

Mouse Positioning Device for Longitudinal Cancer Research

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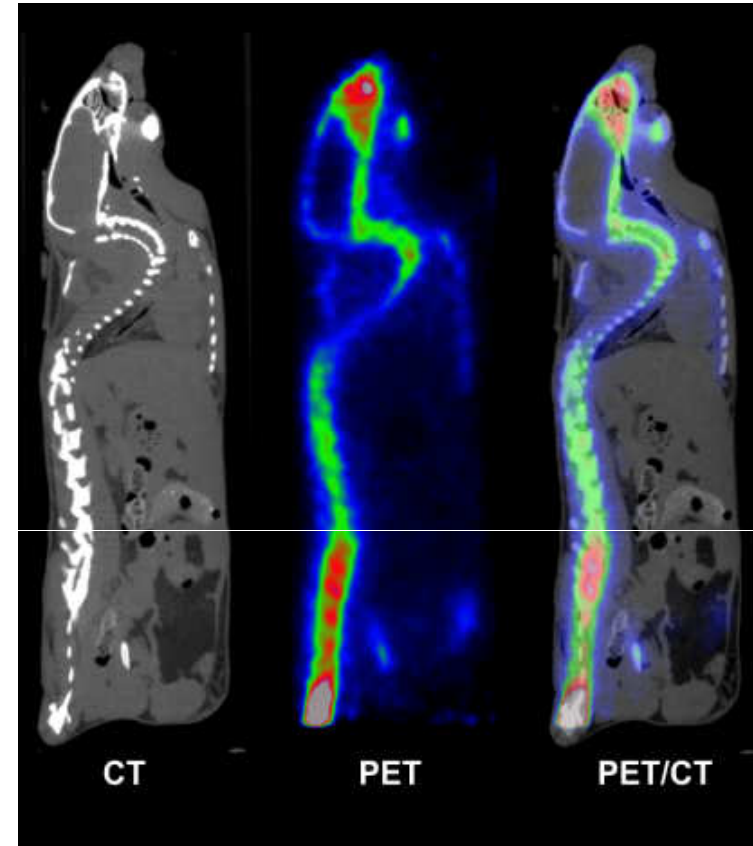
Cancer Treatment: Lab Productivity

- Longitudinal cancer treatment development
 - Animal models
 - Diagnostic imaging methods
 - Limitations in productivity
- Improved productivity requirements
 - Repeatable imaging methods
 - Current methods
- Improved productivity options
- Mouse positioning device selection
 - Testing
 - Potential problems
 - Future work



Evaluating New Cancer Treatments

- Provide state-of-the-art, noninvasive imaging support
- Small Animal Imaging Lab provides images for major producers of microCT, microPET, and hybrid scanners.
- Use animal models to perfect imaging techniques



http://www.df.unipi.it/~fii/g/research_reconstruction.htm



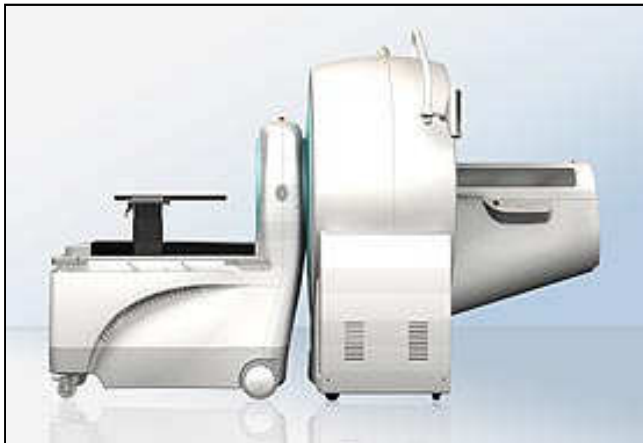
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http://www.cancer.wisc.edu/uwccc/services_smallanimal equip.asp

Reasons for a New Device



- Small Animal Imaging Lab
- Restrain mice during scans
- PET/CT modality
- Precise repositioning
- Required for serial scans
- Registration processing is time consuming
- Current method is labor intensive



