

HHMI SEA

Phage Hunters Advancing Genomics and Evolutionary Science 2019 Program Announcement

Abstract

The Howard Hughes Medical Institute announces a new competition to select up to 20 colleges and universities to participate in the HHMI SEA-PHAGES project. These schools will comprise the twelfth SEA cohort and will begin to offer the PHAGES course in the fall of 2019.

Schools interested in joining the SEA in the 2019-20 academic year must submit a completed application by October 31, 2018. Applications are accepted by email to sea@hhmi.org using the form provided on the SEA website: <http://www.hhmi.org/programs/science-education-alliance>

The SEA-PHAGES project

The HHMI Science Education Alliance – Phage Hunters Advancing Genomics and Evolutionary Science (SEA-PHAGES) project is a discovery-based course-based research experience. This two-semester laboratory course is aimed at undergraduates who are new to college level science and have had little or no research experience. It is assumed that students are concurrently enrolled in introductory undergraduate biology and/or chemistry courses; there are no other pre- or co-requisites. At many institutions, the SEA-PHAGES course replaces the standard introductory biology laboratory course.

In the first semester, students isolate bacteriophages from local environmental samples, purify and characterize their phages, and extract DNA for further analysis. By the end of the first semester, the students will have selected phages for whole genome sequencing. During the break between semesters, the DNA is sequenced and the sequence is then returned to the students. In the second semester, the students employ bioinformatics methods to annotate their phage's genome sequence. After quality control checks, the students' annotated sequence is submitted to the National Center for Biotechnology Information GenBank database. At the end of the school year, a student and a faculty member from each SEA school will be invited to the annual SEA-PHAGES Symposium, which is a student-centered scientific meeting.

Course implementation

HHMI provides the following to the SEA schools:

- course manuals for the first semester ("Phage Discovery" work) and the second semester ("Bioinformatics" work);
- training of course instructors from each new SEA school, including the costs of transportation, accommodations, and meals. There are two training workshops: (i) the Phage Discovery workshop is a week-long workshop conducted in the summer of 2019 at the University of Maryland Baltimore County; and (ii) the Bioinformatics workshop is a week-long workshop conducted in December of 2019 at HHMI headquarters in Chevy Chase, MD.
- sequencing of the genomic DNA isolated by the students at each SEA school;

- quality control checks of the DNA sequence and the genome annotation;
- bioinformatics software;
- year-round technical support;
- organizing and hosting the annual SEA-PHAGES Symposium, held at the Janelia Research Campus in Ashburn, Virginia, including the costs of transportation, accommodations, and meals. Each SEA school will be invited to send one student and one faculty member to the Symposium.

SEA-PHAGES institutions are expected to provide the following:

- at least two instructors each semester who will be assigned as a significant portion of their teaching load the SEA-PHAGES laboratory course (the persons teaching the Phage Discovery lab can be but do not have to be the same as the persons teaching the Bioinformatics semester). HHMI recommends that teaching the SEA-PHAGES course represent at least 30 % teaching load per semester per instructor. For new SEA schools, it is essential that instructors participate in the two training workshops;
- course scheduling so that each laboratory section (excludes lecture) of the SEA-PHAGES meets at least twice per week for at least 2 hours per meeting throughout the semester;
- appropriate lab space and equipment available to the needs of the SEA-PHAGES course;
- consumable laboratory supplies, which total approximately \$150-200 per student per year (see the detailed list of Supplies and Equipment);
- appropriate computer equipment and IT support;
- timely submission of isolated phages for archiving, DNA samples for sequencing, annotated sequences for quality control checking (see the list of program deadlines included in the Program Timeline);
- participation in SEA-PHAGES-sponsored assessments.

Supplies and Equipment

The phage discovery portion of the course requires supplies and equipment found in most colleges and universities. The list below represents a reasonably complete list of supplies and equipment required to deliver the SEA-PHAGES lab course. This does not include consumables or “extras” such as lab notebooks, disposable lab coats, etc. For a more complete list, please email sea@hhmi.org.

Supplies:

- Baffled flasks (250-mL)
- Media bottles (100-mL and 250-mL screw capped)
- Micropipettors and tips (10-20 μ L, 20-200 μ L, and 1000 μ L)
- Pipettes, serological (5-, 10-, and 25-mL)
- Pipettor, automatic (e.g. Pipet Aid®)
- Racks (for various tubes see below)
- Thermometers
- Tubes (10-mL culture tubes, 15- and 50-mL conical tubes [e.g., Falcon®], microcentrifuge [e.g., Eppendorf®])
- Petri plates

Equipment:

- Autoclave
- Balances (micro- and milligram ranges)
- Bunsen Burner
- Centrifuges (Table-top, high speed and microcentrifuge)
- Electrophoresis (agarose gel) equipment and supplies
- Freezer (-80°C and -20°C)
- Heating blocks
- Incubators (30°C or 37°C; shaking and non-shaking)
- Microwave
- pH meter
- Photography equipment and supplies
- Power supplies
- Refrigerator
- Spectrophotometer, fluorometer, or nanodrop
- Stir plates
- Transilluminator
- Vortexer
- Water baths
- The computer software for the Bioinformatics component of the course requires the following minimum computer configurations: Windows XP/Vista/7 or Mac OS X 10.5; 1.6 GHz/x64 dual-core processor; 4 GB RAM; 128 MB video memory; 20 GB free hard-drive space.
- The software requirements are likely to require the support of the institution’s IT staff.

Other Resources:

- Reliable high-speed internet access
- Electron microscope access

Program Timeline (Timeline dates are for reference, and are subject to change)

Application Deadline	October 31, 2018
Notification to Applicants	December, 2018
Acceptance Deadline	January, 2019
Identify 2019 Symposium Participants	March, 2019
Identify 2019 Phage Discovery Workshop Participants	March, 2019
SEA-PHAGES Symposium	June 7 – 9, 2019
Phage Discovery Workshop Option A	June 22 – 28, 2019
Phage Discovery Workshop Option B	July 6 – 12, 2019
Identify 2019 Bioinformatics Workshop Participants	October, 2019
Bioinformatics Workshop	December 9 – 13, 2019
Submit DNA Samples [Semester schools]	November, 2019
Submit DNA Samples [Quarter schools]	January, 2020
Submit Phage Lysates	February, 2020
Identify 2020 Symposium Participants	March, 2020
Submit a Student Abstract for the 2020 Symposium	May, 2020
Submit Annotations for Quality Control Review	May, 2020