



DEPARTMENT OF
Biomedical Engineering
UNIVERSITY OF WISCONSIN-MADISON

Stage Top Platform for Stable and Long-Term Intravital Imaging of Mouse Mammary Tumor Models



Members

- Hailey Kanter (BWIG)
- Abbylee Maeder (Communicator)
- Amara Monson (BSAC)
- Christy Li (BPAG)
- Joel Matthews (Team Leader)



Clients and Advisors

- Dr. Kris Saha

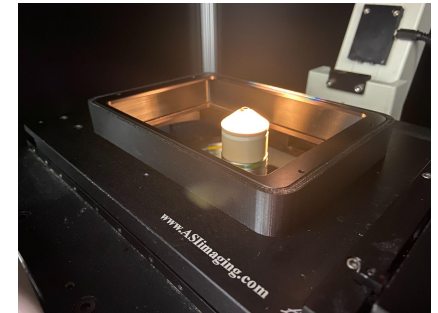
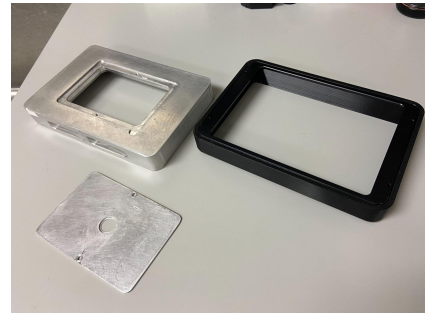
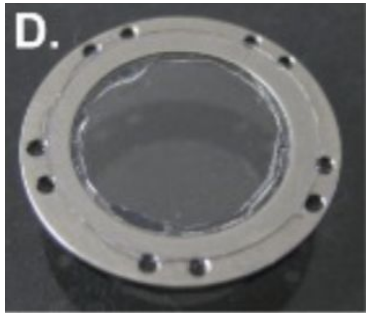


- Dr. Susanne Ponik



Background Material

- Intravital imaging for breast cancer research
- Stainless steel imaging window
- PDMS imaging window

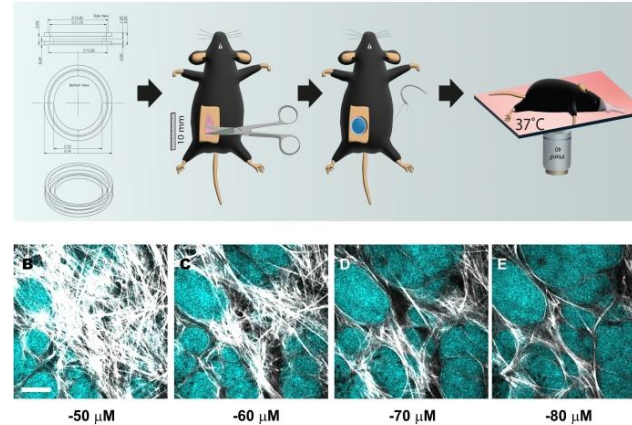
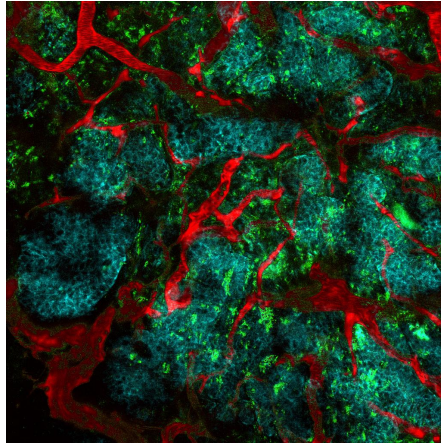


From left to right: (1) Stainless steel imaging window [1], (2) PDMS imaging window [2], (3) examples of metal and plastic risers and metal tray, (4) plastic riser set up in microscope



Problem Statement

- Flexible PDMS lens that stays in mouse for up to 8 weeks
- Stage top platform that stabilizes PDMS lens
- Pressure must be put on mammary gland during imaging



From left to right: (1) Collagen dense tumor microenvironment [3], (2) Set up for intravital imaging [4]