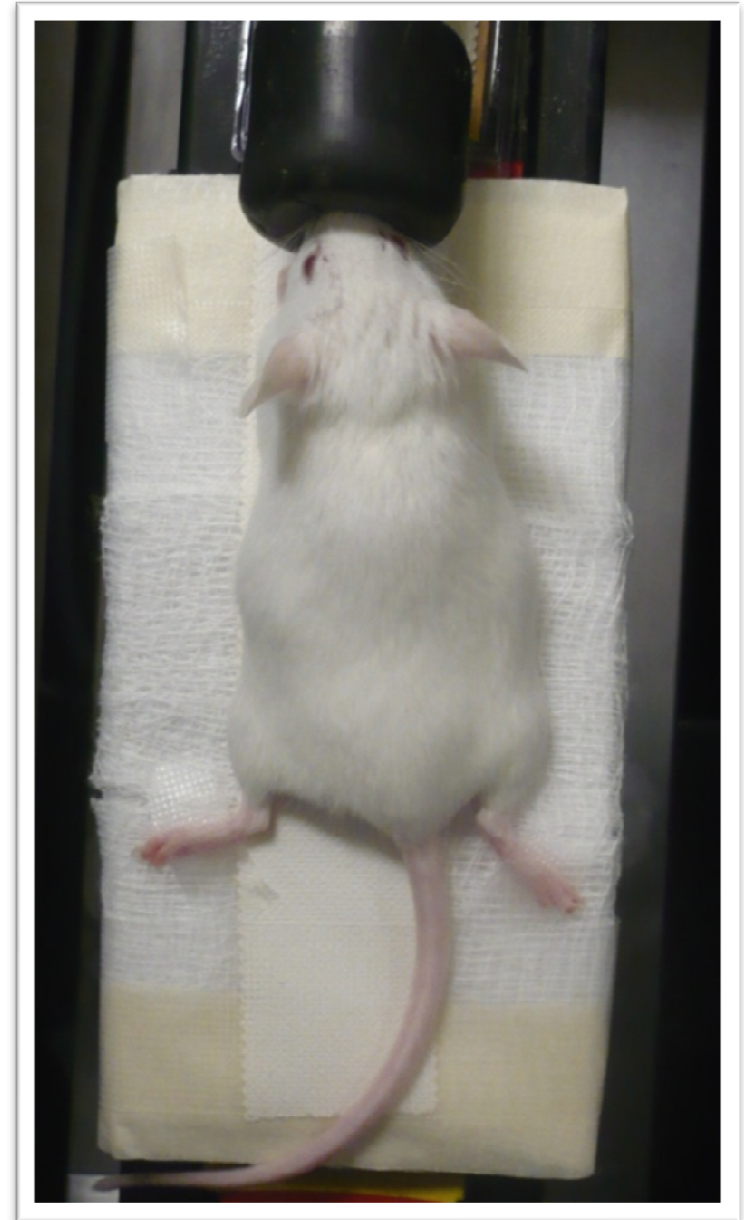
<https://www.medical.siemens.com/>

Design Criteria

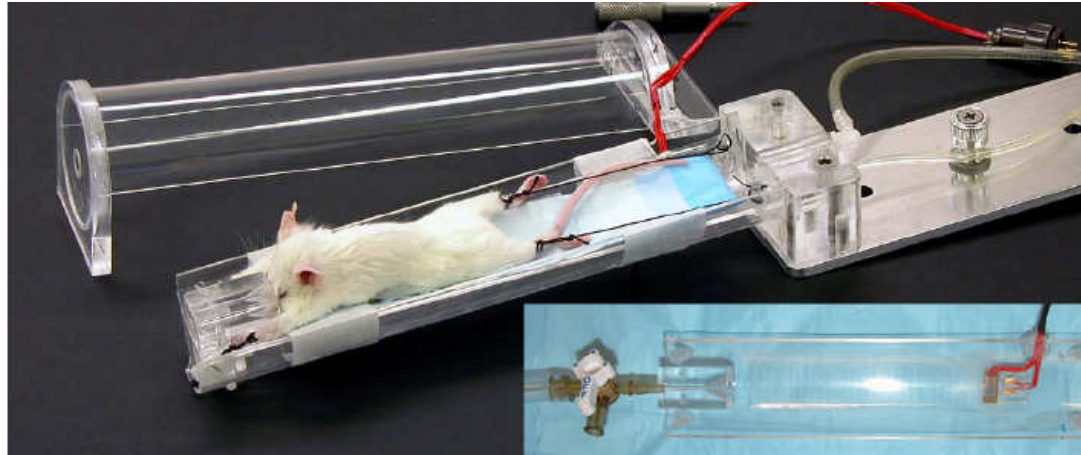
- Restrains mouse in case anesthesia fails
- Replicates position within 1 mm
- Positioning of animal and device takes 5-10 min
- Minimize interference with PET/CT imaging
- Easy to clean, no permanent cloth
- Acceptable for RARC approval
- Attaches to existing carbon fiber bed
- Multiple scans of 3-10 mice over multiple 2 week periods
- \$100 budget



