

**Project Title:**  
**Pupil Size Modulation System**

**Contact (name, email, phone):**

Benjamin Xu, MD, PhD; [ben.yixing.xu@gmail.com](mailto:ben.yixing.xu@gmail.com); 510-851-1938

**Availability for Kickoff and Weekly Meetings:**

Student teams are to meet with the sponsor on a weekly basis, typically at the sponsor's facilities. The kickoff meeting is especially important. Please indicate if you are available to meet during the kickoff period:

- Beginning to mid November for Fall-Winter projects (yes/no): yes
- Mid to end of February for Winter-Spring projects (yes/no): yes

If not available please specify an alternate contact person for kickoff:

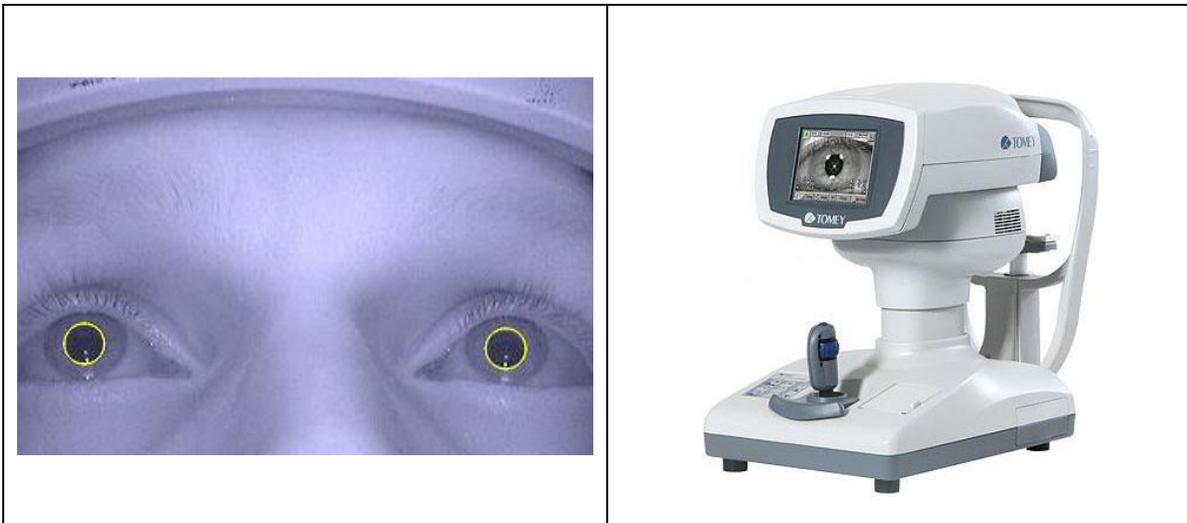
**Company website:**

None

**Project Description**

***Background:***

The iris is an intraocular structure that plays an important role in the development of angle closure glaucoma, a major cause of permanent vision loss world-wide. The structural configuration of the iris is reflected in the diameter of the pupil. However, pupillary diameter is dynamic, modulated by factors such as light exposure and emotional state. These variables make studying the biomechanics of the iris and its role in the development of glaucoma a challenging topic.



<p>Description of photo 1</p> <p>Example of pupillometry, the measurement of pupil size. This system utilizes infra-red light and an HD camera. (<a href="http://www.metrovision.fr/mv-pu-notice-us.html">http://www.metrovision.fr/mv-pu-notice-us.html</a>)</p>	<p>Description of photo 2</p> <p>Anterior segment optical coherence tomography machine capable of producing 3-dimensional images of intraocular structures.</p>
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**Summary of MAE156 Project Objective:**

The project objective is to design, build, and test a system that can regulate the diameter of the pupil. This feedback control system monitors the diameter of the pupil and uses this information to modulate an external light source. Based on the difference between the desired pupillary diameter and the actual pupillary diameter, the external light source becomes more bright, causing constriction of the pupil, or more dim, causing dilation of the pupil. The system will also have a light sensor to measure the luminance of light delivered to the eye.

**Skills Used in Project:**

- 1) Mechanical engineering - developing a compact attachment onto an anterior segment optical coherence tomography machine (photo 2) for a light source and light sensor close to the eye without impairing visualization of the pupil by a computer-connected webcam
- 2) Computer programming - interfacing a webcam to detect the diameter of the pupil (**Matlab programming skills preferred**)
- 3) Electrical engineering - utilizing a computer output signal to dynamically modulate an external light source

*Are there any citizenship or confidentiality issues required of the student team?*

No

**Budget**

The budget for each project is a not-to-exceed amount, which will be billed to the sponsor at completion of the project.

Equipment and Parts	\$ 4200
Shared Shop Expenses - UCSD	\$ 800
Total	\$ 5000

**Sponsor's Fiscal Contact Person (Name, email, phone):**

Name: Allison Price Bishop  
 Email: [ajprice@ucsd.edu](mailto:ajprice@ucsd.edu)  
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