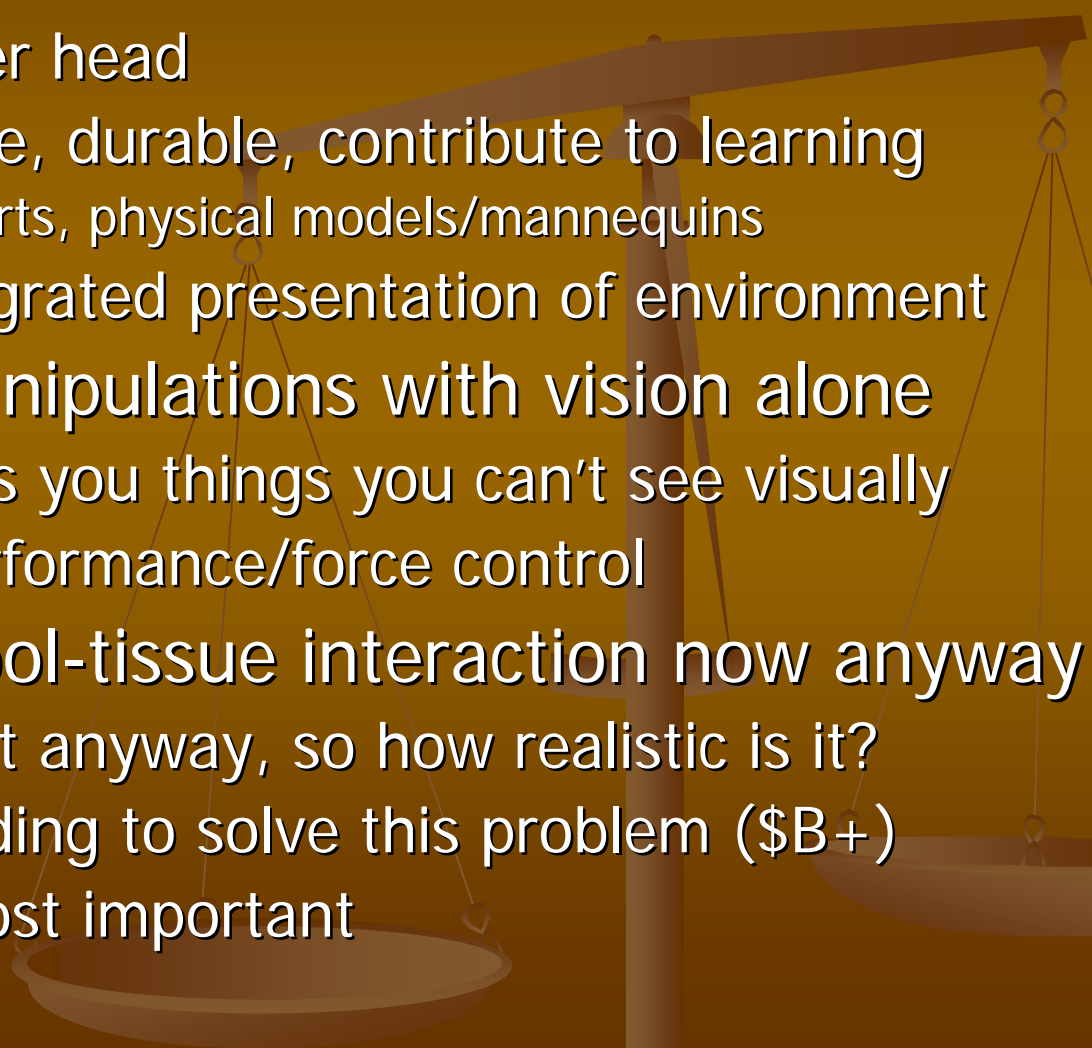


- Our fine panelists and audience

Notes

- Depends on what you want to teach
 - Observation does not imply dexterity/skill
 - Robotic surgery does not require forces
 - So why should teaching surgery need it?
 - But would improve quality, safety & speed
 - Difficult to obtain forces in robotic surgery
 - Open surgery requires all senses
 - Probing, pressure, instrument feedback, tension
 - Only well-trained surgeon can deal with lack of feel
 - Bad outcomes if not listening to haptic cues
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Notes

- Bad haptics worse than none at all
 - Beware your shower head
 - Best: cheap, reliable, durable, contribute to learning
 - Polymer-based inserts, physical models/mannequins
 - Visual haptics: integrated presentation of environment
 - Can do delicate manipulations with vision alone
 - Sometimes feel tells you things you can't see visually
 - May speed task performance/force control
 - Can't do realistic tool-tissue interaction now anyway
 - Patients all different anyway, so how realistic is it?
 - Don't have the funding to solve this problem (\$B+)
 - Cognitive issues most important
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Notes

- Using experts to fine tune haptics unreliable
 - Butch would be a great lawyer
 - Suturing- people do best with visual
 - Haptics nice addition, but don't hold back field
 - "Give me vision, or you will have death"- BRQ
 - Don't know forces/have computing power/funds
 - Vision/deformations are biscuit, haptics are gravy
 - Still need to compute forces anyway
 - Wide variability in tissue properties need to be learned
 - Humans fill in anyway- Fysics
 - Haptics is a design tradeoff, just like other aspects
 - Higher variability in performance without force feedback
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