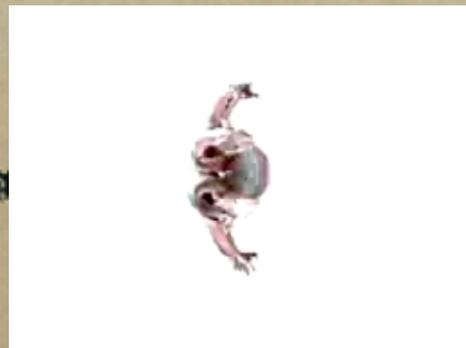


# Beer Bellies, Bountiful Behinds and other Mysteries of the Human Form



*Sandy Ressler*  
*National Institute of Standards and Technology*

*Digital Human Modeling for Design and Engineering*  
*Montreal Canada, June 18, 2003*

# Outline of Talk

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- *Tell them what you are going to say*
- *Tell them*
- *Tell them what you just told them*

*Don't you just despise  
people that read  
PowerPoint Slides!!!*

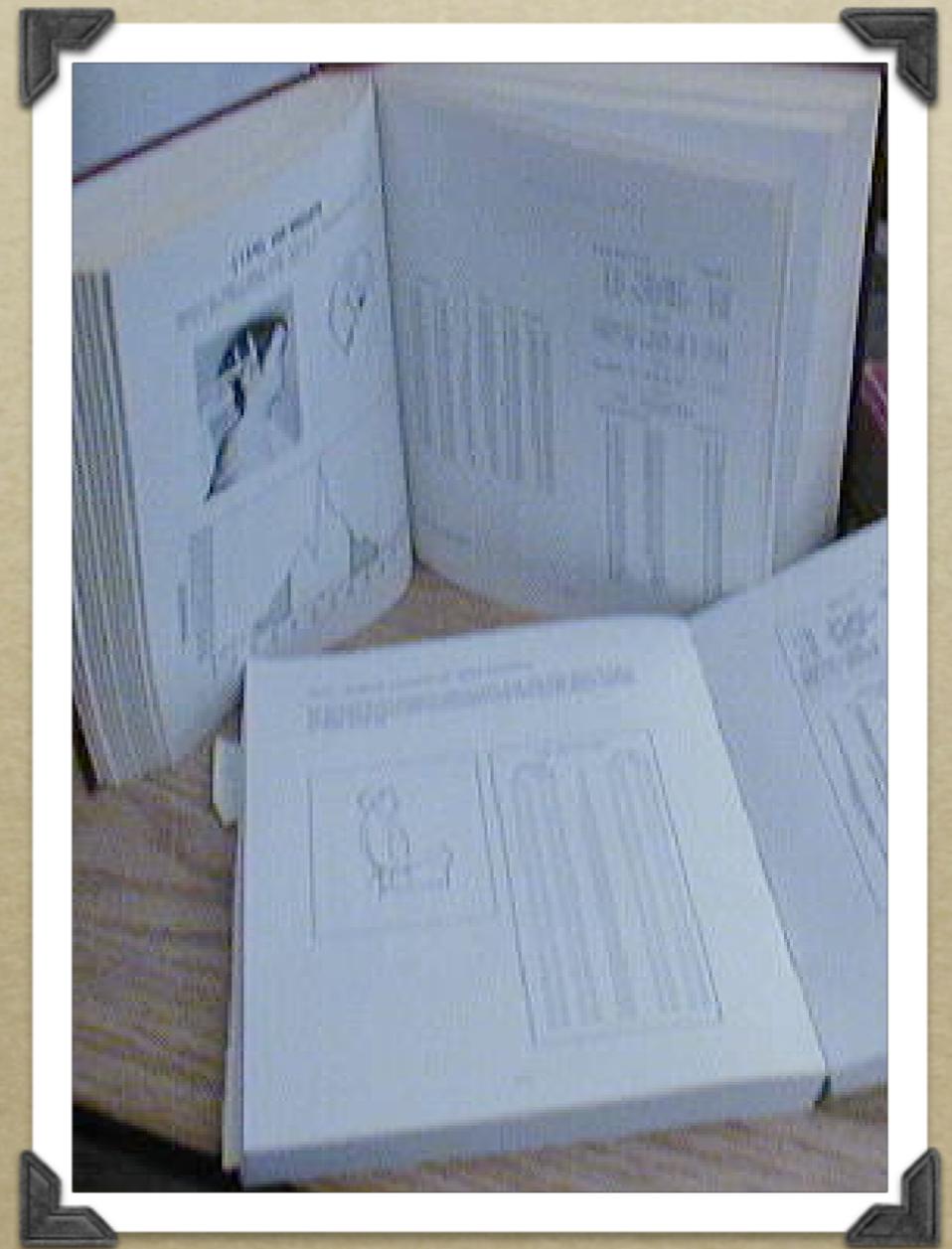
# The Real Outline

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- *How we got into this human stuff*
- *Using 3D on the Web (VRML and beyond)*
- *Human Shapes (Beer Belly)*
- *Semantic Web (Bountiful Behinds)*

# How'd we get into this.

- What do you mean it's only in a book!!



