

# KBC DAYS 2022

**8-9 November**

Programme - Research Infrastructures -  
Visual Abstracts - Participants



# DAY 1, Tuesday 8 November

## SESSION 1:

Chairperson: Stefan Björklund

- 9.00 Welcome**  
Stefan Björklund  
Scientific Coordinator of KBC
- 9.10 Opening of the KBC DAYS 2022**  
Pernilla Christensen  
Deputy Dean, Faculty of Forest Sciences, Swedish University of Agricultural Sciences
- 9.20 "Elevator talks" presentations by PhD students (part I)**  
(2 minutes each)
- **#1 Chemistry in thin water films on mineral surfaces**  
N. Tan Luong, Department of Chemistry, Umeå University
  - **#2 Role of bacterial vesicle associated toxin in potential treatment of cancer**  
Palwasha Baryalai, Department of Molecular Biology, Umeå University
  - **#3 Is the key of solving the plastic problem in a desert of salt in Bolivia?**  
Diego Alejandro Miranda, Department of Chemistry, Umeå University
  - **#4 How strongly do plant cells stick together?**  
Léa Bogdziewicz, Umeå Plant Science Centre, Department of Forest Genetics and Plant Physiology, Swedish University of Agricultural Sciences
  - **#5 Stopping nerves to stop cancer**  
Luz María González Castrillón, Department of Integrative Medical Biology, Umeå University
- 9.30 Keynote lecture I: Data Driven Life Science.**  
**Part I: An update on the new Wallenberg program;**  
**Part II: Understanding molecular mechanisms of malaria transmission at genome scale**  
Oliver Billker  
Member of the DDLs Steering Group and Director of Molecular Infection Medicine Sweden (MIMS), Department of Molecular Biology, Umeå University

# DAY 1, Tuesday 8 November

## 10.15 "Elevator talks" presentations by PhD students (part II) (2 minutes each)

- **#6 Unraveling the Secrets of Antibiotic Resistance Transfer**  
Annika Breidenstein, Department of Medical Biochemistry and Biophysics, Umeå University
- **#7 Connecting phenotypes and genotypes in Swedish aspen trees**  
Mikko Luomaranta, Umeå Plant Science Centre, Department of Plant Physiology, Umeå University
- **#8 What makes a tree a tree?**  
Eduardo Rodriguez Soldado, Umeå Plant Science Centre, Department of Plant Physiology, Umeå University
- **#9 Secreting proteins, snatching nutrients, blocking the immune defense - Everyday life for Chlamydia**  
Karsten Meier, Department of Molecular Biology, Umeå University
- **#10 How do spruce and pine trees experience stress?**  
Elena van Zalen, Umeå Plant Science Centre, Department of Plant Physiology, Umeå University
- **#11 What does 8 months of snow mean to plants?**  
Emil Andersen, Department of Ecology and Environmental Sciences, Umeå University

10.30 *Coffee break*

## SESSION 2: NEW FACULTY MEMBERS, AWARD AND GRANT RECIPIENTS AT KBC

*Chairperson: Stéphanie Robert*

- 10.45 dNTPs and maintenance of genome stability**  
Andrei Chabes  
Department of Medical Biochemistry and Biophysics, Umeå University
- 11.00 How plants coordinate their development, healing, and immune responses**  
Peter Marhavý  
Umeå Plant Science Centre, Department of Forest Genetics and Plant Physiology, Swedish University of Agricultural Sciences
- 11.15 Understanding signals of mitochondrial DNA instability**  
Paulina Wanrooij  
Department of Medical Biochemistry and Biophysics, Umeå University
- 11.30 Unwinding the function of four-stranded DNA structures**  
Nasim Sabouri  
Department of Medical Biochemistry and Biophysics, Umeå University

# DAY 1, Tuesday 8 November

## 11.45 **Catching up with climate: Natural and Assisted migration**

María Rosario García-Gili

Umeå Plant Science Centre, Department of Forest Genetics and Plant Physiology, Swedish University of Agricultural Sciences

12.00 *Lunch break*

## SESSION 3: PANEL DISCUSSION

### 13.00 **Panel discussion "History and future perspectives of research collaborations at KBC"**

Moderators: **Stefan Björklund**, Scientific Coordinator of KBC, and **Selma Dahmane**, Umeå Postdoc Society

Panel members:

**Bernt Eric Uhlén**, Professor at the Department of Molecular Biology

**Carl Kempe**, Kempe Stiftelsen

**Eva-Maria Diehl**, communications officer for KBC 2009-2018

**Göran Samuelsson**, Professor emeritus at the Department of Plant Physiology, Umeå Plant Science Centre

**Hans Wolf-Watz**, Professor emeritus at the Department of Molecular Biology

**Marianne Sommarin**, Professor at the Department of Plant Physiology, Umeå Plant Science Centre

**Per Gardeström**, Professor emeritus, at the Department of Plant Physiology, Umeå Plant Science Centre, Scientific Coordinator for KBC 2008-2018

## INTERACTION SESSION

### 14.00 **Visual abstracts presented by PhD students**

and

**Infrastructure Corner:** discussion with infrastructure representatives

and

**Drop-in discussion with Olga Vinnere Pettersson**, Scientific lead for the SciLifeLab Planetary Biology capability

*Coffee and cake*

# DAY 1, Tuesday 8 November

## SESSION 4: PRESENTATIONS AND KEYNOTE LECTURE II

*Chairperson: Eric Libby*

- 15.20 Data - a legal point of view**  
Johan Nordlund  
IP- and innovation lawyer, the Innovation Office, Umeå University
- 15.35 Life science data management at the SciLifeLab Data Centre**  
Johan Rung  
Head of SciLifeLab Data Centre
- 15.55 "Rapid Cycling Breeding", a new SSF project**  
Ove Nilsson  
Director of Umeå Plant Science Centre Department of Forest Genetics and Plant Physiology, Swedish University of Agricultural Science
- 16.10 PREDICT - modernising a cohort in the era of precision health**  
Beatrice Melin  
Head project leader PREDICT case cohort, Department Radiation Sciences, Umeå University
- 16.30 Keynote lecture II: Consilience through Complexity: Moving Beyond the Interdisciplinary Cookbook**  
David Krakauer  
President and William H. Miller Professor of Complex Systems, Editor in Chief SFI Press, Santa Fe Institute, USA
- 17.15 Visual abstracts viewing and mingling before the dinner starts*
- 18.00 CELEBRATION OF THE 15<sup>TH</sup> ANNIVERSARY OF KBC**  
*Gala Dinner*

## DAY 2, Wednesday 9 November

### SESSION 5: BIG DATA AND DDLS

*Chairperson: Teresa Frisan*

- 8.30 UmU Data Science Node**  
Johan Trygg  
Department of Chemistry, Umeå University
- 8.50 Planetary Biology capability at SciLifeLab**  
Olga Vinnere Pettersson  
Scientific lead for the SciLifeLab Planetary Biology capability
- 9.10 Arctic Ocean Big Data: A Polar bear view**  
Johan Wikner  
Department of Ecology and Environmental Sciences and Umeå Marine Sciences Center, Umeå University
- 9.30 Mining microbiomes for novel secondary metabolites**  
Laura Carroll  
Department of Clinical Microbiology, Umeå University
- 9.50 *Coffee break*

### SESSION 6: UMEÅ POSTDOC SOCIETY (UPS)

*Chairperson: Maximiliano Estravis Barcala*

- 10.00 Career Paths: presentations and open discussion with the former KBC postdocs**  
Moderator: **Maximiliano Estravis Barcala**, Umeå Postdoc Society  
**Shi Tang**, Research fellow, Department of Physics, Umeå University  
**Andrea Vincent**, Professor, Biology School, University of Costa Rica
- Research Highlights: short talks from current postdocs:**
- 11.00 Chloroplast signals modulate chromatin dynamics during plant greening**  
Marti Quevedo  
Umeå Plant Science Centre, Department of Plant Physiology, Umeå University
- 11.15 Ultrafast Mid-Infrared Photothermal Imaging**  
Eduardo Maia Paiva  
Department of Applied Physics and Electronics, Umeå University
- 11.30 Turning up the notch on discovery of fitness factors in an enteropathogen**  
Atin Sharma  
Department of Molecular Biology, Umeå University

## DAY 2, Wednesday 9 November

**11.45 Predicting endocrine disruption with confidence - a prioritisation strategy to identify suspect compounds of emerging concern**

Maria Sapounidou

Department of Chemistry, Umeå University

12.00 *Lunch break*

### SESSION 7: INFRASTRUCTURE PRESENTATIONS

*Chairperson: Linda Sandblad*

**13.00 Introduction**

Linda Sandblad

Director of Umeå Centre for Electron Microscopy (UCEM)

**13.05 CASP - data analysis support for life scientists**

Kate Bennet

CASP platform manager, Department of Chemistry, Umeå University

**13.15 Microscopy Facility at UPSC**

Anna Gustavsson and Martda-Derba Maceluch

Umeå Plant Science Centre Department of Plant Physiology, Umeå University and Umeå Plant Science Centre, Department of Forest Genetics and Plant Physiology, Swedish University of Agricultural Sciences

**13.25 Gas Isotope Ratio Mass Spectrometry Facility**

Dmitry Shevela

IRMS lab manager, Department of Chemistry, Umeå University

**13.35 Panel discussion**

Moderator: **Linda Sandblad**, Director of Umeå Centre for Electron Microscopy, Umeå University

Panel members:

