

# 2016-18

## KBC Report



Chemical Biological Centre /

Kemiskt Biologiskt Centrum (KBC)

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KBC

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Appendix 1A. Publications 2016-2018 with involvement of the KBC Infrastructures is available online at

[https://www.umu.se/en/chemical-biological-centre/kbc-scientific-infrastructure/publications\\_2016\\_2018](https://www.umu.se/en/chemical-biological-centre/kbc-scientific-infrastructure/publications_2016_2018)

# KBC report 2016-2018

## Presentation

The Chemical Biological Centre (Kemiskt Biologiskt Centrum, KBC) is an interdisciplinary centre for basic science-oriented research in life/natural sciences, technology, medicine and forest sciences at Umeå University (UmU) and the Swedish University for Agricultural Science (SLU). KBC is an international environment represented by more than 50 nationalities. Since its start in 2007, KBC is now established as a valuable resource for coordination and support of 16 important technical platforms/infrastructures which are available to all scientists at Umeå University and SLU.

## Goals and Mission

KBC was initially formed as a structure to coordinate activities aimed at nourishing contacts between scientists working in the new KBC-building. Over the years, the activities of KBC have developed into a project that embraces a large part of the research activities within the field of basic research-oriented life sciences at UmU and SLU, Umeå. In addition to representatives from all departments located within the KBC-building, the KBC board now includes representatives from IceLab, Department of Applied Physics and Electronics/TEC-Lab, Department of Physics, Umeå Centre for Microbial Research (UCMR), and the most recently added representatives from the Department of Integrative Medical Biology (IMB) and Umeå Centre for Molecular Medicine (UCMM), which are parts of the newly formed Medical Biology Centre (MBC) located next to the KBC building.

The mission of KBC has been simple and straightforward: to increase contacts and to stimulate interdisciplinary collaborations between scientists working within the field of basic-oriented life sciences in Umeå, to support and organize technically demanding and expensive research infrastructures, and to spread information about this strong research environment at Umeå University to the outside world. KBC's focus is to serve the researchers' needs for doing high-class research in fast-developing fields.

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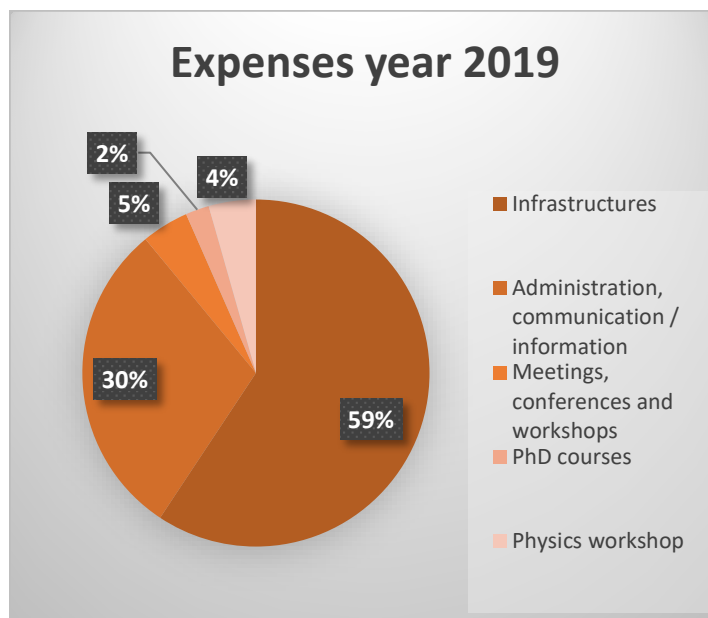
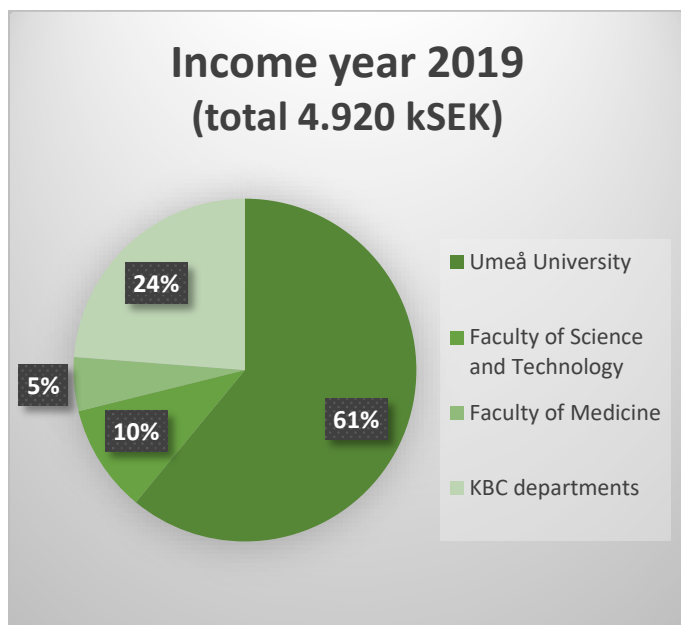
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<https://www.umu.se/kemiskt-biologiskt-centrum/> (Swedish)  
<https://www.umu.se/en/chemical-biological-centre/> (English)

## KBC budget 2016-2019

The yearly budget for the years 2016-2018 was in total 4,750 kSEK. Umeå University centrally contributed with 3,000 kSEK, the Faculty of Science and Technology with 500 kSEK, and the Faculty of Medicine with 250 kSEK. The KBC departments contributed with 150 kSEK each (50 kSEK each for the smaller KBC units). From 2019, the contribution from the KBC departments was increased to 175 kSEK each for the larger, and 60 kSEK each for the smaller departments. The total budget income for 2019 is 4,920 kSEK.



As seen from the figures, most of the incomes (85%) come from Umeå University centrally, and from the participating departments. Similarly, most of the expenses (89%) are used to support the technical platforms/infrastructures and for communication and administration.

## KBC activities 2016-2018

### Coordination and organisation of KBC infrastructures

Several technical platforms/infrastructures are located in either the KBC building or associated with KBC Departments/Centres. A major task for the KBC-group is to support technical platforms and infrastructures, both financially and by helping with administration and communication. Once a year, technical platforms and infrastructures can apply for support from the KBC group. This support includes:

- annual evaluation of activities at the technical platforms/infrastructures;
- economical support (parts of salaries to personnel, costs for organising courses);
- help in the organisation of larger events, seminars, workshops, conferences (booking, announcing, registration, technical support, recording and streaming);
- help in the organisation of practical courses that give licence to use equipment at the infrastructures (online registration, booking of localities, announcements on the screens, homepage, course certificates);
- help in promoting the visibility of the infrastructures (presentation on the info screens, developing homepages).

#### The list of the Scientific Infrastructures / Core Facilities / Technical Platforms in the KBC environment

##### National Infrastructures:

- Biochemical Imaging Centre Umeå (BICU)
- Umeå Core Facility for Electron Microscopy (UCEM)
- Swedish Metabolomics Centre (SMC)
- Nuclear Magnetic Resonance (NMR) spectroscopy KBC Core Facility
- Chemical Biology Consortium Sweden (CBCS)

##### KBC infrastructures:

- Computational Life Science Cluster (CLiC)
- Vibrational Spectroscopy Core Facility (ViSp)
- Proteomics Core Facility
- Protein Expertise Platform (PEP)
- NanoLab
- Biogeochemical Analytical Facility (BAF)
- Biopolymer Analytical Platform (BAP)
- Fluorescence In Situ Hybridization (FISH)

**Other Infrastructures at KBC** (the following scientific infrastructures do not receive financial support from and are not evaluated by the KBC group but are invited to present themselves during the KBC Days):

- Trace Analysis Platform (TAP)
- X-Ray Photoelectron Spectroscopy (XPS)
- The Mesocosm Facility