Combined  Male  Female

18 Head Circumference

20 Head Length

23 Lower Face Height

24 Face Height

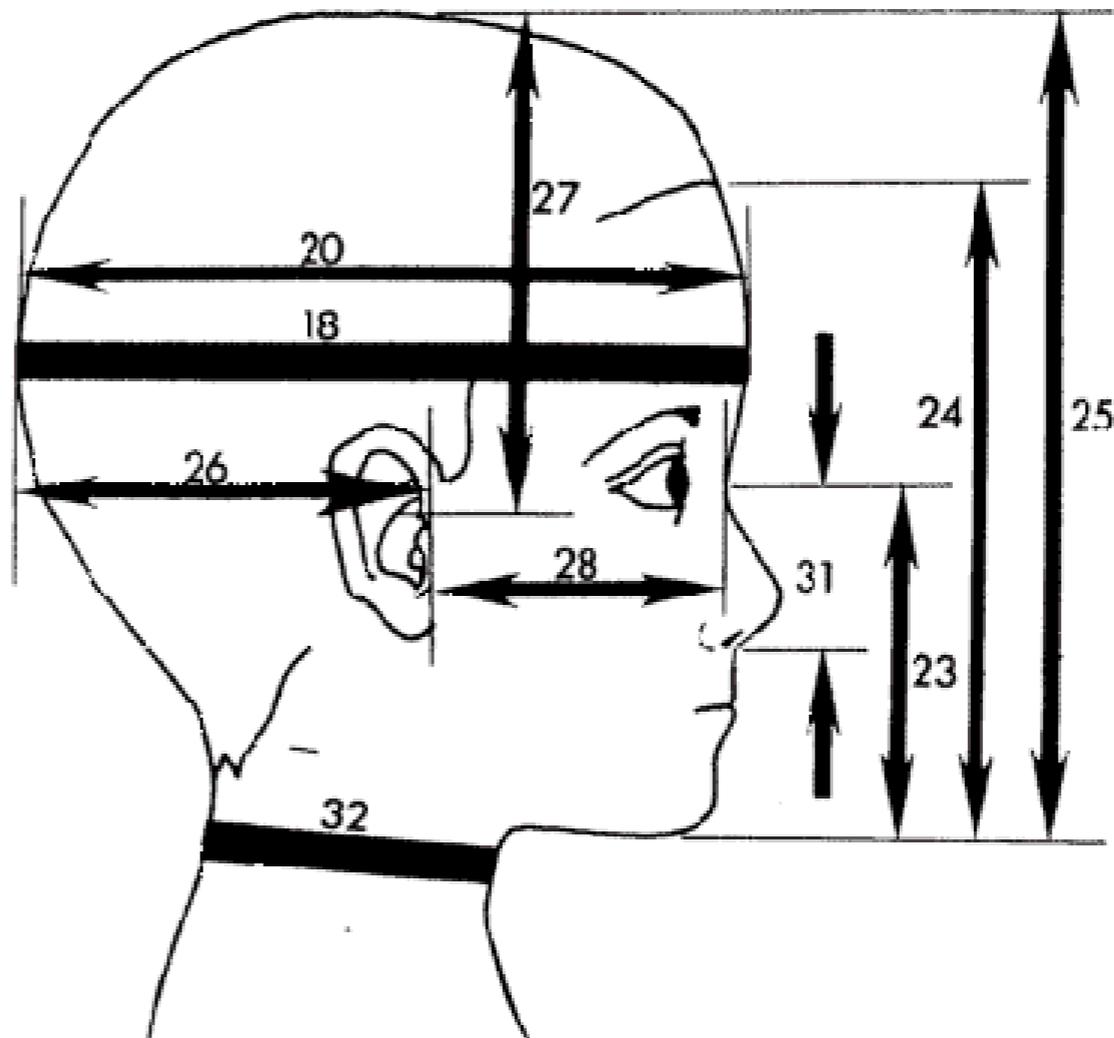
25 Head Height

26 Tragon to Back of Head

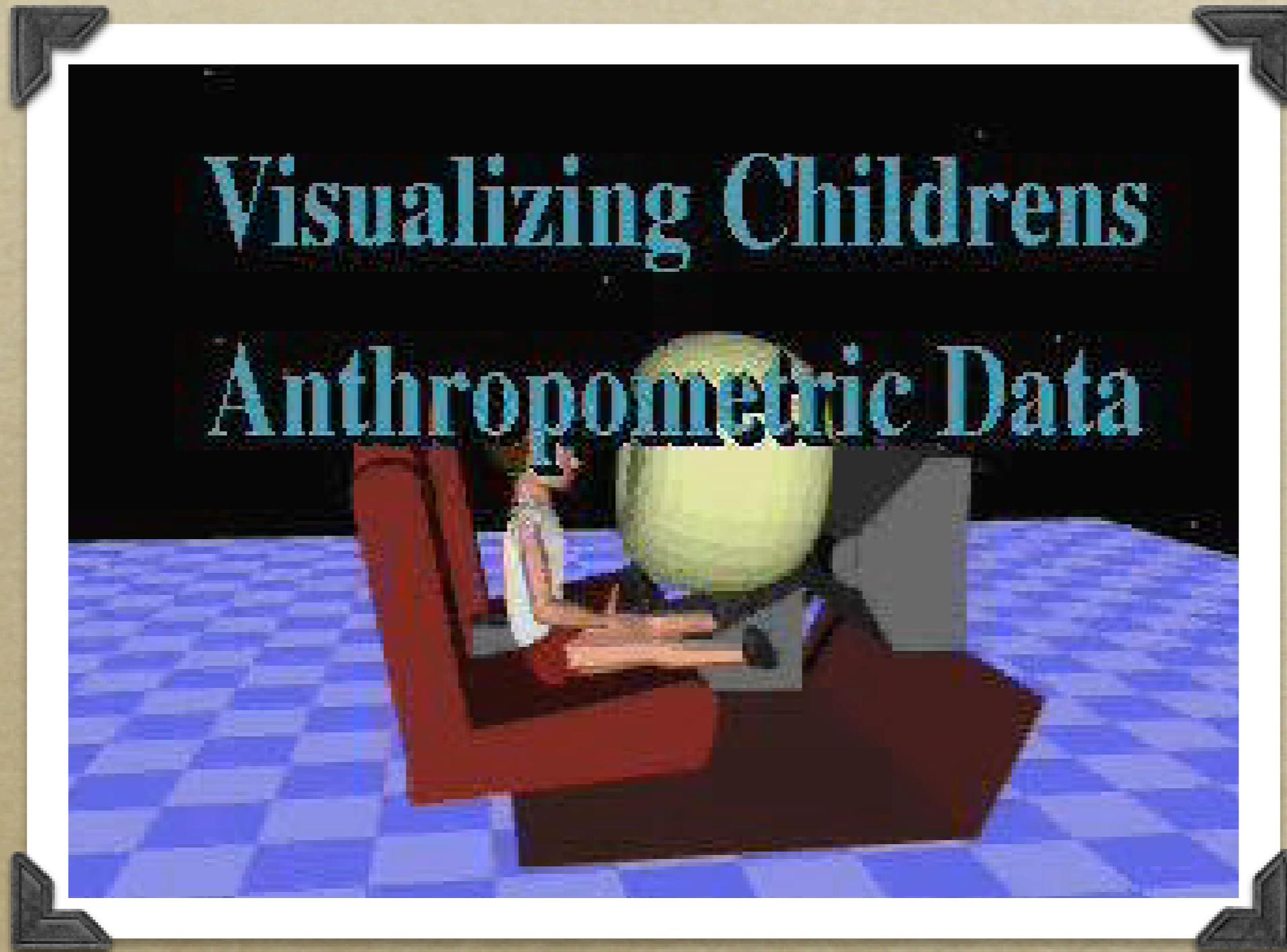
27 Tragon to Top of Head

28 Ear-Sellion Depth

31 Nose Length



AnthroKids data on the web



Creating 3D Models from Kids Data

# AnthroKids Customer Applications

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- Guidelines for child labor on farm
- Manufacturing of lawn mowers
- School furniture design & purchasing
- Diaper changing pad
- Toy design
- Medical illustration
- Children's clothing
- Infant product design

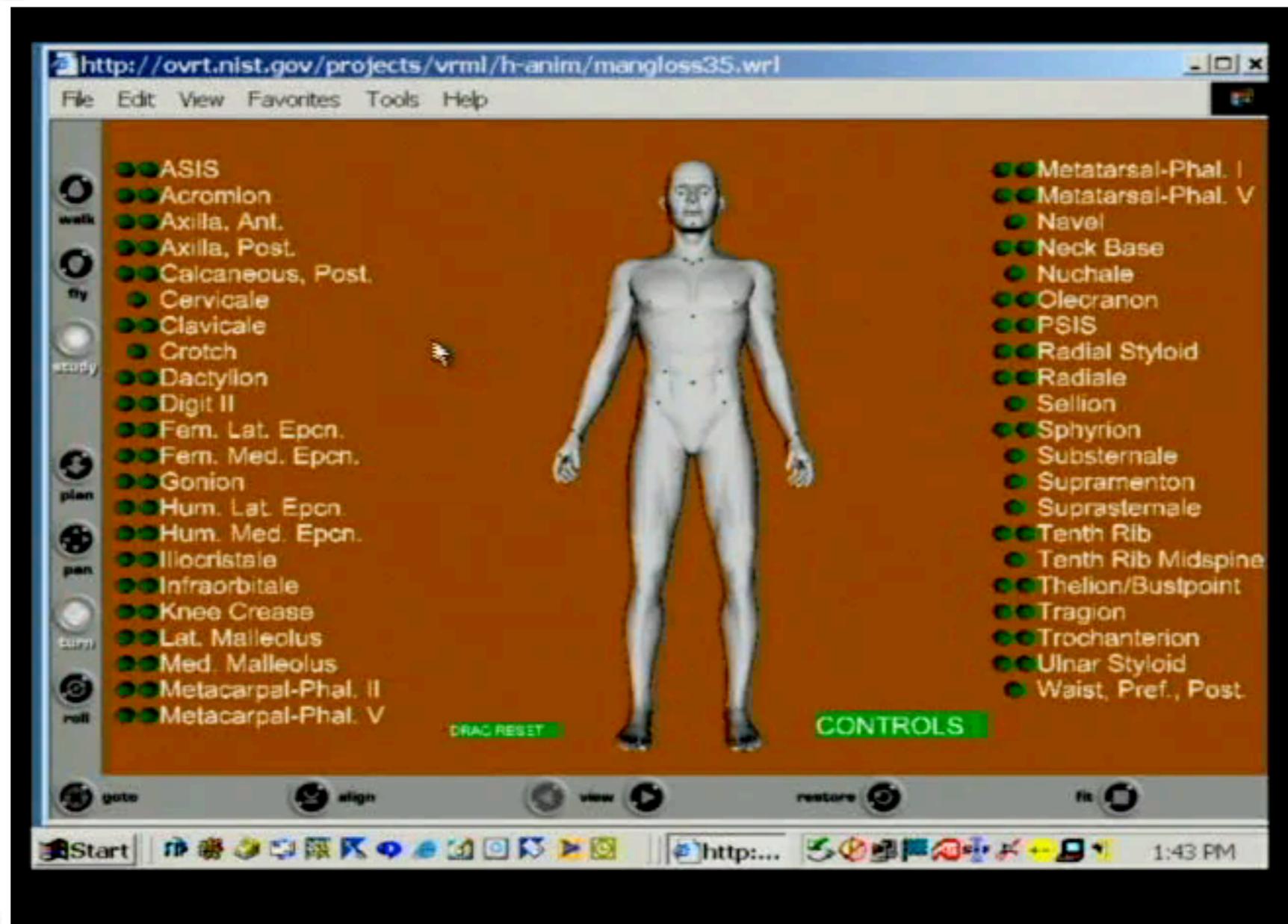
Child passenger safety  
Crash dummy design  
Child chair design  
Product safety standards (Canada)  
Childrens anthropometric standards (Slovenia)  
Childrens pop-up book design  
Emergency drug dosage estimation  
Nursery design  
School furniture for Chile  
Accident investigations