**Supapit Wongkuna**, Department of Molecular Biology, Umeå University

**Karim Rafie**, Department of Medical Biochemistry and Biophysics, Umeå University

**Kathryn Robinson**, Umeå Plant Science Centre, Department of Plant Physiology, Umeå University

**Niklas Söderholm**, Department of Chemistry, Umeå University

14.05 *Coffee break*

## DAY 2, Wednesday 9 November

### **SESSION 8: NEW FACULTY MEMBERS, AWARD AND GRANT RECIPIENTS AT KBC**

*Chairperson: Christiane Funk*

- 14.15      Deep sequencing air to monitor entire ecosystems**  
Per Stenberg  
Department of Ecology and Environmental Sciences, Umeå University
- 14.30      How plants deal with heat and cold: Molecular mechanisms of auxin transport in response to temperature stress**  
Petra Marhava  
Umeå Plant Science Centre, Department of Forest Genetics and Plant Physiology, Swedish University of Agricultural Sciences
- 14.45      GoodFib: Towards the establishment of trees with high-yield and high-quality wood fibers for more sustainable improved feedstock (Novo Nordisk Emerging investigator grant)**  
Stéphane Verger  
Umeå Plant Science Centre, Department of Forest Genetics and Plant Physiology, Swedish University of Agricultural Sciences
- 15.00      "Trees that grow better" - A new SSF project**  
Stefan Janson  
Umeå Plant Science Centre, Department of Plant Physiology, Umeå University
- 15.15      Using AI for early identification of hazardous chemicals - PARC, a new EU funded research project**  
Patrik Andersson  
Department of Chemistry, Umeå University
- 15.30      Concluding remarks**
- 15.35      Guided tours to infrastructures ´ facilities**

# **Information from Research Infrastructures**

## Ancient and Environmental DNA Lab - aeDNA Lab

Analysis of ancient and environmental DNA (a/eDNA) is a rapidly expanding scientific field, opening exciting new possibilities to address paleoenvironmental, ecological and evolutionary research questions. The a/eDNA-based studies require DNA-free working environment to eliminate false signals from modern DNA contamination. To facilitate and promote innovative research development in paleoecology, evolutionary biology and aquatic ecology, where Umeå University has strong research groups, the Department of Ecology and Environmental Science (EMG) established an a/eDNA lab in 2018. This made it possible to process soil, peat bog, lake sediment and water samples in-house at Umeå University for subsequent DNA preparations, and cuts down the contamination risk and processing time for all projects.

### LAB INFORMATION

- The lab is located in the basement of NC building. It consists of a shower room, 1st preparation room, 2nd preparation room (here you change to clean suit, mask, etc.), and the operation lab.
- The operation lab has positive air pressure, accompanied by a HEPA air filter system at 40 l/s.
- Both the preparation room and the operation lab have UV sterilization system and alarms installed.
- The a/eDNA lab provides the space for DNA extraction and pre-PCR preparations. The lab contains a -20°C freezer, a 4°C fridge, a droplet generator (for droplet digital PCR only), a centrifuge for Eppendorf tubes, an UV crosslinker, an oven with rotators, a biological hood, a notebook computer, shelves, and working benches.

### TASKS THAT CAN BE PERFORMED IN THIS LAB

- DNA extraction from paleo- and environmental samples
- a/eDNA storage
- Pre-DNA amplification (PCR) preparations
- Droplets generation for droplet digital PCR (ddPCR) for DNA quantification
- Total DNA/RNA quantification using Fluorometer (Qubit)
- Library preparation for metagenomics

### STEERING BOARD

Xiao-Ru Wang, Jonatan Klaminder and Christian Bigler  
Department of Ecology and Environmental Science (EMG)

### MANAGEMENT

Access to and utilization of the lab is coordinated and managed by Xiao-Ru Wang, Doreen Huang and David Hall (EMG).

### CONTACTS

Xiao-Ru Wang, [xiao-ru.wang@umu.se](mailto:xiao-ru.wang@umu.se), 090-786 9955  
Doreen Huang, [doreen.huang@umu.se](mailto:doreen.huang@umu.se)  
David Hall, [david.hall@umu.se](mailto:david.hall@umu.se)

### MORE INFORMATION

Homepage is under construction

# Research Infrastructures

## The Biogeochemical Analytical Facility - BAF

The infrastructure provides instruments for analysis of key chemical parameters in terrestrial and aquatic biogeochemical and ecological research and as such is of major interest for a large range of research groups.

BAF act as a core analytical facility for several major research projects run by researcher at EMG together with their collaborators and is also open for other users at Umeå and other universities.

### INSTRUMENTS

The facility covers a scope of different instruments including:

- Gas chromatograph (set up for analyses of CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O (FID, ECD)) - Perkin Elmer, Clarus 500
- TOC/TN analyzer (also including particulate carbon) - Skalar, Formacs HTI
- Nutrient analyzer (NO<sub>3</sub>+NO<sub>2</sub>, NH<sub>4</sub>, PO<sub>4</sub>, TN, TP) - Seal Analytical, QuAAtro -39
- Fluorometer - Perkin Elmer, LS55
- Flow cytometer - BD Instrument, Facs, Verse
- Respicond facility (to measure respiration)
- Inverted microscope also with epifluorescence and cameras - Nikon, Eclipse TE 2000 and Eclipse Ti

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### CONTACTS

For analyses contact: Anders Jonsson  
Department of Ecology and Environmental Sciences  
Mobile: 070-2778659  
E-mail: [anders.jonsson@umu.se](mailto:anders.jonsson@umu.se)

### MORE INFORMATION

<https://www.umu.se/en/research/infrastructure/baf/>



## Biopolymer Analytical Platform - BAP

The Biopolymer Analytical Platform (BAP) is dedicated to support research among KBC groups on cell walls of terrestrial and aquatic plants, and biopolymer materials. Our competence lies in applying a large range of standard methods for the analysis of lignocellulose, as well as in fine detection of soluble sugars and starch. The methods include carbohydrate and lignin composition analysis using conventional wet chemistry and state-of-the-art analytical devices. The instrumental backbone for many of those methods is gas chromatography/mass spectrometry (GC/MS). Pyrolysis-GC/MS is one of the most important analytical tools that quickly yields highly reproducible and comprehensive chemical fingerprinting of carbohydrate and lignin types in samples in the lower microgram range.

Postdocs, PhD students or project students with good lab work skills are required to do sample preparation in the BAP lab. We also provide an option to hire a professional staff hourly, in case your group has a lack of lab workers for sample preparation. It is possible to try a new method with us in the form of a project.

### EXAMPLES FOR APPLICATIONS

- Pyrolysis-GC/MS for carbohydrate and lignin (G, S and H types) content estimation and for identification of organic compounds in soil/sediment
- TMS/Alditol acetate sugar-GC/MS for monosaccharide composition analysis
- Updegraff cellulose/anthrone assay for crystalline cellulose determination
- Klason and acetyl bromide lignin assay for lignin determination
- Enzymatic assays for soluble sugars and starch detection
- Size exclusion chromatography (SEC) for determination of MW, DP etc. of lignocellulose polymers
- Sample preparation and extraction using accelerated solvent extractor (ASE) 350

### CONTACT

First contact for the customer: Laboratory manager, Junko Takahashi-Schmidt ([Junko.TS@slu.se](mailto:Junko.TS@slu.se)). We are in KBC G5

### STEERING COMMITTEE

Totte Niittylä (Director), Dept. of Forest Genetics and Plant Physiology, SLU  
Ewa Mellerowicz, Dept. of Forest Genetics and Plant Physiology, SLU  
Hannele Tuominen, Dept. of Forest Genetics and Plant Physiology, SLU  
Leif Jönsson, Dept. of Chemistry, UmU  
Ola Sundman, Dept. of Chemistry, UmU  
Junko Takahashi-Schmidt, Dept. of Forest Genetics and Plant Physiology, SLU

### MORE INFORMATION

<https://www.upsc.se/platforms/cell-wall-analysis/4845-biopolymer-analytical-platform.html>



## The Biochemical Imaging Centre Umeå - BICU

The Biochemical Imaging Centre Umeå (BICU) provides state-of-the-art imaging technology including advanced light microscopy and characterization of biomolecules and their interactions. BICU is an open-access imaging centre that offers cutting-edge technologies to researchers all over Sweden. Detailed information regarding our imaging centre organization and user fees can be found on our webpage.

We provide access and training to wide range of instruments including widefield, confocal and TIRF microscopy, FLIM, FLIM-FRET, FRAP and live cell imaging for an optimal spatial and temporal resolution. Furthermore, the centre provides real-time quantification of binding of biosensors through solid-phase interaction techniques. Apart from providing microscopy services we also actively take part in programs aimed at training young researchers in the use of the basic as well as advanced microscopy techniques and basic image analysis.

BICU is part of a National Microscopy Infrastructure (NMI): a Swedish infrastructure for the use and support of advanced microscopy in life science. The mission of NMI is to provide faster access to innovative technology and competence in microscopy for the life science research community. NMI also coordinates national and international knowledge exchange programs in microscopy. NMI in Umeå is the node specialized for advanced correlative imaging techniques. Hereby, BICU closely collaborates with Umeå Centre for Electron Microscopy (UCEM) to provide accessibility to various correlative light and electron microscopy (CLEM) techniques both in room temperature and cryo.

### CONTACTS

Facility Director: Richard Lundmark, [richard.lundmark@umu.se](mailto:richard.lundmark@umu.se)

Facility Manager: Irene Martinez Carrasco, [irene.martinez@umu.se](mailto:irene.martinez@umu.se)

Senior Research Engineer for CLEM: Naga Venkata Gayathri Vegesna, [gayathri.vegesna@umu.se](mailto:gayathri.vegesna@umu.se)

Research Engineer for Affinity: Johan Olofsson Edlund, [johan.olofsson.edlund@umu.se](mailto:johan.olofsson.edlund@umu.se)

### MORE INFORMATION

<https://www.umu.se/en/research/infrastructure/biochemical-imaging-centre-umea-bicu/>



# Research Infrastructures

## **Bioinformatics Coordinator - National Genomics Infrastructure - NGI**

The National Genomics Infrastructure (NGI) is the largest technical platform within SciLifeLab and provides access to technology for massively parallel next-generation sequencing, genotyping, proteomics and associated bioinformatics support. The platform comprises of three nodes: NGI Stockholm, SNP&SEQ Technology Platform and Uppsala Genome Center. Next-generation DNA sequencing techniques can be used for a variety of studies: whole genome re-sequencing, de novo sequencing, transcriptome profiling including quantification and identification of transcript isoforms and miRNAs, ChIP-seq to detect transcription binding sites across the genome, and targeted sequencing of amplicons such as 16S rRNA genes and metagenomic sequencing of microflora genomes. NGI provides options for both short-read and long-read sequencing. Modern genome analyses critically depend on expertise in computational biology. Such expertise is closely integrated with the National Genomics Infrastructure unit to optimize throughput, data handling, and basic analysis. .