Current Device in Small Animal Imaging Lab

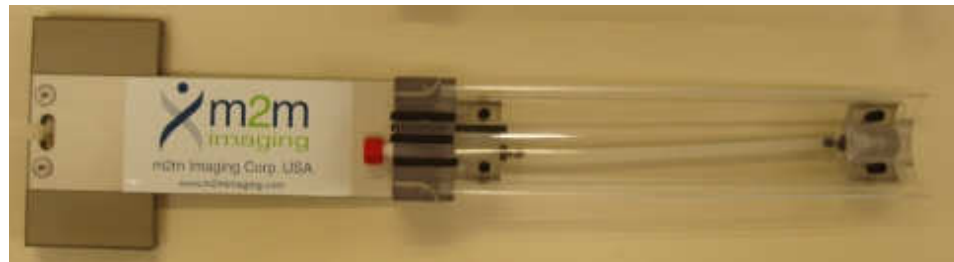


Devices Used in Other Labs



Crump Institute for Molecular Imaging

<http://www.iop.org/EJ/article/>



m2m

<http://www.m2mimaging.com/products/>



Numira

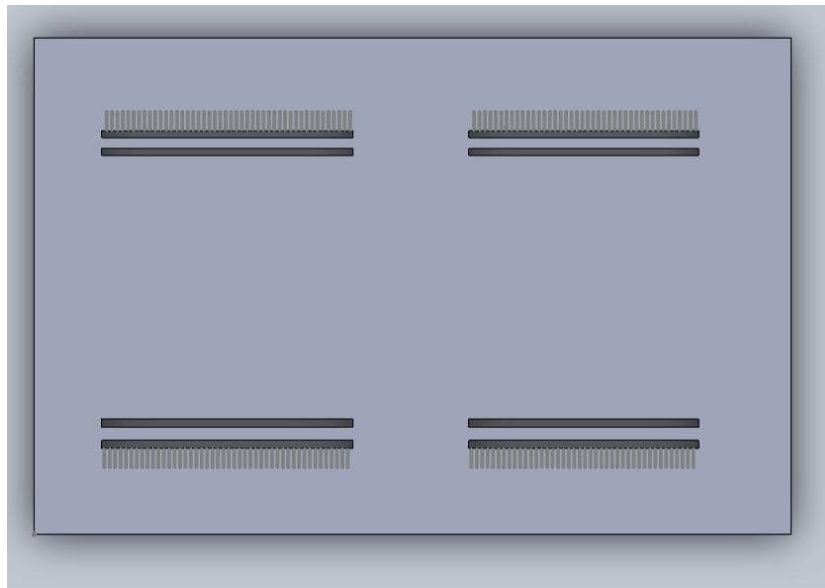
<http://www.numirabio.com/site/services/imaging-chamber>



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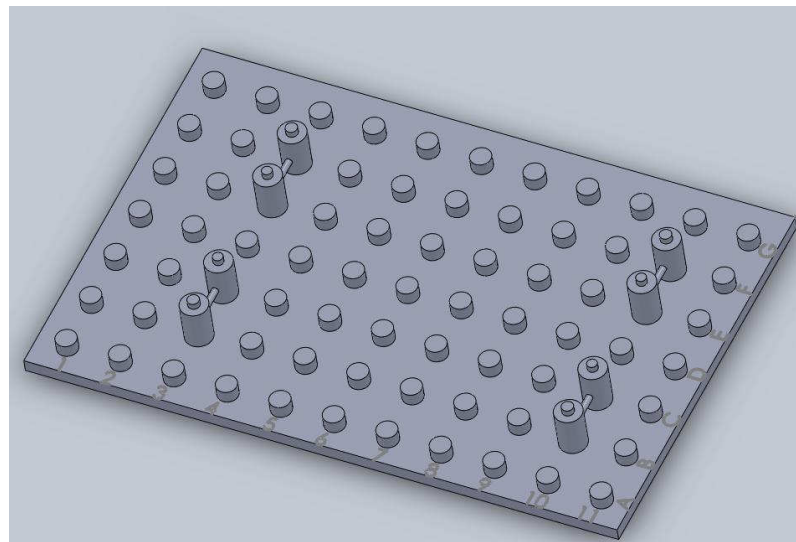
Sliding Velcro Slot Design

