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HHMI's Science Education Alliance Aims to Be a National Resource

□ The Howard Hughes Medical Institute (HHMI) today announced the creation of the Science Education Alliance, an exciting new program that extends HHMI's historic commitment to enhance the teaching of science and inspire new generations of scientists. The Science Education Alliance is built on the knowledge and experience HHMI has gained from supporting science education advances in the United States over the last 20 years.

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The Science Education Alliance (SEA), headquartered at HHMI's Janelia Farm Research Campus in Northern Virginia, will become a national network of scientists and educators who are working collaboratively to develop and distribute new materials and methods to the education community. Its members are now rolling out a pilot project — a nationwide genomics course that will involve first-year college students in authentic research. This is one example of the kind of innovative curricula and teaching methods that the SEA will disseminate, said Tuajuanda C. Jordan, HHMI senior program officer and director of the SEA. Jordan was formerly associate vice president of academic affairs at Xavier University of Louisiana.

The SEA initiative is a new direction for HHMI, which for two decades has funded science education programs run by faculty and teachers at institutions across the United States. By creating the SEA, HHMI is taking a more active role in catalyzing change in science education. The Institute is staffing the SEA program with its own employees, who are building the alliance with the help of HHMI's extensive network of grantees and educators. HHMI is committing a total of \$4 million over the first four years of the program.

SEA represents the next step in HHMI's education programs, said Peter J. Bruns, HHMI vice president for grants and science education. With the SEA,

we are creating a national network of faculty and students. HHMI and our grantees will be working together to create something entirely new.

Although collaboration is an established and accepted part of scientific research, Bruns said there are currently few opportunities for collaboration focused on improving science education. The SEA is a true alliance that will require the cooperation and commitment of HHMI staff, participating faculty and students, and their institutions, said Bruns.

In the first of what will be a series of new programs, workshops and courses from the SEA, HHMI is now unveiling the details of a nationwide genomics course to bring the excitement of discovery to first-year college students. The course is being piloted this fall at the University of Pittsburgh by HHMI professor Graham F. Hatfull, who is professor and chair of the department of biological sciences. After the pilot course is completed in spring 2008, the course will be made available to colleges and universities nationwide.

The research-based laboratory course provides beginning college students with a true research experience that will teach them how to approach scientific problems creatively and will hopefully solidify their interest in a career in science. We are trying to catch students early - before they have a chance to become bored or overwhelmed by the typical large introductory science course, said Jordan.

Numerous studies have shown that students rank undergraduate research experience as the most important factor when deciding whether to pursue graduate studies or a career in research. Our goals for the national genomics course are to improve science education at the national level and to increase the number of college students who continue to be science majors, and possibly go on to careers in science, said Bruns.

The genomics course builds on the work of two HHMI professors— Sarah C.R. Elgin at Washington University in St. Louis and Hatfull—and the efforts of several other grantees: Brad Goodner, HHMI undergraduate program director at Hiram College in Ohio, and A. Malcolm Campbell, director of the HHMI-supported Genome Consortium for Active Teaching at Davidson College in North Carolina. All four are also scientific advisors to the SEA.

Students in the pilot genomics course at the University of Pittsburgh are isolating and characterizing previously unknown bacteriophages, viruses that infect bacteria. Bacteriophages were chosen for student research because they are plentiful, highly diverse, and easily isolated directly from nature. They also have relatively simple and small genomes.

In the two-semester course, students will first isolate their own bacteriophage. Their next goals will be to isolate the bacteriophage's DNA, and then clone and sequence the DNA. After sequencing is complete, students will finish, annotate, and compare the genomes of their bacteriophages against bacteriophage genomes sequenced by other students in the SEA national network. They will use vetted, interactive computer programs and public databases to do these comparisons. Faculty will be expected to publish or

present research findings from the project and deposit final phage sequence information into public databases.

In the genomics course, our goal is to leverage the knowledge and experience of educators supported by HHMI over the past two decades to create a national course that will make it possible for undergraduates to have an authentic research experience, said Jordan.

Jordan says the long-term goal of the genomics course is to provide students with a challenging research project that results in the complete genome characterization of a total of at least 12 unique bacteriophages per year, leading to peer-reviewed publications with student co-authors in mainstream scientific journals and science-education-focused journals. The outcome of their studies could shed light on various scientifically relevant issues, including virus-host interactions and microbial gene transfer, said Bruns. Based on the pilot-course experience, Jordan and her collaborators will develop a resource guide for the course and design a training workshop for faculty to be held during summer 2008.

The SEA staff is now beginning formal recruitment of the first 12 participating institutions that will implement this unique course during the 2008-2009 academic year. The goal, according to Jordan, is to identify a mix of colleges and universities to participate with an expectation that up to 20 students would take that course at each location. Participating faculty will meet three times with SEA staff and scientists before teaching the course.

HHMI has committed three years of support to up to 36 institutions participating in the SEA program. That support will provide resources to develop the course, reagents and laboratory components, computing support and software and an internet-based networking infrastructure for all participants. Jordan hopes that by 2011 more than 700 students will be taking the course at 36 institutions.