### **CONTACTS**

Kristina Benevides, NGI/SciLifeLab, Umeå/Solna, Sweden  
[kristina.benevides@umu.se](mailto:kristina.benevides@umu.se)

### **MORE INFORMATION**

<https://ngisweden.scilifelab.se/>



## Computational Analytic Support Platform - CASP

The Computational Analytics Support Platform (CASP) is a data analytics service at Umeå University (UmU), launched during 2021, within the framework of the Computational Life Science Cluster (CLiC), an Umeå node and representative within NBIS (National Bioinformatics Infrastructure Sweden). CASP is a local KBC infrastructure that primarily supports, but also trains life scientists in the analysis of experimental data using data-driven tools and strategies. We focus on the analysis of data from a wide range of technologies including, but not limited to, downstream omics (metabolomics/proteomics), spectroscopy and imaging.

Our aim is to bridge the gap between data science and life science, allowing researchers to convert complex data into meaningful biological and chemical interpretations via the use of advanced data-driven tools and strategies. Combined, the group have strong expertise in data-driven life science, in addition to wide domain expert knowledge arising from active engagement with multiple projects in the 'omics' area and beyond. This allows a full understanding of the researcher's needs, not only in terms of the data analysis, but also in how the data was generated and equally important, the interpretation of the biology behind the project.

### Support packages we provide

- Packaged and customer-specific data analytics projects
- One-to-one consultations for data analysis support
- Personalised tutorials including theoretical knowledge and hands-on experience using data analysis and processing software
- Extended data analytics support for high-throughput experimental platforms including the Swedish Metabolomics Centre

### Services we provide

- Statistical experimental design
- Multivariate data analysis
- Image analysis
- Deep learning and machine learning
- Pathway analysis and interpretation
- Publishing

### CONTACTS

Please contact the Platform Manager Kate Bennett ([katie.bennett@umu.se](mailto:katie.bennett@umu.se)). We can help with the analysis of many different data types so please feel free to contact us and we will be happy to answer your questions.

We look forward to supporting you in your projects!

### MORE INFORMATION

<https://www.umu.se/en/research/infrastructure/computational-analytics-support-platform-casp/>



## Chemical Biology Consortium Sweden - CBCS

CBCS aims to help researchers identify and develop small molecules that affect their biological system of interest. Using small molecules to decipher and understand the function of biological pathways can give you powerful research tools and set the ground for generating new leads for drug discovery. CBCS Umeå is part of the national SciLifeLab infrastructure service in Chemical Biology and has served researchers in Sweden for over ten years. Since 2022 the infrastructure has grown to include nodes at all six Universities and expanded the portfolio of new services to include, e.g., screening in BSL-3, cell painting and functional precision medicine. CBCS national services are available to all users.

CBCS Umeå offers research facilities, equipment, user clubs and staff with expertise in assay development, small molecule screening, medicinal and computational chemistry, and profiling of compound quality. In addition, we have a state-of-the-art compound collection for screening projects and a research collaboration with AstraZeneca that provides access for academic researchers to their annotated small molecule library of 14,000 compounds, targeting over 1,700 human proteins.

Consultations and smaller service projects are offered on a first-come, first-served basis, while more extensive screening and chemistry projects are made available through a peer-review process. Projects are prioritised based on merit, scientific impact, and practical feasibility. The instrument park at CBCS Umeå can be accessed through collaborative forms or user agreements.

### EQUIPMENT AT CBCS UMEÅ

- Plate readers; Biotek Synergy H4 and BMG ClarioStar
- High Content Screening Microscope – Molecular Devices ImageXpress
- High Throughput Flowcytometry - Sartorius IQUE3
- Liquid handling robotics; BC NxP, 96- and 384-wel, Wellmate.
- HPLC, Gilson & Shimadzu, fully equipped chemistry labs.

### SERVICES PROVIDED

- Development of biological assays (e.g., bacteria, yeast, cells, organelles, viruses) for high-throughput screening
- Biochemical (target based) and cell-based high-throughput screening
- High-throughput flow cytometry and imaging technology
- Organic chemistry and synthesis / Computational chemistry & modelling
- General expertise in preparative and analytical chemistry
- Course; Introduction to High Throughput Screening

### CONTACTS

Department of Chemistry, KBC-building, Floor 4C  
Erik Chorell: [erik.chorell@umu.se](mailto:erik.chorell@umu.se)  
Stina Berglund Fick: [stina.berglund.fick@umu.se](mailto:stina.berglund.fick@umu.se)

### MORE INFORMATION

[www.cbcs.se](http://www.cbcs.se) ; [www.scilifelab.se/units/cbcs](http://www.scilifelab.se/units/cbcs);  
[www.umu.se/en/research/infrastructure/cbcs](http://www.umu.se/en/research/infrastructure/cbcs)



## The Single Cell Detection Facility: Fluorescence *In Situ* Hybridization - FISH

for environmental, clinical, food and biotechnology research

The goal of the Single Cell Detection Facility is to employ Fluorescence In Situ Hybridization (FISH) to identify genes in intact whole cells or viruses in their natural environment - without cultivation nor nucleic acid extraction. FISH can therefore complement not only other microscope based studies but also disruptive molecular biological methods, which rely on the extraction of cell components such as DNA. Thus, FISH can retrieve the information that is otherwise lost when extracting cell components, such as morphology, distribution, single cell activity and association with other cells or viruses.

FISH can be employed in different samples (environmental, clinical, food, industry/ biotechnology), and can target all cell types (Archaea, Bacteria, Eukarya) and certain viruses. The most common gene target for cell identification is the ribosomal gene, but new techniques are emerging that will also allow the in situ detection of other genes, such as housekeeping genes, functional genes, and pathological genes. FISH can also be combined with many other methods, such as cultivation, molecular methods, radioactive/isotope methods, flow cytometry, RAMAN spectroscopy, mass spectrometry, and spectral imaging.

The KBC FISH research facility is located at the department of medical biochemistry and biophysics, and is managed by Natuschka Lee. The research facility contains all equipment necessary for FISH, including a large collection of gene probes for various taxa, reference samples, and a high performance computer for bioinformatics with a gene sequence database for phylogenetic studies, gene probe evaluation and design. Today, FISH is included in different research projects at UmU and outside, e.g. in plant, fungal and animal biology, microbial geocology, pathogen detection, and different industrial applications, e.g. wastewater treatment, pulp and paper industry, and food production. Within the near future, two kinds of courses will be organized at KBC: a) introduction into the bioinformatic package ARB for phylogeny and biomarker design; b) overview of different FISH techniques for different research fields (environmental, clinical, industrial).

### CONTACT

Natuschka Lee, Lab Microbial Geocology and Astrobiology, Department of Ecology and Environmental Science and Department of Medical Biochemistry and Biophysics, Chemical Biological Center (KBC), Umeå University. E-mail: [natuschka.lee@umu.se](mailto:natuschka.lee@umu.se)

#### References:

- Lee NM. 2018. Whole Cell Identification of Microorganisms in their Natural Environment with FISH. Analytical Geomicrobiology. Cambridge University Press. Eds: D Alessi, H Veeramani, J Kenney, pp.187-212.
- Borecki G, Lee NM. 2016. Rapid Microscope Based Identification Method for Tuberculosis and Other Mycobacteria: FISH. Tuberculosis. SMGebooks, USA.

### MORE INFORMATION

<https://www.umu.se/en/research/infrastructure/fluorescence-in-situ-hybridization-fish/>



# Research Infrastructures

## High Performance Computing Center North - HPC2N

**High Performance Computing Center North (HPC2N)** is a national center for Scientific and Parallel Computing.

We are a collaboration between universities and research institutes who form a competence network for high performance and parallel computing, grid and cloud computing, scientific visualization and virtual reality (VR), as well as effective mass-storage solutions, in Northern Sweden. The primary objective of the center is to raise the national level of competence in HPC and to transfer HPC knowledge and technology to new users in academia and industry.

The Director of HPC2N is Professor Paolo Bientinesi from the Computing Science Department.

We offer different types of hardware for computing and visualization including standard CPUs and Graphical Processing Units (GPU)s. Most common packages for Scientific Research are installed on our cluster for instance GROMACS, VASP, MATLAB, R, among others.

To get started with our system, we offer different types of training courses including introductory courses, and more specialized courses in topics such as Molecular Dynamics, QM/MM, Git, R, Machine Learning, MPI, Julia, and OpenMP.

We provide a general support through a ticket system and a more advanced support for specific questions from researchers on-demand. .

### CONTACT

For general questions: [info@hpc2n.umu.se](mailto:info@hpc2n.umu.se)

**Visiting address:**  
Umeå University  
MIT-building  
HPC2N  
Campustorget 5, 4th  
S-907 36 Umeå  
Sweden

### MORE INFORMATION

<https://www.hpc2n.umu.se/>



# Research Infrastructures

## National Research Infrastructure for Data Visualization - InfraVis

InfraVis is a Swedish national research infrastructure for visualization of all kinds of research data. InfraVis gives researchers around Sweden access to combined state-of-the-art visualization competence and knowledge across nine partner universities. This makes it possible for InfraVis to quickly put together application expert teams to provide the best visualization support for a given research project. In so doing, InfraVis supports research workflow, enables scientific discovery through visualization and helps researchers communicate their scientific output in a clear and interactive manner.

### InfraVis can help you with

- Visualization of all kinds of research data
- Multidimensional visual analytics
- Time series interactive visualizations
- Visualizations resulting from physical simulations
- 3D modelling and animation for scientific research and communication
- Immersive interactive visualizations in VR/AR

And more...

### CONTACT

Do you need data visualization support?