# Human 3D on the Web

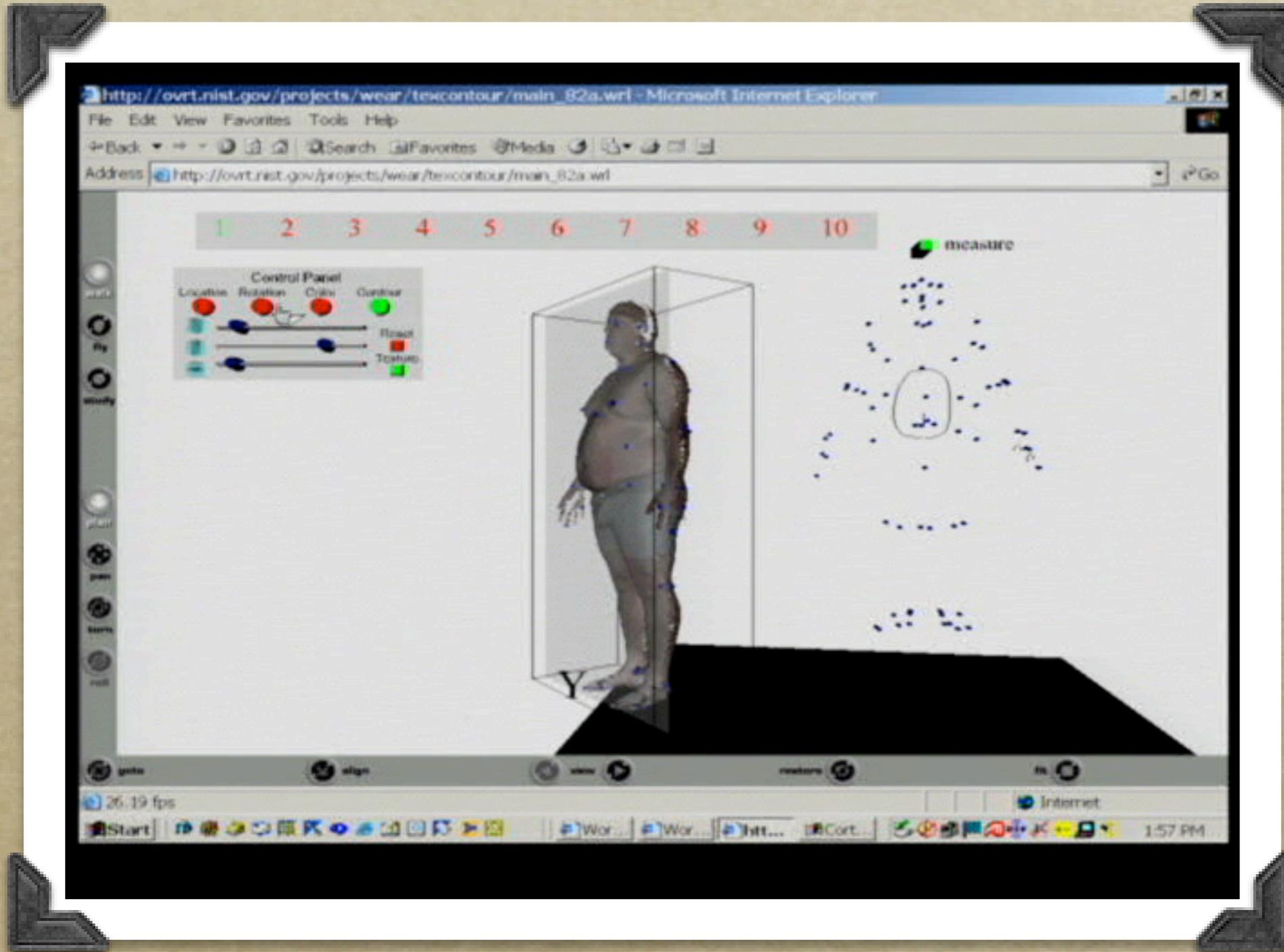
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- *VRML, Virtual Reality Modeling Language*
- *H-ANIM*
- *X3D*

**Web3D - Generic Term**



# AnthroGloss



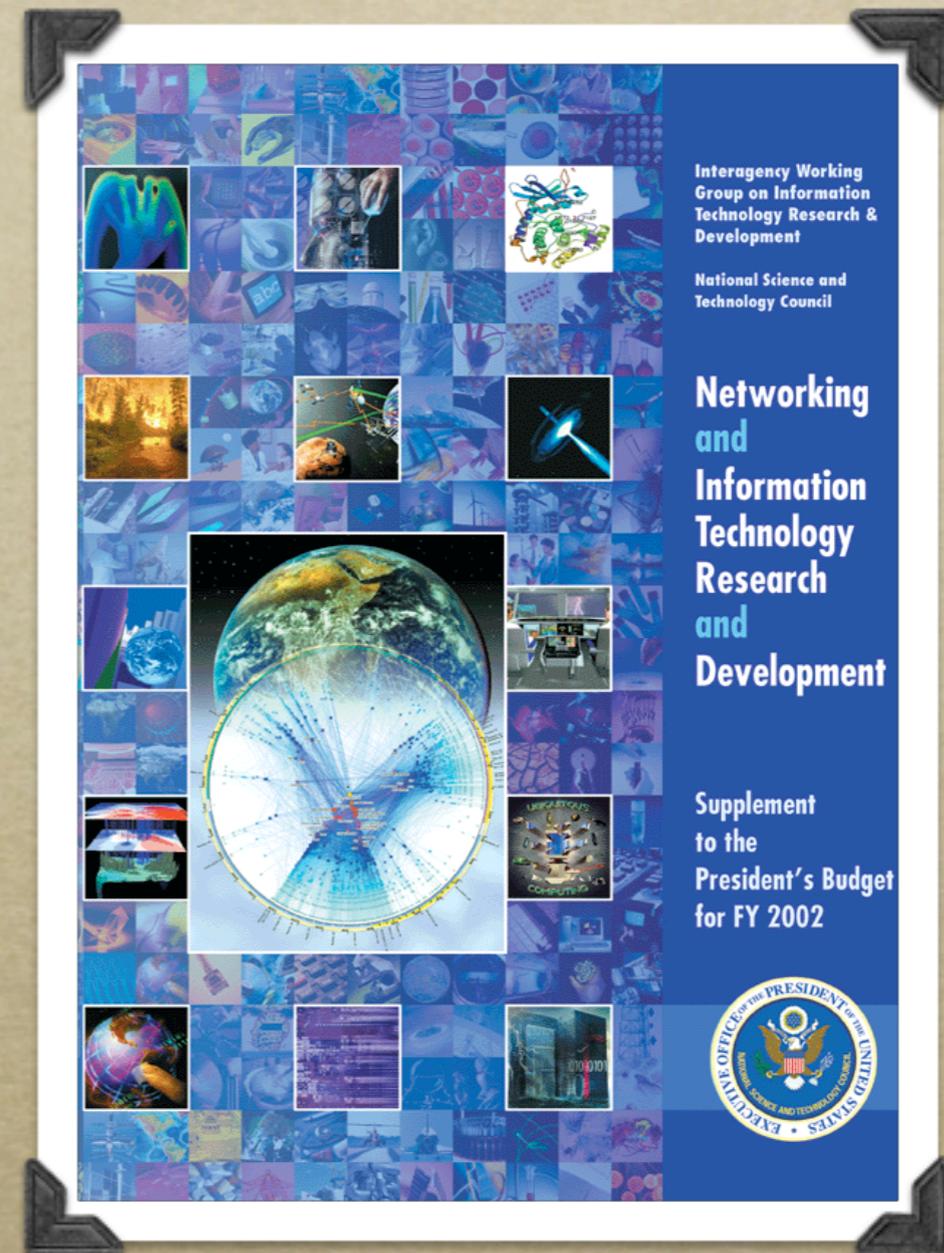
# Web3D CAESAR Viewer

# The Big Picture and Human Shape

---

# National Grand Challenge Application

- *Creating Scientifically Accurate, 3-D Functional Models of the Human Body*
- *Advances in computational speeds, visualization software, and data storage capacities are bringing us closer to being able to generate large-scale 3-D models and simulations of enormously complex phenomena such as the human body. To suggest how computationally challenging such models are: It is taking the world's fastest computing platforms in the Federal government's national research laboratories to begin to create quantitatively accurate visualizations of the Nation's nuclear weapons stockpile. It will take substantially more computational capacity to generate a precise 3-D visual model of the human body, starting from atoms, molecules, and cells, through organs and the circulatory and musculo-skeletal systems.*





Who are you kidding! You  
wanna make games!

