

Graduated Bowman Probes

Date: February 27 to March 6, 2026

Client: Dr. James Law

Advisor: Professor Monica Ohnsorg

Team:

Neel Srinivasan nsrinivasan8@wisc.edu (Team Leader/BPAG)

Caden Robinson carobinson5@wisc.edu (BSAC)

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Cole Miller ctmiller8@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 continued its fabrication plan for the set of graduated Bowman's probes. The team first met with UW makerspace staff to inquire about the capabilities their laser machines had. We found out that while they can laser anneal/mark stainless steel, they are unable to help us out due to the small probe size & surface area. The team has also reached out to Professor Justin Williams to ask for advice on the fabrication and design plans of the Bowman's probes. The team has again reached out to Professor Pfefferkorn to update him on the makerspace response and ask if he is still interested in helping us with fabrication. The team also plans to have at least one prototype completed prior to show and tell such that we maximize the feedback received from our peers.

Summary of Weekly Team Member Design Accomplishments

- Team:
 - Had individual conferences with Professor Ohnsorg and received group feedback on preliminary presentations
 - Reached out to Professor Williams to ask for design and fabrication advice
 - Reached out to Professor Pfefferkorn to update and inquire about his labs help with prototype fabrication
- Neel Srinivasan:
 - Revised and continued research into the differences between laser annealing and marking as Professor Pfefferkorn informed the team that there is a difference between the two
 - Began researching necessary frame/structures that we could build to keep the probe steady during the actual laser marking procedure to ensure uniformity
- Caden Robinson:
 - Researched different properties of stainless steel and how laser annealing affects them
 - Learned about autoclaving with laser annealing to see how higher temperatures and pressures affect the oxidation layers on the probes
- Caleb White:
 - Got in contact with Pfefferkorn after meeting with the Makerspace, discussed connecting with one of his graduate students.
 - Researched CerMark and TherMark, 2 spray/paste options that could be used for the laser marking of the probes.
 - Began to consider a formalized testing procedure that needs to be curated as the fabrication timeline to the first prototype will not be very long.
- Cole Miller:
 - Conducted additional research on laser marking techniques and their compatibility with stainless steel medical probes.

- Investigated potential laser parameter settings (power, speed, and frequency) that could produce consistent and readable markings without damaging the probe surface.

Weekly/Ongoing Difficulties

N/A

Upcoming Team and Individual Goals

- Team:
 - Begin fabrication & have at least one prototype ready for show and tell on March 20, 2026
 - Research necessary ceramic coatings for the laser marking procedure
 - Research fixture fabrication methods for uniform laser marking procedure
- Neel Srinivasan:
 - Research ceramic coatings and their effects on stainless steel during laser marking procedures
 - Meet with team/Professor Pfefferkorn for 2nd meeting to discuss future plans
 - Attempt to meet with Professor Williams with team to ask for design advice
- Caden Robinson:
 - Meet with Pfefferkron to fabricate the prototype
 - Begin talking about testing and meet with the client to set up cadaveric testing
 - Order medical grade probes assuming fabrication goes well
- Caleb White:
 - Order multiple samples of various different spray/paste options for testing on the probes
 - Meet with Dr. Williams to gain his insight and expertise into the project

- Begin to design/fabricate the testing fixture that Pfefferkorn had mentioned is required for the fabrication process

- Cole Miller:
 - Arrange meeting with Dr. Williams to discuss the project
 - Begin fabrication of prototypes with Pfefferkorn
 - Continue discussing how to test our probes

Project Timeline

| Project Goal | Deadline | Team Assigned | Progress | Completed |
|------------------------------|----------|---------------|----------|-----------|
| Meet with client | 2/2 | All | ✓ | ✓ |
| Product Design Specification | 2/5 | All | ✓ | ✓ |
| Preliminary Presentations | 2/20 | All | ✓ | ✓ |
| Preliminary Deliverables | 2/25 | All | ✓ | ✓ |
| Show and Tell | 3/20 | All | X | X |
| Poster Presentations | 4/24 | All | X | X |

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| Component 3 | | | | | | | | | |
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| TOTAL: | | | | | | | | \$50.97 | |