Contact us via <https://infravis.se/helpdesk/>

Roger Mähler, Node Coordinator for InfraVis at Humlab Umeå University,  
[roger.mahler@umu.se](mailto:roger.mahler@umu.se)

Subscribe to InfraVis National Newsletter:

<https://ui.ungpd.com/Surveys/67d46498-6b6d-4530-85d4-49c17de54361>

Fill in InfraVis User Needs Survey:

<https://sunet.artologik.net/gu/Survey/19279>

### MORE INFORMATION

<https://infravis.se/>; <https://www.umu.se/forskning/infrastruktur/infravis/>



# Research Infrastructures

## NanoLab

NanoLab is an open-access infrastructure located at the Department of Physics. It is a classified Class 100 cleanroom which comprises a variety of advanced fabrication and characterization setups, including, **thin-film deposition system (PVD75 thermal evaporator)**, **nanoimprinter (Obducat NIL 2.5)**, **mask aligner (Karl Süss Mask Aligner MJB3)**, **X-ray diffractometer (PANalytical Xpert3 Powder)**, **optical tensiometer (Attension Theta)**, **low-pressure plasma system (diener electronics ATTO)**, **Four-Point Probe system**, **High Vacuum AFM**, as well as number of standard pieces of equipment, such as spin coaters, optical microscopes, vacuum ovens, hotplates, UV- curing boxes, analytical scales, etc. , visit NanoLabs website for more technical details, specific parameters and requirements for each individual equipment.

Original manuals and short user manuals for all equipment are to be found in KBC website and in the NanoLab.

The equipment in NanoLab is made available to all scientists at Umeå University, as well as external institutions.

Besides the equipment available in the Nanolab, the Nanolab offers space for user´s own experiment inside the cleanroom. Users have access to fume hoods and central gases (N<sub>2</sub>, Ar, H<sub>2</sub>, O<sub>2</sub>, liquid CO<sub>2</sub>, compressed air) and vacuum in each working station and inside the fume hoods.

Trainings are offered annually for using the cleanroom and for the most of the equipment. Check KBC or Nanolab homepage for recent course announcements or contact Dr. Roushdey Salh (the coordinator of the NanoLab).

The infrastructure is supported by KBC and supervised by experts from department of Physics, Microbiology, and Applied physics and electronics. The NanoLab is used for both research and to educate student in advanced levels.

The NanoLab has special environment, with this unique opportunity comes many responsibilities and restrictions. All users are kindly asked follow the general rules of a cleanroom and to keep an active eye on the overall facilities and taking part in improving the cleanroom. Therefore, every user must take part in the cleanroom training seminar before having the license to use the NanoLab and the facilities independently. .

## CONTACT

Roushdey Salh, [roushdey.salh@physics.umu.se](mailto:roushdey.salh@physics.umu.se)

## MORE INFORMATION

<https://www.umu.se/en/research/infrastructure/nanolab/>



## National Bioinformatics Infrastructure Sweden - NBIS

NBIS, National Bioinformatics Infrastructure Sweden, is a distributed national research infrastructure. We are the SciLifeLab bioinformatics platform and the Swedish node in Elixir, a European intergovernmental organisation bringing together life science resources from across Europe. With over a hundred staff members, we work with bioinformatics support, infrastructure and training.

NBIS has staff at six sites: Göteborg, Linköping, Lund, Stockholm, Uppsala, and Umeå. We provide expertise in most areas of bioinformatics, including omics analysis, genome assembly/annotation, image analysis and biostatistics. We also offer support in systems development, such as interactive websites and data processing pipelines.

NBIS is mainly funded by the Swedish Research Council, SciLifeLab, the Knut and Alice Wallenberg Foundation, and Swedish universities.

### We provide:

- Weekly online drop-in sessions, Tuesdays at 14:00; <http://meet.nbis.se/dropin>. Join to discuss study design, data analysis or other bioinformatics-related questions.
- Free consultation meetings to discuss study design.
- Hands-on project support, ranging from assistance with smaller tasks to long-term engagement.
- Free, extensive hands-on support to a limited set of projects selected in a peer review process (enabled by a grant from Knut and Alice Wallenberg Foundation).
- Tools, data management, systems development and guidelines for the life science community.
- Introductory and advanced training events, such as workshops in RNAseq data analysis, epigenomics data analysis, tools for reproducible research, python programming, and many other bioinformatics related topics.
- The Swedish Bioinformatics Advisory program - A mentorship program for PhD students interested in guidance from a bioinformatics expert.

### CONTACT

Jeanette Tångrot, [jeanette.tangrot@umu.se](mailto:jeanette.tangrot@umu.se)

### MORE INFORMATION

<https://www.nbis.se>



## Nuclear Magnetic Resonance - NMR

The KBC NMR Core facility provides access to state-of-the-art NMR equipment and expertise for all researchers in the KBC and Campus environment. This facility is part of the national infrastructures SwedNMR funded by VR RFI and SciLifeLab and it is operated by the Swedish NMR Centre at the University of Gothenburg and Umeå University. As a national service infrastructure, we grant access to academic and industrial researchers across Sweden.

The NMR facility offers access to powerful liquid and solid-state NMR infrastructure with spectrometers ranging from 400 to 850 MHz. Our ultrafast magic angle spinning probe and upcoming cryo-MAS probe (Nov 2022) are unique for the Nordic countries. High-field instruments are equipped with cryo-probes for optimal sensitivity for biomolecular solution NMR and environmental NMR. Robotic sample preparation and sample changers are available for high-throughput applications such as metabolomics of biofluids and fragment- based screening (FBS). This facility offers nationwide unique solid-state NMR at 850, 600 and 500 MHz for studies of membrane proteins & amyloid fibrils and metabolomics on intact tissues.

### SERVICE PROVIDED BY THE INFRASTRUCTURE

The NMR core facility offers nation-wide NMR access in three areas: Liquid- and solid-state structure analysis, metabolite studies and chemical biology. In addition, our personnel provide expertise in all three areas and can assist in all steps of project, from experimental design and sample preparation to data analysis.

Three-dimensional structures can be determined for soluble proteins, solid and membrane-bound proteins, nucleic acids and biomolecular complexes.

Metabolite studies, especially metabolomics, can be carried out on liquid and solid samples, including temperature-sensitive biological specimen. Advanced support of the entire process is provided, including bioinformatics data analysis support (through NBIS). Through collaboration with the Swedish Metabolomics Centre, we offer combined NMR- and MS-based metabolomics.

Our solid-state NMR equipment allows structural studies of insoluble protein aggregates such as amyloid fibrils and membrane proteins in their functional lipid environment. FBS is routinely performed using substance libraries from - and in interaction with - Chemical Biology Consortium Sweden (CBCS).

### PERSONNEL

Gerhard Gröbner, prof., Platform Director, Dept of Chemistry  
Jürgen Schleucher, prof., Platform Director, Dept of Med Biochemistry and Biophysics  
Mattias Hedenström, Senior Research Engineer, Dept of Chemistry  
Tobias Sparrman, Senior Research Engineer, Dept of Chemistry  
Ilona Dudka, Senior Research Engineer, Dept of Chemistry  
Joao Figueira, Senior Research Engineer, Dept of Chemistry

### MORE INFORMATION

<https://www.umu.se/en/research/infrastructure/nmr/>; <https://www.scilifelab.se/services/integrated-structural-biology/>; <https://www.swednmr.se>



# Research Infrastructures

## Protein Expertise Platform - PEP

The Protein Expertise Platform (PEP) is a core facility at the Chemical Biological Center (KBC) and a node of the national infrastructure Protein Production Sweden (PPS). PEP provides researchers with needed services and expert advice in questions of bioinformatics, cloning, growth optimization, expression and protein purification

### MATERIAL

PEP keeps a set of cloning vectors, with a variety of fusion partners and purification tags, designed to improve protein solubility and to facilitate protein purification. In addition, PEP also have different strains of competent *E.coli* bacteria ready for transformation, as well as various antibiotics and proteases that are commonly used in protein expression and purification.

### CLONING

We offer cloning services e.g. PCR (standard cloning), subcloning, and mutagenesis.

### PROTEIN EXPRESSION SCREEN (SMALL SCALE)

We can run a small-scale expression test to see if your protein of interest is expressed and soluble. If you experience problems due to low solubility or low expression, we can run a small-scale experiment to test a number of different setups.

### PROTEIN EXPRESSION AND PURIFICATION (SCALE UP)

We also offer scaled-up protein expression and purification using affinity tags, IEX and SEC.

### EDUCATIONAL ACTIVITIES

Graduate courses such as the fast "Cloning, Protein Expression and Purification" (CPEP), "Protein Crystallization" and "Basic Bioinformatics" courses address many topics of high interest for young researchers. Taking our courses enables them to independently solve general problems ranging from sequence analysis, primer design, molecular cloning to protein construct design and purification.

### CONTACTS

For Project request or questions regarding our services:

Mikael Lindberg, [mikael.lindberg@umu.se](mailto:mikael.lindberg@umu.se)

Uwe Sauer [uwe.sauer@umu.se](mailto:uwe.sauer@umu.se)

### MORE INFORMATION

<https://www.umu.se/en/research/infrastructure/pep/>



# Research Infrastructures

## Swedish Metabolomics Centre - SMC

Swedish Metabolomics Centre (SMC; [www.swedishmetabolomicscentre.se](http://www.swedishmetabolomicscentre.se)) was launched in 2013 via an infrastructure grant from Knut & Alice Wallenberg Foundation and co-funding from Umeå University, Swedish University of Agricultural Sciences and Chalmers Technical University. Since 2016 SMC is a part of SciLifeLab. The centre aims to support the researchers at Swedish Universities with mass spectrometry based small molecule, lipid and metabolomics analysis in biological tissues and fluids, and furthermore, to become a leading knowledge centre in metabolomics and related areas.

### SERVICES

All service request starts with a meeting between the SMC and the customer, either in person or over the phone or Skype, to better understand the customer's research question and together decide the analysis of choice. SMC also offers an Open lab access service (OAP-service), where researchers after training by SMC personnel can rent an instrument and perform analysis themselves.