# Engineering Design

## Skin Deformation

---

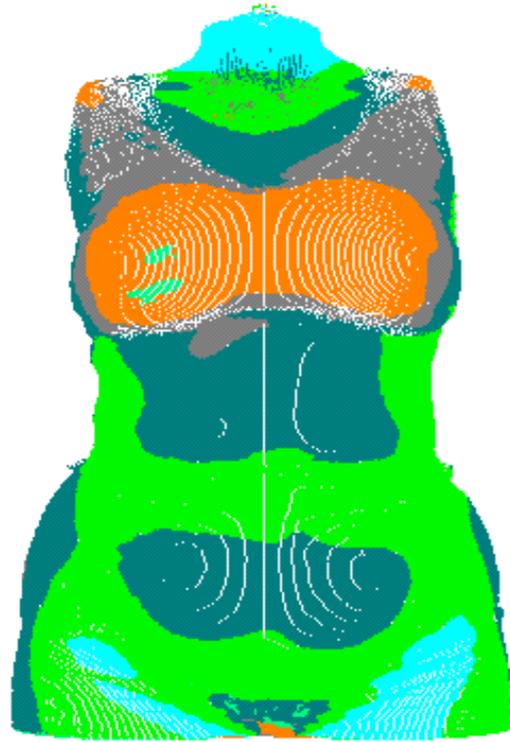
- *Traditional anthropometric methods do NOT have the data.*
- *Traditional univariate measures inadequate*
- *Models of skin deformation based on the “ground truth” of 3D measurements are needed.*

