

LA-UR-07-2777

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<i>Title:</i>	MCNP Medical Physics Database
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<i>Intended for:</i>	American Nuclear Society Summer Meeting Boston, MA, June 24-28, 2007



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# MCNP Medical Physics Geometry Database

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## Abstract:

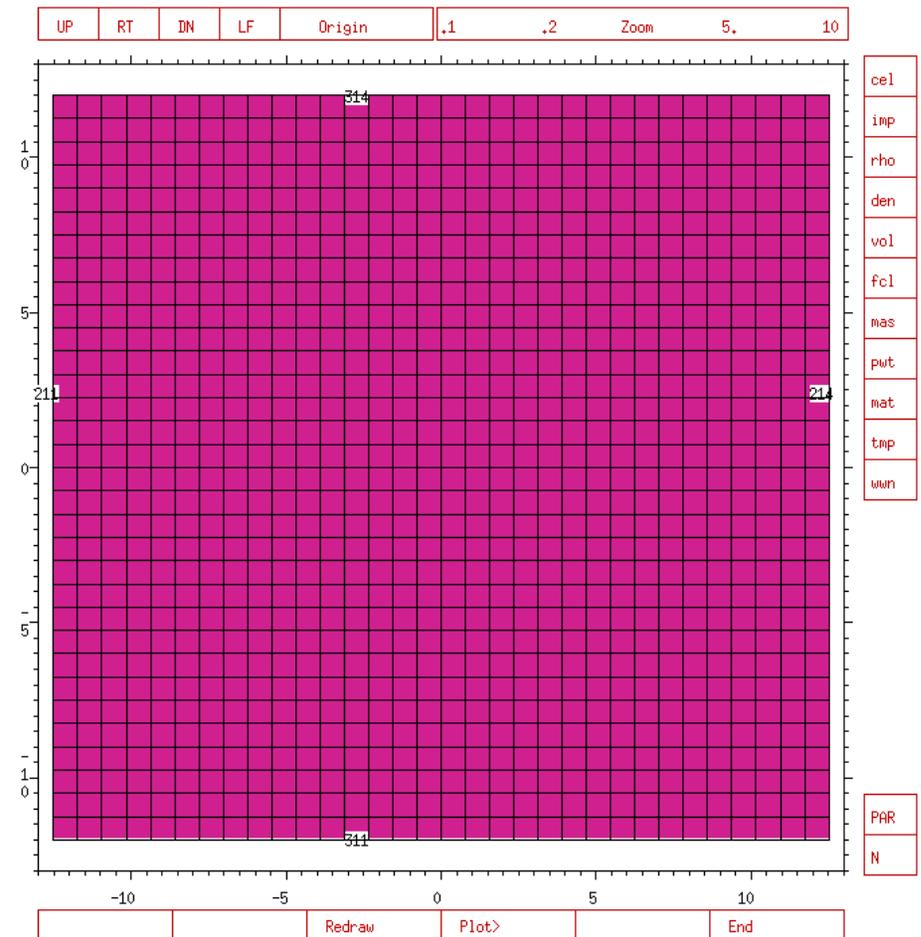
With the growing interest in using MCNP for medical physics calculations, demand has been increasing for geometric models which represent various portions of the human body. This database of analytical and voxelized (possibly based on CT data) geometries, in mcnp input deck form, would help to meet that need. They could be used for organ-specific dose calculations, code comparisons, or geometric representation studies.

Contributions to this database are welcome. For more information, contact [jgoorley@lanl.gov](mailto:jgoorley@lanl.gov).

LA-UR-08-2113, LA-UR-07-2777, LA-UR-06-8172, LA-UR-05-6921, LA-UR-04-8518

# Cubes

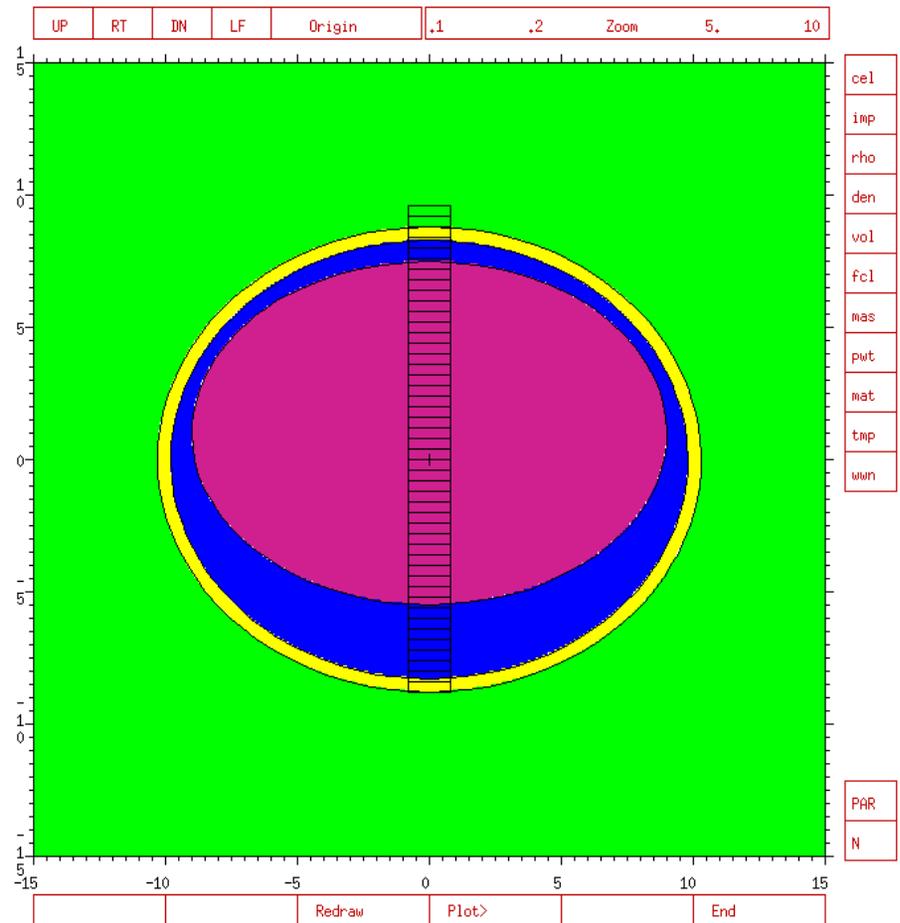
- Tissue or Water cubes
- Same total size, different voxel sizes
- Uses lattice geometry
- Useful to learn how to set up lattice geometries