- Untargeted metabolite profiling (metabolomics)
- Targeted metabolite profiling, e.g. amino acids, sugars, fatty acids, TMAO (for details, contact Head of Facility).
- Lipid profiling (for details, contact Head of Facility).
- Study design
- Method development
- Basic statistics
- Open lab access services

### EQUIPMENT

Mass spectrometers

- Leco Pegasus BT, GCTOFMS
- Leco Pegasus HT, GCTOFMS
- Agilent 7000C, GCQqQMSMS
- Thermo Scientific LTQ-Orbitrap XL
- Agilent UHPLC-QqQMSMS 6495
- Agilent UHPLC-QqQMSMS, 6490 (2)
- Agilent 6546 Accurate-Mass UHPLC-QTOFMSMS (2)
- Agilent 6560 Ion Mobility UHPLC-QTOFMSMS

### CONTACTS

For service requests or questions please contact: [info@swedishmetabolomicscentre.se](mailto:info@swedishmetabolomicscentre.se)

Head of Facility: Dr. Annika Johansson ([annika.johansson01@umu.se](mailto:annika.johansson01@umu.se)),

+46722445254

### MORE INFORMATION

[https://www.umu.se/en/research/infrastructure/metabolomics/;](https://www.umu.se/en/research/infrastructure/metabolomics/)

<https://www.swedishmetabolomicscentre.se/>



# Research Infrastructures

## Trace Analysis Platform and Gas Isotope Ratio Mass Spectrometry - TAP and IRMS

A Technical Platform at the Department of Chemistry

This platform aims to provide state-of-the-art equipment, user training and support for trace analysis of small molecules and metals in complex matrices, such as environmental and biological samples. The platform supports the detection of minute quantities of analytes such as metals, organic compounds, organometallic compounds with both qualitative and quantitative methods, and gases with their isotopologues. For metals both total concentrations and speciation analysis are supported.

### APPLICATION EXAMPLES

The equipment that forms the foundation of the platform is or has been supporting work in the following areas:

- Trace element analysis (metals, phosphorus, sulphur, chlorine and bromine)
- Speciation analysis (Hg, Sn and As compounds)
- Protein-metal complexes and interactions
- Trace analysis of persistent organic pollutants (POPs)
- Multi-residue analysis of pharmaceuticals
- Indoor air pollutant and metabolomics studies
- Non-target screening/characterization and identification of unknowns
- Online detection of gaseous analytes and their isotopologues

### INSTRUMENTATION

The platform has mass spectrometry based equipment, most often coupled to initial chromatographic separation, encompassing the following fields:

- Organic GC-MS
- Organic LC-MS
- Organo-Metal ICP-MS
- Gas isotope-ratio MS with direct liquid or gaseous online sampling

### SERVICES

The platform primarily provides access to instrumentation, but can also provide analytical services and operator training. The services may include: design of experiments, sample preparation, instrumental analysis and interpretation of data. Service is provided at three different levels: 1) Seed projects (a few samples), 2) Small projects (10s of samples) and 3) Projects and long-term service (100s of samples) Contact the relevant co-ordinator for questions on availability, prices and level of support.

### CONTACTS

The facility is mainly located on the 6:th floor in the KBC building.

Main Contact:	Peter Haglund, Director, 090-786 6667
Co-ordinators:	Erik Björn, ICP-MS, 090-786 5198 Peter Haglund, Non-Target MS Analysis, 090-786 6667
Per Liljelind	GC-MS, 090-786 9321
Richard Lindberg	LC-MS, 090-786 5464
Dmitry Shevela	Isotope-ratio MS (3:rd floor), 090-786 5293

### MORE INFORMATION

<https://www.umu.se/en/research/infrastructure/tap/>; <http://tap.chem.umu.se/>; <http://irms.chem.umu.se/>



# Research Infrastructures

## Umeå center for Electron Microscopy - UCEM

UCEM provides instruments and methods in Transmission Electron Microscopy (TEM) and Scanning Electron Microscopy (SEM) as a national research infrastructure. UCEM is an interdisciplinary core facility for imaging and advanced Electron Microscopy (EM). UCEM houses seven EM instruments, sample preparation equipment as well as computer infrastructure and software for image processing. The facility staff provides service and training to users in the facility labs, where students and scientists can perform advanced sample preparation, imaging and image analyses.

SEM instruments, Merlin and Evo, offer high-resolution surface imaging, with multiple detector systems operating under cryo, room temperature or heated conditions. Correlative Light and Electron Microscopy (CLEM) solutions for finding the precise location of a target proteins or structure of interest simplifying localization and high-resolution imaging of the same sample. The Scios DualBeam is an instrument combining SEM with a Focused Ion Beam (FIB) for micro-manipulation, volume imaging methodology and thin lamella preparation for subsequent TEM or tomography analyses.

TEM instruments Jeol 1230 and Talos L120 offer ideal TEM solutions for entry level and sample screening, electron tomography and CLEM. Service at UCEM also includes cell and tissue fixation, resin embedding, ultra-microtome sectioning, Tokuyasu sectioning, immunolabeling and staining techniques. Cryo-EM is the method of choice for visualization of hydrated proteins, viruses, cells and small organisms. Samples are plunge frozen in liquid ethane, preserved in amorphous ice and imaged under cryo-condition with Glacios 200 kV and Titan Krios 300 k, equipped with autoloader for cryo samples. The Cryo-EM facility was upgraded in 2022 with the Glacios and the new direct electron detectors, Falcon 4, including a new Selectris energy filter for contrast enhancement on Titan Krios. The method “Cryo-EM single particle 3D reconstruction” is used for structure biology studies and cryo-electron tomography is used to study e.g. molecular complexes, subcellular volumes or microorganisms in 3D.

Together with BICU and UCEM provides CLEM imaging support as part of the National Microscopy Infrastructure (NMI) and offer micro-patterning on grids and cryo stage fluorescence microscopy with a Leica Thunder system. Cryo-EM facility and FIB-SEM volume imaging are SciLilfLab units. UCEM is also part of the Nordic network CryoNET organizing annual user meetings. UCEM supports sample preparation for MAX IV microscopy beamline and other synchrotron users. The establishment of an advanced EM facility in Umeå was made possible through external funding by the Swedish Research Council, Knut and Alice Wallenberg Foundation and the Kempe Foundations.

### CONTACT

For general enquiries: Linda Sandblad, Facility Coordinator / Director

Visiting address: Electron Microscopy Building (former Säkerhetshuset), KB-D, Umeå University

Mobile: +46 (0)70 932 49 36, E-mail: [linda.sandblad@umu.se](mailto:linda.sandblad@umu.se)

### MORE INFORMATION

<https://www.umu.se/en/research/infrastructure/umea-centre-for-electron-microscopy-ucem/>



# Research Infrastructures

## Technical platforms at Umeå Marine Sciences Centre - UMF

### Chemical and biological analysis of marine samples

We provide analytical instruments and technical equipment for chemical and biological analysis of marine samples. The instruments are calibrated regularly, and the expert staff provides necessary training. Analysis of samples may be ordered from the accredited laboratory specialized in marine samples.

### Field projects

We also offer research vessels and advanced sampling equipment for sampling in the marine environment. A long term marine environmental database is available for background data on chemical and biological parameters.

### Mesocosm facility

The indoor mesocosm facility includes 12 mesocosms with control of many physical parameters, such as light, temperature, chemical composition of water, thermocline and rate of convective stirring. The facility has been upgraded so that projects that require ice covered water surfaces can be performed. The upgrade also includes state of the art lamps, and a ventilation that ensures natural levels of CO<sub>2</sub> in the room.

### Fish tank facility

The fish tank facility has been renovated and upgraded to allow for use of toxic substances. The temperature of three different streams of running water can be controlled. We plan to have it up for booking during 2023.

## EXAMPLES OF RESEARCH

- **Temperature Fluctuation Attenuates the Effects of Warming in Estuarine Microbial Plankton Communities**, *Frontiers in Marine Science*, Frontiers Media S.A. 2021, Vol. 8 Marco J. Cabrerizo, *et al.*
- **An indoor pelagic mesocosm facility to simulate multiple water-column characteristics**. *Int Aquat Res* 10:13–29, Båmstedt U.; Larsson H. 2018.
- **Terrestrial discharges mediate trophic shifts and enhance methylmercury accumulation in estuarine biota**. *Science Advances*, 3(1), Jonsson, S. *et al.* 2017.
- **Differentiated availability of geochemical mercury pools controls methylmercury levels in estuarine sediment and biota**. *Nature Communications*, 2014 Vol.5, Jonsson, S. *et al.* 2014.
- **Increased freshwater discharge shifts the trophic balance in the coastal zone of the northern Baltic Sea**. *Global Change Biology*, 18(8): 2509-2519, Wikner, J., Andersson, A. 2012.

## CONTACTS

Siv Huseby, Environmental analyst, [siv.huseby@umu.se](mailto:siv.huseby@umu.se)  
Henrik Larsson, Senior research engineer, [henrik.larsson@umu.se](mailto:henrik.larsson@umu.se)

## MORE INFORMATION

<https://www.umu.se/en/umea-marine-sciences-centre/marine-research/>



# Research Infrastructures

## The UPSC Microscopy Facility

**The Umeå Plant Science Centre (UPSC) Microscopy Facility** offers hands-on introductions, user consultation, and open-access usage following mandatory introduction based on a flat rate fee per hour for usage of equipment.

**UPSC Microscopy Facility** has the main focus to work with plant images and hence our confocal and multiphoton systems are tailor-made for work with thick samples, have spectral detectors to adapt to autofluorescence, very sensitive HyD or GaAsP PMT detectors and long working distance objectives as well as high resolution objectives. We have sectioning equipment, motorized stages for tiling and stitching at our imaging microscopes and often both highly sensitive monochromatic cameras and color cameras. Our latest addition is a Thunder flexisystem stereo/microscope to remove out of focus blur and thus clarify fluorescence imaging using computational clearing and adaptive deconvolution.