# Beer Bellies

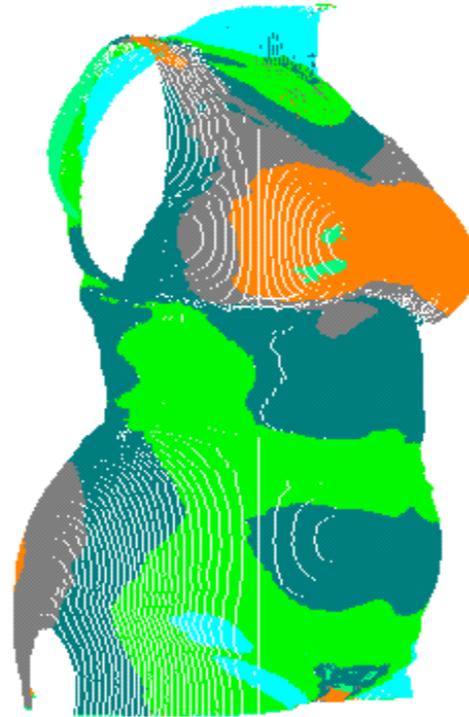
*did you say diet?*



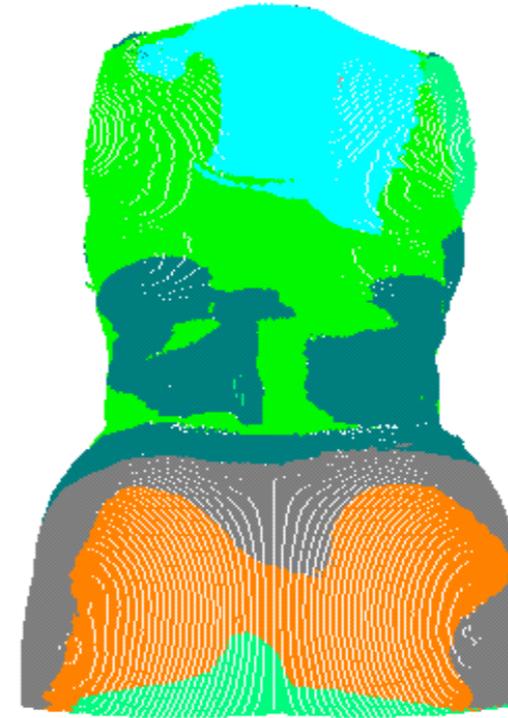
Radial Difference Map Front



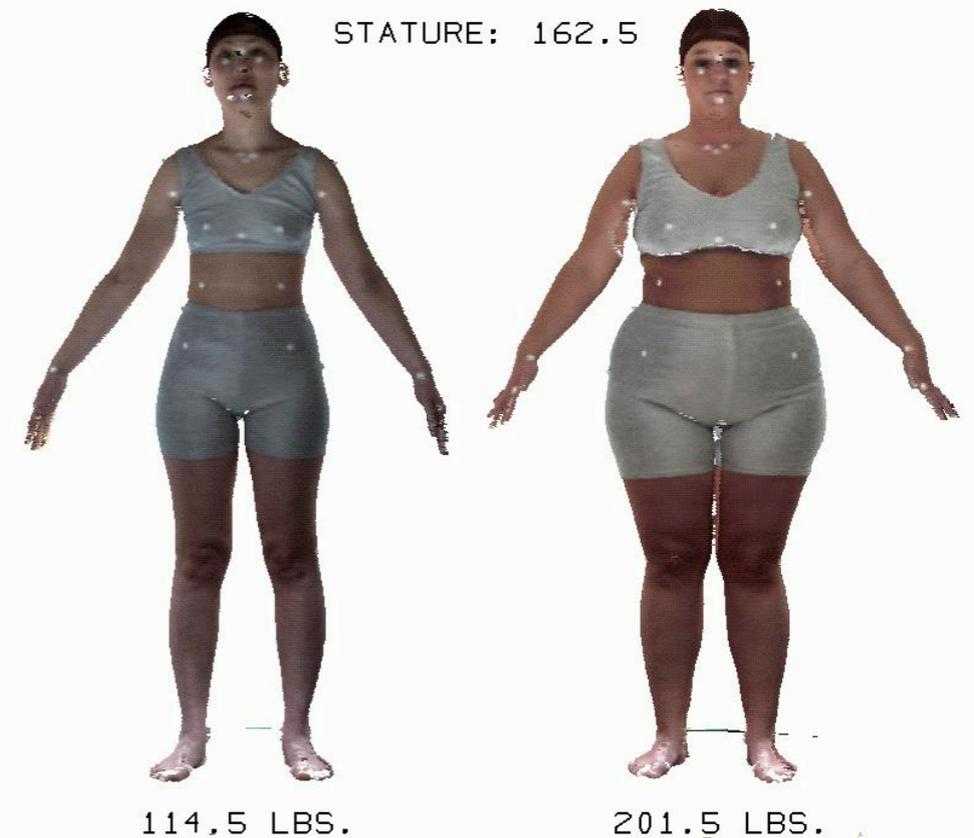
Radial Difference Map 45 Degrees



Radial Difference Map Back

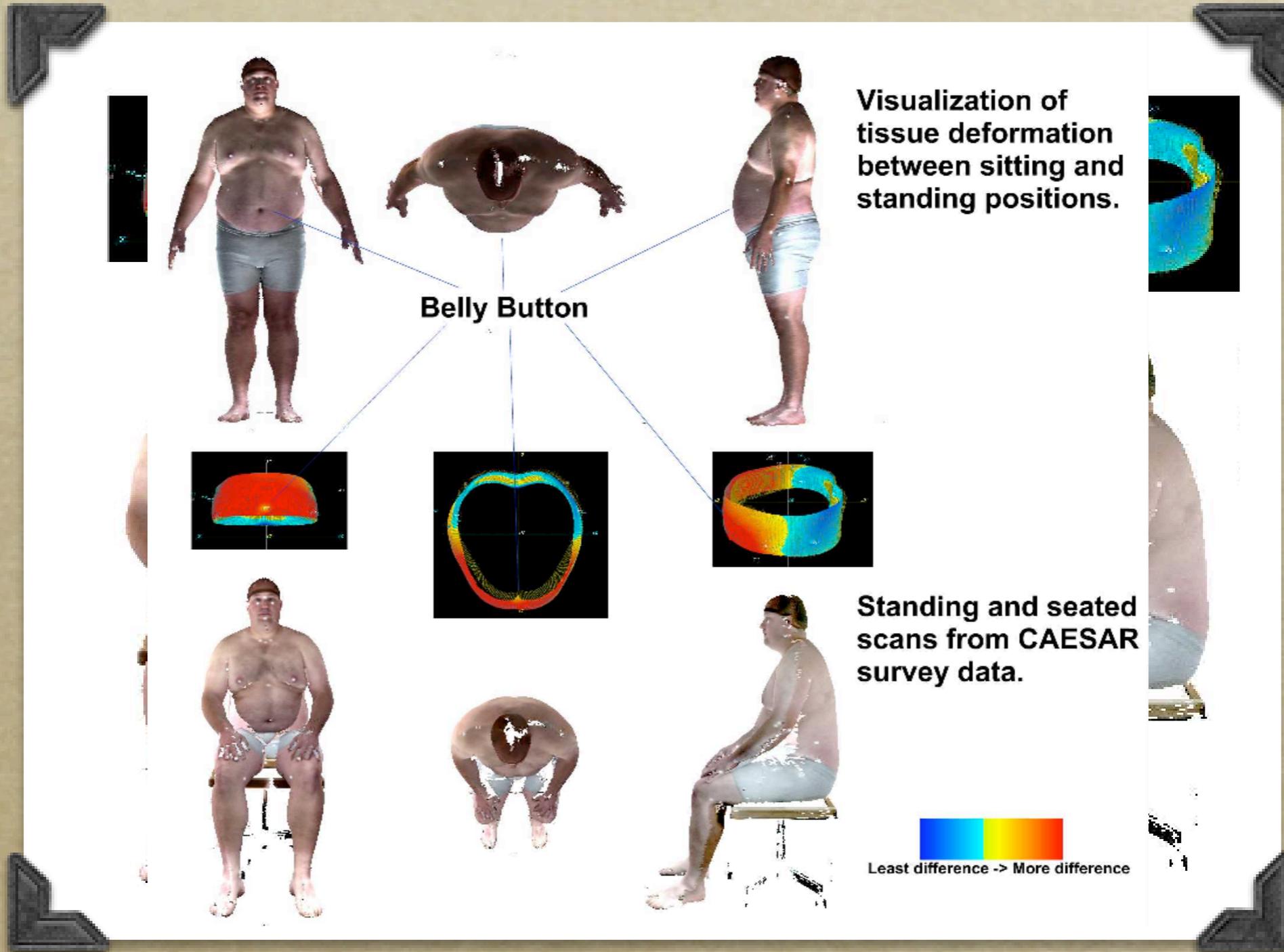


DISTANCE	COLOR
Negative	Pink
< 20 mm	Blue
20-40 mm	Green
40-60 mm	Slate
60-80 mm	Gray
80-100 mm	Orange
>100mm	Blue Green

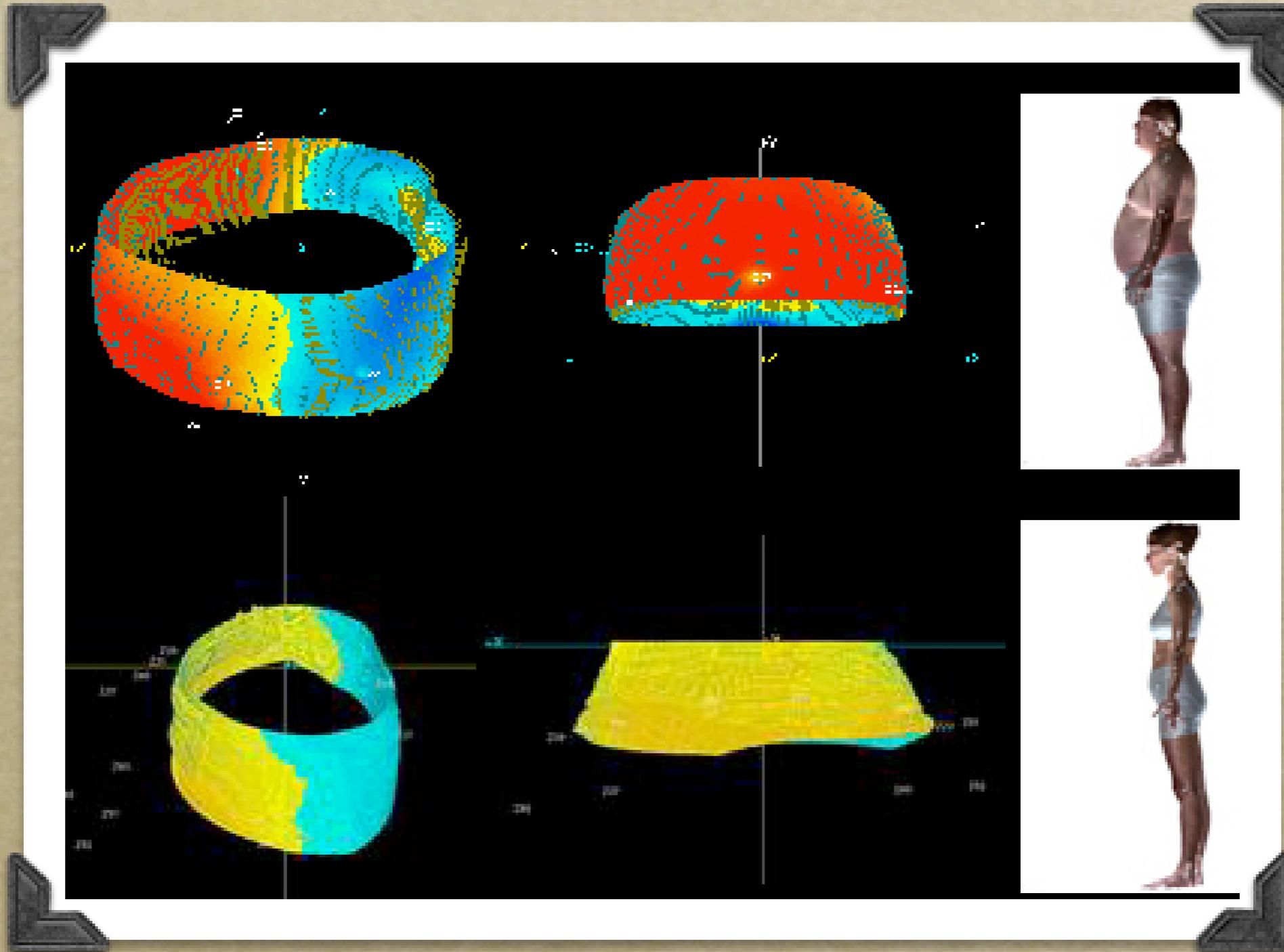


# Let's Compare Figures

*same height, different weight/shape*



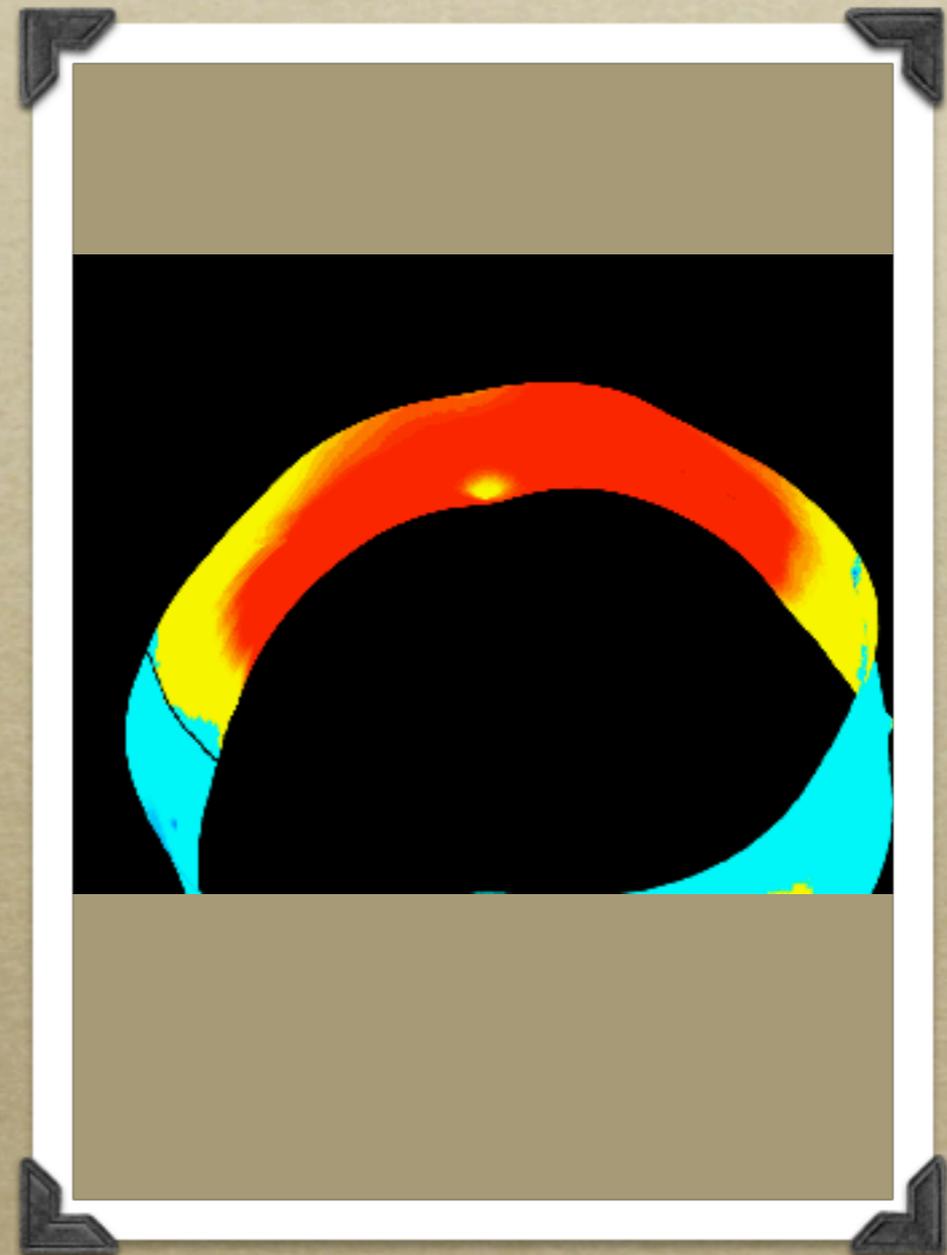
# Beer Belly Visualization



Comparing Beer Belly with none

# Engineering Design

- *Use static CAESAR models.*
- *Measure between standing and seated scanned data.*
- *Convert to VRML and add interactivity.*