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# Snyder Head Phantom - Analytical

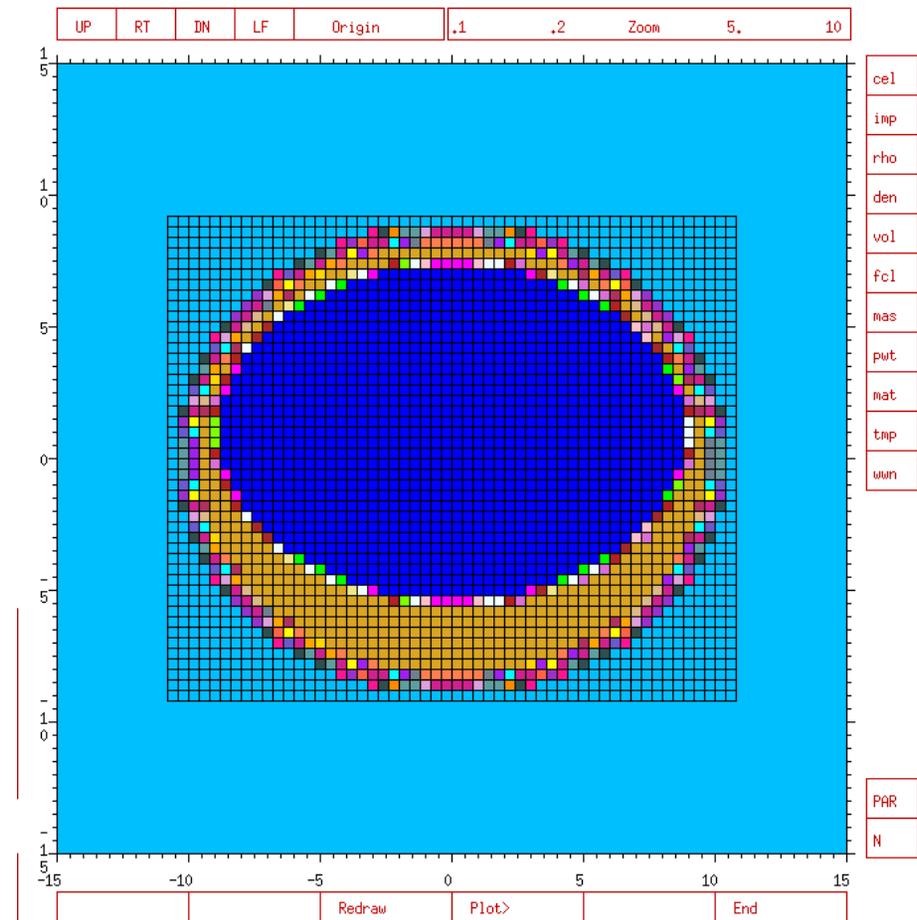
- Snyder head phantom w/ scalp
- Analytical geometry
- 3 materials
- Tallies along z-axis



