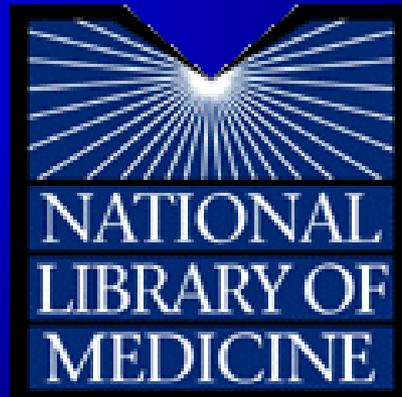


Images for Health



Michael J. Ackerman, Ph.D.

Assistant Director

High Performance Computing and Communications

National Library of Medicine

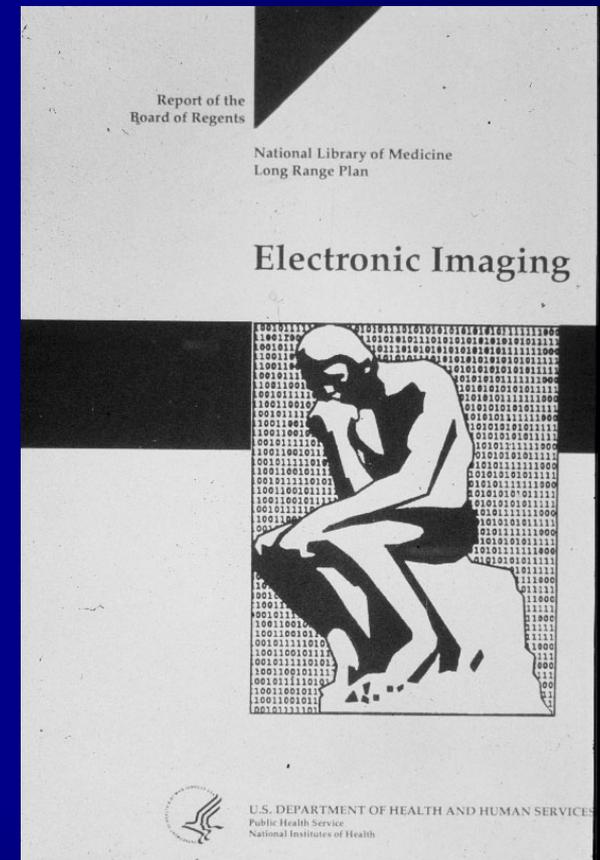


THE VISIBLE HUMAN PROJECT®

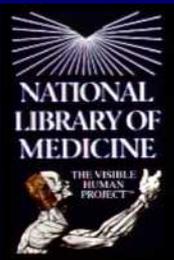


FROM THE
NATIONAL
LIBRARY
OF MEDICINE

“The NLM should undertake a first project, building a digital image library of volumetric data representing a complete normal adult human male and female. This **Visible Human Project** would include digitized photographic images from cryosectioning, digital images derived from computerized tomography, and digital magnetic resonance images of cadavers.”

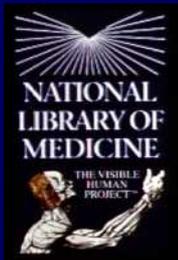


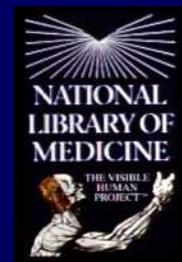
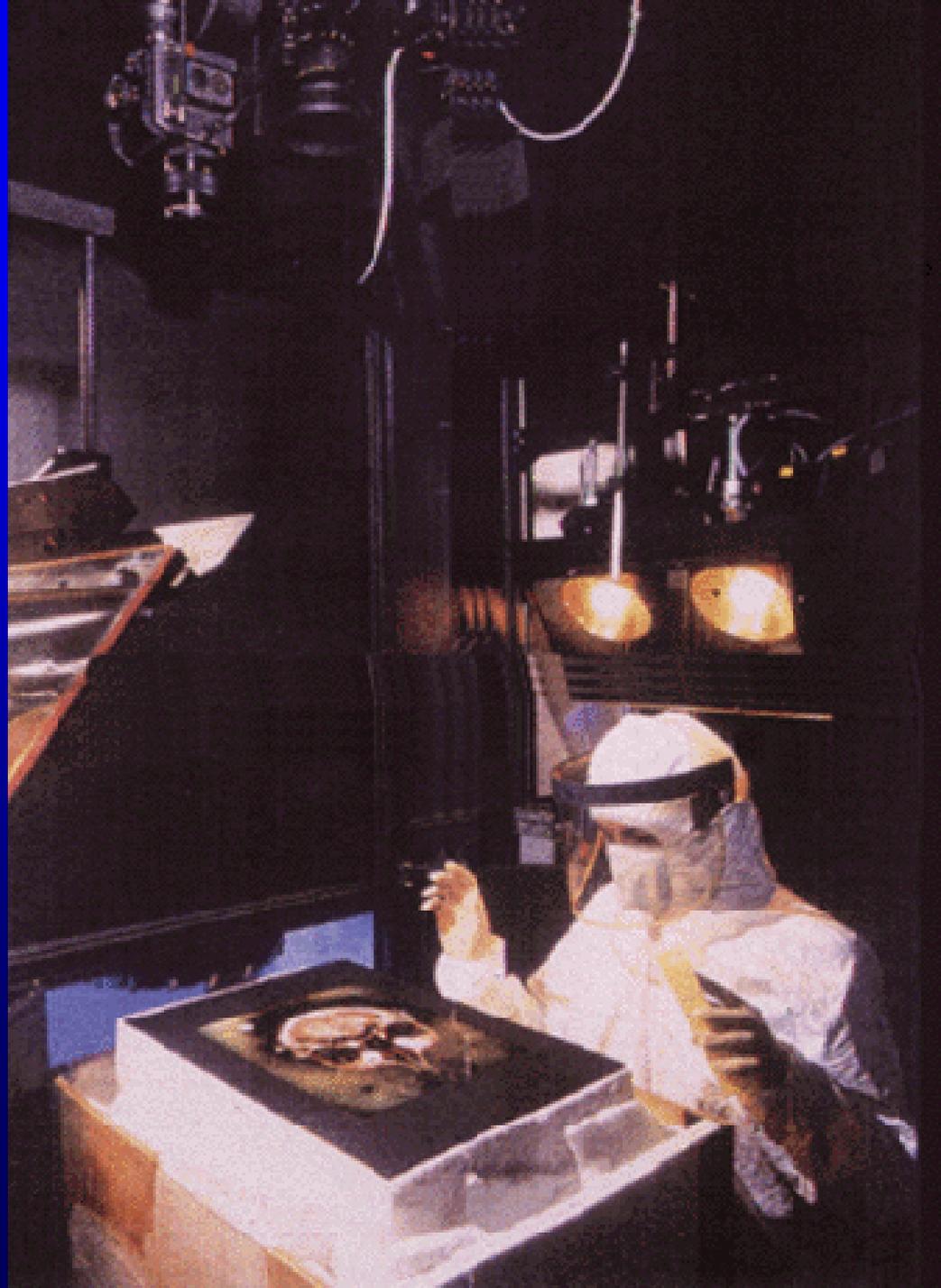
1989 Board of Regents
Planning Panel on
Electronic Imaging