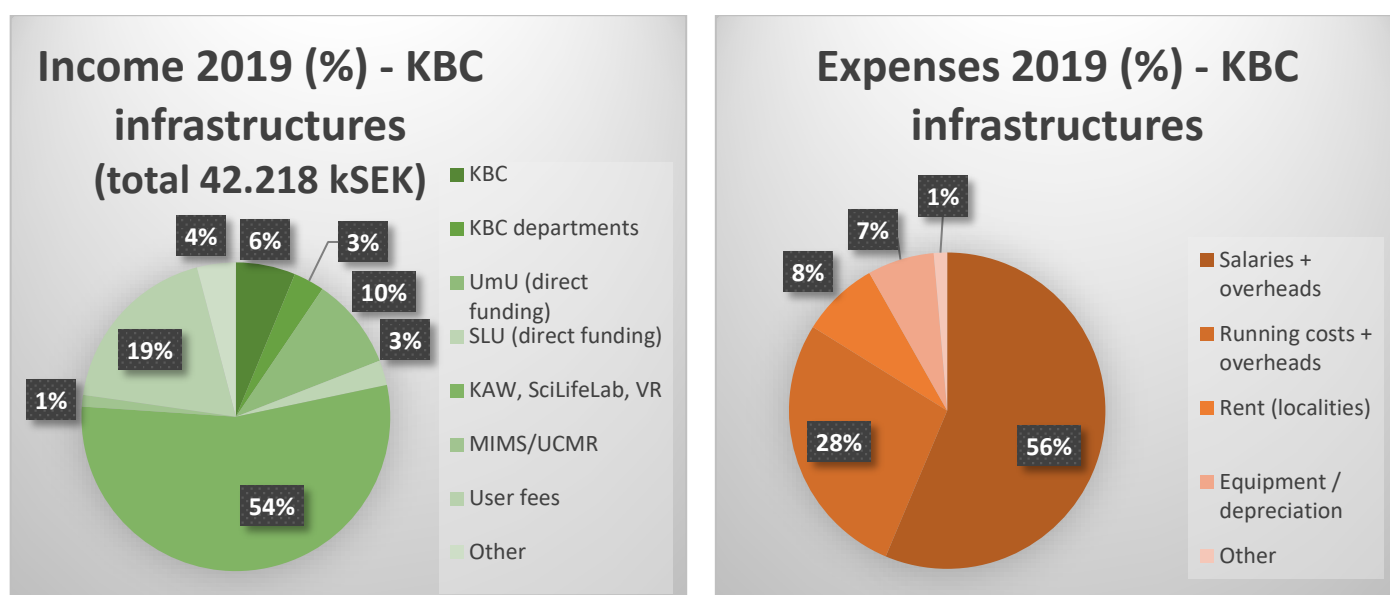
KBC performs annual evaluations of the 13 infrastructures/technical platforms in order to standardise the reporting system of different technical platforms and to assure high-quality standard and service. The annual evaluation reports include:

- a description of the main activities during the last year;
- a description of the infrastructure organization and steering;
- lists of employed personnel, users/customers and publications;

- a description of equipment owned by the infrastructure;
- information on services offered by the infrastructure;
- a description of the availability of the infrastructure and how booking of services is organized;
- a description of teaching activities;
- a full budget specifying all expenses and incomes including user fees and support from other local, national or international sources;
- a specification on the requested economic support from KBC for the coming year including a specification of what costs the support will cover;
- a list of planned future developments of the platform including a description of new equipment that needs to be bought and equipment that needs to be updated or replaced during the next 3-year period.

A summarized report of each infrastructure for the period 2016-2018 is presented in Appendix 1.

### Summary of the KBC Infrastructures / Core facilities budgets



The financial support from KBC for the infrastructures differs depending on their needs and their total budget (e.g., 3% of the total income for UCEM and NMR, 63% to Proteomics Core Facility, 60% for BAF). This support can be used e.g. for salaries, running costs, maintenance of equipment and machinery park or organising courses. KBC is also supporting new infrastructures initiatives. The overall goal of KBC is to assure functional infrastructure services targeted to the researchers' needs.

### Coordination of internal and external communication (KBC Communication Office)

During 2016-2018, the KBC Communication Office continuously worked on developing, improving and synchronising different communication channels (homepage, event-letter, and digital signage) used for internal and external communication.

#### Homepage

KBC Communication Officers are regularly updating the KBC website <https://www.umu.se/en/kbc/> (<https://www.umu.se/kbc/>). The KBC website aims to present KBC and its organisation, to provide information and contacts about KBC services and KBC infrastructures, to announce seminars, courses and other events in the online calendar, and to publish news related to the KBC environment.

During 2018, the KBC Communication Officers moved the content of the KBC website to the new homepage of Umeå University. They are still working on optimising the content and the display of the content, specifically regarding the implementation of the information about the scientific infrastructures that were moved now to the Research Web of Umeå University.

### Events-letter

The KBC communication officers send out a weekly events-letter including up-coming seminars and events, approaching registration/application deadlines, and important information from the house services. The KBC events-letter is ordinarily sent on Friday afternoons to more than 700 recipients. The staff at the majority of the KBC departments and the Department of Molecular Biology is receiving the events-letter as well as more than 100 individual subscribers from UmU, SLU, and other organisations. The KBC Communication Office continuously gets requests to add new subscribers to the events-letter.

### Digital signage

In 2015, digital information screens were installed in the common areas of the KBC building, as well as at all KBC departments. They are used to announce seminars, thesis defences, research courses, conferences, and other events and news. In total, the KBC Communication Officers administer the content of seven screens located in the central areas of the KBC building and co-administer nine other screens that are located at the KBC departments, at IceLab and at the Department of Molecular Biology. KBCon, the Interactive Learning Environment at KBC, installed a new screen in the central area of the KBC building in 2018. This screen is also co-administered by the KBC Communication Officers in close collaboration with the KBCon facilitator which allows easily exchangeable information to be displayed on the screens.

The KBC Communication Officers are continuously working on improving the presentation of information on the screens, e.g. by including QR-codes with links to the events announced on the screens.

### NatureJobs and ResearchGate job announcements

The KBC group decided in 2017 to buy job packages for announcing open positions at NatureJobs and ResearchGate. Researchers from the KBC departments can use job adverts out of these packages for announcing open positions/fellowships for a reduced price and expanding their candidate search internationally to find high-qualified candidates. The KBC Communication Office assists in posting the position/fellowship adverts on the respective job portals and the KBC administrator is sending internal invoices to the researchers.

50 job adverts were bought from ResearchGate at the beginning of 2017 for a discount of 25%. This package was renewed in 2018 and included the possibility to extend the announcing time to 45 days instead of the standard 30 days of posting. The first job package bought from NatureJobs included 20 jobs with 50% reduction and 60 days of posting time. In parallel, a job employer profile presenting the KBC environment was published. The job package without the employer profile was renewed at the beginning of 2018 and because of high demand, it was extended at the end of 2018 to a 40-job package of "enhanced" jobs with better visibility and 60% reduction. In total, 57 posts were published at NatureJobs, and 69 at ResearchGate during 2017 and 2018.

The KBC Communication Office continuously gets requests about extending this service to departments that are not part of KBC. This extension could increase the overall discount and would be beneficial for all researches using this job announcement service.

### Conferences, workshops, and symposia organised and/or supported by KBC

From the start of the KBC environment, the KBC Communication Office and KBC Service Centre support scientists in organising conferences, symposia, workshops, and other research meetings. The establishment of the KBCon in 2017 brought the benefits of up-to-date technical support and enhanced communication e.g. in form of video



recording and live-streaming. KBC annually organises the KBC Days, an interdisciplinary conference with the aim to stimulate exchange and interactions within the KBC environment. KBC also offers financial support to departments and individual researchers to organise scientific events at KBC. The requests for support have increased over time and is now exceeding the current capacity of the KBC Communication office.

A detailed list of the events organised and/or supported by KBC in 2016-2018 is presented in Appendix 2. The following few examples describe the organised events that had an interdisciplinary focus and represent the collaborative, initiative, and multidisciplinary nature of KBC.

### KBC DAYS

Since 2009, KBC organises annually the KBC Days, an interdisciplinary conference with presentations from the different departments affiliated with KBC and from the scientific infrastructures. The main focus of the KBC Days is to support exchange and interactions within the KBC environment and to update each other on new developments. During the conference, the KBC group, represented by the scientific coordinator, informs about the performance of KBC and the vision for the coming year. Newly recruited faculty members and awardees from the different departments are invited to present their research and recently granted large research projects and research highlights are presented. All mid-term PhD students are asked to present their projects by a poster and a 2-min long "Elevator talk". The PhD student presentations are evaluated, and the best presentation is awarded the KBC poster prize.

