

The Metagenomics Education Partnership: Harnessing the Power of Microbial Genome Sequencing and Big Data with High School Students and Teachers

West Seneca West Students and Mr. J. Rodemeyer with
Dr. S. Koury, PhD of SUNY at Buffalo



Community Partnerships

- NIH Science Education Partnership Award (SEPA) awarded to Dr. Stephen Koury of the University at Buffalo and partners:
 - UB's Department of Biotechnical and Clinical Laboratory Sciences
 - New York State Area Health Education Center System
 - UB's Center of Excellence in Bioinformatics & Life Sciences
 - Buffalo Niagara Waterkeeper
 - Schools of Western New York

This unique opportunity for teachers and students involves metagenomic analysis of local water samples, generating data on the microbial health and well-being of our waterways.



Sample Collection

Our research started with students collecting two liters of water from Cazenovia Creek located at the Ridge Road bridge.



Sample Collection, Cazenovia Creek at Ridge Road (October 6, 2022, 8:00 am)



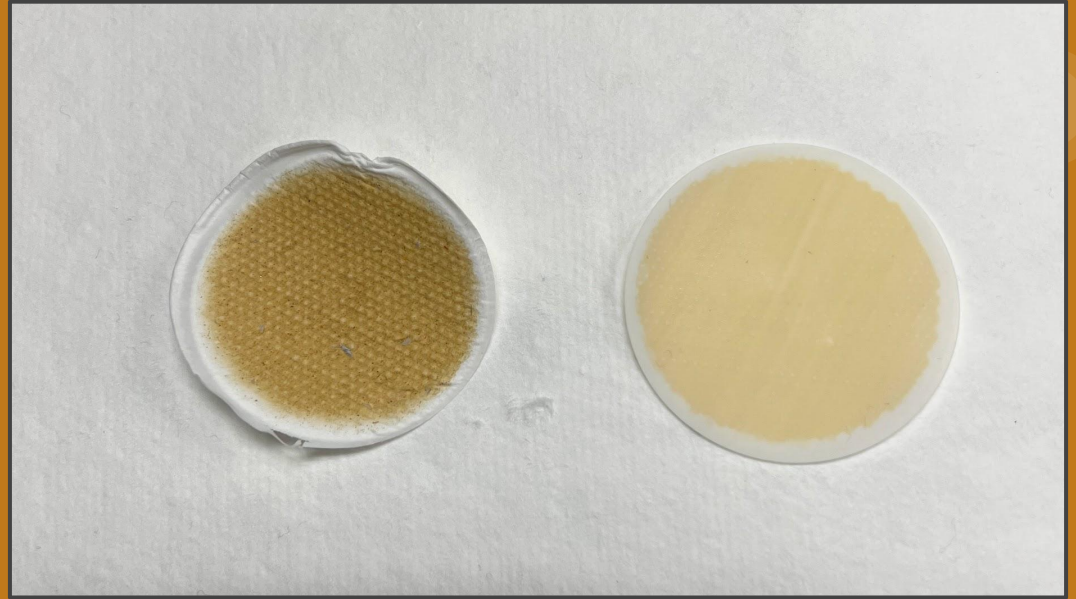
Water collection device

Laboratory Experience

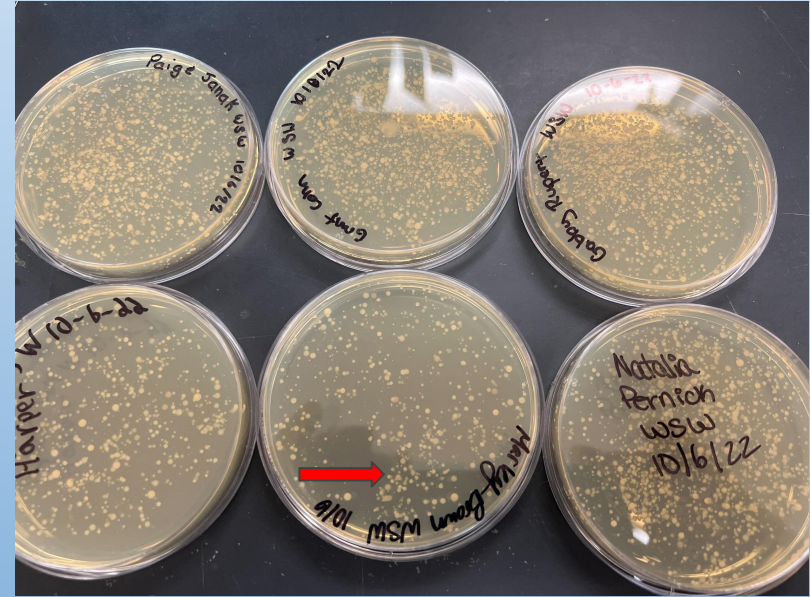


Students working closely with Dr. Koury on our first day in a clinical laboratory setting.

Sample filtration to isolate bacteria from any stream sediments

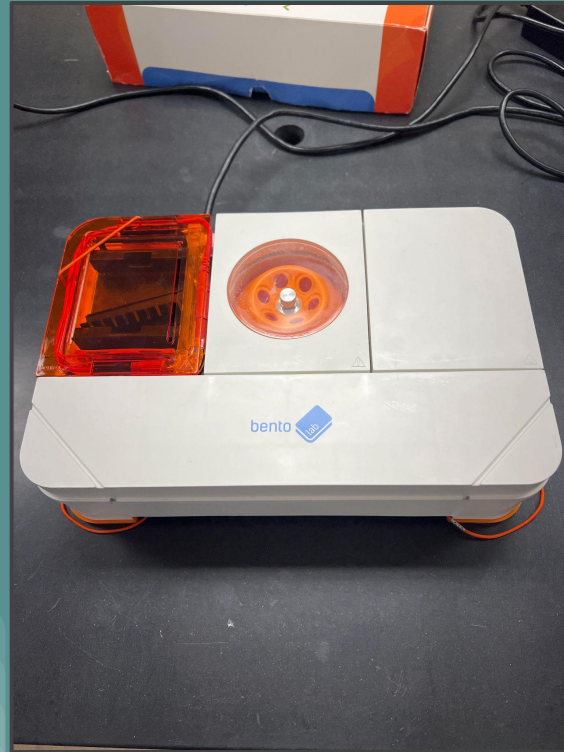


Setting Up Bacterial Growth Plates



- *Student samples after incubation
- *One colony was selected for whole genome sequencing.

Thermocyclers and instrumentation used to read and amplify DNA segments via polymerase chain reaction (PCR) to obtain enough DNA for sequencing

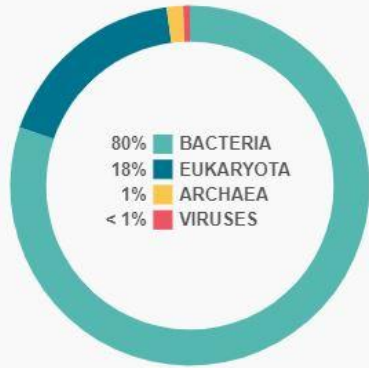


Sequencing Technology

West Seneca West students will use a new technology developed by Oxford Nanopore Technologies called MinION, which is a portable, real-time device for DNA and RNA sequencing.