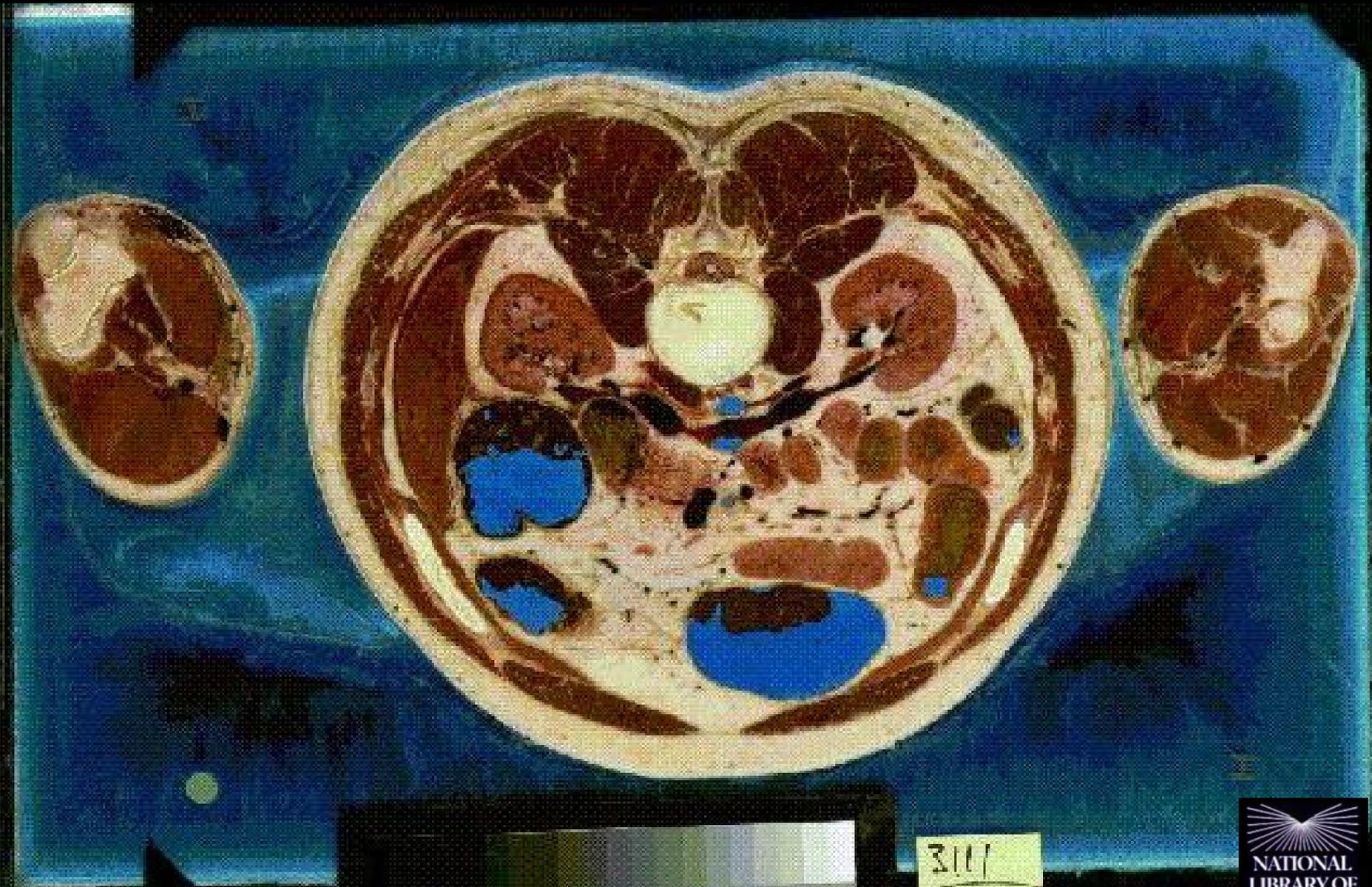


Background - 1989

- Knowledge in pictures
- New Technologies
 - Computers
 - Video displays
 - Storage media
 - Networks
- NLM as Picture Archive