The KBC Days is also an important event for the KBC infrastructures to improve their visibility and to update the KBC environment about their development and services. All infrastructures get the opportunity to marketize themselves in the form of a short talk, posters, running slide presentations on the information-screens, and/or by arranging guided tours to their facilities.

About 270-280 participants joined the KBC Days every year in the period 2016-2018. In connection with the KBC Days 2016, a workshop directed to research infrastructures and people who work with questions related to the organisation of infrastructures was organised. The aim of the workshop was to discuss different aspects of scientific infrastructure organisation (e.g. service, research, method development, education, evaluation).

In 2017, the KBC Days were combined with the official inauguration of KBCon, the Interactive Focus Environment at KBC. Additionally, PhD students got the opportunity to join a poster presentation course with a special focus on digital poster presentations. The course was organised in close collaboration with KBCon.

Since KBC started to intensify its collaboration with the new Medical Biology Centre (MBC) in 2018, researchers from MBC were invited to present their research during the KBC Days 2018. Half a day of the programme was assigned to them which was highly appreciated both by MBC and KBC researchers.

The programmes of all former KBC Days are available at the KBC homepage: <https://www.umu.se/en/chemical-biological-centre/about-the-department/conferences-workshops-and-other-events/kbc-days/>



*Images from the KBC Days Conference, 6-7 November 2018*

### Umeå Renewable Energy Meeting (UREM)

The Umeå Renewable Energy Meeting (UREM) was organised annually between 2009 and 2017 at KBC. The meeting was highly interdisciplinary, with international speakers and attendees having backgrounds in physics, chemistry,

biology and physiology. The aim was to strengthen renewable energy related research and education at Umeå University and SLU that is carried out in research environments as for example "Artificial Leaf", "Solar Fuels", "MicroBioRefine" and "Bio4Energy". In addition to sessions with scientific presentations, 'Meet the speaker lunches' were organized for PhD students and postdocs. The idea of these lunches was to give young scientists the possibility to meet in small groups with a leading scientist while having lunch together. The meeting usually took place in February and had between 130 and 170 participants in 2016 and 2017. In both years, the scientific conference was preceded by a school event where speakers or participants of the conference met with pupils to present and discuss their research (please read more under "Outreach Events").

KBC gave financial support to all UREM conferences and the KBC Communication Office supported the organising committee with organisation, especially with the practicalities (e.g. room bookings, travel bookings for invited speakers, registrations, preparation of the abstract book).

### Cell Biology Symposium

The first interdisciplinary Cell Biology Symposium was arranged on 30-31 May 2018 at KBC on the initiative of Richard Lundmark, director of BICU, and Stéphanie Robert from the UPSC Microscopy Facility. Their idea was to bring together researchers from different fields that work with cell biological methods to improve the networking on the Umeå campus and facilitate interdisciplinary collaborations. About 120 participants from twelve different Departments/Centres joined the meeting and exchanged knowledge and ideas on fundamental and applied aspects of cell biology as well as novel approaches and techniques that are useful for basic research. The programme included scientific talks and poster presentations but also several interactive activities, such as round table discussions, open project pitches that were arranged by IceLab, image competition and a quiz during the conference dinner. The symposium was accompanied by exhibitions from nine commercial sponsors.

The scientific organising committee included members from different departments/units at KBC (UPSC, IceLab, BICU) but also from other departments of Umeå University (UCMM, IMB, Radiation Sciences). The KBC Communication Office took care of most of the practicalities related to conference organisation.

The main funding was raised by attracting commercial sponsors but also the Faculty of Science and Technology, Umeå University, supported the symposium financially as well as KBC by paying the rent for the localities.

### IceLab Lunch Pitches

To promote collaborations between researchers from different disciplines, the Integrated Science Lab (IceLab) regularly organises interdisciplinary research lunches with the vision to "let ideas meet and mate". Two to three speakers are presenting in a 5 min-presentation a 'problem' that is then informally discussed with the other participants over lunch. The KBC Communication Office is supporting the events by arranging the announcements and providing online registration forms.

The IceLab Lunch Pitches moved in 2017 from the IceLab localities to the Interactive Learning Environment KBCon, attracted by the highly interdisciplinary environment at KBC and by the communication technologies provided by KBCon. Since 2019, the KBCon facilitator helps with live-streaming and recording of the lectures. The videos are available at the IceLab homepage.

Between 2017 and April 2019, 14 Lunch Pitches were arranged, allowing 30 researchers from different departments and research fields to discuss their problems with an interdisciplinary audience. The speakers and participants are not only coming from KBC but from more than 22 different department/units within UmU and SLU including Computing Sciences, Geography, Psychology, Community Medicine & Rehabilitation and Sociology.



*Presentations and discussions during several Lunch Pitches events 2018-2019 at the KBCon Interactive Learning Environment.*

## Research Courses

Research courses for PhD students and Postdocs and the user-license courses are organised by scientists and core facilities at KBC on a regular basis. Many of the courses were established during the period 2009-2014 when the KBC Research School at KBC was organised and coordinated in collaboration with the Research School at Umeå Centre for Microbial Research (UCMR). Both Research Schools received support from the Swedish Research Council.

During 2016-2018, 36 research courses were arranged in the KBC environment (see the detailed list in Appendix 3). KBC supported several of those courses financially and the KBC Communication Office helps with the booking of localities, managing online registrations and announcements, and preparing course certificates. KBC aims to increase the number of research courses to stimulate interdisciplinary collaboration and to provide high-quality education.

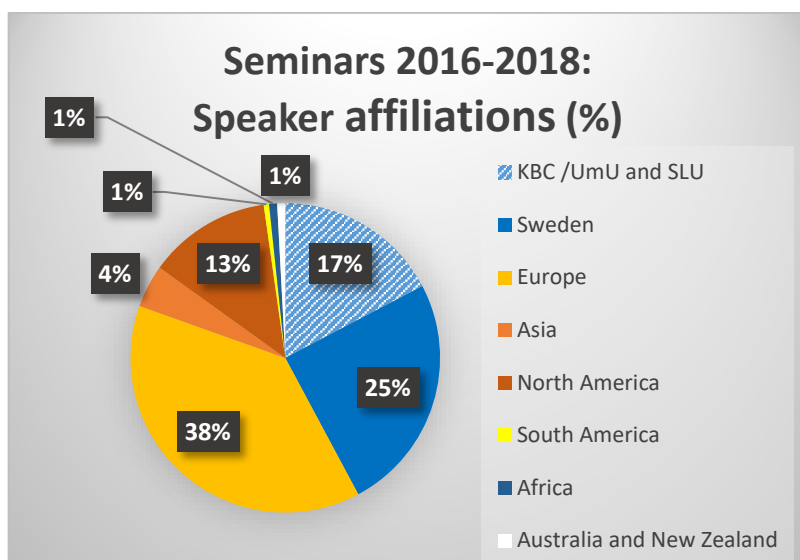
## Seminars at KBC

The KBC departments/units are regularly arranging seminars with invited international and national guests. These seminars are open for all researchers at UmU and SLU, not only those working in the KBC-building. Several seminar series are arranged on a weekly basis, including

- UPSC Seminars / UPSC Cutting-Edge seminars, organised by Umeå Plant Science Centre
- MedChem Seminar series, organised by the Department of Medical Biochemistry and Biophysics
- EMG Seminar Series, organised by the Department of Ecology and Environmental Sciences
- Chemistry Seminars, organised by the Department of Chemistry
- Physics Seminar Series, organised by the Department of Physics

A new seminar series, initiated by PhD students and postdocs from KBC, started in 2018. The seminar series, called "Directions in Science", aims at illustrating different career possibilities for scientists, both in academia and outside academia and on giving practical tips for career development. Local and international experts from academia and industry are invited in order to exchange their knowledge and experiences. The topics cover e.g. writing grant proposals, scientific writing, managing cross-disciplinary projects and outreach activities, careers in publishing and business development. During 2018, five speakers gave seminars that were well attended by 30-50 people, including PhD students, postdoc, group leaders, and entrepreneurs. The seminar series was financially supported by KBC and KBCon and organisationally supported by the KBC Communication Office. The seminar series will be continued in 2019.