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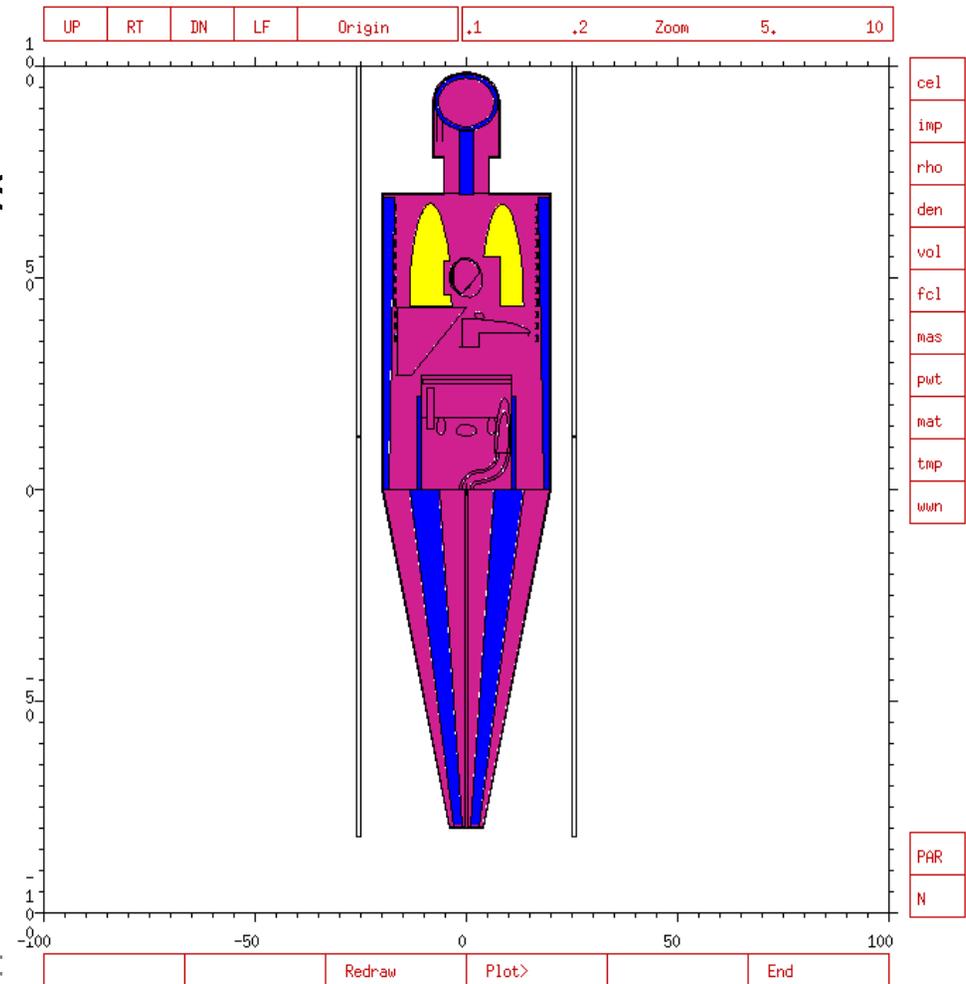
# Snyder Head Phantom - Voxel

- Snyder head phantom w/ scalp
- Voxel/Lattice geometry
- 4, 8, or 16 mm cubes
- Homogenized Materials
- Useful with previous example to compare voxel and smooth surface geometry



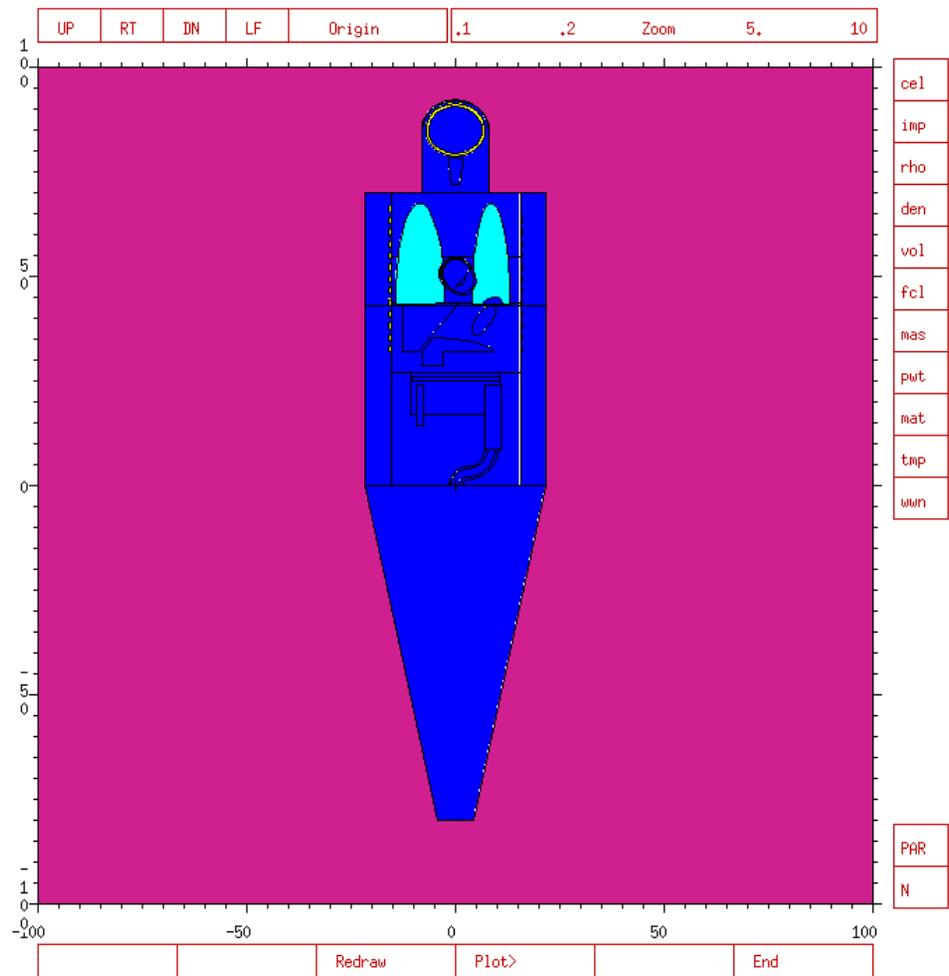
# MIRD12 (ORNL)

- Based on ORNL 1996 publication of MIRD specs
- 35 discrete cells
- 3 mats (soft, bone, lung)