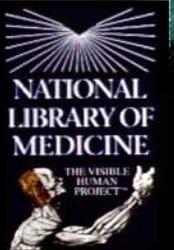


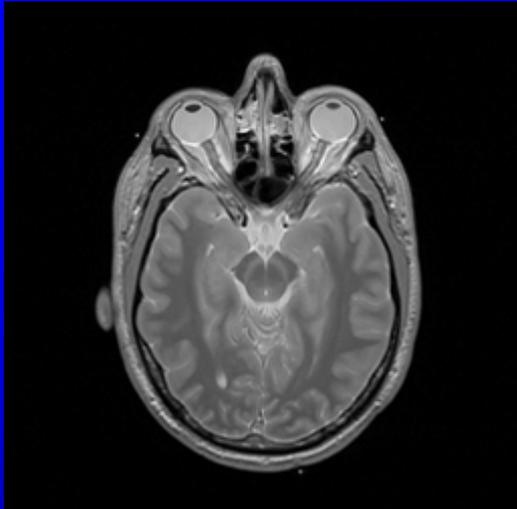




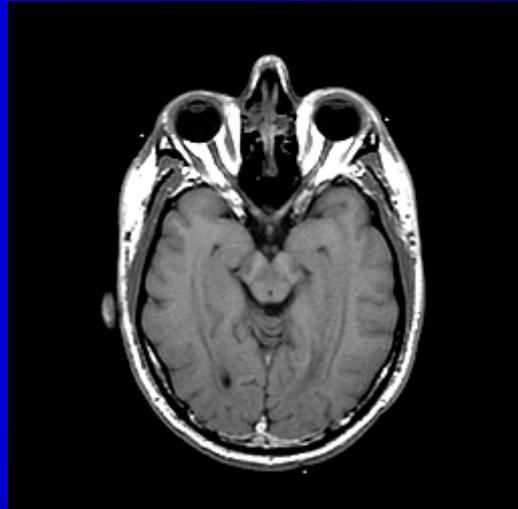
PATIENT INFORMATION

3111

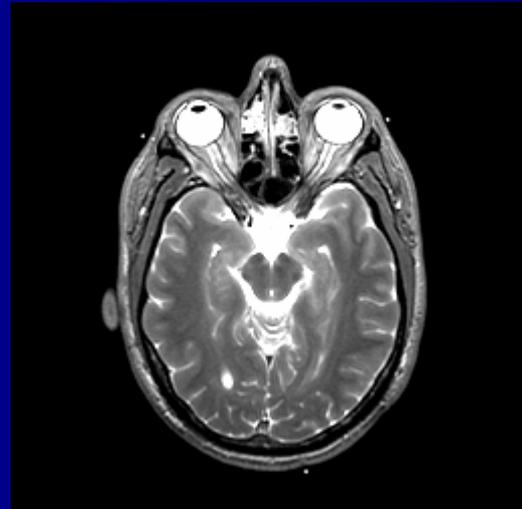




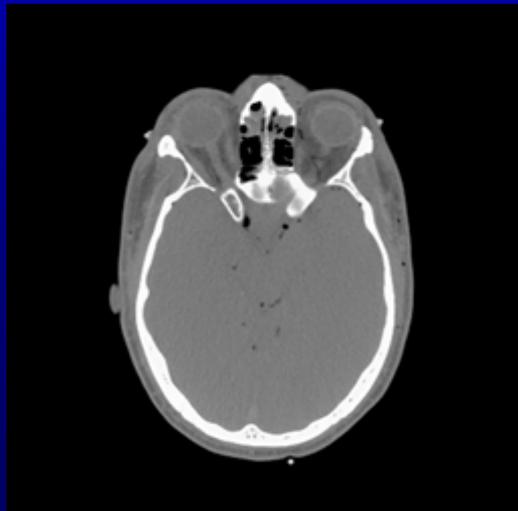
MRI - Proton Density



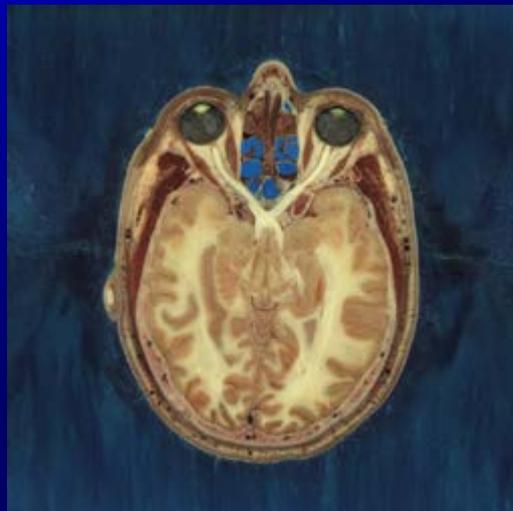
MRI - T1



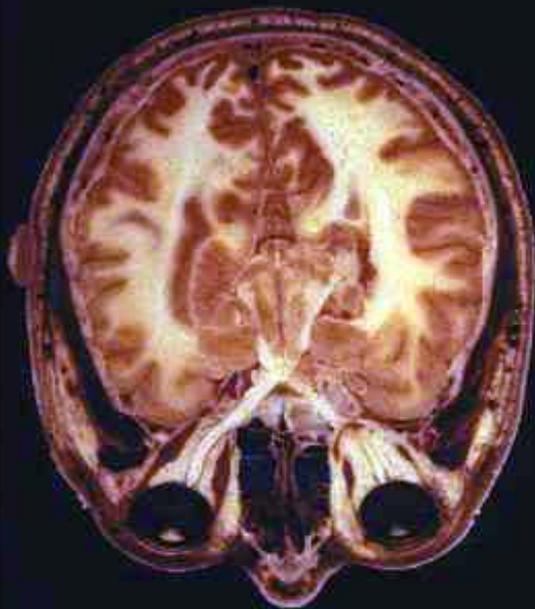
MRI - T2



CT

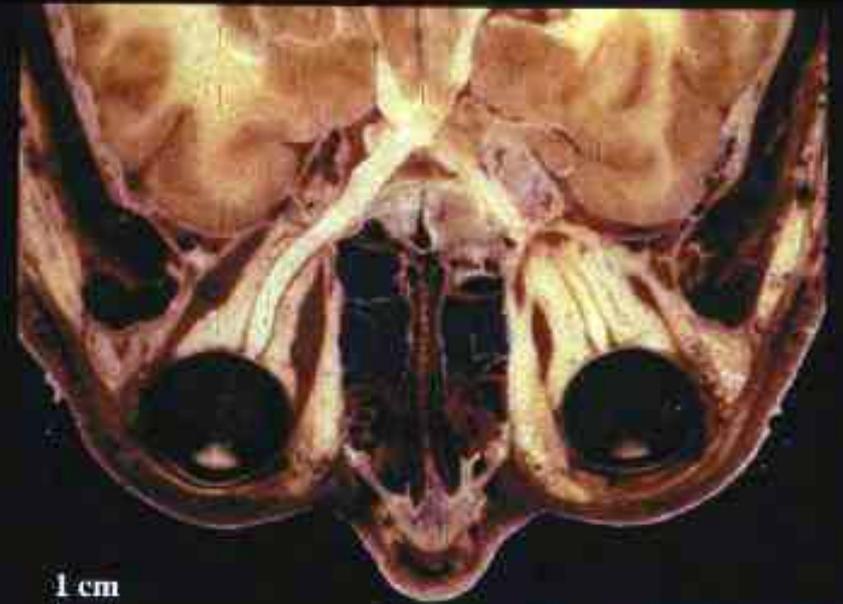


Cryosection



1 cm

slice 70mm_vm1106



1 cm

slice 70mm_vm1106



1 cm

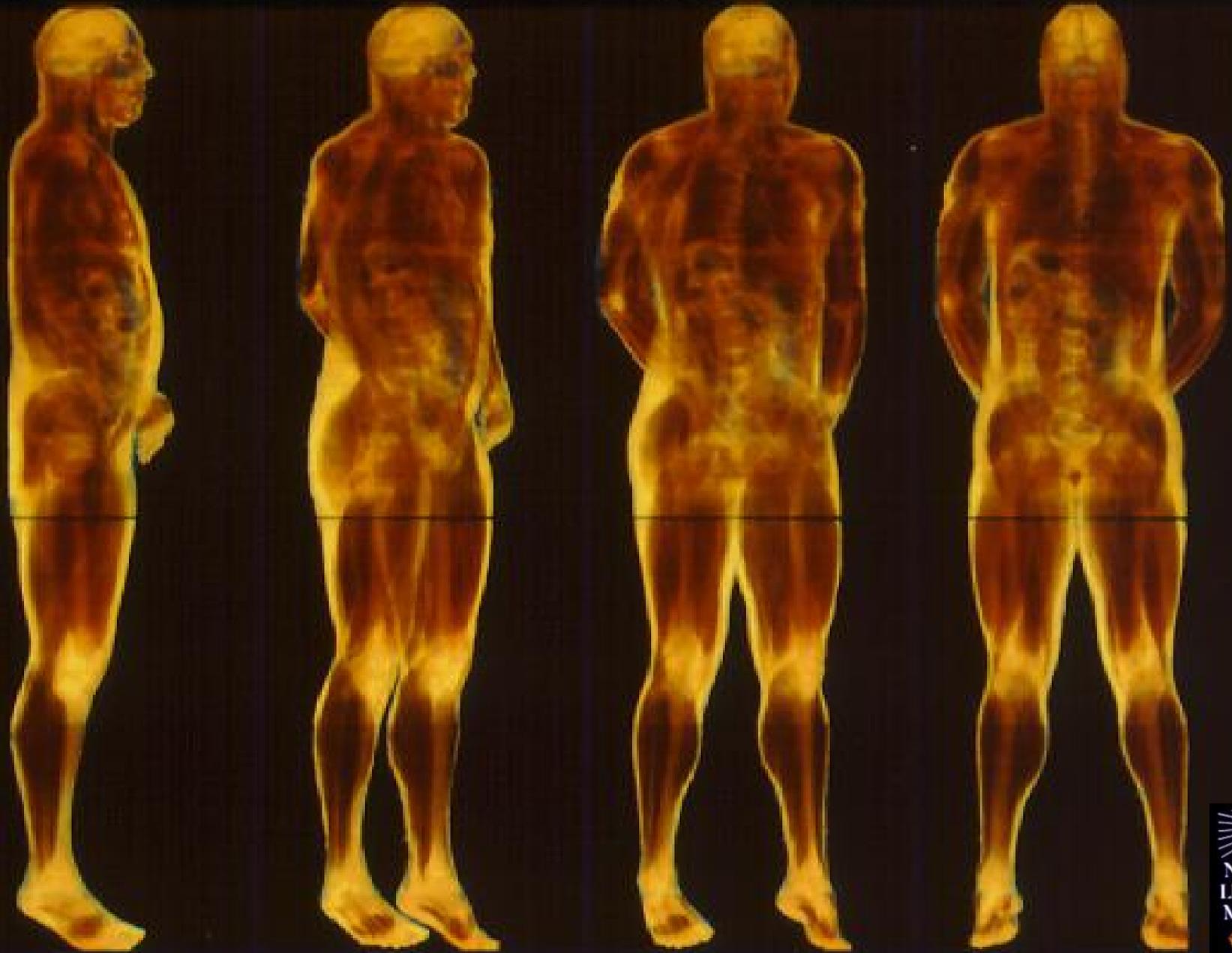
slice 70mm_vm1106



1 cm

slice 70mm_vm1106







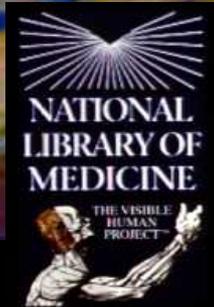
Pancreas



Male 1.00mm data



Female 0.33mm data





Projects Based on
the Visible Human
Data Set

[Applications](#)
for viewing
images

[Sources of](#)
images and
animations

[Products](#)

[Mirror Sites](#)

[Tools](#)

[Media Productions](#)

[Related Projects](#)

[Funding Sources](#)

Projects Based on the Visible Human Data Set

Products

- Beyond Vesalius: download free software or purchase it on CD-ROM, from [Wright State University](#).
- The Visible Human Male CD-ROM, videodisc, poster, and library of 3D models from [Visible Productions](#).
- Visual Human product offerings distributed by [Expomed](#):
 1. [Visual Man and Visual Man Lite CD-ROMs](#) from Data Express.
 2. [Visible Human Male CD-ROM](#) from Research Systems, Inc.
 3. [Visible Human Female CD-ROM](#) from Research Systems, Inc.
- The Dissectable Human CD-ROM from [Engineering Animation, Inc. and MediaTech USA](#).
- Visible Human Product offerings from [Springer Verlag, Electronic Media](#):
 1. [VOXEL-MAN interactive 3D atlas on CD-ROM](#) for Unix workstations (Institute of Mathematics and Computer Science in Medicine, University of Hamburg),