# Does anyone really care?

---

- *Truck driver comfort (major safety issue)*
- *Easy access to controls (reach and accomodation studies)*
- *Motorcycles - motorcycle occupant packages (beer belly Jack, and wide load Jane ...from an unnamed manufacturer)*
- *Sales*

# Truck Features

## Kenworth To Introduce Extended Day Cab Offering More Room for T600, T800 and W900

LOUISVILLE, Ky., March 19, 2003 – Kenworth is introducing a new extended day cab for its lineup of heavy duty trucks that provides drivers with more room and storage space. Available on the T600, T800 and W900, the option will be well-suited for both regional hauling applications and vocational customers who are looking for more cab comfort.

“We believe that a Kenworth extended day cab will be popular option with those fleets and owner operators who want to provide an even more comfortable and productive driver environment,” said David Warren, Kenworth product marketing manager. “This extended day cab runs six inches longer with the roof raised five inches over our traditional day cab. The result is a very spacious

cab with **two more inches in driver belly** and leg room, more head room and 21 degrees of recline in the driver’s seat.”



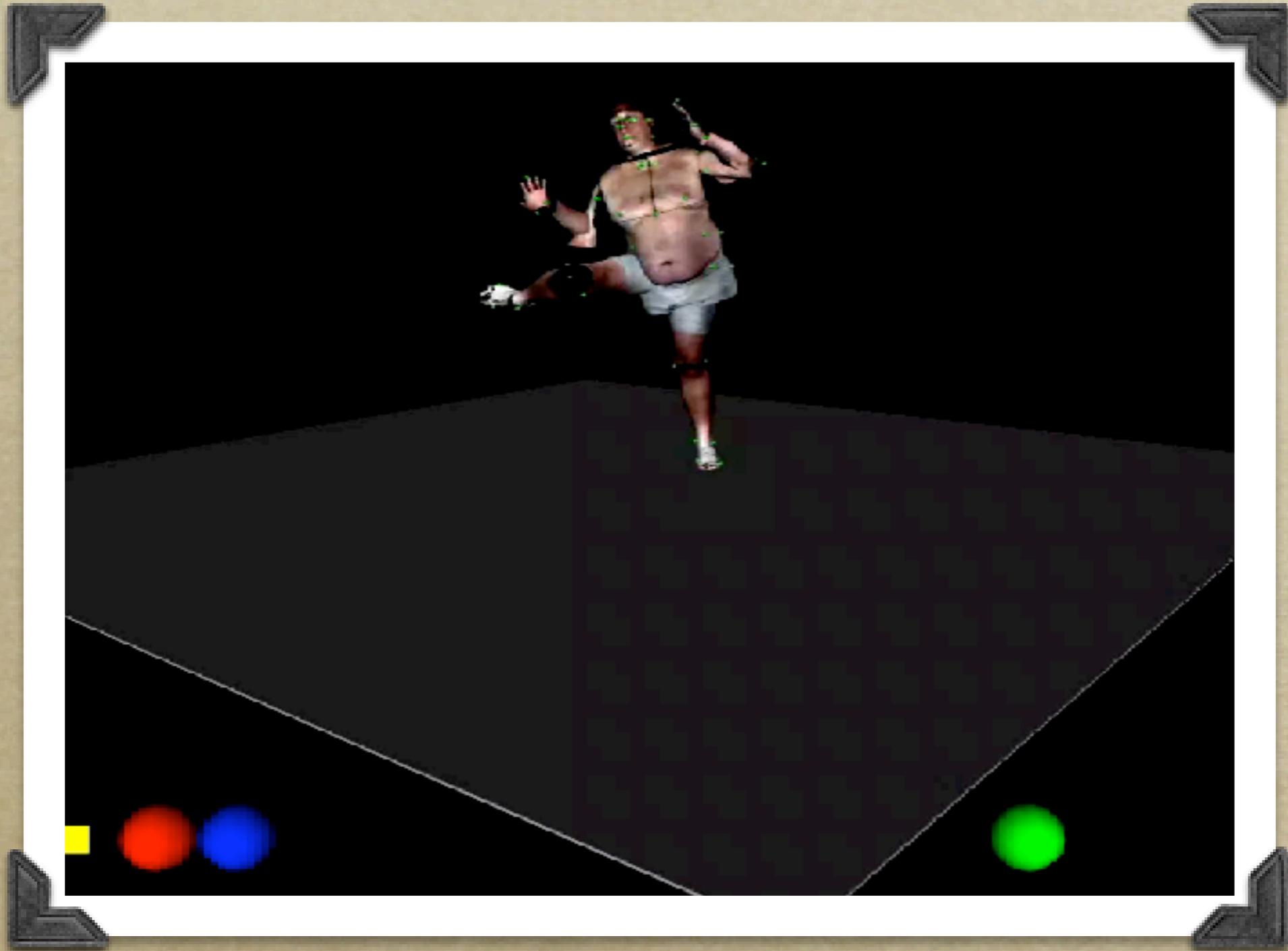
# Making CAESAR Move

---

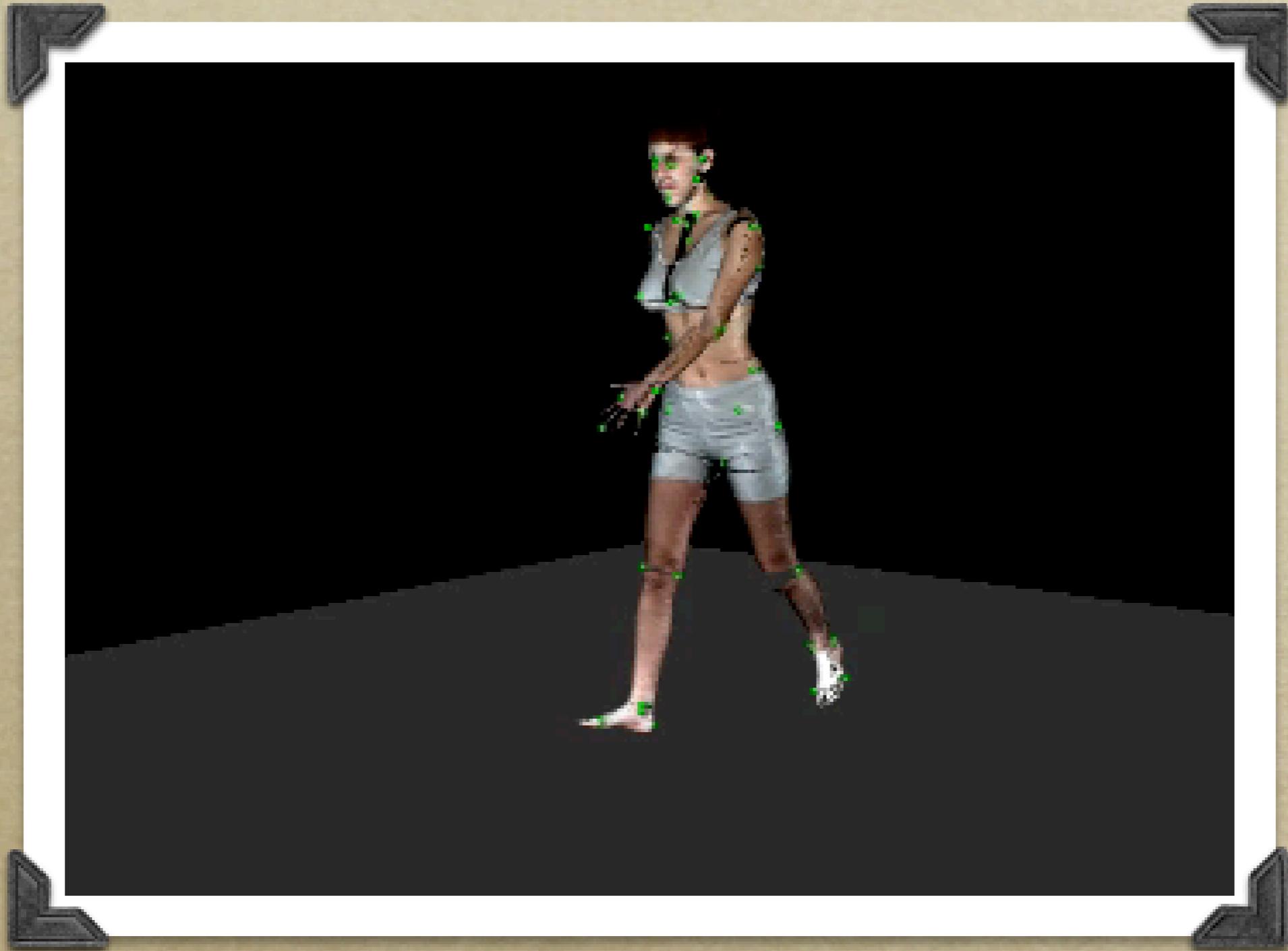
- *Applying hand animated parameters to VRML models of CAESAR bodies*
- *Two techniques for using motion capture data for CAESAR*