Sequencing Results using MinION



READS ANALYSED
198,000

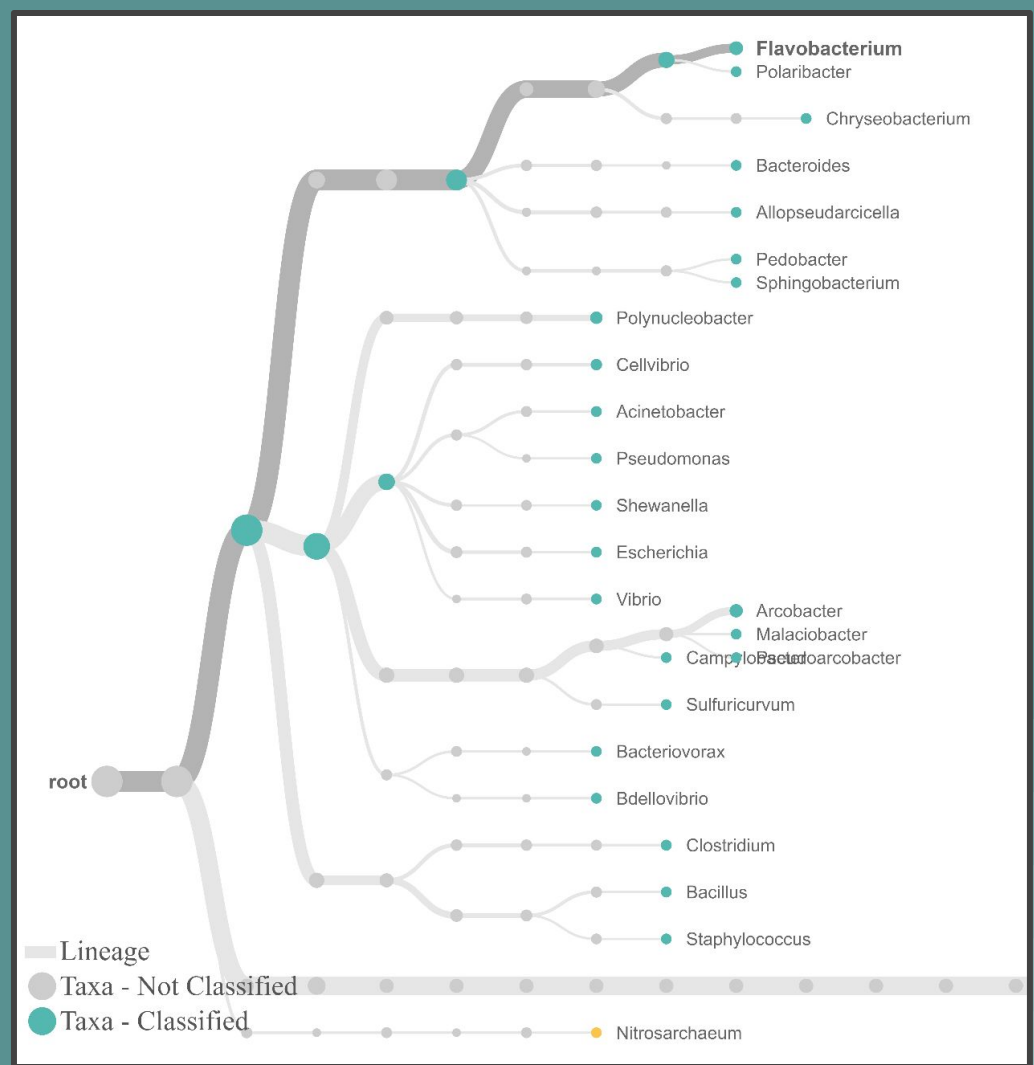
READS CLASSIFIED
42,561

READS UNCLASSIFIED
155,439

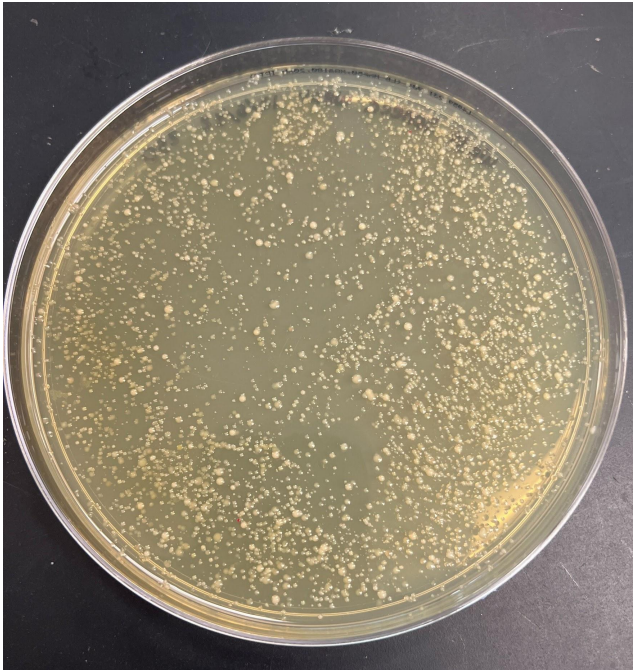
*Sample only

This phylogeny is a representation of our data when sequencing is complete. Our data will then be uploaded for anyone to use.

Using [EPI2ME](#), we can select any organism and start, continue, or add to any future research.

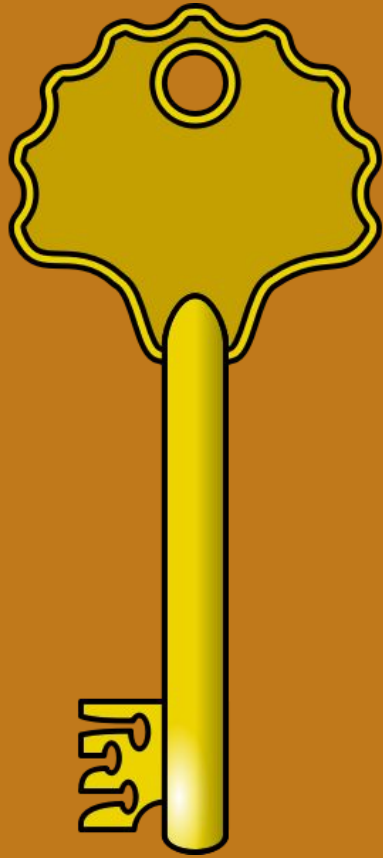


Upcoming Stages of Whole Genome Sequencing



With our selected colony grown in culture, we will extract high molecular weight DNA.

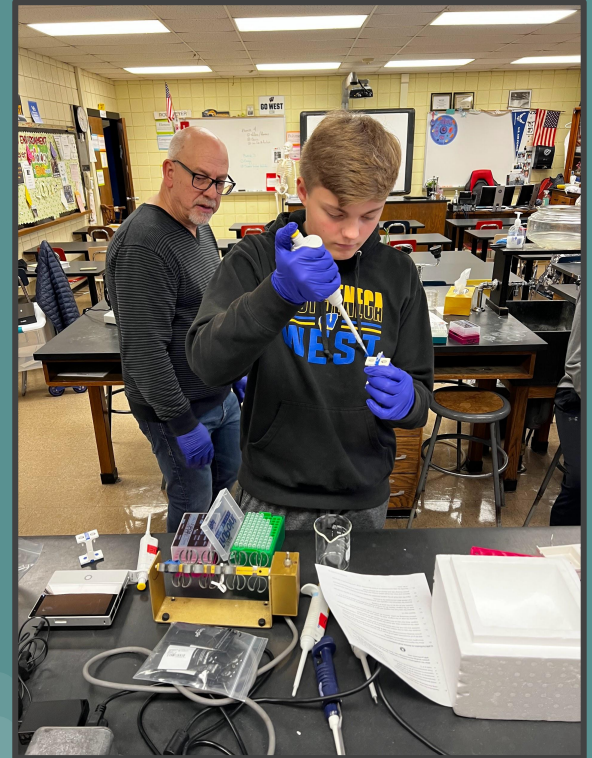
DNA sequencing libraries will be prepared with the goal of building a genome for bioinformatics analysis.



By design, this work highlights the importance of understanding the makeup of microbial communities in our waterways.

This data can help safeguard local resources for current and future generations through education and policy.

Student/Teacher Experience



This project has provided an invaluable experience for our students. When completed, they will have gained an extraordinary view of bioinformatics, research, and STEM programs available. They will also have their names forever attached to genuine genetic research. We could not thank Dr. Koury enough for opening this up to our kids and teachers in West Seneca.

