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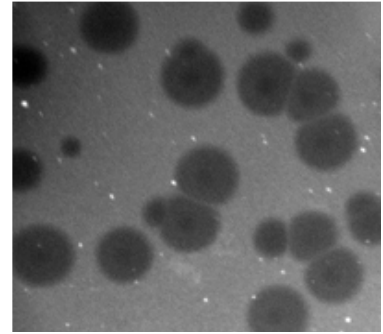
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Students Find, Name Bacteriophages in Massive Team Project

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BLOOMINGTON, Ill.— A scientific paper with nearly 3,000 authors brings to mind the notion of a group project spiraled completely out of control.

Yet the massive team of scholars, including Illinois Wesleyan University biology faculty David Bollivar and Loni Walker along with nearly 40 students, allowed researchers to sequence the largest-ever number of bacteriophages – viruses that infect and replicate within bacteria. The enormous number and diversity of bacteriophages (or “phages”) means they play an important role in nearly every ecosystem, yet scientists don’t know much about how they evolved or how different phage populations are related to each other. In a new scientific paper recently published in the journal *eLIFE*, Bollivar, Walker and other authors show that phages do not form discrete populations as previously suggested but are rampantly exchanging genes with each other to generate a broad spectrum of genetic diversity.



Phage Kazan was found by Tess Kelley '16

Efforts to sequence and analyze the genomes of bacteria-infecting viruses are part of the nonprofit Howard Hughes Medical Institute’s Science Education Alliance (SEA). The SEA Phage Hunters Advancing Genomics and Evolutionary Science (PHAGES) project, an integrated research and education program, allows students – typically first-year undergraduates – to isolate bacteriophages from local soil, extract DNA from the phages, then sequence and analyze the phage genomes within their biology undergraduate courses. Over the past seven years, thousands of undergraduate students – including students at Illinois Wesleyan – have joined the effort. Bollivar, the Miner Linnaeus Sherff Endowed Professor of Botany, was instrumental in implementing labs at Illinois Wesleyan as part of those efforts.

“The PHAGES laboratory is just one way that biology faculty at Illinois Wesleyan engage students in authentic research experiences,” said Bollivar. “Students gain a greater appreciation for the practice of science from this experience.”

The *eLIFE* paper is authored by 199 faculty, including Bollivar and Walker, and 2,664 students from more than 80 colleges and universities, including 39 from Illinois Wesleyan. The paper is believed to have the second-highest number of authors on a scientific paper, topped only by the paper describing the discovery of the Higgs boson.

By engaging freshman students, who typically do not have expert knowledge, in contributing genuine advances in scientific knowledge, SEA-PHAGES organizers said the program “creates a scientific community of students engaged in authentic research.”

SEA-PHAGES students nationwide have found thousands of new bacteriophages. Students get to name their own phages, adding an element of fun to the scientific exploration. Illinois Wesleyan students have named phages after themselves and the school mascot “Titan” among others. All IWU phage names can be found in the online database.

The SEA-PHAGES program “has contributed to the growth of the collection of sequenced mycobacteriophages to nearly 700 individual isolates, of which 627 were selected for a detailed analysis,” the authors said in the *eLIFE* paper. “This is by far the largest collection of sequenced phage genomes for any single host and thus promises to substantially advance our understanding of phage diversity.”

In the paper, researchers said that while genomes could be categorized into 28 clusters, the genomes are not completely unrelated. Genes and groups of genes are shared between different clusters, with the phage population in a constant state of change, and continuously acquiring genes from other microorganisms and viruses.