All seminars arranged by the KBC departments are announced in the weekly event-letter, on the information screens in the KBC environment, at the Department of Molecular Biology, and at IceLab, and in the calendar on the KBC and UmU homepages.



During 2016-2018, between 125 and 145 seminars were organised each year. 58% of the speakers had an international affiliation illustrating the strong international network of the scientists at KBC.

In addition, all thesis defences by PhD students from KBC departments (on average, 30 per year) are announced in the whole KBC environment.

## Social activities

To improve the work environment and to facilitate the interactions between researchers from different departments, the KBC Communication Office is organising traditional social events in collaboration with the KBC Service Centre and the KBCon Interactive Learning Environment. Besides, KBC is also financially supporting the KBC choir that is meeting once a week.

### KBC- Stafetten (KBC cross country skiing relay)

The traditional KBC-Stafetten is an annual event and, despite its name, participation in the KBC-Stafetten is not limited by the affiliation to the KBC departments. After it had to be cancelled a couple of years in a row due to bad weather conditions, it was relaunched again in 2018. 13 teams participated in 2018 and 16 in 2019, cheered by a crowd of supportive colleagues. Every team consists of four members that are either skiing after each other or all at once on one pair of skis.



Images from KBC Skidstafetten 28 February 2018 and 26 February 2019

### KBC Grillfest (KBC Family BBQ)

The first KBC Grillfest (KBC Family BBQ) was organised in 2017 and repeated in 2018, starting a new tradition for KBC researchers and their families to mingle before the summer break. KBC and KBCon provide the basics (some food, barbecues including charcoals) and activities for children (e.g. a bouncing castle), and even life-streaming of a soccer

game (arranged by KBCCon facilitator in 2018). About 100 people including family members joined the Grillfest every year in 2017 and 2018.



Images from the KBC Grillfests 8 June 2017 and 14 June 2018

## Outreach events

### Fascination of Plants Day

In 2017, UPSC coordinated a public science event on the 20<sup>th</sup> of May to celebrate the 4<sup>th</sup> international Fascination of Plants Day. The idea of this event is to fascinate people for plants and plant science. The day is organised every second year on an international level with events all over the world. Several departments from KBC participated with activities in 2017, e.g. with hands-on experiments and scientific demonstrations. The event is directed towards families with kids and the interested public and took place 2017 at *Sliperiet, Konstnärligt Campus*. KBC supported the event financially and the KBC Communication Office helped with the announcement of the event.

### ForskarFredag

ForskarFredag 2018 was hosted by KBC because of the moving and renovation of Umevatoriet where it was organised previously. It is a public science event organised once per year in September all over Sweden as part of the European Research Night. The event in Umeå is mainly directed to families with kids including a chemistry and physics show as well as hands-on experiments and demonstrations. Many researchers from KBC participated with an activity in the event on the 28<sup>th</sup> of September 2018 that was centrally coordinated by the Communications Office of Umeå University. The KBC Communication Office supported the central organisation before the event with practical on-site advice and advertisements at KBC as well as on the day itself with additional manpower.

### Umeå Renewable Energy Meetings

The Umeå Renewable Energy Meeting (UREM) is an international conference that was yearly arranged at KBC between 2010 and 2017. A group of scientists from different KBC departments organised the meetings together with the KBC Communication Office. The conference started always with an outreach event for school kids in the eighth grade. The pupils were invited to public lectures given by scientists participating in the conference and a type of science fair at which different research projects were presented and pupils could experiment themselves.

### Visit of the Nobel Laureate Jacques Dubochet in 2017

Linda Sandblad from the Umeå Core Facility for Electron Microscopy (UCEM) and KBC invited in 2017 the Nobel Laureate Jacques Dubochet to Umeå University. As part of his visit, school classes were invited to listen to his public lecture. 37 high-school pupils could afterwards participate in an informal meeting with the laureate to ask questions. The KBC Communication Office took an active part in organising the programme for the visit of Jacques Dubochet and also served as a contact for the Nobel laureate before, throughout and after his stay.



Images from different outreach activities during Fascination of Plants Day (20 May 2017), ForskarFredag (28 September 2018), UREM meeting (14 February 2017), visit of the Nobel Laureate Jacques Dubochet (13 December 2017).

## Evaluation of the KBC performance

One of the main missions of KBC is to increase contacts and to stimulate interdisciplinary collaborations between scientists working in life/natural sciences and medicine. During 2016 - 2018, several interdisciplinary and inter-departmental projects were established and granted.

There are several examples of research projects that clearly stated that the KBC environment was central to the formation of research collaborations. One of these examples is the project 'Pharmaceuticals in aquatic environments', a collaboration between researchers from the Department of Ecology and Environmental Science (EMG) and the Department of Chemistry. A young research career reward to Jonatan Klaminder (EMG) set the condition for an experiment aiming to connect ongoing research of pharmaceuticals (Jerker Fick, Dept of Chemistry) with aquatic researchers at EMG (J. Klaminder, T. Brodin and M. Jonsson). The collaboration resulted in a publication in the prestigious journal *Science*, and a Wallenberg Academy Fellow Award to Jonatan Klaminder. This collaboration has so far resulted in 20 peer-reviewed publications. The importance of the KBC environment for the formation of this research group was emphasized by the researchers themselves as seen from the Umeå University press-release about their *Science* paper, ([https://www.umu.se/en/news/pharmaceutical-residue-in-water-result-in-bold-and-voracious-perch\\_5828416/](https://www.umu.se/en/news/pharmaceutical-residue-in-water-result-in-bold-and-voracious-perch_5828416/)):

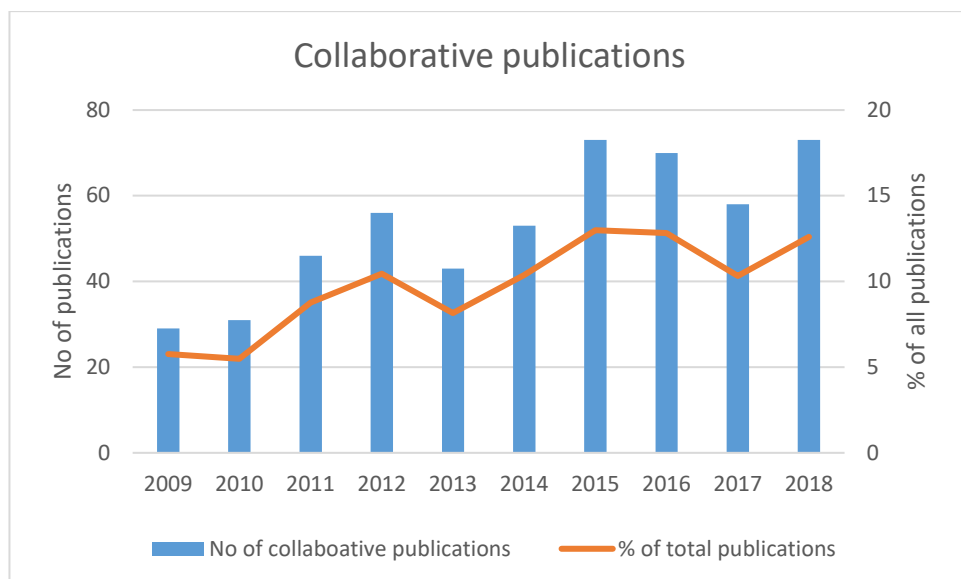
*"When scientists from different fields get together it may result in new angles of research. Jonatan Klaminder, who studies pollution, happened to hear Jerker Fick, who investigates pharmaceutical residue in the environment, being interviewed on the radio about his research. Because they both work in the same building, the Chemical Biological Centre at Umeå University, they met and started talking. Ecologists Tomas Brodin and Micael Jonsson who study fish behaviour and aquatic ecosystems were invited to join the conversation."*

Recently, Tomas Brodin and Jerker Fick implemented their research ideas into the outreach project 'Spindeljakt' in collaboration with *Forskarhjälp*/Research Assistant that is led by the Nobel Museum and is funded by the Foundation for Strategic Research, SSF. The goal of *Forskarhjälp* is to give school students an opportunity to participate in an ongoing research project and to better understand the scientific process. With the help from 67 high-school classes from different regions of Sweden, the researchers from Umeå University were able to collect large amounts of data on how drug residues are spread from watercourses up to terrestrial organism, e.g., spiders.

