The Elegant Mind Club: Undergraduate Research Club to Explore Consciousness Through the Minds of *C. elegans*

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UCLA, Elegant Mind Club @ Department of Physics and Astronomy

http://www.elegantmind.org

UCLA Science Poster Day on May 24, 2016

INTRODUCTION

The Elegant Mind Club seeks to study *Caenorhabditis elegans*, a simple yet behaviorally insightful organism, to provide undergraduate students across disciplines the unique opportunity to design their own research methods and carry out experiments in a laboratory setting, allowing them to explore the nature of scientific research.

With only 302 neurons and a relatively simple method of cultivation, the nematode *C. elegans* is an ideal model organism to study neuroscience and biophysics.

GOALS

To provide students with the environment and resources to:

- Take ownership of a research experiment from hypothesis to publication, utilizing peer-reviewed publications and online resources including WormBook, WormAtlas, and the Caenorhabditis Genetics Center to generate their own procedures from the leading methods.
- Independently maintain, culture, and prepare live *C. elegans* samples for their own experiment. Direct involvement with the biological samples teaches students the discipline of working with chemicals and maintaining a sterile working environment.
- Design and innovate specialized hardware, encouraging students to strive for the most controlled and reproducible system for their experiment. This promotes individual problem-solving.
- Apply MATLAB and associated software to conduct data analysis for biophysical characteristics and neuronal imaging.

LAB MEMBERS

Since summer of 2013, we have recruited more than 30 new members every quarter. Senior members personally train them to assimilate quickly into the environment. Today, we have over 50 active students, including international students and students from out-of-state universities. We are still growing!

Fig. 1 (From left) First: Etta D'Orazio (President), Richa Raghute (Biology Adviser), Crystal Ma, Christina Lee, An-Tuong (Anthony) Bui, Rebecca Huang, Amanda Yamada Second: Phat Mai, Joe Thatcher, Huan (Harrison) Khong, David Mann, Miki Rai (Media Advisor) Third: Sonya Watson, Tifffany Lu, Athanasios (Nathan) Kloutsiniotis, Ryka Sehgal, Umar Rehman, Tien Nguyen Fourth: Anthony Baldo, Javier Carmona, Ben Hakakian, Steve Mendoza, Fadi Aboud Syriani, Ahis Shrestha (Data Adviser). Not pictured: Kevin Donohue (Vice-President), Trudy Tan (Secretary), Blake Madruga (Microscope Advisor).

BEHAVIOR EXPERIMENTS

After proposing a project and consulting empirical sources, students assemble the appropriate apparatus for the experiment. As of now we have built systems for imaging worms under the absence of external stimuli, electric field, magnetic field, thermal gradients, and light stimulation. We also developed several advanced freely-moving real-time worm-tracking microscope capable of imaging neural activities in 2D and 3D.

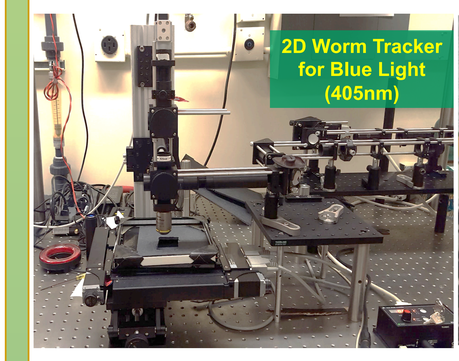


Fig. 2 The phototaxis set-up incorporates a rig that fires a laser with precision at photosensitive neurons in the worm's anterior. A microscope tracks the animal in real time using a LABView program.

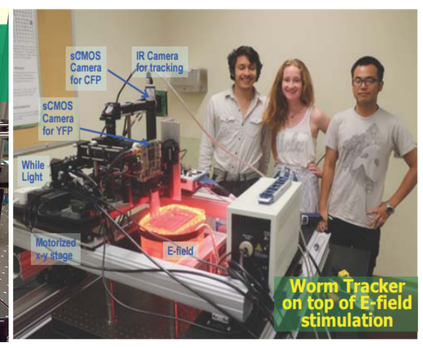


Fig. 3 A worm-tracking microscope tracks the center of mass of a worm in high resolution. The system is equipped with a sCMOS camera for CFP/YFP imaging.

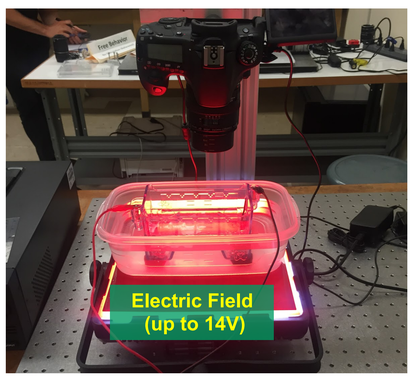


Fig. 4 The electrotaxis set-up incorporates a power source that runs current through two electrodes and into a salt water bath in a gel electrophoresis chamber, generating an electric field through an agar pad.

