Creating avenues for environmental monitoring

Using the open-source OpenFlexure microscope (OFM) in education and research

Per Wilhelmsson (Dr. rer. nat.) – PKI Utveckling AB
&
Vattenhallen Science Center Lunds universitet

VATTENHALLEN
SCIENCE CENTER

Open-source hardware and the OpenFlexure project

open source hardware

*… design is made **publicly available** so that **anyone can study, modify, distribute, make**, and **sell** the design or hardware based on that design.*

The OpenFlexure Project

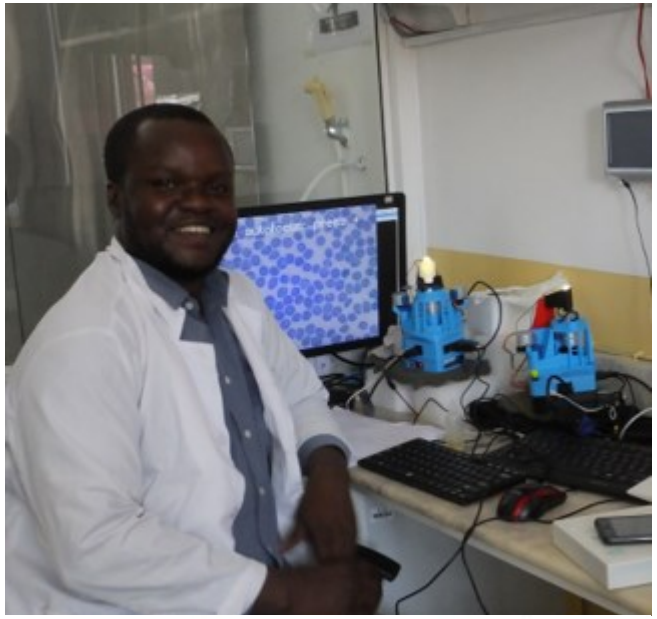
- Richard Bowman et al. University of Cambridge
- High quality microscopy available to anyone!
- 3D-printed parts and off the shelf components (~250€)
- User friendly lab-grade microscopes for a fraction of traditional prices
- Active community guarantees quality control and continued development of new features

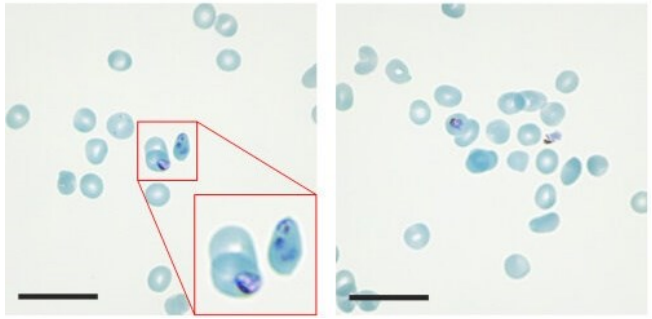
Credit: Joel Collins

"**the whole system of Patents … is one productive of immense evil.**" Isambard Kingdom Brunel 1851, leading engineer during the industrial revolution.