Another example of inter-disciplinary and inter-departmental collaboration that thrives in the KBC environment is a project that aims to map how plants react to abiotic stresses. In 2017, the researchers Åsa Strand (Umeå Plant Science Centre), Stefan Björklund (Dept of Medical Biochemistry and Biophysics), and Martin Rosvall (Dept of Physics) have been granted 35 million SEK from the Swedish Foundation for Strategic Research for a five-year research program on systems biology. The strength of this project is the different expertise of the interdisciplinary collaborators. Åsa Strand's research is focused on cellular signalling pathways, Stefan Björklund is an expert in the regulation of gene expression in the nucleus, and Martin Rosvall develops mathematical models and algorithms to map complex networks. Together, they aim to decode how plants acclimate to stressful growth conditions such as drought or extreme temperatures. In the press release about the granted project (<https://www.umu.se/en/news/35-million-sek-for-interdisciplinary-research-on-plant-stress-responses--5814120/>), Martin Rosvall underlined:

*"The wide expertise available at the Chemical Biological Centre (KBC) at Umeå University has been crucial for the cooperation that is the basis of our application. We are glad to be part of this interdisciplinary research environment."*

Finally, a trend of a continuous increase in the relative contribution of inter-departmental KBC publications during 2009-2018 indicates that KBC serves its purpose of creating a good environment for stimulating and supporting interdisciplinary research collaboration.



*Number of publications from the KBC environment and relative contribution of collaborative inter-departmental publications during the period 2009-2018. The data is retrieved from DiVA, the UmU publication database. A publication was considered as collaborative if at least two authors were affiliated to different KBC departments/units (the Departments of Medical Biochemistry and Biophysics, Physics, Chemistry, Plant Physiology, Ecology and Environmental Sciences, Umeå Centre for Microbial Research (UCMR), and Molecular Infection Medicine Sweden (MIMS)). Publication type: Article, review/survey, article in journal, book, chapter in book, conference paper.*

## The KBC Environment/Organisation

### KBC affiliated departments and collaborative partners

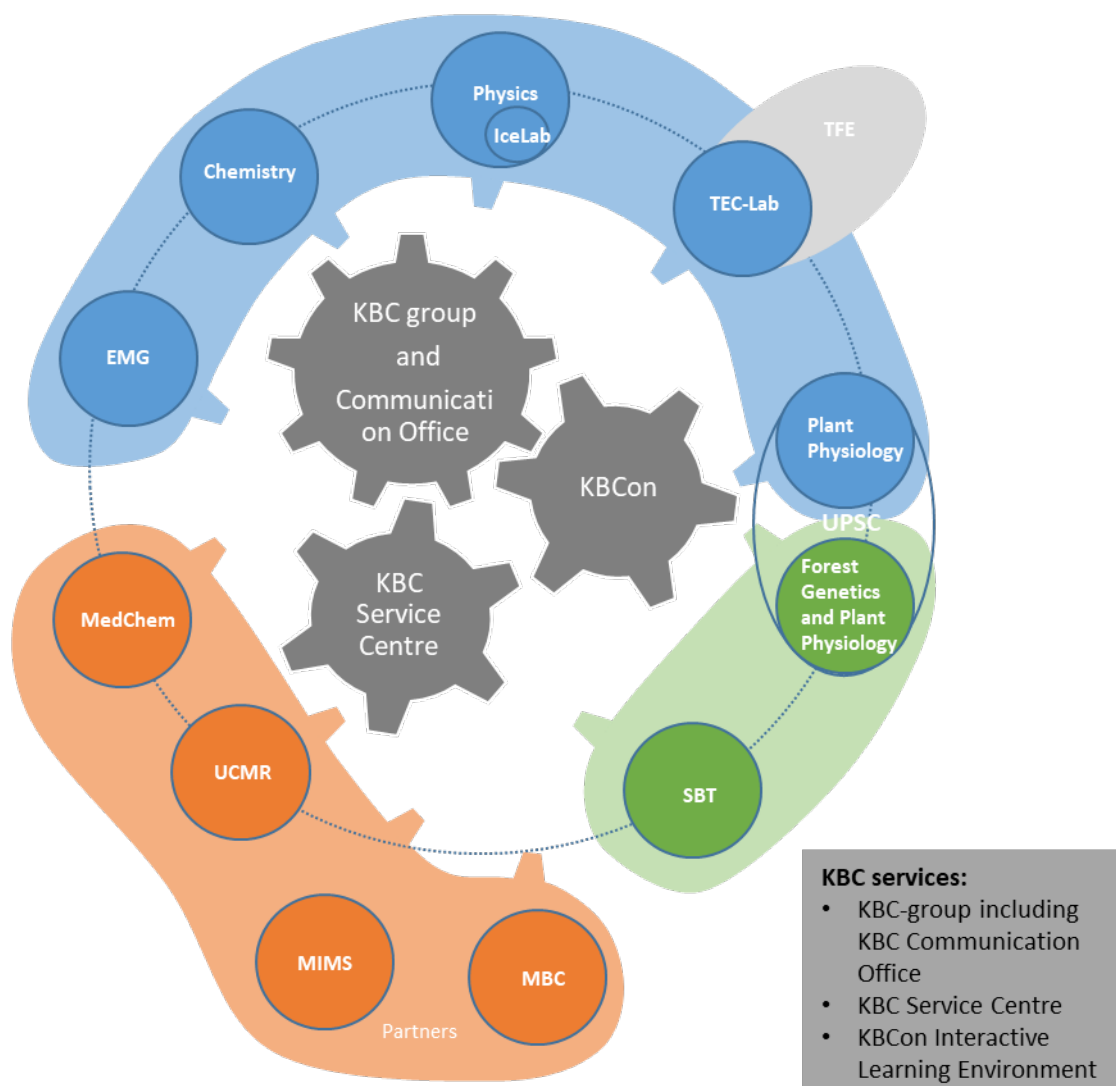
The KBC Environment today includes all departments located within the KBC building and affiliated departments at other locations on campus. It also includes research centres, research units and centres of excellence at Umeå University (UmU) and the Swedish University of Agricultural Sciences (SLU). Three faculties and two universities are represented in KBC. All participating departments and research units, as well as affiliated members, are represented in the KBC Group, the board which is coordinating the research and infrastructure activities at KBC.

### KBC Services

There are three different structures located in the KBC building that provide services to the departments and researchers: the KBC-group including the KBC Communication office, the KBC Interactive Learning Environment, and the KBC Service Centre. KBC Interactive Learning Environment and the KBC Service Centre are funded independently from the KBC-board but collaborate tightly with the board and the KBC Communication office. In addition, the KBC departments benefit from a mechanical workshop, IT-support, the Chem Shop (Kemiförrådet), and recently also from a common autoclaving facility. To coordinate activities and to arrange the services more efficiently, the KBC Service Centre and KBC Interactive Learning Environment have representatives in the KBC-board. Additionally, the staff of the KBC Service Centre, KBC Interactive Learning Environment, the KBC Communication Office and the KBC Scientific coordinator are meeting regularly once per semester.



## Organisation at the Chemical Biological Centre - KBC



### Departments / Research Centres of the Faculty of Science and Technology (UmU)

- Department of Ecology and Environmental Sciences (EMG)
- Department of Chemistry
- Department of Physics and Integrated Science Lab (IceLab)
- The Thermochemical Energy Conversion Laboratory at KBC (TEC-Lab/KBC), part of the Department of Applied Physics and Electronics (TFE)
- Department of Plant Physiology - part of the Umeå Plant Science Centre (UPSC)

### Departments / Research Centres of the Faculty of Medicine (UmU)

- Department of Medical Biochemistry and Biophysics (MedChem)
- The Umeå Centre for Microbial Research (UCMR, VR funded Linnaeus Centre), managed at the Department of Molecular Biology

#### Partners:

- The Laboratory for Molecular Infection Medicine Sweden (MIMS), the Swedish node in the Nordic EMBL Partnership for Molecular Medicine; managed at the Department of Molecular Biology
- The Medical Biology Centre (MBC), represented by the Departments of Integrative Medical Biology (IMB) and Umeå Centre for Molecular Medicine (UCMM)

### Departments / Research Centres of the Faculty of Forest Sciences (SLU)









- Department of Forest Genetics and Plant Physiology - part of the Umeå Plant Science Centre (UPSC)
- Department of Forest Biomaterials and Technology (SBT)

#### Partners:










- The Vinnova Competence Centre for Forest Biotechnology (Collaborative project within UPSC)

### The KBC group and Scientific Coordinator for KBC (January 2019)

The KBC group meets one time per month and is chaired by the Scientific Coordinator for KBC, Professor Stefan Björklund. The KBC Communication Officer, Anna Shevtsova, acts as a secretary for the group. During 2018, there were major changes in the KBC group. Per Garderstöm, who was the Scientific Coordinator for KBC since 2008 retired and Stefan Björklund was appointed by the Vice-Chancellor as new Scientific Coordinator. Eva-Maria Diehl, who worked with 50% as KBC Communication Officer since 2009, moved to work 100% at MIMS. The position of the KBC Communication Officers is now shared by Anna Shevtsova and Anne Honsel. Since 2018, the KBC group is joined by the representatives from the two departments of the newly formed Medical Biology Centre (MBC) located next to the KBC building, the Head of the KBC Service Centre (Erik Ånger), and the KBCon Facilitator (Hardy Hall).