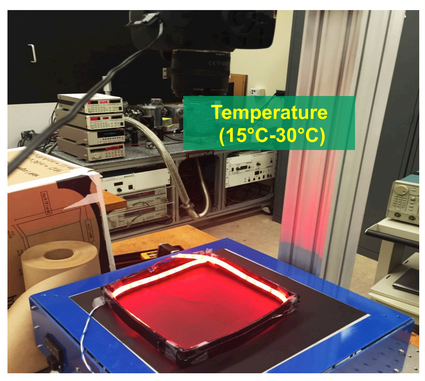


Fig. 5 A thermal gradient generated by an aluminum temperature plate and cooling system. Worm behavior is photographed via time-lapse.

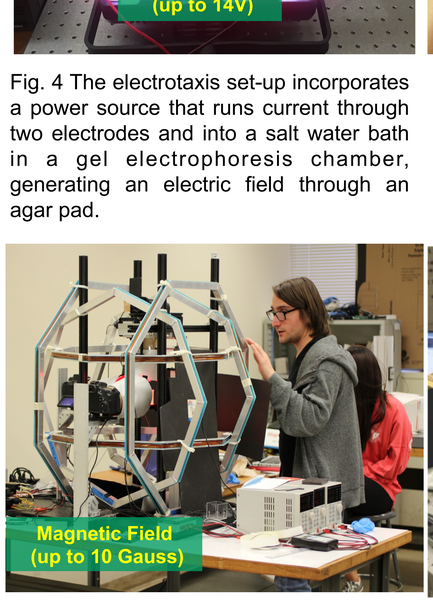


Fig. 6 The Helmholtz copper coil chamber generates a magnetic field in three dimensions around a worm sample sitting in the middle of the apparatus.

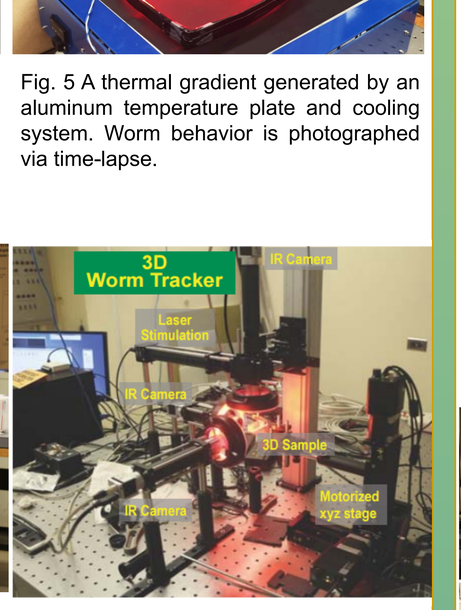


Fig. 7 The 3D worm tracking microscope synchronizes three objectives in x, y and z planes to generate an image of a worm navigating a gelatin medium in a 2 cm^3 cuvette.

OUR LAB FACILITIES

Our laboratory is composed of six rooms in Knudsen Hall, UCLA.

Central Lab Knudsen 4-173

- Meetings, lectures, discussions, and article presentations
- New member training
- Social space

Data Lab Knudsen 4-173A

- Nine PC rigs built and customized by students
- Image processing
- MATLAB and LabVIEW software coding and data analysis

Behavior Lab Knudsen 4-162

- Home of the magnetic field, electric field, thermal plate, and free motion systems
- Undergraduate experimental systems workshop

Biology Lab Knudsen A-154

- *C. elegans* cultures in incubators
- Sample preparation for all experiments
- Biological & chemical stock

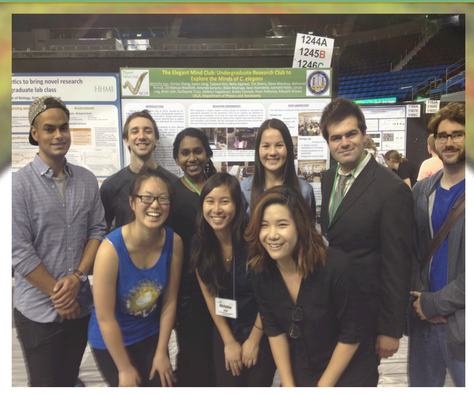
Tracker Lab Knudsen 4-166

- Development of real-time worm-tracking microscopes
- Observation of neural activities under various external stimulations.

Microscope Lab
Knudsen B-171

- Development of advanced microscopes for 2D and 3D imaging
- Light field microscopy of neural structures
- 3D scanning of zebrafish and mouse brains.

Fig. 8,9 The Elegant Mind Club presented a total of 8 posters at the C. elegans 20th International Meeting 2015 at UCLA



JOIN US!

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