- Dimensions: 5 1/2" × 3 1/2" × 1/8"
- Material: Acrylonitrile butadiene styrene (ABS)
 - Inexpensive
 - Has low attenuation
- Two 1 1/2" slits in each corner cut 1/4" apart
- Restraints: 4 double-sided Velcro strips
- Ruler
- Device attaches to bed with pegs on bottom of board



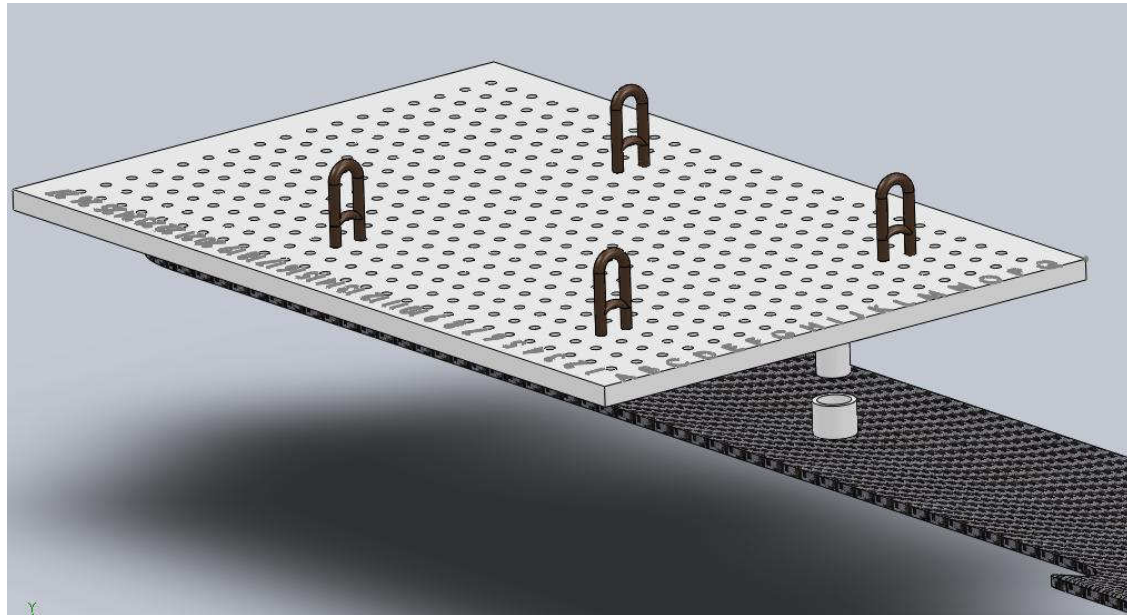
Lego Board Design

- Dimensions: 5 1/2" x 3 1/2" x 1/8"
- Material: LEGO - ABS [1]
- 144 1/5" diameter raised cylinders
 - Aligned in 16 rows and 9 columns
 - Letter and number coordinate system
- Device attaches to the bed with pegs on bottom of board
- Two LEGO pegs attached with a band placed over limbs
- Pegs also attached around body
- Record coordinates of pegs to replicate position



Peg Board Design

- Dimensions: 5 1/2" × 3 1/2" × 1/8"
- Material: ABS
- 459 1/16" holes drilled 1/8" apart, 1/4" border
 - Aligned in 27 rows and 17 columns
 - Letter and number coordinate system
- Device attaches to bed with pegs on bottom of board
- Flat board allows for tracing of body of mouse
- Pegs attached to bands to go over limbs of mice