Animating CAESAR  
(hand animation...Nancy)



Motion Capture (BVH to HANIM)



BVH walking motion export  
from Poser



Motion capture applied to CAESAR  
body in POSER

# Dealing with Anthropometric Data Bases

---

## **The Semantic Web**

# What is the Semantic Web?

- In
- m
- A
- w
- N
- b
- c



en wo  
marku  
onom  
ly to j  
rmati  
(fuzz)  
s).



n

# Semantic Web

---

- *If the existing World Wide Web is Web 2.0  
the Semantic Web is Web 3.0*
- *Attempt to associate meaning to queries  
and their results*
- *<http://www.w3.org/2001/sw/>*

**very much a WORK IN  
PROGRESS!!!**

*Let's look at the problem  
of Ambiguous Names*



Speaking of Bountiful Behinds

# Original Title of Talk

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*Beer Bellies,*     **Fat Asses,**

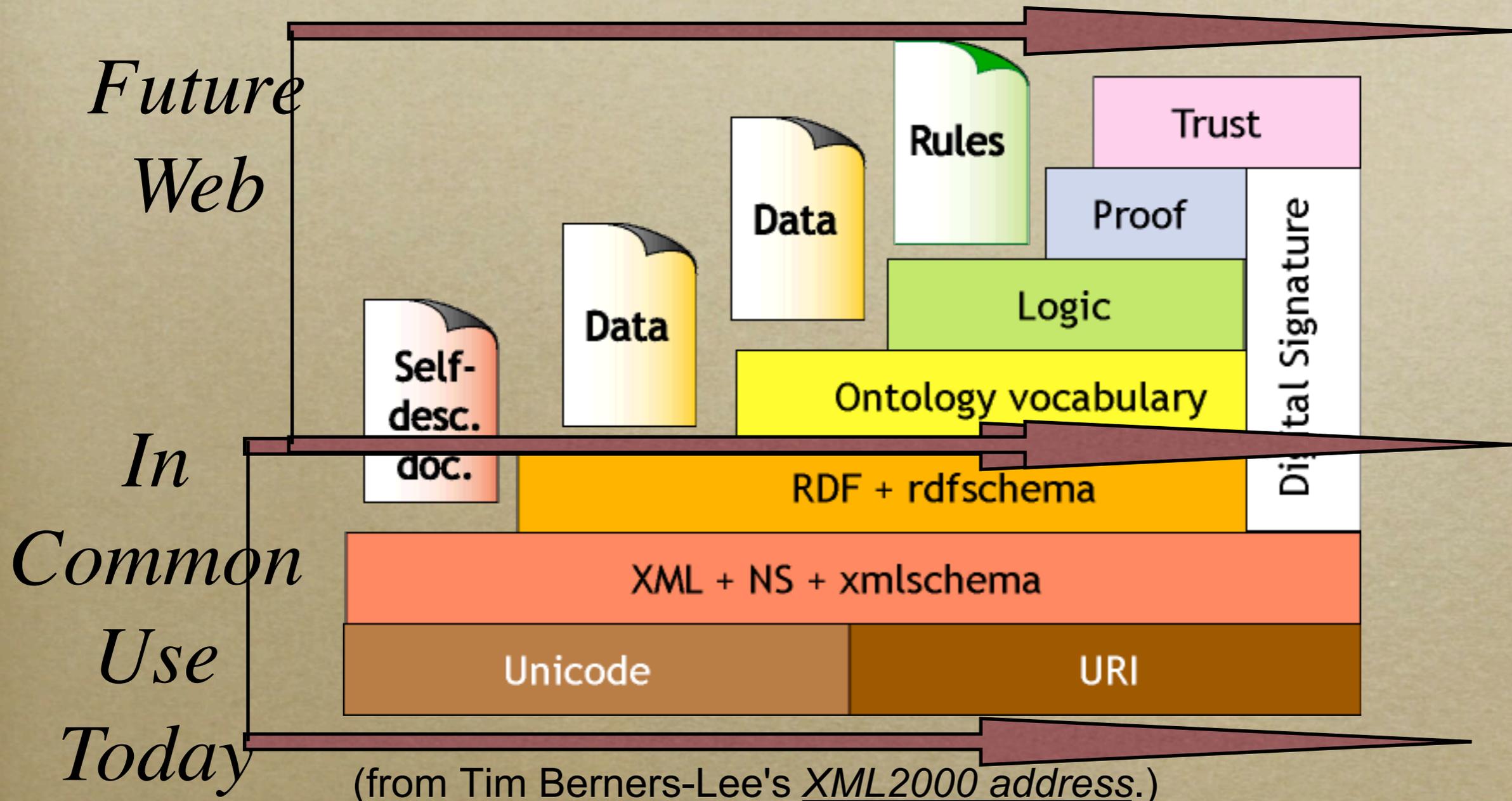
*and other  
Mysteries  
of the  
Human  
Form*

# Big Problem: multiple phrases, same meaning

---

- *Bountiful Behinds, Fat Asses, Big Butts, Giant Glutious Maximus, Big Booty, ...*
- *Belly button, navel, midway between landmark 10 and 14*
- *Same word with multiple meanings (depending on context): title “Hamlet” (name of book); title: “Sir” Edmund Hillary (personal status)*

