

Graduated Bowman Probes

Date: September 18 to September 24, 2026

Client: Dr. James Law

Advisor: Professor Wally Block

Team:

Neel Srinivasan nsrinivasan8@wisc.edu (Team Leader)

Caden Robinson carobinson5@wisc.edu (BPAG)

Caleb White cfwhite@wisc.edu (BWIG)

Kenneth Sun kksun2@wisc.edu (BSAC)

Sudhi Chavadam chavadam@wisc.edu (Communicator)

Problem Statement

Bowman probes are the standard instrument used in interrogation of the nasolacrimal (tear duct) system in Ophthalmology. They are available in various sizes and provide tactile feedback to the surgeon when probing the canalicular/nasolacrimal system, allowing them to assess for strictures, discontinuities, obstruction, or other abnormality within its lumen. Probing is typically performed prior to the passage of implants such as nasolacrimal stents (eg. Crawford, Lacriflow, Nunchucku, Monoka), to confirm patency of the nasolacrimal system. Available probes on the market do not have any markings on them which may allow the surgeon to make measurements to points within the canalicular/nasolacrimal lumen (eg. a stricture at 30 mm distal to the punctum), which can be helpful in correlating with imaging findings, or for accurate clinical documentation and therefore inform management of nasolacrimal pathologies. We propose the development of such a stent with inscribed bands corresponding to millimeter markings which may be referenced during canalicular or nasolacrimal probing.

Brief Status Update

This week the team has completed the Product Design Specification(PDS) and began splitting up project work. Specifically, the team will meet on Friday, September 25th to decide which team members will be responsible for different aspects of the project. At the moment, the team is planning for some of us to begin working on creating the anatomical phantom while the others focus on testing protocols and working with Mr. S to continue manufacturing probes. The team also has a preliminary presentation which will be delivered to advisors and peers next Friday, October 2nd. Finally, the team is currently waiting on Mr. S to return with the sample probes and offer a manufacturing price estimate.

Summary of Weekly Team Member Design Accomplishments

- Team:
 - Conducted research on tissue properties of nasolacrimal duct for accurate representation in phantom
 - Planned team meeting to discuss team plan for probe and phantom manufacturing/testing
 - Meet with Dr. Block to discuss status updates and course of action
- Neel Srinivasan:
 - Researched ways to maximize existing testing protocols' effectiveness and efficiency(Autoclave, Uniformity, Accelerated Life). Specifically, looked into how to increase sample size, and discussed with team running non-phantom tests in parallel with phantom creation
- Caden Robinson:
 - Researched ways to make a soft tissue mimic using electrospinning and PLCL with gelatin
 - Learned more about the native tissue in the nasolacrimal duct and the ECM
- Caleb White:
 - Looked into how we can mimic the internal layers of the lacrimal conduit. Specifically the mucosal layer and aqueous film.
 - From this research found an appropriate PVA hydrogel recipe that could be promising.
 - Set up a meeting with a grad student to discuss potential application of chaotic bio printing.
- Kenneth Sun:
 - Researched and Wrote 4 Phantom testing proposals to test for standardization and realism.
 - Researched and wrote probe testing improvements for the last semester testing.
- Sudhi Chavadam:

- Began utilizing liquid resin 3D printers to fabricate nasolacrimal duct and sac anatomy to mimic soft tissue stiffness
- Troubleshooting printer failure and model stability and adjusting STL parameters using preform slicing software to address thin wall issues

Weekly/Ongoing Difficulties

N/A

Upcoming Team and Individual Goals

- Team:
 - Work on Preliminary Presentation
 - Begin testing with probes of received from Mr. Schumacher
 - Print bony mold for silicone pouring
- Neel Srinivasan:
 - Finalize updated non-phantom testing protocols
 - Work with team to create, practice, and deliver preliminary presentation
- Caden Robinson:
 - Reach out to Dr. Ohnsorg about electrospinning with PLCL
 - Begin making initial prototypes of the nasolacrimal soft tissue mimic
- Caleb White:
 - Meet with grad student to discuss chaotic printing.
 - Touch base with Mr. Schumacher on graduation status
 - Work on preliminary presentation
- Kenneth Sun:
 - Begin working with Neel on improving our probe testing and begin testing once probes come back from Mr.Schumacher.

- Sudhi Chavadam:
 - Fabricate usable shells of the nasolacrimal internal anatomy
 - Fabricate the bony anatomy and correctly identify the anatomically accurate areas where the duct should be placed within the phantom model

Project Timeline

Project Goal	Deadline	Team Assigned	Progress	Completed
Meet with client	Sep 11, 2026	All	✓	✓
Product Design Specification	Sep 18, 2026	All	✓	✓
Preliminary Presentations	Oct 2, 2026	All		
Preliminary Deliverables	Oct 7, 2026	All		
Show and Tell	Oct 30, 2026	All		
Poster Presentations	Dec 4, 2026	All		

TOTAL:	\$0.00							