Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_\_

**Initial Research Project Interest Survey 2016-17**

Please rank your level of interest about the following topics. Place a “1” next to the topic you are most interested in, a “2” next to the next best option, etc. Rank your top 10 choices. Don’t forget to add your own idea too!

Research Topics

\_\_\_\_\_ 1. **Aquaponics**: Aquaponics is the combination of hydroponic plant production with aquaponics (fish farming). In aquaponic systems, the nitrogen waste produced by fish or other animals is recycled by helpful bacteria into a fertilizer for the plants. We have a large-scale operation working in the engineering building, and I have several desktop-scale models to experiment with.

\_\_\_\_\_ 2. **Symbiogenesis:** I believe I informally observed the symbiogenesis of *Hydra littoralis* and *Nannochloropsis* two years ago. In this process, the brown, heterotrophic *Hydra* may form a symbiotic relationship with *Nannochloropsis* microalgae, to form “green” hydra with internal algae that provide it nutrition. I have been unable to find any research indicating this particular symbiogenesis has been documented before, and this may be an opportunity for a real, new, scientific discovery worth of a publishable formal paper. Efforts to research this in class have been foiled by a difficult time culturing the hydra, a difficult organism to maintain healthy cultures with.

\_\_\_\_\_ 3. **Toxicology (microworms)**: Microworms (*Panagrellus redivivus*) are nematodes (roundworms) commonly used as live fish food. These organisms are very easy to culture, and provide an excellent animal model for determining the toxicity of various substances you might wish to test. They are also useful for population studies.

\_\_\_\_\_ 4. **Microbial fuel cells**: MFCs use the metabolic power of microorganisms to convert organic compounds into electrical energy. Designing and constructing MFCs is an expanding field with potential uses for making human populations more sustainable by capturing more energy from waste products, or providing energy in remote locations, such as the deep-sea floor. 2014-15 teams broke our previous voltage-production records by using efficient electrode combinations

\_\_\_\_\_ 5. **Comparative Anatomy**: Through careful dissection and analysis, compare two or more phylogenetic groups of animals. By comparing similar systems in different organisms, insights into the evolution and development of different groups can be gained.

\_\_\_\_\_ 6. **Maze-solving behavior in slime moulds**: Slime molds are an interesting group of protists that have demonstrated amazing maze-solving abilities, even though they are extremely simple colonies of cells. *Physarum polycephalum* is a model species.

\_\_\_\_\_ 7. **Computer Modeling**: Computer simulations of living systems can provide great insight into how those systems function. In the past, student teams have used the computer simulations SimEarth and Golly (a cellular automaton program) to investigate a wide range of biological questions.

\_\_\_\_\_ 8. **Vermicomposting**: Worms can turn your garbage into nutritious compost that provides lots of nutrition to soil. Research involves starting and maintaining a population of worms, and testing any number of variables to maximize results.

\_\_\_\_\_ 9. **Evolution: Phylogenetics / Genomics / Bioinformatics**: Information technology continues to revolutionize our understanding of biology and evolution. The use of computers to analyze large sets of genetic data allows researchers to piece together the story of how the species found on Earth came to be. Past projects have investigated the colonization of the Galapagos Islands by “Darwin’s” finches and the association between biogeography, continental drift, and evolution.

\_\_\_\_\_ 10. **Metabolic effects of drugs on *Daphnia****: Daphnia* is a genus of tiny freshwater crustaceans. They can be used as a model organism for testing the metabolic effect of drugs because their microscopic heart beats can be easily counted. Other experiments with *Daphnia* are also a possibility here.

\_\_\_\_\_ 11. **Evolution: Multicellular yeast**: Because they are unicellular Eukaryotes easy to grow in lab, the common baker’s yeast (*Saccharomyces cerevisiae)* are one of the best understood species on Earth. Recent experiments have shown that multicellularity is a selectable trait in these organisms, and such studies can potentially help explain the evolution of multicellular organisms.

\_\_\_\_\_12. ***Drosophila* genetics**: *Drosophila* fruit flies are the most common organism for animal genetics experiments, that have yielded many crucial scientific discoveries. Many mutant strains are readily available for study.

\_\_\_\_\_ 13. ***Brassica* genetics**: The genus *Brassica* includes many important species of vegetable crops, including cabbage, kale, broccoli, cauliflower, turnip, and many others. These species all interbreed readily, and produce interesting hybrids. The *Fast Plants®* system uses mutant strains of *Brassica* as well. Can you breed a faster-growing canola oil plant?

\_\_\_\_\_ 15. **Planaria regeneration**: A new option for 2016-17. Planarians have amazing regenerative abilities… Can you produce a planarian with 2 heads? 4? 8? Only one way to find out!

\_\_\_\_\_ 14. **Your experiment idea**:

 Please describe one biology experiment that might be possible to conduct in our classroom that you would be interested in conducting. I can make no promises…

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