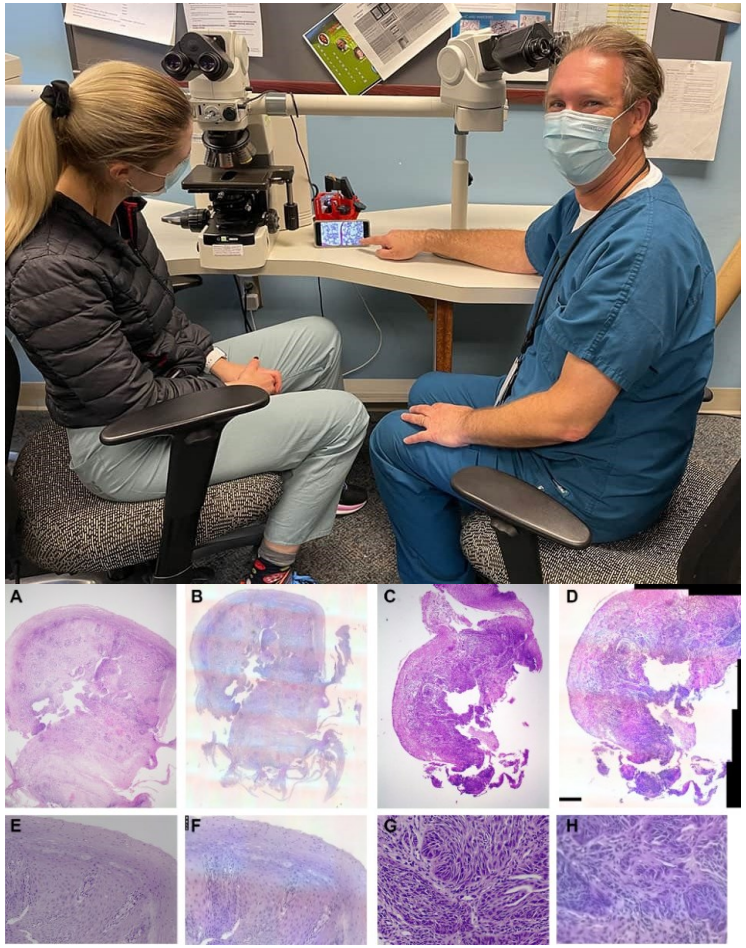
OFM - applications and recognition

Malaria detection - Africa





Pathology - USA, South America & Africa



WHO innovative health technologies

Environmental monitoring in educational settings

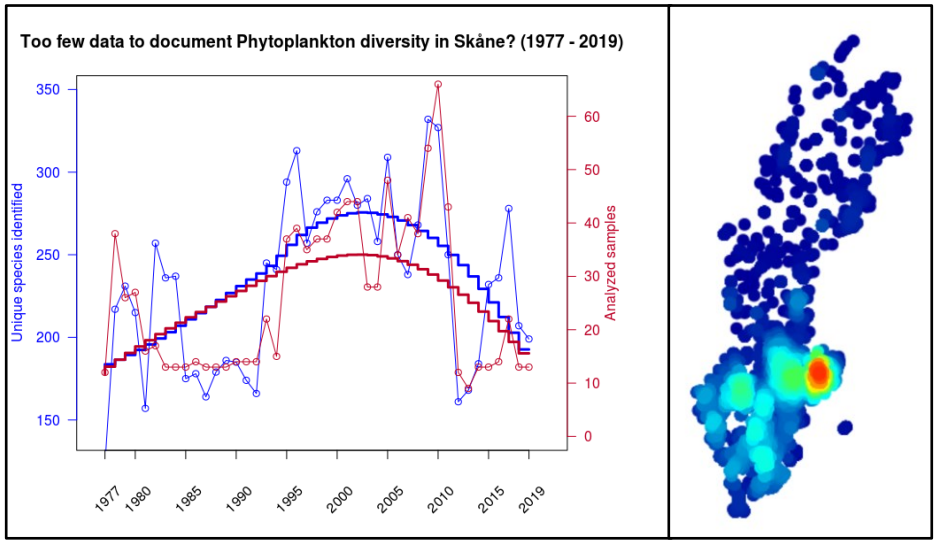
Microscopic organisms are the backbone in our global ecosystem

Rapidly changing climate pose a significant stress factor on ecosystems

More data is required to understand biogeographic changes

Challenges

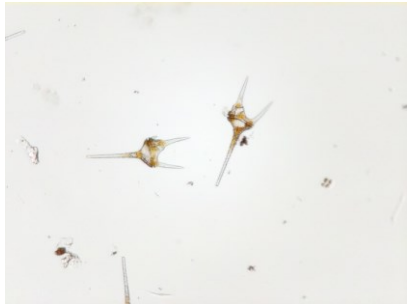
- **Expensive methodology** resulting in **few samples** being analysed thus **limiting** our **understanding**

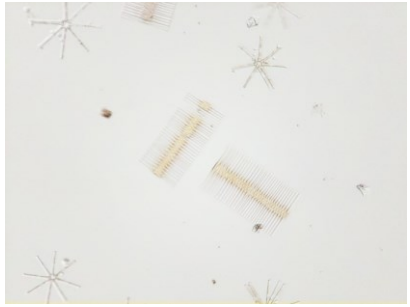


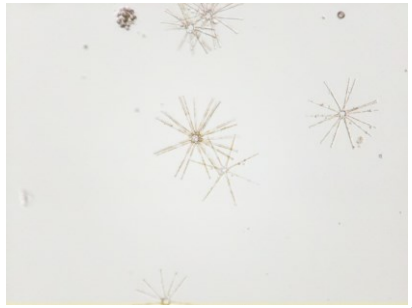
The figure on the left (unpublished results) highlights the need of more inventory data. Using the available national database of environmental data (https://miljodata.slu.se/MVM/) we can see that in Skåne, the southmost province of Sweden, the observed diversity of freshwater phytoplankton highly correlates with the number of samples analysed. The only way to get rid of this bias, and get a clear view of the situation, is to collect and process more samples. The figure on the right highlights the geographic bias on a national level with regards to recently analysed freshwater phytoplankton samples.

Can open-source microscopes contribute?

- **Increased access** to high quality **microscopes** will make it possible to **collect more environmental data!**

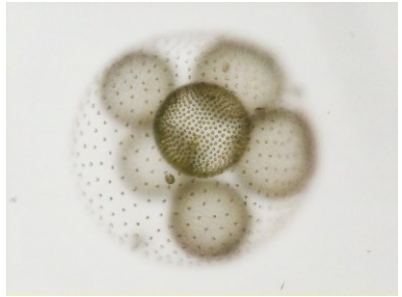


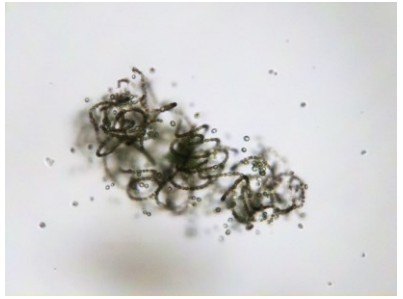


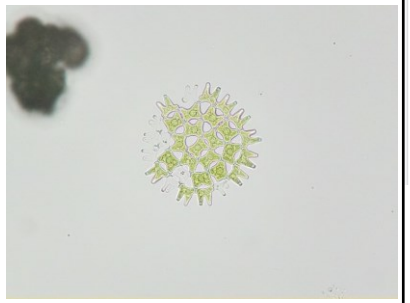


Sjölabbet - Build your own microscope!