Chair, Scientific Coordinator for KBC	<b>Stefan Björklund</b> Professor, Dept of Medical Biochemistry and Biophysics		Research Infrastructures	<b>Marianne Sommarin</b> Professor, senior, Dept of Plant Physiology / UPSC, Senior Adviser for research infrastructures	
Department of Chemistry	<b>Fredrik Almqvist</b> Professor, Co-Director for CBCS <i>Deputy: Lars Lövgren, Head of department</i>		Department of Ecology and Environmental Sciences (EMG)	<b>Ann-Kristin Bergström</b> Professor  <i>Deputy: Kerstin Abbing</i>	
Department of Medical Biochemistry and Biophysics	<b>Andrei Chabes</b> Professor, Head of department		Department of Physics	<b>Thomas Wågberg</b> Professor, Head of department  <i>Deputy: Kjell Rönmark</i>	
Department of Plant Physiology / UPSC	<b>Stefan Jansson</b> Professor, Head of department  <i>Deputy: Johannes Hanson</i>		Department of Forest Genetics and Plant Physiology, SLU	<b>Thomas Moritz</b> Professor, Director of the Swedish Metabolomics Centre  <i>Deputy: Karin Ljung, Head of department</i>	

Report 2016-2018 Chemical Biological Centre / Kemiskt Biologiskt Centrum (KBC)

Department of Applied Physics and Electronics/KBC TEC-Lab	<p><b>Christoffer Boman</b></p> <p>Senior lecturer (Associate Professor)</p> <p><i>Deputy: Markus Broström</i></p>		Department of Forest Biomaterials and Technology, SLU	<p><b>Mikael Thyrel</b></p> <p>Assistant professor</p> <p><i>Deputy: Francesco Gentili</i></p>	
Umeå Centre for Microbial Research (UCMR)	<p><b>Bernt Eric Uhlin</b></p> <p>Professor, senior. Dept of Molecular Biology, affiliated as professor at MIMS, director of UCMR</p>		Department of Integrative Medical Biology (IMB), Medical Biology Centre (MBC)	<p><b>Per-Arne Oldenburg</b></p> <p>Professor, Head of department</p>	
Umeå Centre for Molecular Medicine (UCMM), Medical Biology Centre (MBC)	<p><b>Lena Gunhaga</b></p> <p>Professor, Head of department</p> <p><i>Deputy: Ulf Ahlgren</i></p>		KBC Service Centre	<p><b>Erik Ånger</b></p> <p>Service director at the Dept of Chemistry, Head of the KBC Servicecenter and Chemical Supply</p>	
KBCon Interactive Learning Environment	<p><b>Hardy Hall</b></p> <p>Facilitator for the KBCon Interactive Learning Environment</p>		KBC Communication Office	<p><b>Anna Shevtsova</b></p> <p>Communication Officer for KBC (75%)</p>	
KBC Communication Office	<p><b>Anne Honsel</b></p> <p>Communication Officer for UPSC (90%) and KBC (10%)</p>		<p><b>Former management member</b></p> <p><b>Per Gardeström</b> Professor emeritus, Department of Plant Physiology Scientific coordinator for KBC 2008 – 31/03/2018</p> <p><b>Eva-Maria Diehl</b> Communication officer KBC (50%) 2009 - 1/05/2018 and MIMS (2009 - present)</p>		

## KBC Communication Office

The KBC Communication Office is responsible for internal and external communication in the KBC environment and for giving administrative support to the KBC group. The Communication Officers support the departments, units and infrastructures at KBC internally in their research and education activities and help to stimulate interactions between the different departments and infrastructures. Externally, the KBC Communication Office aims at spreading information about research activities at KBC, at increasing knowledge about and arousing interest for research and education activities in the KBC environment. The external communication is targeted mainly towards other departments and faculties at UmU and SLU and at the University hospital but also to the national and international research communities and to the society.

The KBC communication officers are in general responsible for:

- updating the KBC homepage;
- announcements of events (e.g. seminars, workshops, conferences, thesis defences) arranged in the KBC environment;
- informing about other events of interest on the Umeå campus;
- the organisation of the KBC Days and other events in the KBC environment;
- support in the organisation of conferences, workshops, discussion series, and other types of scientific meetings;
- supporting researcher and scientific infrastructures in organising scientific courses;
- assisting researchers from the KBC environment in press communications, publishing research results and other news in collaboration with the Faculty's communication officers;
- creating information material about the KBC environment and scientific infrastructures and assisting with visitor programmes;
- administrative support to the KBC group (protocol for the KBC group meetings, KBC reports, collecting, analysing and presenting information about the KBC activities);
- participating in the Faculties' and the University's communication network.

During 2016 - 2018, the Communication Office personnel has increased. In May 2016, Anne Honsel started to work as the Communication Officer for KBC (25%) supporting Eva-Maria Diehl (50%). Anna Shevtsova took over from Eva-Maria Diehl in May 2018. From 2019 on, the time of the KBC Communication Officers has increased from 75% to 85% in total (75% Anna Shevtsova, 10% Anne Honsel).

More detailed information about the activities of the KBC Communication Office activities in the years 2016-2018 are described under 'KBC activities 2016-2018' - 'Coordination of internal and external communication' and 'Events organised and/or supported by KBC'.

### Contacts:

Anna Shevtsova, PhD  
Communication officer for KBC (75%)  
KBC - building, KB-J3, Linnaeus väg 6, 90736 Umeå  
[info.kbc@umu.se](mailto:info.kbc@umu.se)  
[anna.shevtsova@umu.se](mailto:anna.shevtsova@umu.se)

Anne Honsel, PhD  
Communication officer for KBC (10%) and UPSC (90%)  
KBC - building, KB-J3, Linnaeus väg 6, 90736 Umeå  
[info.kbc@umu.se](mailto:info.kbc@umu.se)  
[anne.honsel@umu.se](mailto:anne.honsel@umu.se)

### KBCon Interactive Learning Environment

KBCon, the Interactive Learning Environment at KBC, is a set of premises (Glasburen, KB.F3.01, KBC Atrium, Lilla Hörsalen, and Carl Kempe salen) with integrated communication technologies that provide dynamic meeting places for a wide range of event types. KBCon has a facilitator, Hardy Hall, who is training people in the use of these technologies and is providing support for more demanding events such as video-conferencing, live-streaming and recording.

KBCon aims to enable and improve researchers' ability to spontaneously present and discuss complex datasets and models, locally and internationally. Secondly, KBCon aims to improve the ability of core facilities to communicate their services and recruit users. Lastly, KBCon aims to enhance the visibility of research and careers in science to students from all levels. KBCon shares a common communications action plan with the other two Interactive Learning Environments at Umeå University that includes outreach to departments, website development, and digital signage.

Contact:

Hardy Hall, PhD

Facilitator for the KBCon Interactive Focus Environment

KBC Communication office, KBC - building, KB-J3, Linnaeus väg 6, 90736 Umeå

[hardy.hall@umu.se](mailto:hardy.hall@umu.se)

### KBC Service Centre

The KBC Service Centre is the internal house service in the KBC building. The KBC Service Centre is responsible for general maintenance and provides help with a broad spectrum of practical issues for both employees and visitors of the KBC building. The costs for this service are split between the departments in the KBC building according to the number of employees. These costs are not included in the budget of the KBC group. The activities at the KBC Service Centre are coordinated by Erik Ånger, KBC Facility Manager, Department of Chemistry.