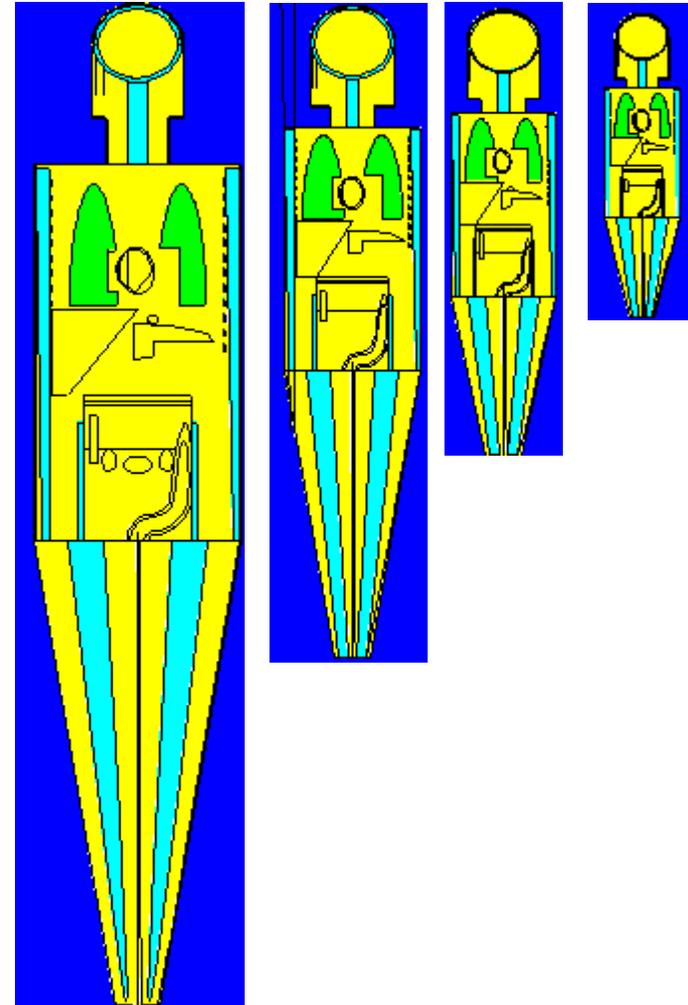
# MIRD (Yanch)

- MIRD Like
- MCAT Phantom + 5 organs
- 60 discrete cells
- 3 mats (soft, bone, lung)
- Prof. Jackie Yanch, MIT



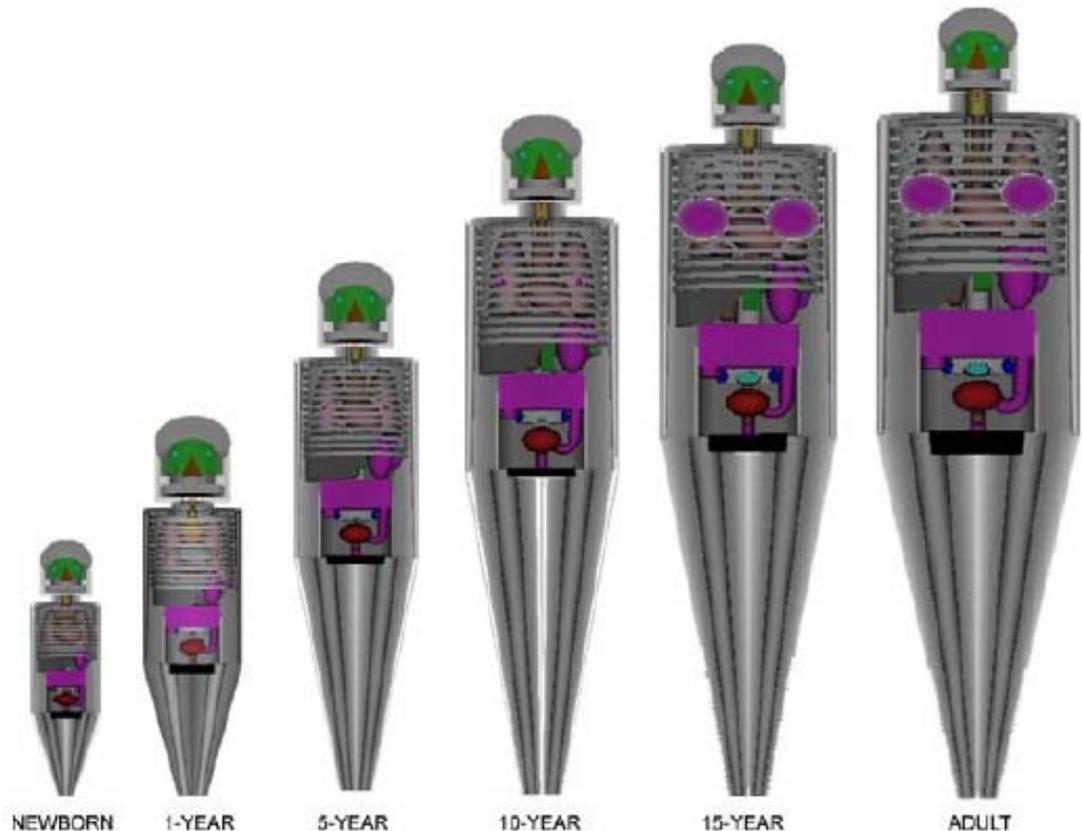
# MIRD Humans

- Male, Female
- Children: 1, 5, 10, 15
- 40+ discrete cells
- 3 Materials
- D. Krstic and D. Nikezic, U. of Kragujevac, Serbia