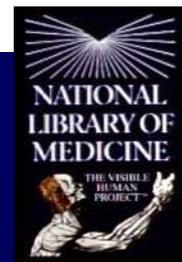


Marching Through the Visible Man

The National Library of Medicine is creating a digital atlas of the human body. This project, called the [Visible Human](#), has already produced computed tomography, magnetic resonance imaging and physical cross-sections of a human male cadaver. This paper describes a methodology and results for extracting surfaces from the Visible Male's CT data. We use surface connectivity and isosurface extraction techniques to create polygonal models of the skin, bone, muscle and bowels. Early experiments with the physical cross-sections are also reported. There is a [companion paper on the Visible Woman](#).

[Make Your Own Visible Woman](#) shows how to use the [Visualization Toolkit](#) to make and render surface models of the Visible Woman.

General Electric Corp., Research & Development



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What's New at NCAR

[FY 2000 Annual Scientific Report now available](#)



[more news](#)

ACD

atmospheric chemical, geochemical, and biogeochemical cycles

ASP

postdoctoral appointments, summer colloquia, NCAR's geophysical turbulence program

ATD

observing systems and platforms, field program support, instrument development, data management

CGD

models of climate system components; atmosphere, oceans, land, and ice; global dynamics

ESIG

societal impacts and policy issues related to climate and weather

HAO

solar variability, solar magnetism, solar-earth interactions

MMM

numerical weather prediction and simulation, cloud/climate interactions, weather processes

RAP

aviation weather detection and forecasting systems, technology transfer to public and private sectors

SCD

supercomputing, high-speed networks, visualization, data analysis and archiving, user support

