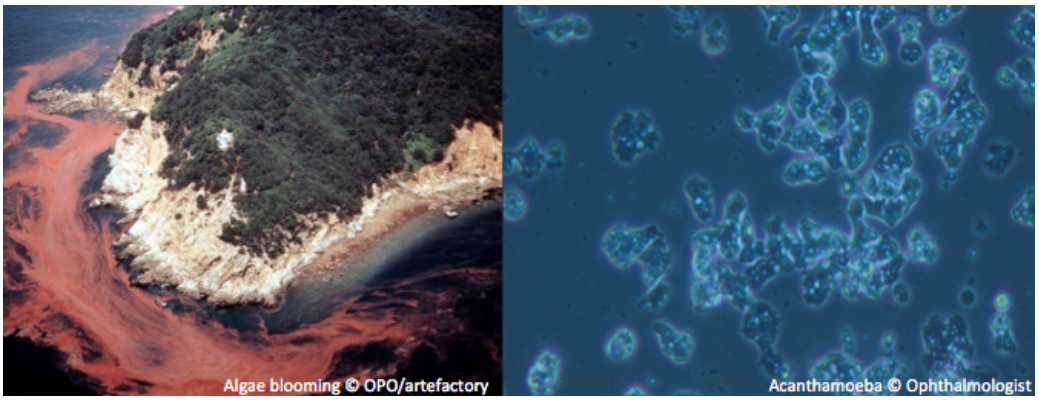
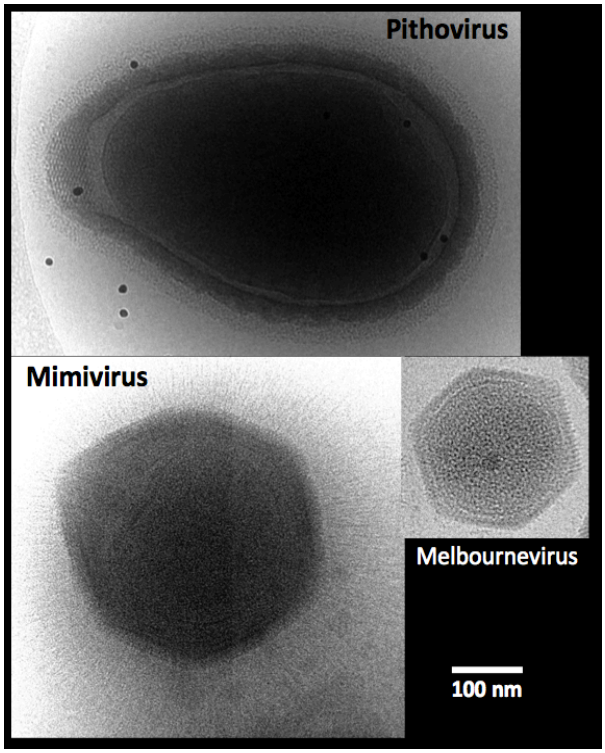
## Isolating new and mysterious viruses in our environment (Master degree project/Internship/research training)

***"I am looking for a motivated student of learning how to isolate new viruses from our environment and how to characterize them using molecular and structural approaches."***

A vast number of viruses present in our environment, as witness the fact that they comprise ~94 % of total nucleic-acid-containing particles in the oceans. These environmental viruses infect to unicellular organisms (e.g. algae/amoeba) and could affect an ecosystem such as energy cycles and the structure of microbial communities. These viruses are sometimes unexpectedly giant.




**Giant viruses**

What is the definition of a virus? People often imagine that viruses exist in a very small world. We clearly defined viruses as being different from cellular organisms such as bacteria and eukaryotic cells. However, these definitions grew outdated after the first giant amoebal Mimivirus was isolated. Researchers have reported a large variety of giant viruses in terms of shape and size, including the largest-ever Pithovirus (isolated from the 30,000-years-old core of the Siberian permafrost). Beyond size, these giant viruses possess non-virus-like structural properties similar to bacteria or eukaryotic cells; thus, they blur the lines between viruses and cellular organisms. The massive population of giant viruses in our environment continues to remain a mystery.

The project focuses on these environmental viruses and is composed of two steps.

**STEP 1. Propagation, purification and characterization of giant viruses.** The student will learn basic virology and molecular biology for characterizing viruses. This includes figuring out their mysterious structural traits using an electron microscope.

**STEP 2. Isolation of new algae/amoeba viruses from environmental water/soil samples.** We will isolate viruses from water samples collected in Swedish lake using algae/amoeba cells. The student can bring own water/soil samples for testing if she/he likes. The student will use any methods learned in STEP 1 for characterizing the newly isolated viruses.

**For further information, please contact Kenta Okamoto.**
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**References**

1. Okamoto, K., et al., Cryo-EM of a Marseilleviridae virus particle reveals a large internal microassembly. *Virology*, **516**, 239-245 (2018)

2. Okamoto, K., et al., Structural variability and complexity of the giant *Pithovirus sibericum* particle revealed by high-voltage electron cryo-tomography and energy-filtered electron cryo-microscopy. *Sci Rep*, **7** (1), 13291 (2017)