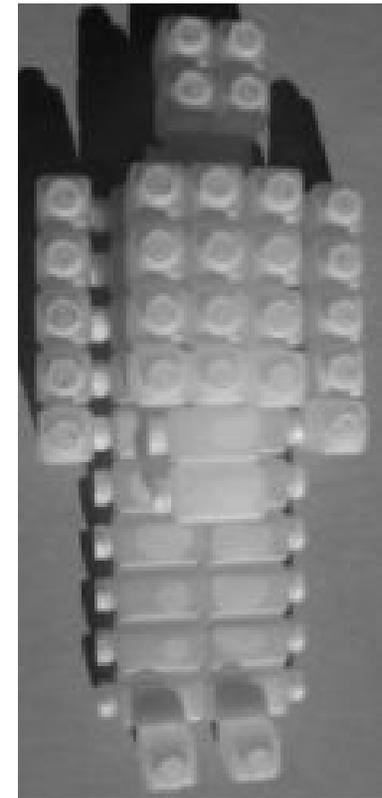
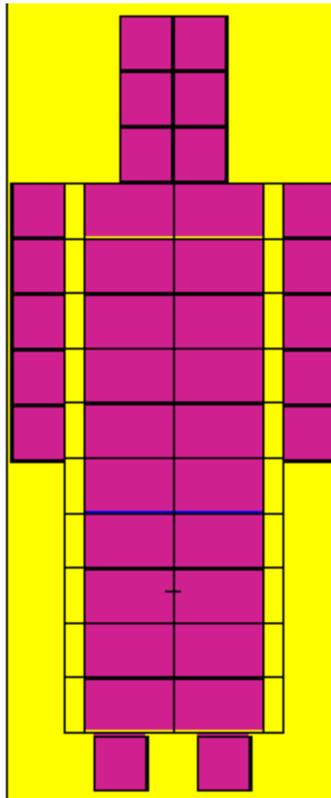
# MIRD Humans

- NewBorn, 1, 5, 10, 15, year olds + Adult
- 95 discrete anatomical regions
- 21 Materials
- Created by EUNYOUNG HAN



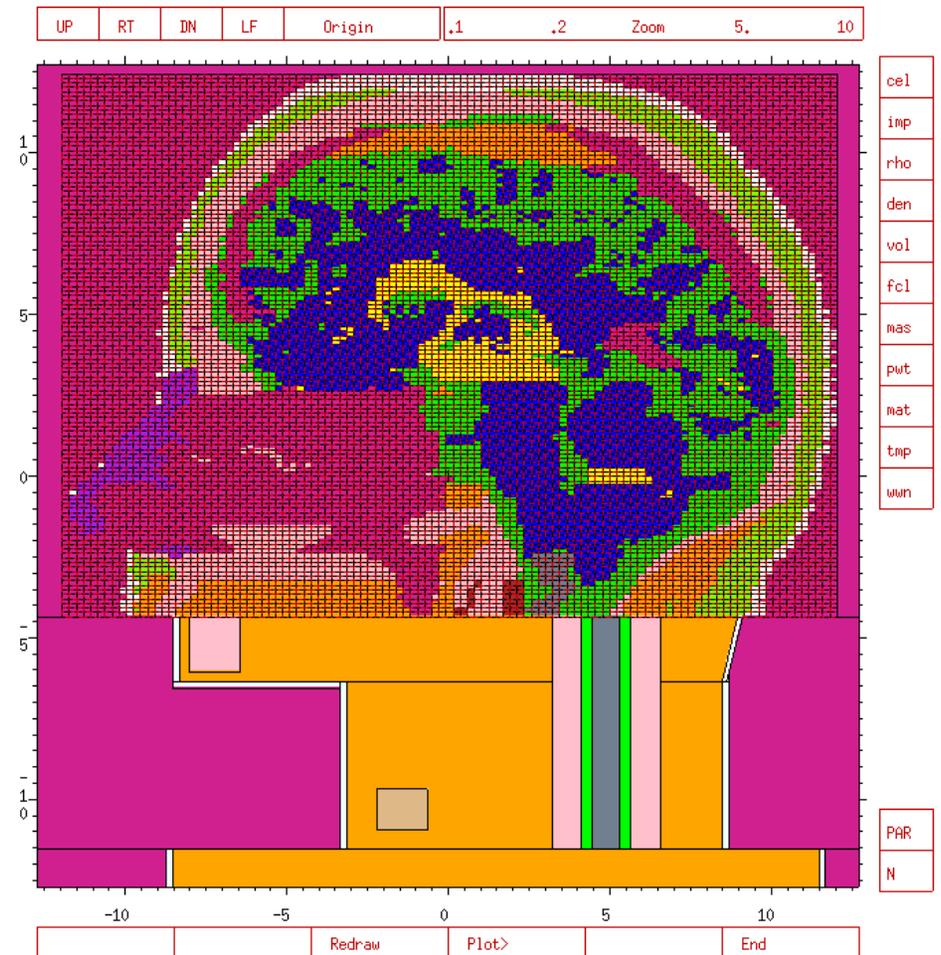
# Bottle Phantom

- Markus Schlagbauer
- Austrian Research Centers Seibersdorf
- Analytical Geometry
- Useful to compare to direct measurements (if you have the phantom)