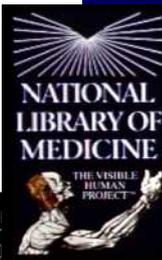
QUICK LINKS

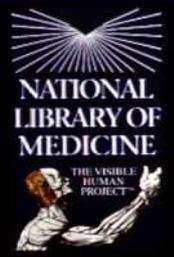
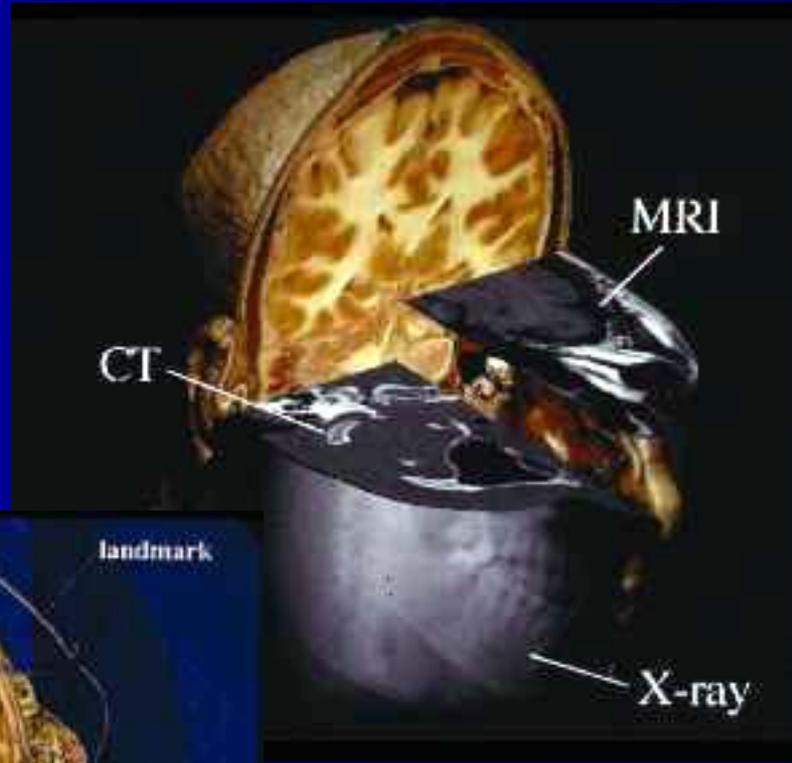
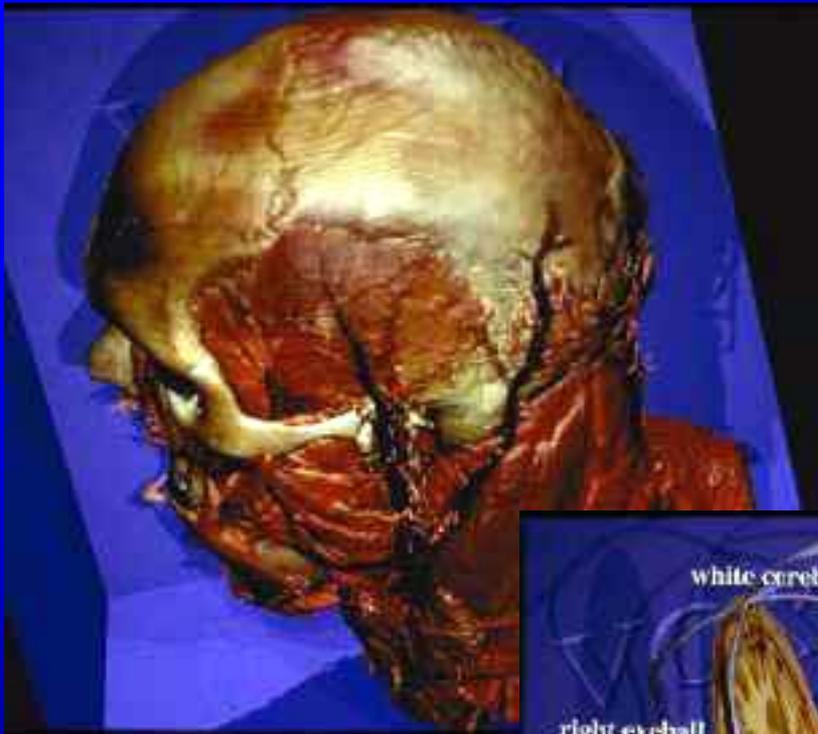