### EQUIPMENT

- Sectioning: Cryostat – CryoStar NX70 equipped with CryoJane tape system, Vibratome VT1000S, Microtome Zeiss HM 350, Ultramicrotome – Power Tom XL
- Light microscopes: Leica DMI8 inverted fluorescence microscope, Leica 205FA epifluorescence microscope, Leica Thunder Imager Model Organism etc.
- Fluorescence Activated Cell Sorter (FACS) BD FACS Aria III Flow Cytometer
- Immunorobot: Intavis InsituPro VSI
- Atomic Force Microscope NanoWizard® 4 XP BioScience with Leica LSI HSC macroconfocal is placed on top.
- Confocal microscopes: Zeiss LSM780 CLSM with inverted stand, Zeiss LSM880 CLSM with airyscan, airyfast, PicoQuant FLIM, FLIM-FRET, FCS, FCCS and inverted stand, Zeiss LSM800 CLSM with airyscan and upright stand, Leica Stellaris 8 DIVE multiphoton with White light laser, powerful Mai-Tai multiphoton laser, Tau, Lightning and inverted stand, Nikon AZ-Z2 vertical macroconfocal

### CONTACT

Facility Director: Stephanie Robert

[stephanie.robert@slu.se](mailto:stephanie.robert@slu.se)

Facility managers: Marta Derba-Maceluch

[marta.derba-maceluch@slu.se](mailto:marta.derba-maceluch@slu.se)

(light microscopes, sectioning and AFM),

Anna Gustavsson

[anna.gustavsson@umu.se](mailto:anna.gustavsson@umu.se)

(confocals and multiphoton)

### MORE INFORMATION

<https://www.upsc.se/platforms/microscopy-facility.html>



# Research Infrastructures

## Vibrational Spectroscopy Core Facility - ViSp

ViSp provides FT-IR and Raman spectroscopy and microspectroscopy services, ranging from design of experiments to measurements and data analysis. ViSp has state-of-the-art instrumentation, including two vacuum bench FTIR spectrometers, an FTIR microscope with a 64x64 focal plane array detector, two confocal Raman microscopes with 5 laser lines (from 405 to 785 nm), a fiber optic probe and polarizers, and a portable Raman spectrometer. The techniques are suitable to detect and localise (at sub/micron level) chemical changes in a wide range of samples, at high speed and low cost, non-destructively and free of external agents (dyes, markers, labels). ViSp can provide both hardware and software development to adapt the techniques to the needs of the users / projects.

### EXAMPLE APPLICATIONS/RESEARCH PROJECTS

Due to the exceptional versatility of the techniques, example projects cover a wide range of scientific disciplines and applications. Among the most prominent are materials sciences (nanotechnology, semiconductors), plant sciences (high-throughput chemotyping/screening, investigating the effects of gene manipulations or environmental factors), environmental sciences and biofuel applications (from microplastics, to biochars, and algae), bio/geo/chemistry (absorption on mineral surfaces, real-time, in situ monitoring of reactions, protein conformational changes) and medicine (assessing tissue compositional changes under various pathological conditions, diagnosing and monitoring disease onset and progression, drug targeting and molecular mechanistic studies, in vivo chemical compositional analysis of tissues). ViSp is primarily research driven and actively participates in projects where new methods need to be developed as well as applying existing methodologies in new areas.

### TEACHING ACTIVITIES / COURSES

A User License Course is run twice a year, giving a basic introduction to vibrational spectroscopy in general and training users in running their own experiments at ViSp. ViSp is also involved in several courses at Umeå University and SLU.

### LOCATION

Chemistry Department, Building C, floors 1 and 6.

### CONTACT

András Gorzsás, manager

E-mail: [andras.gorzsas@umu.se](mailto:andras.gorzsas@umu.se)

### MORE INFORMATION

<https://www.umu.se/en/research/infrastructure/visp/>



## X-Ray Photoelectron Spectroscopy Platform - XPS

The X-ray photoelectron spectroscopy (XPS) platform is an open infrastructure at Umeå University enabling users both within UmU and outside to obtain analyses of the chemical composition of their sample surface. Knowledge of the elemental composition, oxidation state and spatial distribution of atoms at surfaces, near-surfaces, and interfaces is crucial to our understanding of key reactions in nature and technology. Surfaces are, after all, the interface through which materials - as small as nanoparticles and bacteria, to as big as nuclear fuel reactors and spaceships - interact with their environments. XPS, also known as Electron Spectroscopy for Chemical Analysis (ESCA), is now one of the most widely used tools in countless fields of science and engineering where advanced analyses of surfaces and interfaces is needed. The platform provides surface analysis by XPS technique. Full range of conventional XPS experiments is available including monochromatic Al K $\alpha$  excitation, angle- resolved XPS, XPS imaging, and cryogenic measurements.

### EQUIPMENT

AXIS Ultra DLD is an electron spectrometer manufactured by Kratos Analytical, Ltd. (UK). The instrument was installed at the Dept of Chemistry in 1999 and upgraded twice with a Delay-Line-Detector in 2004 and new X-Ray power supply in 2009. The new XPS spectrometer (AXIS SUPRA+) is purchased and expected to be in operation May-June 2023.

### SERVICES

**In the outermost 10 nm of a surface (10 atomic layers), XPS provides:**

- Identification of all elements (exc. H and He) present in concentrations >0.1 atomic %
- Semi quantitative determination of the elemental surface composition
- Information about the molecular environment (oxidation state, bonding atoms, etc.)
- Non-destructive elemental depth profile 10 nm into the sample and surface heterogeneity assessment
- Lateral variations in surface chemical composition (XPS imaging with spatial resolution of 5  $\mu$ m)
- Studies on wet/hydrated (frozen) samples

The XPS platform is **the only facility for XPS analyses in Northern Sweden** (north of Uppsala). The platform supports a unique field of research, developed at the Department of Chemistry involving investigations of fast-frozen samples including mineral-aqueous solution interfaces, interfaces of biomaterials with biologically relevant media, and surface chemistry of microorganisms. The platform also supports a large range of research areas by providing state-of-the-art surface analysis in areas including ecology, chemistry, physics, archeology, molecular biology and engineering. .

### STEERING BOARD

Andrey Shchukarev (Researcher, Dept of Chemistry), Knut Irgum (Prof., Dept of Chemistry), Jean-François Boily (Prof., Dept of Chemistry), Ludmilla Morozova-Roche (Prof., Dept of Medical Biochemistry and Biophysics)

### CONTACT

Andrey Shchukarev, Dept of Chemistry, KB.C6, B6-35-07 (XPS lab) and B6-33-07 (office), tel. 090-786 5361. [andrey.shchukarev@umu.se](mailto:andrey.shchukarev@umu.se)

### MORE INFORMATION

<https://www.umu.se/en/research/infrastructure/xps/>



# Research Infrastructures

## X-Ray Diffraction Facility - XRDF

The X-ray Diffraction Facility at the Dept. of Chemistry and the Chemical Biology Centre takes your project from pure protein to 3D structure. XRDF provides expert crystallographic advice and hands-on access to nano-drop crystallization robots as well as to automated crystal imaging and storage system. Collections of X-ray diffraction data is done on the state of the art X8 PEOTEUM X-Ray diffraction system providing atomic resolution 3D structures of proteins and their complexes with DNA and RNA.

### **XRDF Crystallization Services:**

- Crystallization Set-ups in 96-Well Plates (up to 288 different conditions per plate) using Commercial and Custom Crystallization Screens
- Crystal Imaging, Evaluation & Storage
- Optimization of initial crystallization conditions

### **X-ray Diffraction Data Collection (using in-house X-ray Generator & Synchrotron):**

- From Single Crystals (Powders Diffraction also possible)
- X-Ray Crystal Structure Determination
- 3D Structure Refinement, Quality Validation & PDB data deposition

### **X-Ray User Training Courses:**

- Course in Crystallography & Crystallization
- User training for crystallization robot and crystal imager (“driver’s licences”)

### **Collaborations with KBC platforms (added value):**

- PEP, UCEM, NMR, LCBU, Imaging facility, ..

### **CONTACT**

Uwe Sauer, Assoc. Prof.  
E-mail: [uwe.sauer@umu.se](mailto:uwe.sauer@umu.se)

### **MORE INFORMATION**

[https://www.umu.se/en/research/infrastructure/x\\_ray\\_diffraction\\_facility/](https://www.umu.se/en/research/infrastructure/x_ray_diffraction_facility/)



# Overview Infrastructure Presentations

Research Infrastructure	Contact persons	Representatives at the Infrastructurer Corner	Infr. Corner	Tour
<b>Ancient and Environmental DNA Lab - a/eDNA Lab</b>	xiao-ru.wang@umu.se doreen.huang@umu.se david.hall@umu.se	<b>Xiao-Ru Wang</b>	Yes	
<b>Biogeochemical Analytical Facility (BAF)</b>	anders.jonsson@umu.se			
<b>Biopolimer Analytical Platform (BAP)</b>	junko.TS@slu.se	<b>Junko Takahashi-Schmidt</b>	Yes	Yes
<b>Biochemical Imaging Centre Umeå (BICU)</b>	richard.lundmark@umu.se irene.martinez@umu.se gayathri.vegesna@umu.se johan.olofsson.edlund@umu.se	<b>Irene Martinez Carrasco</b>	Yes	Yes
<b>Bioinformatics Coordinator (NGI)</b>	kristina.benevides@umu.se	<b>Kristina Benevides</b>	Yes	
<b>Computational Analytics Support Platform (CASP)</b>	katie.bennett@umu.se	<b>Kate Bennett</b>	Yes	
<b>Chemical Biology Consortium Sweden (CBCS)</b>	stina.berglund.fick@umu.se erik.chorell@umu.se	<b>Stina Berglund Fick</b>	Yes	Yes
<b>Fluorescence In Situ Hybridization facility (FISH)</b>	natuschka.lee@umu.se	<b>Natuschka Lee</b>	Yes	
<b>High Performance Computing Center North (HPC2N)</b>	info@hpc2n.umu.se	<b>Pedro Ojeda May</b>	Yes	Yes
<b>National Research Infrastructure for Data Visualization (InfraVis)</b>			Yes	
<b>NanoLab</b>	roushdey.salh@umu.se	<b>Roushdey Salh</b>	Yes	
<b>National Bioinformatics Infrastructure Sweden (NBIS)</b>	jeanette.tangrod@umu.se	<b>Jeanette Tångrot</b>	Yes	
<b>Nuclear Magnetic Resonance Core Facility (NMR)</b>	mattias.hedenstrom@umu.se tobias.sparrman@umu.se jurglen.schleucher@umu.se gerhard.grobner@umu.se ilona.dudka@umu.se joao.figueira@umu.se	<b>Tobias Sparrman</b>	Yes	Yes
<b>Protein Expertise Platform (PEP)</b>	mikael.lindberg@umu.se	<b>Mikael Lindberg</b>	Yes	Yes
<b>Swedish metabolomics Centre (SMC)</b>	annika.johansson01@umu.se swedishmetabolomicscentre@umu.se	<b>Annika Johansson</b>	Yes	Yes
<b>Trace Analysis Platform (TAP) and Gas Isotope Ratio Mass Spectrometry (IRMS)</b>	peter.haglund@umu.se erik.bjorn@umu.se per.liljelind@umu.se richard.lindberg@umu.se dmitry.shevela@umu.se			