# Zubal Phantom

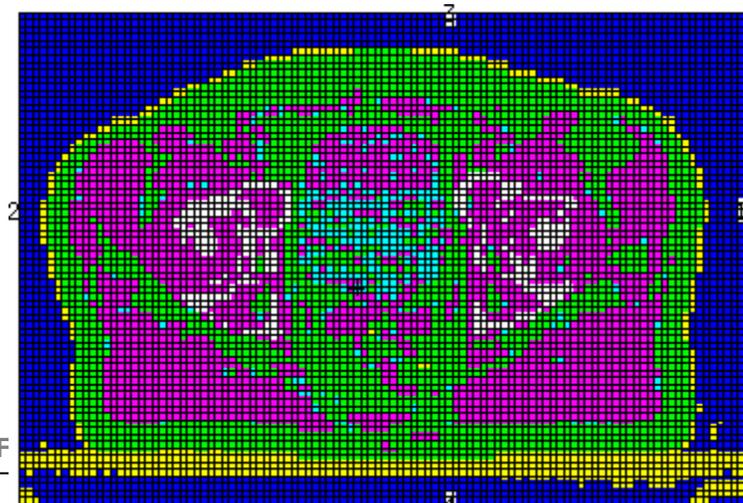
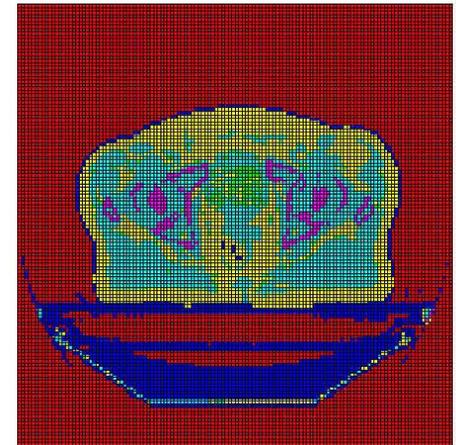
- Voxel Phantom of Head
- 85 x 109 x 120 voxels
- 2.2 x 2.2 x 1.4 mm<sup>3</sup>
- 25 Brain structure tallies
- 15 materials
- Jeff Evans, Ohio State



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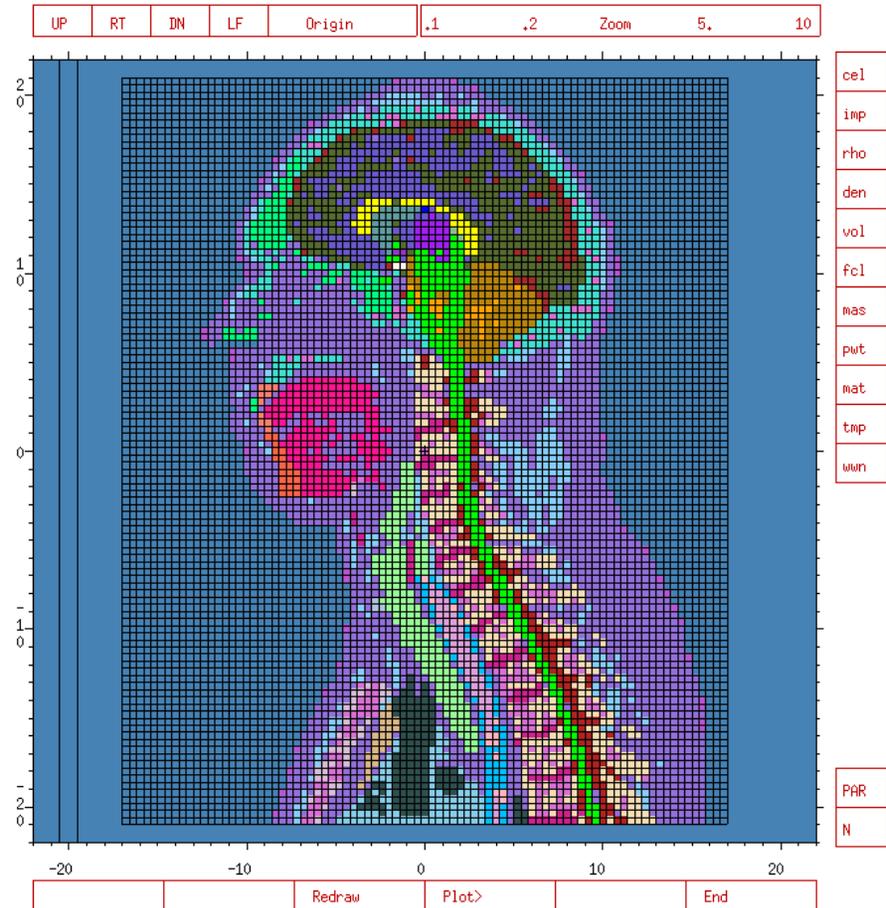
# Male Pelvis Phantom

- Voxel Phantom of male pelvis
- 128 x 128 x 75 voxels
- 3.9 x 3.9 x 3.0 mm<sup>3</sup>
- 5 materials
- By Mark Wyatt  
(wyattms@chartertn.net)
- Converted using MCNP TV



# VIP-Man

- Voxel Phantom of VIP-Man head and upper torso
- 147 x 86 x 105 voxels
- 2 x 2 x 2 mm
- 41 materials / organs
- By George Xu, RPI (xug2@rpi.edu)