The KBC Service Centre provides

- technical support for all KBC buildings;
- external and internal mail service;
- waste recycling and management;
- access badges to the corridors at KBC;
- booking of seminar rooms and lecture halls;
- booking of LCD-projectors, poster walls and other equipment.

The KBC Service Centre also provide a printing service. The service offers printing, laminating, and cutting of printed products (e.g. like posters, flyers, theses, abstract books, course hand-outs and certificates, business cards).

Contact:

Erik Ånger

Service director at Department of Chemistry

Servicecenter KBC, Chemical Supply

KBC, B3, Linnaeus väg 10, Umeå universitet, 901 87 Umeå

[erik.anger@umu.se](mailto:erik.anger@umu.se)

## Mechanic workshop

Since 2017, a new service is offered within the KBC environment. The KBC departments have the possibility to get support from the workshop at the Department of Physics. The workshop offers services to repair laboratory equipment and create tailor-made constructions. It is equipped with machines for constructions in wood, metal and plastics.

The KBC group supports the mechanical workshop through a guaranteed income (200 kSEK in 2019) for the coverage of the services, by the administration of internal invoices, and by advertising and promotion of their services.

Contact:

Peter Wikström, Constructor

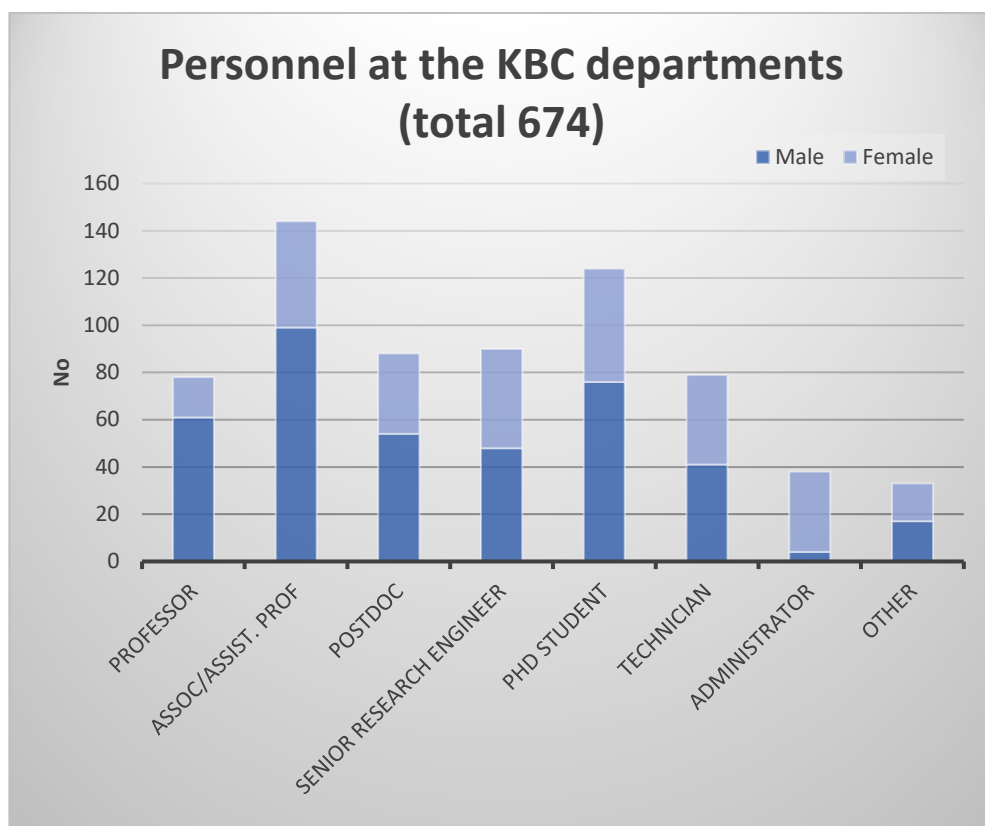
Department of Physics

Fysikhuset, Linnaeus väg 24, FC109

Umeå universitety, 901 87 Umeå

[peter.wikstrom@umu.se](mailto:peter.wikstrom@umu.se)

## Personnel at KBC (January 2019)



Employees at the KBC departments:

Assoc/Assist. Prof: associated professors, senior lectures, assistant professors, lecturers, researchers

Postdoc: postdocs, including fellowship holders; PhD students: postgraduate students

Technician: research engineers, research assistants, system engineers

Other: project assistants, project coordinator, communication officers, service assistants

Not included: emeritus professors, exchange students, master and BSc students, visiting guests

2016-18

# KBC Report

Chemical Biological Centre /

Kemiskt Biologiskt Centrum (KBC)

Contacts:

**Stefan Björklund**, Professor

Scientific Coordinator for KBC  
[stefan.bjorklund@umu.se](mailto:stefan.bjorklund@umu.se)

**Anna Shevtsova**, PhD

KBC Communication officer  
[info.kbc@umu.se](mailto:info.kbc@umu.se)

Homepage: <https://www.umu.se/en/kbc>

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



UMEÅ  
UNIVERSITY



**KBC**

Chemical Biological Centre  
Umeå University/SLU  
[www.umu.se/en/kbc](http://www.umu.se/en/kbc)

## Appendix 1. Description of the KBC Infrastructures

# Biochemical Imaging Centre Umeå (BICU)

### Short Summary of the Facility

**The Biochemical Imaging Centre Umeå (BICU)** provides state-of-the-art imaging technology including advanced light microscopy, affinity measurements and atomic force microscopy. BICU is an open-access imaging centre that offers cutting-edge techniques to researchers all over Sweden according to a fixed organization and user fees as described on the homepage. The combination of methodologies provide means to study strength, as well as spatial and temporal regulation, of interactions between biomolecules in systems ranging from molecules to cells. The centre includes dynamic live cell confocal microscopy and super-resolution microscopy. The state-of-the-art Atomic force microscopes allow for ultra-resolution 3D-imaging and force-interaction measurements. 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 microscopic techniques.

BICU is part of a **National Microscopy Infrastructure (NMI)**: a Swedish infrastructure for the use and support of advanced microscopy in life science. NMI was founded in April 2016 with the financial support from the Swedish Research Council (VR-RFI) and co-financing from the participating Universities. The four participating universities are: Royal Institute of Technology (KTH), Stockholm University (SU), Umeå University (UmU) and University of Gothenburg (GU). 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 in microscopy. NMI in Umeå is the node specialized for advanced correlative imaging techniques. Hereby, BICU closely collaborates with Umeå Core Facility for Electron Microscopy (UCEM) to provide correlative light and electron microscopy (CLEM).

### Equipment

#### *Equipment "owned" by the infrastructure:*

- Zeiss ApoTome microscope
- Nikon A1R Laser Scanning Microscope
- Zeiss Spinning Disk Confocal Microscope
- Zeiss 710 Laser Scanning Microscope
- Bruker Atomic Force Microscope
- Biacore 3000
- Auto-ITC200
- Proteon XPR36

- Ligand Tracer<sup>®</sup> Green
- Imaris working station (software license and analysis computer)
- Cell Asic Onix system for Microfluidics (Millipore)
- POC mini system (Pecon)

#### *Equipment used but not "owned" by the infrastructure:*

- Microinjector (Millipore)
- Cell culture hood and incubator

### Service provided by the platform

- Consultation, advice on experimental design and optimization of experimental conditions
- Technical support
- Personal training to provide driver's license for the user on the instrument
- Assistance with data analysis
- Data storage