Product Design Specifications

- Safety of mouse
- Precise range of motion for objective lens
 - 67mm X, 91mm Y, and 9.3mm Z
- Limit movement of lens for duration of intravital imaging
- Stagetop platform:
 - 2.75 inches by 4.0 inches
 - 1 inches tall with request to lower 2-3 mm
- Material must be able to withstand a heating chamber for 8 hours
- Budget: \$1,500



Competition

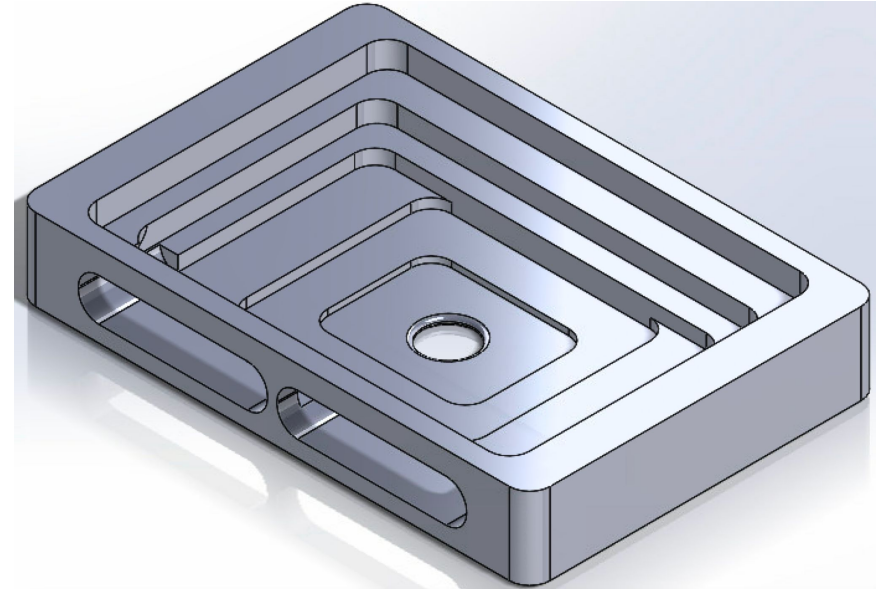
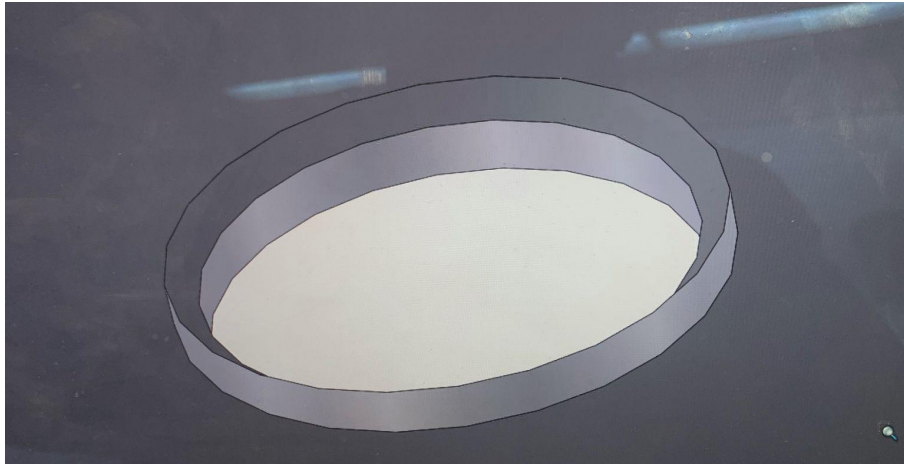
- No market product currently available for purchase
- Client's PhD student designed the current system in use