40 • 40 Years of Discovery and Partnerships •

• Inside UCAR •

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Proc

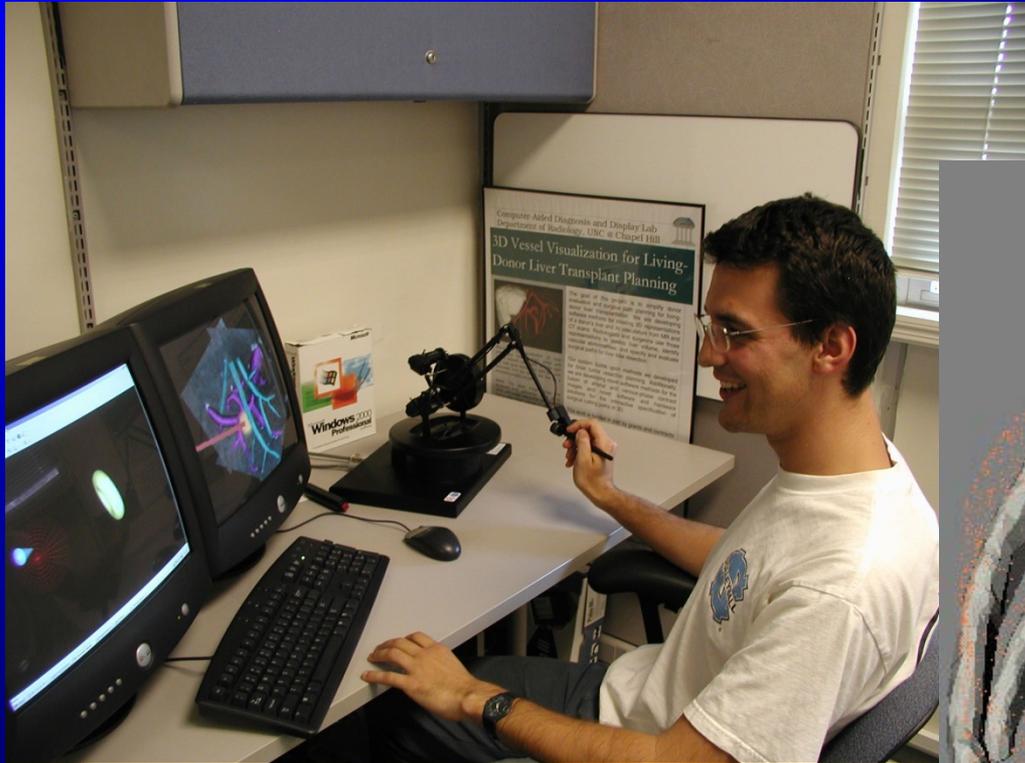




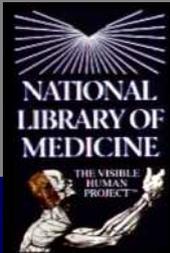
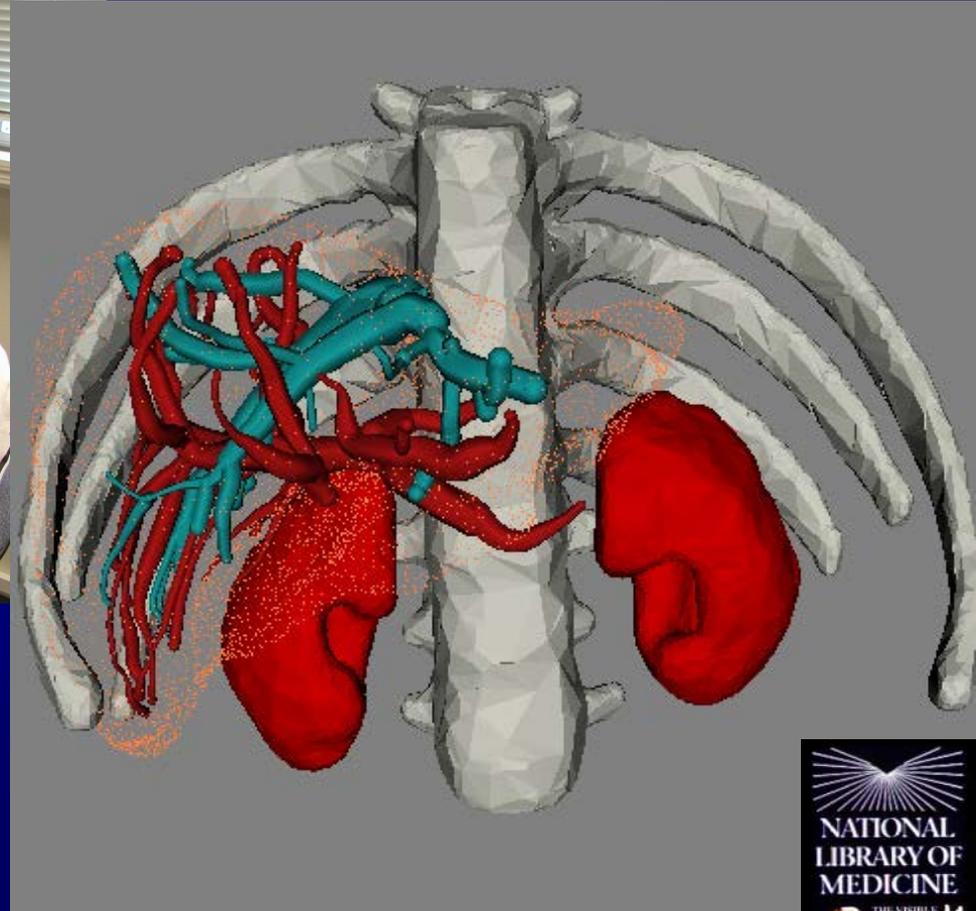
Voxelman - University of Hamburg



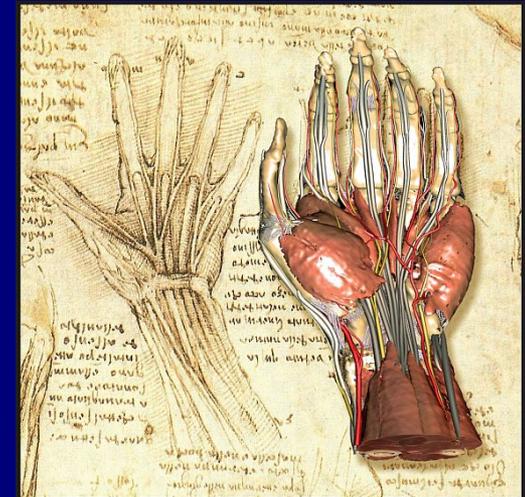
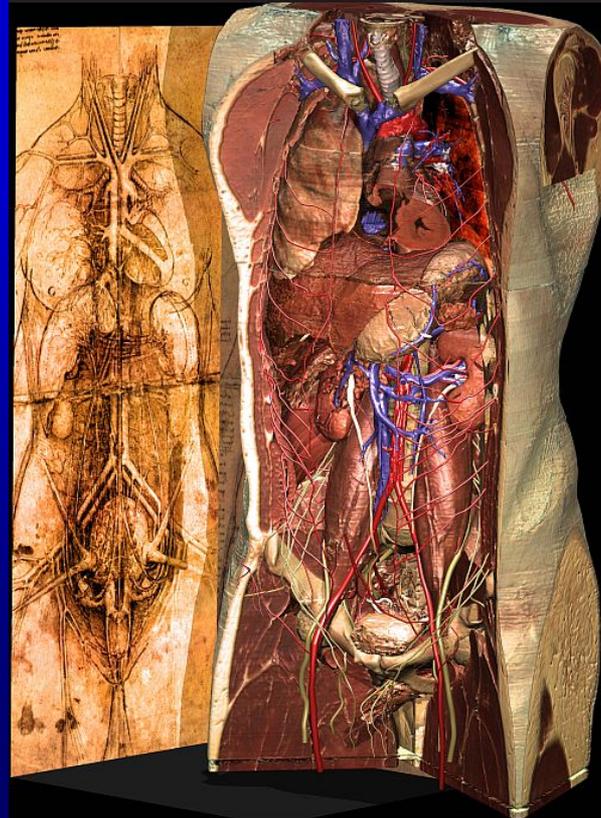
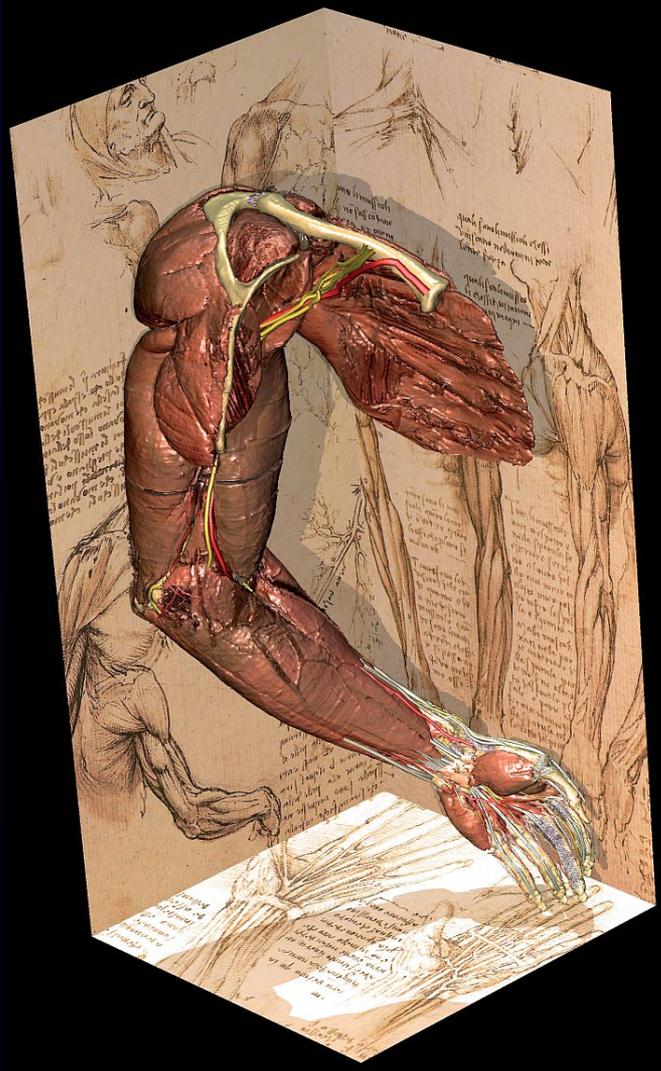
Haptics for Surgical Training