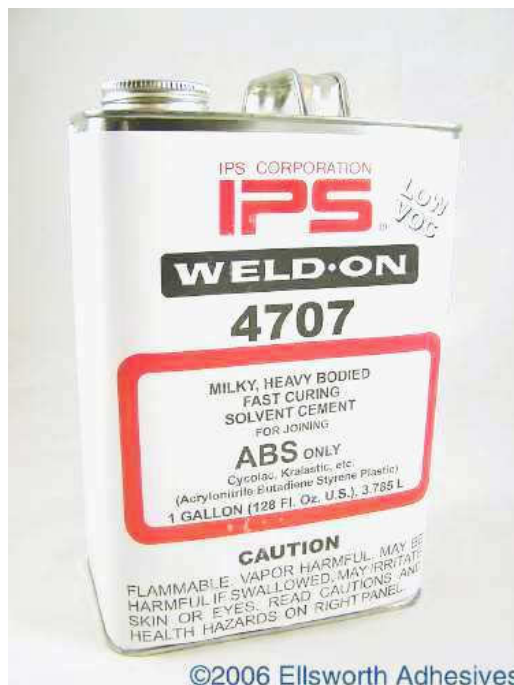


Evaluation of Design Alternatives

Criteria	Velcro Slot	Lego Board	Peg Board
Accuracy (35)	20	25	33
Ease of Use/Speed of Attachment (20)	12	18	16
Animal Safety (15)	12	12	10
Feasibility (15)	10	14	12
Sterility (10)	8	9	10
Cost (5)	3	5	5
TOTAL (100)	65	83	86

Obstacles to Overcome

- Ergonomics
- Acquiring peg materials
- Fabrication of pegs
- Durability of pegs
- Scanner friendly adhesives



©2006 Ellsworth Adhesives



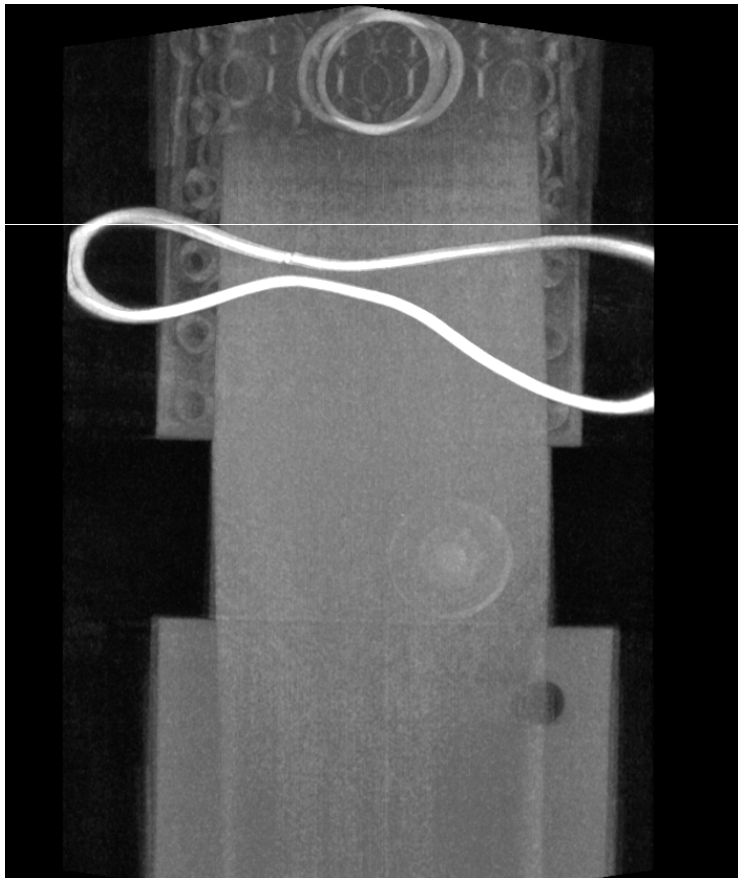
http://z.about.com/d/familycrafts/1/0/K/o/1/ct2-16_superglue.jpg



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How will we test our device?

- Repeated attachments and scans
- Scanning device materials



Where will we go from here?

- Determine which formula of ABS to use [2]
 - 15% to 35% acrylonitrile
 - 5% to 30% butadiene
 - 40% to 60% styrene
- Determine what type of bands and pegs to use
- Secure device attachments to bed at WIMR



References

- [1] The LEGO Group. (2009). *Product quality and safety*. Retrieved from <http://www.lego.com/eng/info/default.asp?page=safety>
- [2] Lenau, Torben. (2003). *Material ABS – acrylonitrile butadiene styrene*. Retrieved from <http://designinsite.dk/htmsider/m0007.htm>



Acknowledgements

- Justin Jeffery
- John Floberg
- Jamey Weichert
- Walter Block



Questions?