# Web Architecture



# Players in the Work in Progress

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*DAML+OIL*

*Dublin Core*

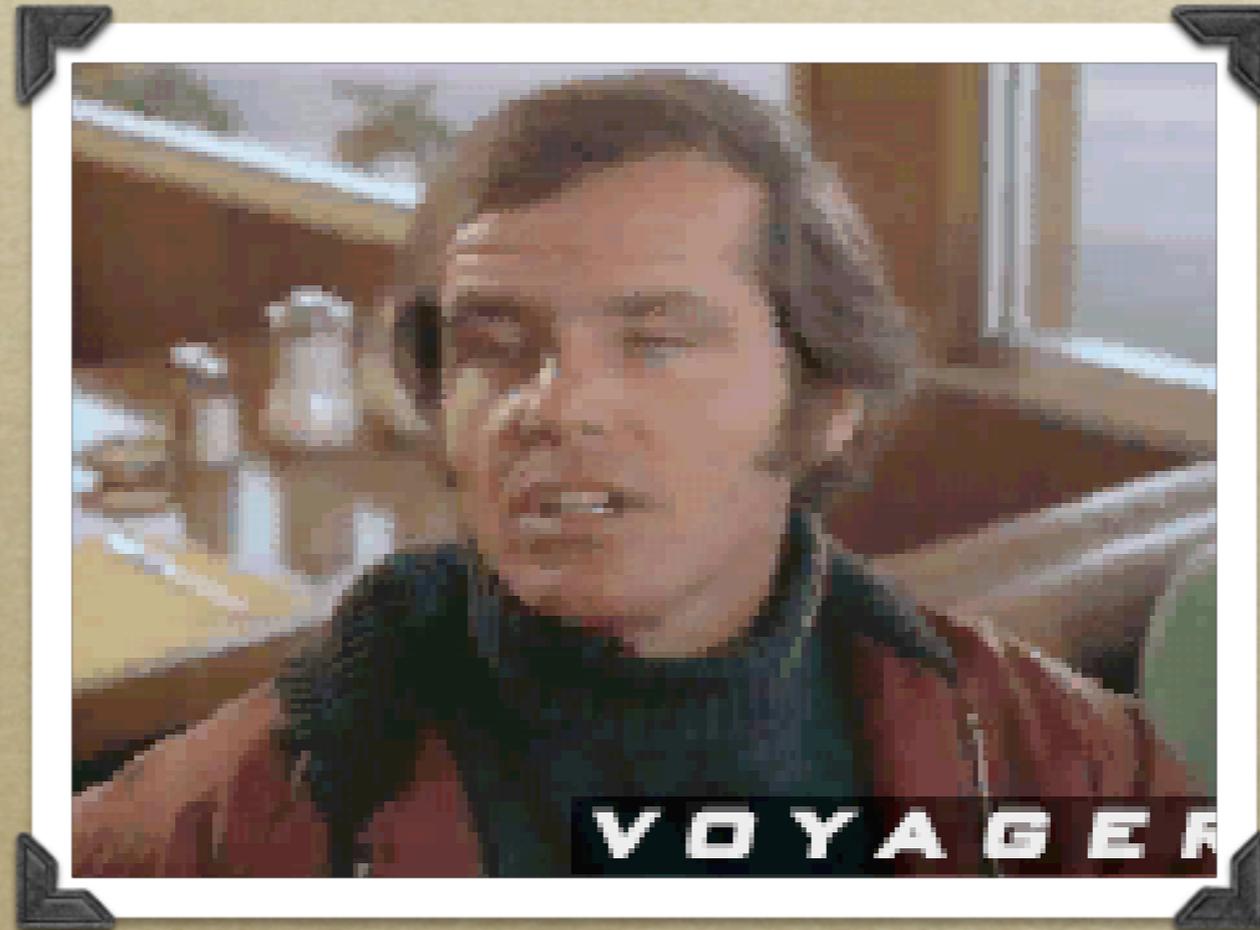
*XML name spaces*

*OWL*

*XML schema*

*RDF*

*Relax NG*



Many Ways to Express Same Concept  
(how to get a side order of plain toast)

# Scientific American (May 2001)

---

- *Article by Tim Berners-Lee, James Hendler and Ora Lassila*
- *“The Semantic Web is not a separate Web but an extension of the current one, in which information is given well-defined meaning, better enabling computers and people to work in cooperation.”*
- **`www.semanticweb.org/  
knowmarkup.html`**

# An example semantic activity

---

- *Kids dealing with Mom's Dr. appointment*
  - *cooperative agents*

# Mom's Appointment (walkthrough)

- *Pete's sister Lucy calls from doctor's office and says: Mom needs to see a specialist and then go to physical therapy biweekly - Pete agrees to share the chauffeuring.*

# Agents talk to each other

---

- *Lucy's agent talks to Dr.'s agent about prescribed treatment.*
- *Looks up lists of providers.*
- *Checks providers locations within 20 mile radius of home AND with good ratings.*
- *Matches appointment times possibilities with Lucy/Pete's schedules.*

# But When People Talk to Each Other

---

- *Pete says: “Lucy you are full of crap...I can’t take off of work on Tues.”*
- *Lucy says: “But Mom want’s to go to that Italian bakery next door.”*
- *Pete says: “I’m getting fat anyway.”*
- *Lucy says: “Look shmuck..you gotta help!”*
- *Pete says: “bite me”*

- *Clearly having Agents negotiate for people is complicated and fraught with difficulty.*

# Agents and Semantic Web

---

- *Nothing magical about agents and they aren't really anything new (daemons, distributed computing, data mining). Just a new conceptual framework for thinking about problems.*
- *Agents with access to “semantics” make for a powerful combination.*

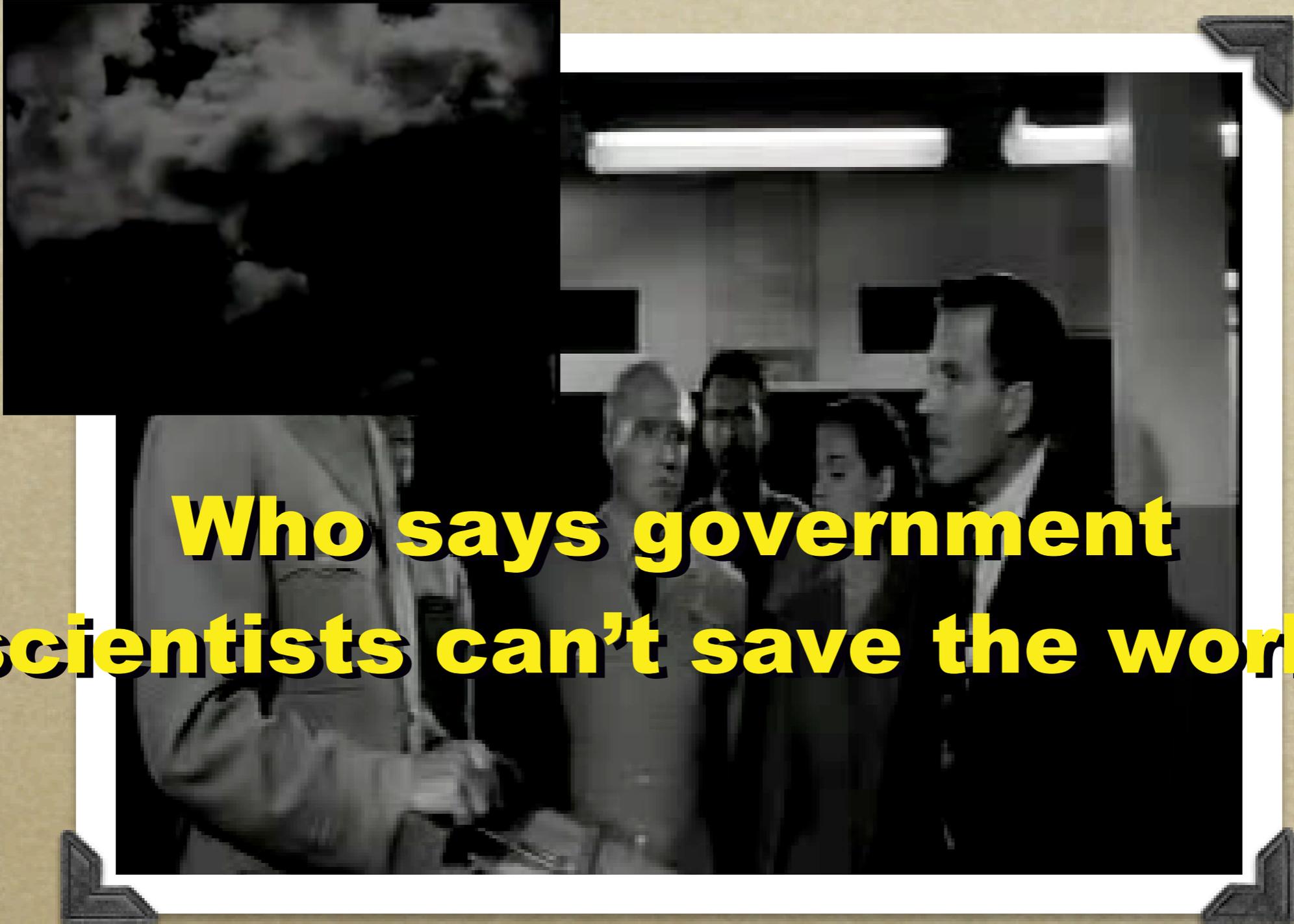
# Shape searching

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- *What is population with a 120cm reach  
AND*
  - *a strength of 20 kgs/cm  
AND*
  - *drives a Toyota*
  - *What would Semantic Shape Searching mean/be?*
  - *Research Topic: What is the vocabulary for shape searching?*
- Shape A similar to Shape B*



From Data to Knowledge  
(hmmm it's not this easy)



**Who says government  
scientists can't save the world!**

The Bureau of Standards (former name of NIST) has been doing this a long time.

# Interoperability Costs

---

- “This study estimates that imperfect interoperability imposes at least \$1 billion per year on the members of the U.S. automotive supply chain. By far, the greatest component of these costs is the resources devoted to repairing or reentering data files that are not usable for downstream applications. This estimate is conservative because we could not quantify all sources of interoperability costs.”
- Interoperability Cost Analysis of the U.S. Automotive Supply Chain - Research Triangle Institute
- [http://www.mel.nist.gov/msid/sima/interop\\_costs.pdf](http://www.mel.nist.gov/msid/sima/interop_costs.pdf)

# Conclusion

---

- *Standards can save you money*
- *Engineering design with 3D bodies is necessary for accurate modeling*
- *Semantics for human search and action is hard.*

**That's All**

- *Semantics can be fun.*

**Folks!!**