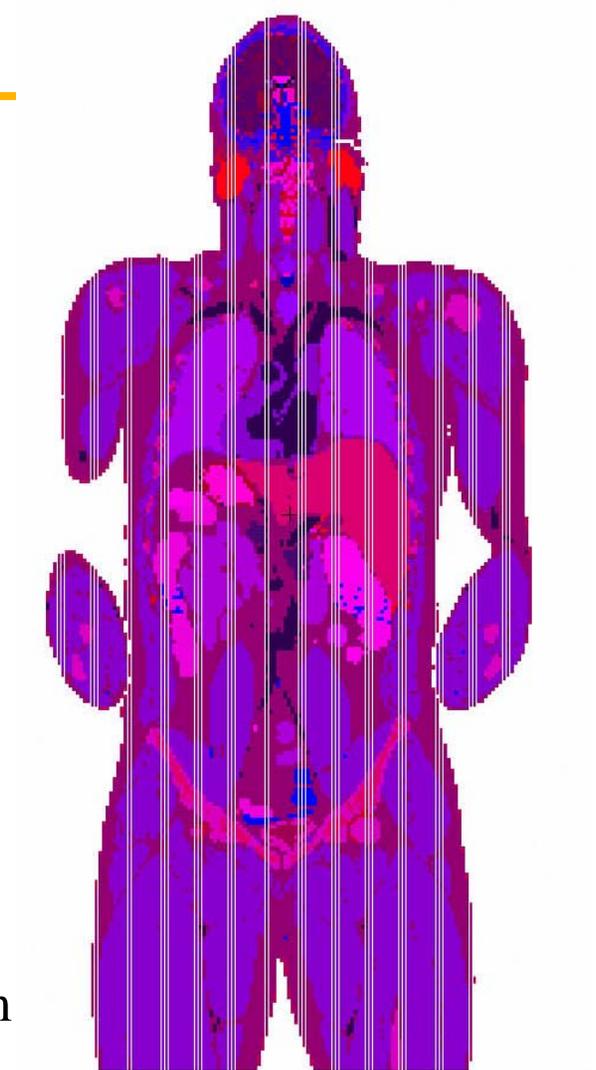


# VIP Man

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- Whole Body Voxel Phantom
- Based on NIH VIP-Man Project
- 6, 100, 300 Million Voxel Models
- 1 or 4 mm<sup>3</sup>
- Available from Prof. Xu of RPI – not in this database

[http://www.rpi.edu/dept/radsafe/public\\_html/home.htm](http://www.rpi.edu/dept/radsafe/public_html/home.htm)



# U. Florida Pediatric Phantoms

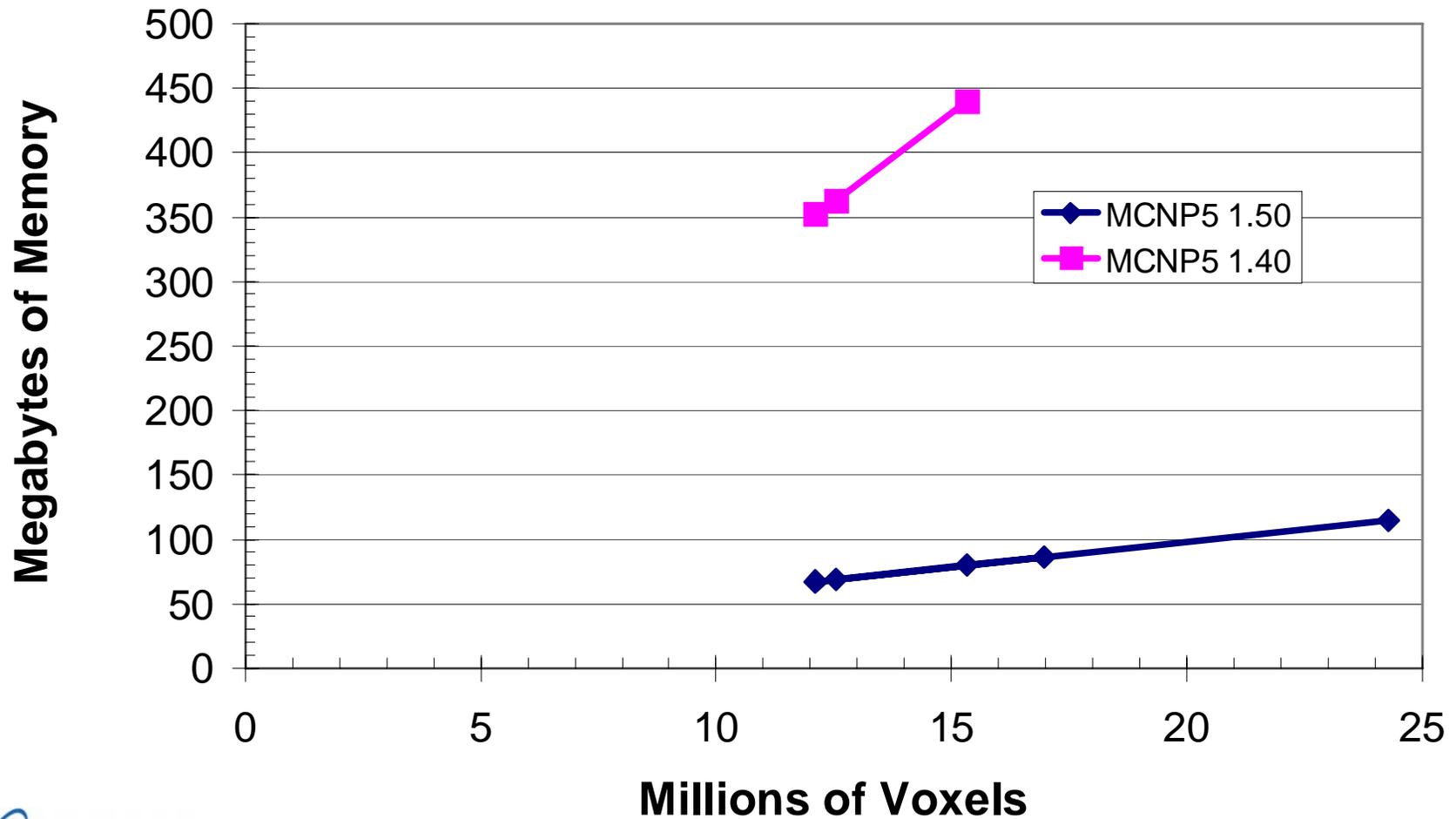
- Whole Body Voxel Phantoms
- 72 anatomical regions defined