- Educational workshop aimed towards teachers and students
- Help participants develop the skills to build and use the OFM
- Provide information on how to collect and share data through national databases

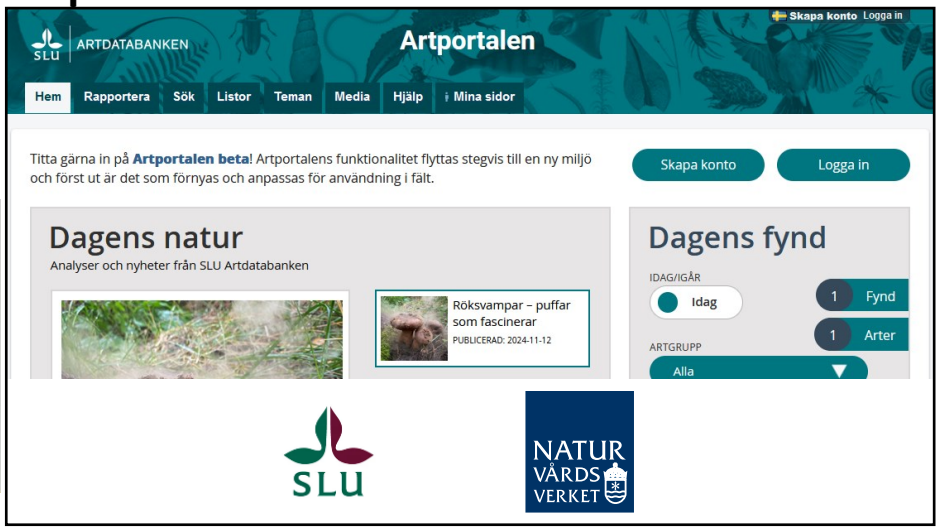






nordicmicroalgae.org

artportalen.se



Sjölabbet - Goals

Creating avenues for environmental monitoring – engaging more people

Bridge the gap between the environmentally interested and environmental research

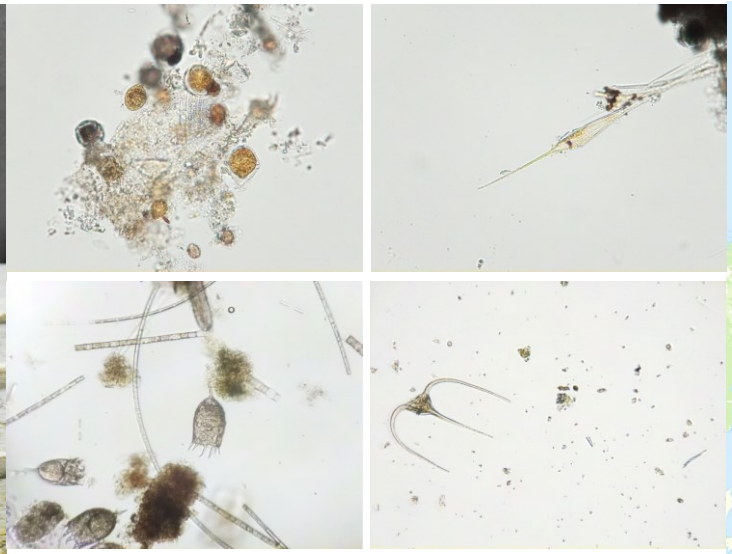
Raise awareness of environmental and biodiversity research, open science, open hardware and the democratisation of science and technology

Contribute towards a better understanding of the environment!

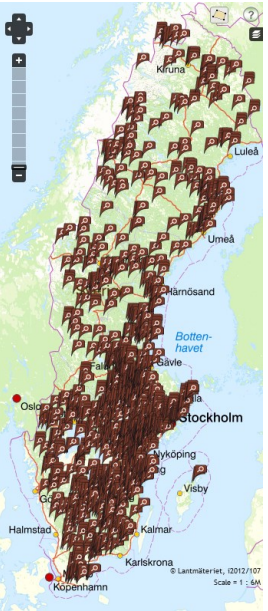
Assemble

Use

Collect



Share



Useful links

The OpenFlexure project

https://openflexure.org/

https://openflexure.discourse.group/

Sjölabbet announcement

https://www.vattenhallen.lu.se/skola/fortbildning/sjoelabbet/

Summary of Sjölabbet 18/6 (2024) experience as a blogpost for https://www.openscienceshop.org/

https://www.openscienceshop.org/building-open-science-hardware-with-secondary-school-teachers/

National environmental databases

https://nordicmicroalgae.org/

https://www.artportalen.se/

Gathering for Open Science Hardware (GOSH)

https://openhardware.science/

My personal webpage summarising this initiative

https://pkiw.github.io/