## Overview Infrastructure Presentations

Research Infrastructure	Contact persons	Representatives at KBC DAYS 2022	Infr. Corner	Tour
Umeå Core Facility for Electron Microscopy (UCEM)	<a href="mailto:linda.sandbland@umu.se">linda.sandbland@umu.se</a>	<b>Linda Sandbland</b>	Yes	Yes
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UPSC Microscopy Plattform	<a href="mailto:stephanie.robert@slu.se">stephanie.robert@slu.se</a> <a href="mailto:marta.derba-maceluch@slu.se">marta.derba-maceluch@slu.se</a> <a href="mailto:anna.gustavsson@umu.se">anna.gustavsson@umu.se</a>	<b>Marta Derba-Maceluch</b> <b>Anna Gustavsson</b>	Yes	
Vibrational Spectroscopy Core Facility (ViSp)	<a href="mailto:andras.gorzsas@umu.se">andras.gorzsas@umu.se</a>	<b>Andras Gorzsas</b>	Yes	Yes
X-Ray Photoelectron Spectroscopy (XPS)	<a href="mailto:andrey.shchukarev@umu.se">andrey.shchukarev@umu.se</a>	<b>Andrey Shchukarev</b>	Yes	
X-Ray Diffraction Facility (XRDF)	<a href="mailto:uwe.sauer@umu.se">uwe.sauer@umu.se</a>			Yes

**MORE INFORMATION ABOUT RESEARCH INFRASTRUCTURES AT KBC**

<https://www.umu.se/en/chemical-biological-centre/kbc-scientific-infrastructures/>



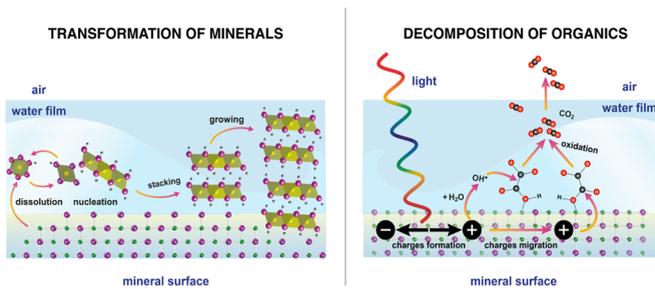
# Visual Abstracts

# Visual Abstract #1

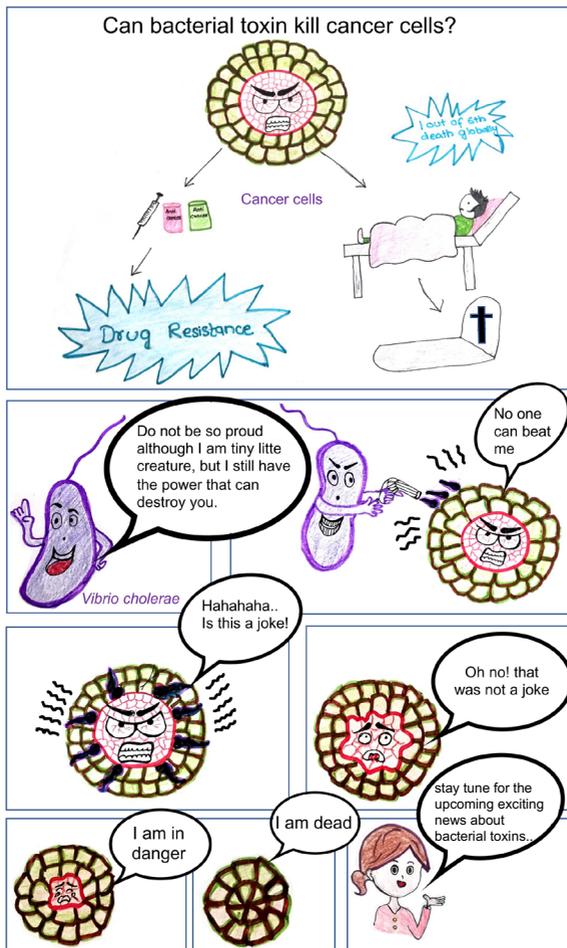
## Chemistry in Thin Water Films on Mineral Surfaces

N. Tan Luong

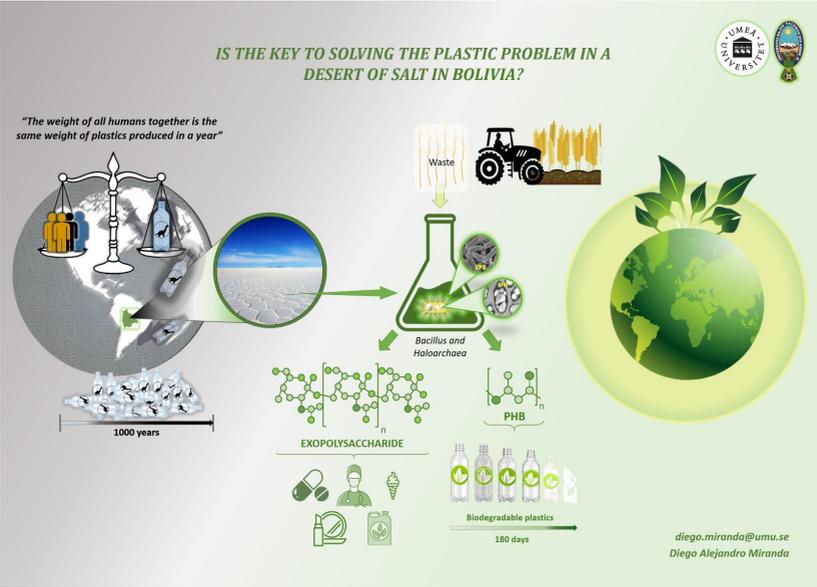
Department of Chemistry, Umeå University