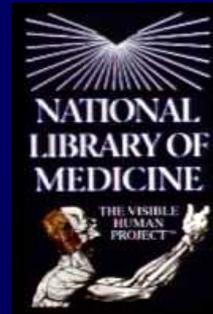
Scan to simulation : 1 hour



Da Vinci meets the Visible Human



Voxelman – University of Hamburg



Office of High Performance Computing and Communications



Pill Identification Challenge



S	NDC: 00000-0000	DATE: 20091014	IMPRINT: C3PI
P	SIZE: 10mm	SCORE: no score	COLOR: WHITE (Blue Opaque)
L	COATING: N/A	SYMBOL: N/A	SHAPE: CAPSULE
Office of High Performance Computing & Communications		Computational Photography Project for Pill Identification (C3PI)	
CS: sRGB IEC61966-2.1		DPI: 2009	IMAGE DATE: 4th February 2011

The need

- Disaster and emergency situations
 - Identify unknown medications
- Consumer health
 - Verify that proper medication was dispensed

Pill Identification Challenge

- Project overview:
 - Take picture of unknown pill using NLM smartphone app
 - App will automatically send picture to NLM
 - **The Challenge: develop the algorithms that NLM will use to match the unknown product picture to the library picture**
 - NLM will return the library pill picture, and pill identification and supporting information to the smartphone app for display

C3PI: Test Image Files

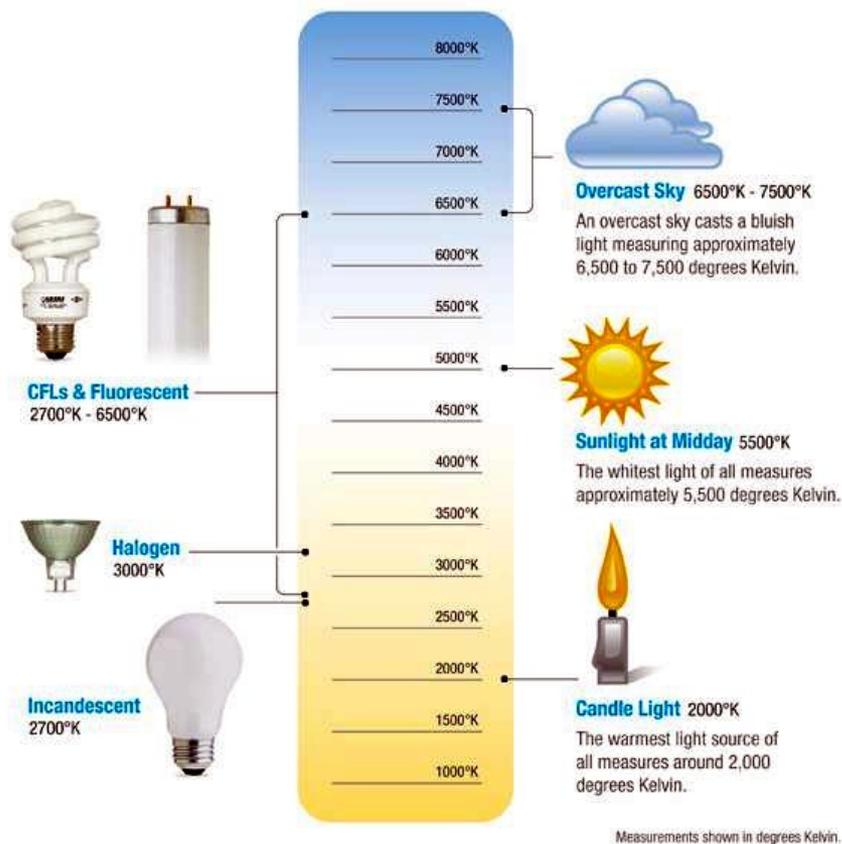
- Category A: Off-Axis Imaging
 - Case #3: Oval and Round OSDF Off-Axis Imaging



White Balance: Automatic
Camera: iPhone 4S
Background: White Paper

C3PI: Test Image Files

- Category B: Varying Illumination



White Balance: Automatic
Camera: Samsung Galaxy S3
Background: White Paper

C3PI: Test Image Files

- Category C: Varying Background



White Balance: Automatic
Camera: Motorola Droid 4
Background: Varied

C3PI: Reference Images

- Non-Polarized and Cross-Polarized Image Acquisition
[NDC 00007-3371]



Non-Polarized



Cross-Polarized

C3PI: Test Image Files

- Category D: Multiple Cameras
[NDC 00071-0530]



White Balance: Automatic
Camera: Nokia Lumina 1020
Background: White Paper



White Balance: Automatic
Camera: Blackberry Curve 8900
Background: Speckled Counter Top