File	Age, Gender	Millions of voxels	Resolution (mm)
ufv02	9 month male	12.5	0.8 x 0.8 x 3
ufv03	4 year female	15.3	0.9 x 0.9 x 5
ufv04	8 year female	12.11	1.1 x 1.1 x 6
ufv05	11 year male	24.2	0.9 x 0.9 x 6
ufv06	14 year male	16.9	1.1 x 1.1 x 6.7

- Created by Choonik & Choonsik Lee

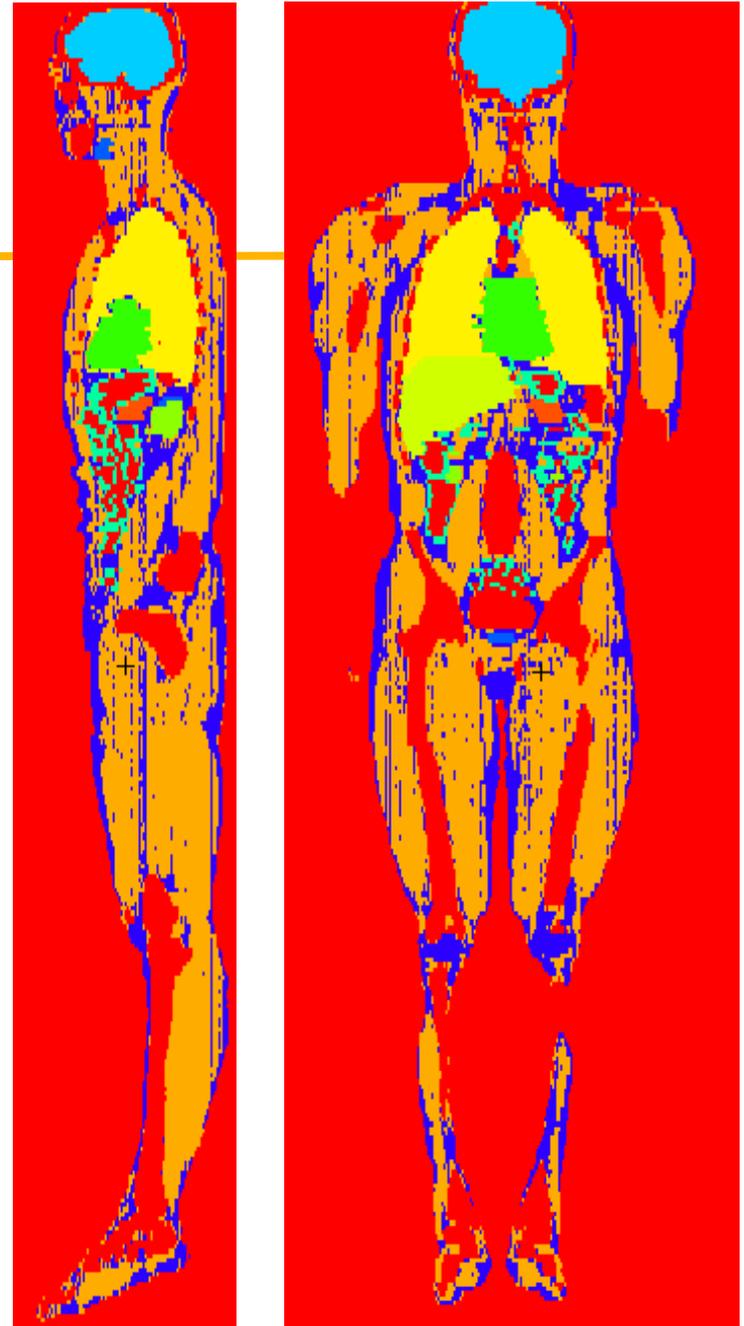


# MCNP Memory Usage for UF Pediatric Phantoms



# Korean Man Phantom

- Whole Body Voxel Phantom
- 48 anatomical regions defined
- 2.0 x 2.0 x 5.0 mm resolution
- 300 x 150 x 344 voxels
- Created by Choonsik Lee



# QUADOS

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- 5 Input decks submitted to the European MP code intercomparison (QUADOS) by MCNP team summer student Alex Redd.  
<http://www.nea.fr/download/quados/quados.html>