## Visual Abstract #2

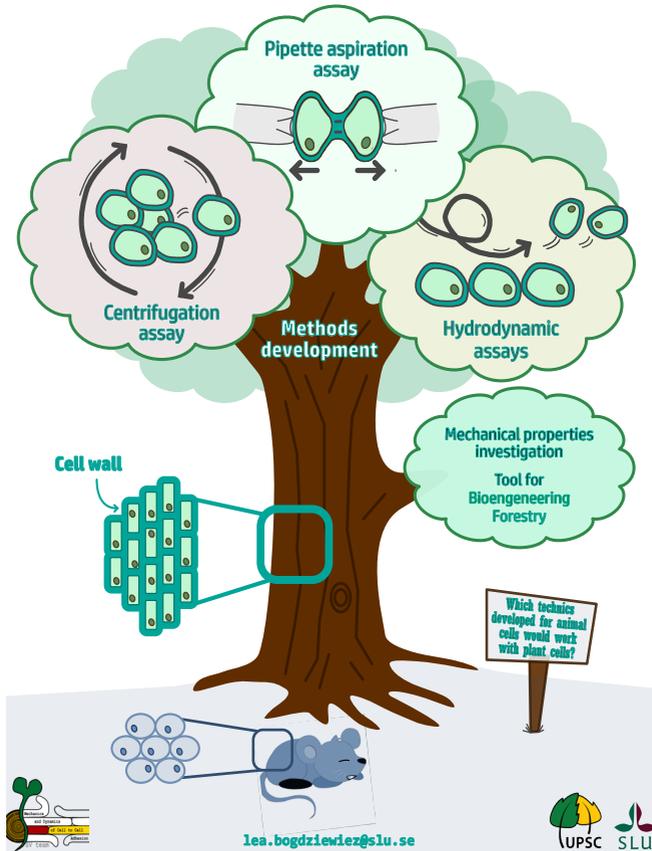


# Visual Abstract #3

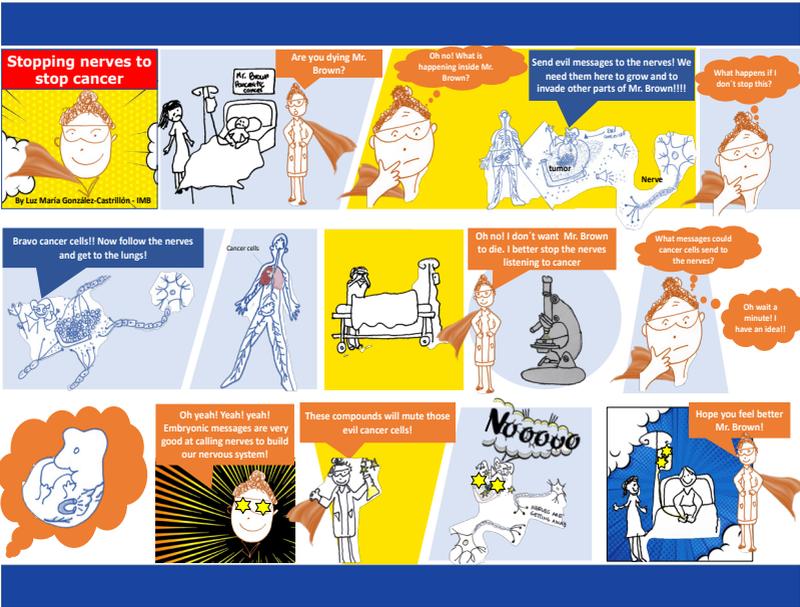


## Visual Abstract #4

# How strongly do plant cells stick together?

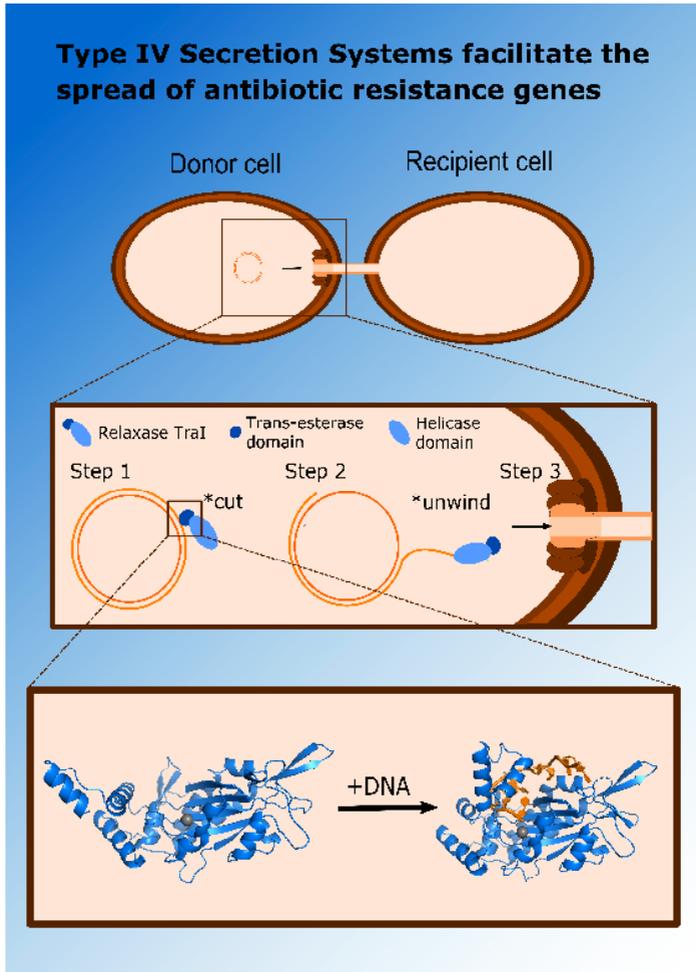


# Visual Abstract #5



## Visual Abstract #6

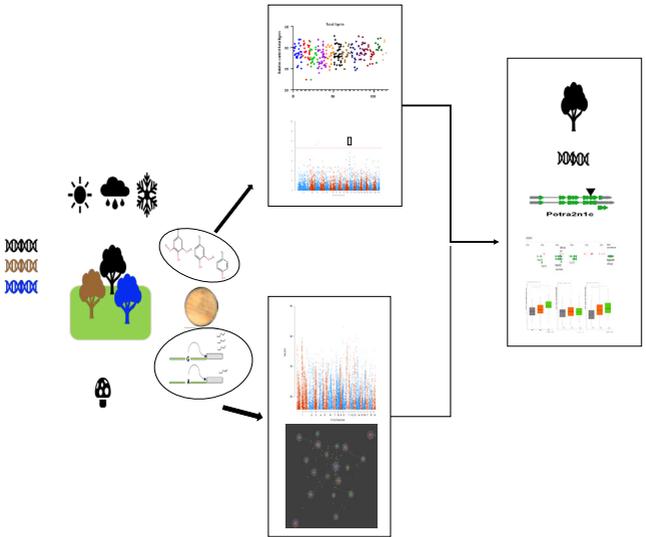
### Type IV Secretion Systems facilitate the spread of antibiotic resistance genes



# Visual Abstract #7



## CONNECTING PHENOTYPES AND GENOTYPES IN SWEDISH ASPEN TREES



UMEÅ UNIVERSITY

Department of Plant Physiology

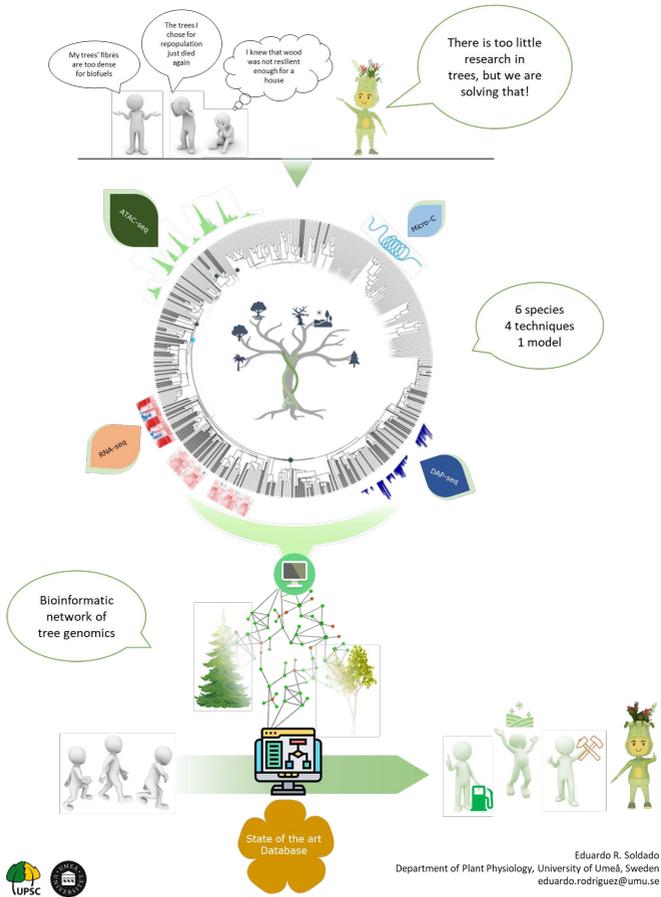
Tuominen group

PhD student Mikko Luomaranta

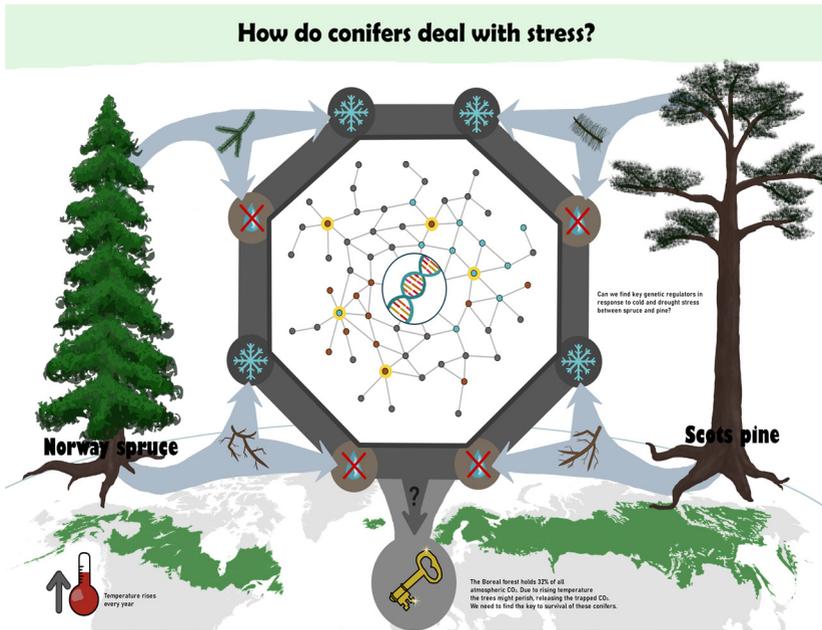
Mikko Luomaranta, UPSC, Department of Plant Physiology, UmU

# Visual Abstract #8

## WHAT MAKES A TREE A TREE?



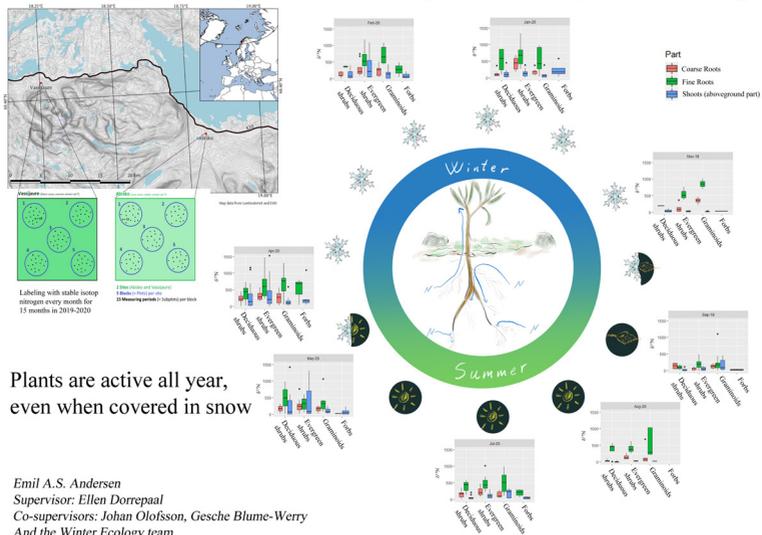
# Visual Abstract #10



Elena van Zalen, UPSC, Department of Plant Physiology, Umu

# Visual Abstract #11

## The hungry winter plants and their year round uptake of nitrogen



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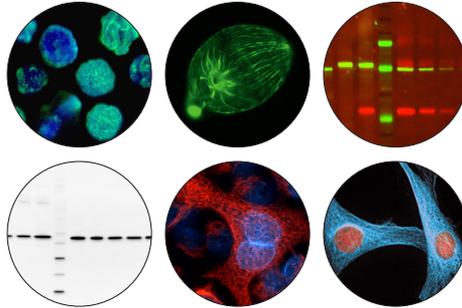
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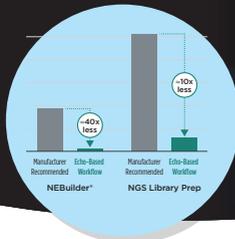


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<sup>1</sup> Shapland EB, Holmes V, Iversen CO, et al. Low-Cost, High-Throughput Sequencing of DNA Assemblies Using a Highly Multiplexed Nextera Process. Shapland et al. ACS Synth. Biol. 2015. doi.org/10.1021/acssynb.5b0032n



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