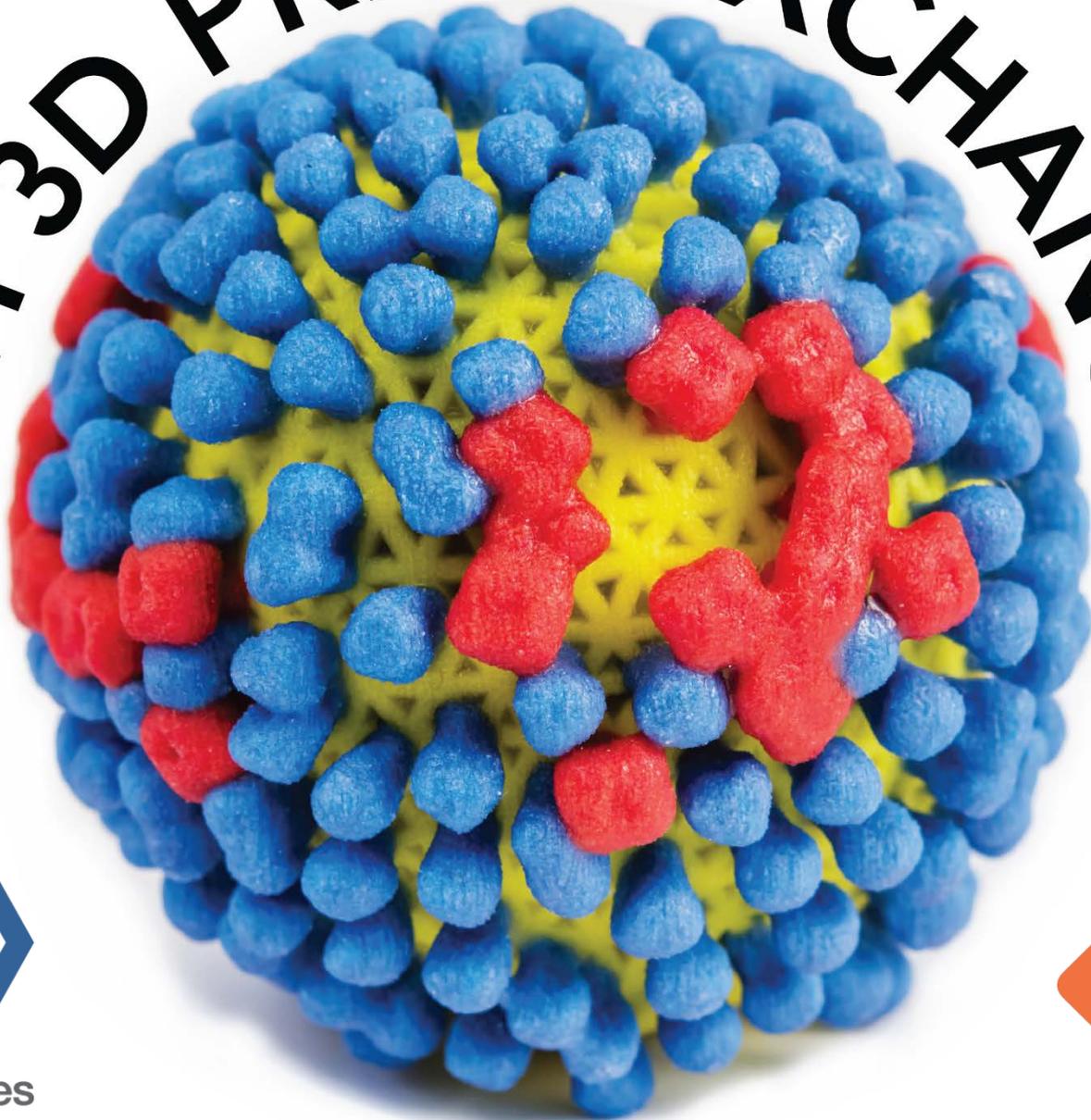
An NLM Problem:

Same pill – new manufacturer (new packaging)

[NDC 00093-0311]



NIH 3D PRINT EXCHANGE

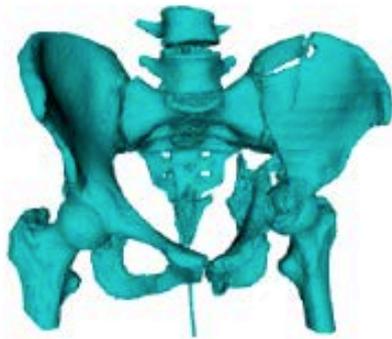


National Institutes
of Health

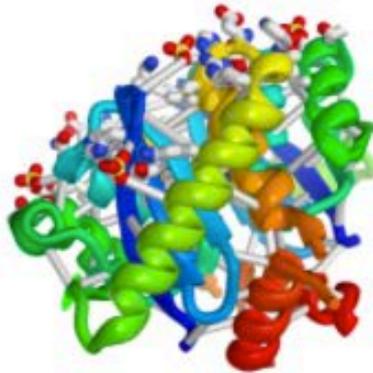


CREATE.

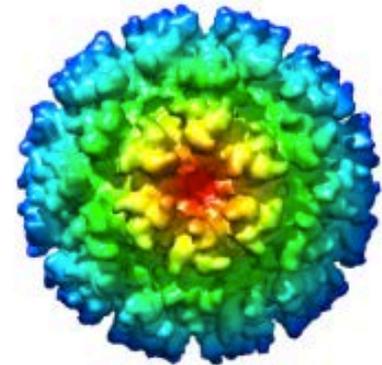
3D printers require digital models that are specially formatted to represent solid structures, which are different from 3D models viewed on a computer screen. The creators of the NIH 3D Print Exchange have developed novel, web-based tools that convert users' data to 3D models that are readily compatible with most 3D printers.



**CREATE MODELS FROM
MEDICAL IMAGING DATA**



**CREATE MODELS FROM
MOLECULAR DATA**



**CREATE MODELS FROM
MICROSCOPY AND OTHER
VOLUMETRIC DATA**

Visible Human Animations

[Anim Home](#)

Results

[Animations](#)

[Volume Pro
Animations](#)

Theory

[Presentations](#)

Visible Human Animations

We present here animations created at Vizlab with the Visible Human dataset and motion capture data.

Please follow a link from the table of contents to the left.

Contact Information

Web / E-mail address

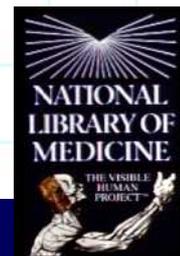
[Dr Deborah Silver](#): silver@caip.rutgers.edu

[Nikhil Gagvani](#): Gagvani@caip.rutgers.edu

[Kundan Sen](#): ksen@caip.rutgers.edu

[Arindam Bhattacharya](#) : arindamb@caip.rutgers.edu

[Andrez Martinez](#) : amart@caip.rutgers.edu



The only way to predict the future
is to invent it.

Lister Hill Center, NLM



<http://www.nlm.nih.gov>