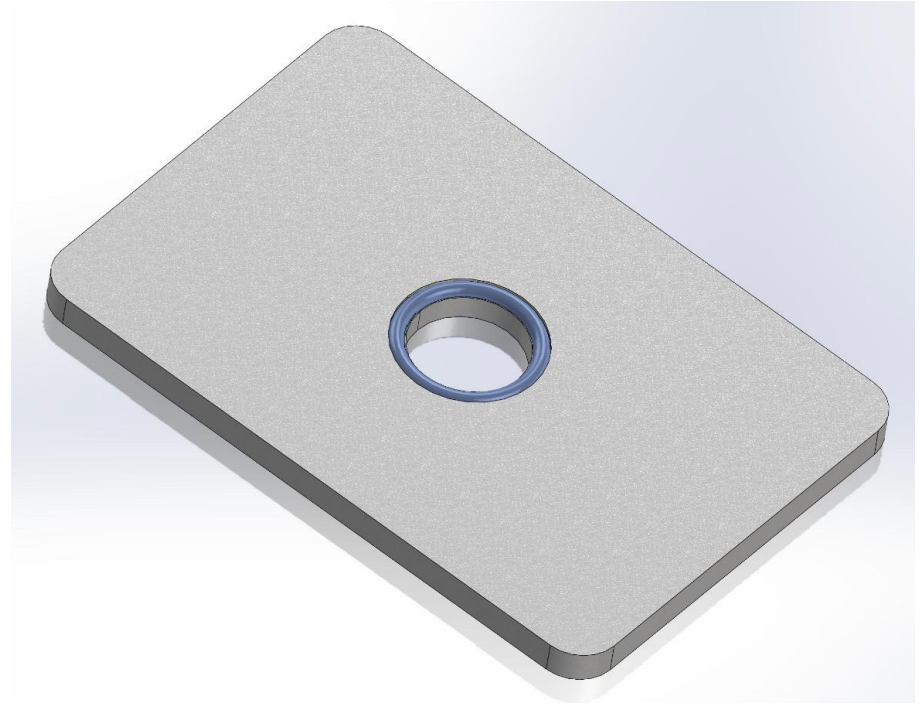
Design Idea 1 - Indented Cut Cylinder



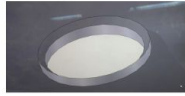

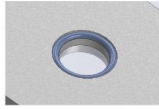
Design Idea 2 - Extruded Cylinder



Design Idea 3 - Gel Ring



Design Matrix - Hailey

Design Criteria	Extruded Cylinder		Indented Cut Cylinder		Gel Ring	
	Score out of 5	Weighted Score	Score out of 5	Weighted Score	Score out of 5	Weighted Score
						
Ease of Use (15)	5/5	15	5/5	15	4/5	12
Ease of Fabrication (15)	3/5	9	5/5	15	4/5	12
Cost (10)	5/5	10	5/5	10	3/5	6
Safety (10)	4/5	8	5/5	10	5/5	10
Precision (Lack of Movement) (25)	4/5	20	4/5	20	5/5	25
Accuracy (Quality of Image) (25)	4/5	20	4/5	20	5/5	25
Total (100)	82		90		90	



Future Work and Conclusion - Hailey

- Stabilizing apparatus
- Imaging of multiple mice
- Fabrication of the prototype
- Testing plan/Testing



References

- [1] T. Sobolik et al. "Development of novel murine mammary imaging windows to examine wound healing effects on leukocyte trafficking in mammary tumors with intravital imaging," *PubMed*, Jan. 2016. [Online]. Available: <https://pubmed-ncbi-nlm-nih-gov.ezproxy.library.wisc.edu/28243517/>. [Accessed: 04-Oct-2022]
- [2] G. Jacquemin, "Longitudinal high-resolution imaging through a flexible intravital imaging window," *Science Advances*, Jun-2021. [Online]. Available: <https://www-science-org.ezproxy.library.wisc.edu/doi/10.1126/sciadv.abg7663>.
- [3] "Research," *Ponik Lab*. [Online]. Available: <https://ponik.crb.wisc.edu/research/>. [Accessed: 06-Oct-2022].
- [4] "Peer reviewed scientific video journal - methods and protocols," *JoVE*. [Online]. Available: <https://www.jove.com/t/63413/a-label-free-segmentation-approach-for-intravital-imaging-mammary>. [Accessed: 06-Oct-2022].



Questions?