### Personnel

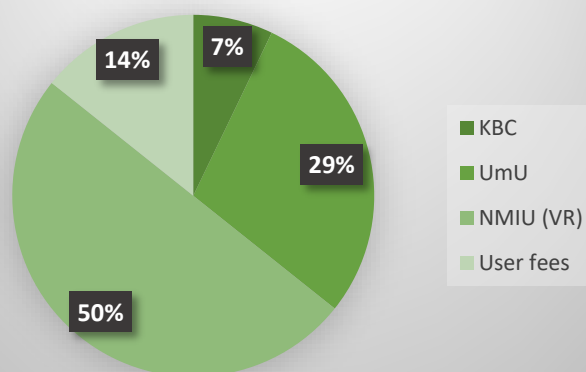
<b>Richard Lundmark</b>	Associate Professor, BICU Director, MIMS group leader Department of Integrative Medical Biology
<b>Irene Martinez</b>	PhD, BICU Facility Manager, Light Microscopy specialist Department of Medical Biochemistry and Biophysics
<b>Naga Venkata Gayathri Vegesna</b>	PhD, Senior Research Engineer for CLEM (from 2017)



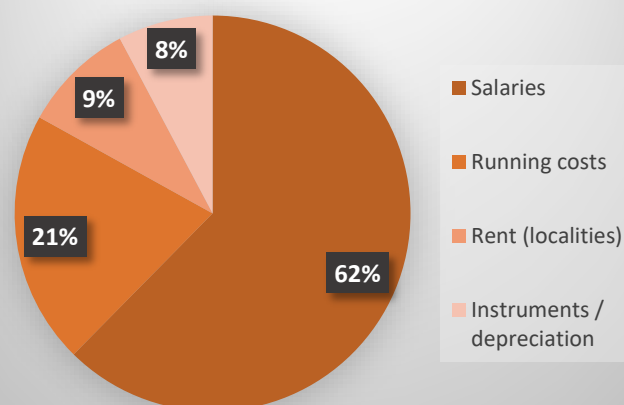
	Department of Integrative Medical Biology and Department of Medical Biochemistry and Biophysics
<b>Steering committee</b>	
Richard Lundmark	Associate Professor, Integrative Medical Biology, UmU
Thomas Borén	Professor, Medical Biochemistry and Biophysics, UmU
Magnus Wolf-Watz	Professor, Chemistry, UmU
Linda Sandblad	PhD, Molecular Biology, UmU
Anders Olofsson	PhD, Medical Biochemistry and Biophysics, UmU
Ludmilla Morozova-Roche	Professor, Medical Biochemistry and Biophysics, UmU
Jonathan Gilthorpe	Associate Professor, Pharmacology and Clinical Neuroscience UmU
Stephanie Robert	Assistant Professor, Department of Forest Genetics and Plant Physiology, SLU, Umeå Plant Science Centre
Affiliated to steering committee:	
Andrei Chabes	Professor, Head of department, Medical Biochemistry and Biophysics, UmU
Karl-Gunnar Westberg	Associate Professor, Integrative Medical Biology, UmU
Markus Grebe	Professor, Scientific advisor, Plant physiology, University of Potsdam, Germany
<b>Contact information</b>	
Chemical Biological Centre KBC - Department of Medical Biochemistry and Biophysics, Umeå University, 901 87 Umeå	
Visiting Address: KBC building, Linnaeus väg 6, Umeå University, floor 6	
Homepage: <a href="https://www.umu.se/en/research/infrastructure/biochemical-imaging-centre-umea-bicu/">https://www.umu.se/en/research/infrastructure/biochemical-imaging-centre-umea-bicu/</a>	

**Budget - BICU**

**Income 2019 (%) - BICU  
(total 3.500 kSEK)**



**Expenses 2019 (%) - BICU**



<p style="text-align: center;"><b>Users BICU - 2016-2018</b> (mean no of PI users/year=72)</p> <table border="1"> <caption>Data for Users BICU - 2016-2018</caption> <thead> <tr> <th>Category</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>UmU</td> <td>38%</td> </tr> <tr> <td>UmU/KBC</td> <td>59%</td> </tr> <tr> <td>SLU/KBC</td> <td>1%</td> </tr> <tr> <td>Other universities in Sweden</td> <td>&lt;1%</td> </tr> <tr> <td>Other universities abroad</td> <td>1%</td> </tr> <tr> <td>Non-academic</td> <td>1%</td> </tr> </tbody> </table>	Category	Percentage	UmU	38%	UmU/KBC	59%	SLU/KBC	1%	Other universities in Sweden	<1%	Other universities abroad	1%	Non-academic	1%	<p style="text-align: center;"><b>Users of the Biochemical Imaging Core Facility</b></p>
Category	Percentage														
UmU	38%														
UmU/KBC	59%														
SLU/KBC	1%														
Other universities in Sweden	<1%														
Other universities abroad	1%														
Non-academic	1%														
<p><b>Teaching activities</b></p> <ul style="list-style-type: none"> <li>• 2016-2018: Personal training, resulting in an individual driver license on a particular instrument, is running throughout the year.</li> <li>• 2016-2017: Annual PhD course in Bioimaging, 1.5 ECTS</li> <li>• 2017-2018: Local demonstrations of BICU and imaging techniques by Irene Martinez and Richard Lundmark</li> <li>• 2017-2018: Lectures on modern microscopy for Medical students and Biomedical students, UmU, by Richard Lundmark and Irene Martinez</li> <li>• 2017-2018: National and international seminars on imaging techniques given by Richard Lundmark.</li> <li>• 2018: 1st NMI course: Microscopy advancement course (Linköping, 13-15 March 2018) given by Gayathri Vegesna</li> <li>• 2018: 2nd NMI course: Advanced Microscopy for Life Sciences: Advanced Microscopy for Life Sciences (Lund, 25-27 September 2018) given by Gayathri Vegesna</li> </ul>															
<p><b>Future development</b></p> <p>During 2018 we have initiated processes to exchange and update major instruments within BICU. We have successfully attracted external and internal funds both via applications and via coordinating the interest of researcher starting up their lab and BICU. The planned instrument park updates include:</p> <ul style="list-style-type: none"> <li>• Installation of two new confocal microscopes at Chemistry and at Molecular Biology. One of the instruments will also provide a new technique FLIM (Fluorescence Life Time Imaging Microscopy) that will expand the microscopy possibilities at the facility;</li> <li>• Installation of a Cryo-CLEM Microscope to facilitate correlative light and cryo-electron microscopy together with UCEM. This cryo-stage will also enable transfer of the sample to the Titan Krios cryo-electron microscope. Together with the National Microscopy infrastructure, we will continue to advertise this National Microscopy infrastructure, the technical possibilities and to outreach more projects with CLEM in Sweden and also locally in the different departments and centers within Umeå University.</li> <li>• Upgrade or replace the ApoTome wide-field microscope at Medical Biochemistry and Biophysics.</li> <li>• Installation of a white light TIRF microscopy system at Clinical Microbiology that will complement our current TRIF system since it is adopted to provide a more even illumination of surfaces. The system will be available and handled according to the BICU policy.</li> <li>• Reparation of the AFM microscope.</li> </ul> <p>During 2019 we also aim to continue to develop the possibilities for researchers to measure protein interactions both in solution and on surfaces using techniques such as ITC, SPR, AFM and Stop-Flow. We intend to include more equipment and subsidize the user fees in order to attract users. We aim to provide personnel to maintain the equipment and support users.</p>															
<p><b>Publications</b></p> <p>Publication statistics: average no publications/year during 2016-2018 (co-authored/acknowledged): <b>0.3/5.7</b></p>															

# Umeå Core facility for Electron Microscopy (UCEM)

## Short Summary of the Facility

**Umeå Core facility for Electron Microscopy (UCEM)** supports electron microscopy (EM) projects and maintains EM instruments for research. Today the facility hosts six electron microscopes (EMs) for different and partly complementary applications, e.g. Scanning Electron Microscopy (SEM) surface visualization, element analyses, Transmission Electron Microscopy (TEM) for cellular morphology, gold-immunolabeling, Cryo-EM for structure biology, tomography and 3D visualization of molecular complexes, microorganisms, cells and tissues. UCEM is used by researchers from both the medical and science and technology faculties at UmU (e.g. departments in the fields of physics, chemistry, life sciences, as well as medical departments with molecular or cell biology related research. UCEM is also used by researchers at SLU and serves as a national facility for electron microscopy. This infrastructure offers both research support, trains postdocs and students in methodology, offers lab space for users and provides service to research projects.

## Equipment

### Equipment owned by the infrastructure:

#### Electron microscopes:

- Jeol 1230 TEM, 80 kV, Tungsten filament, Gatan Orius CCD camera 4 M pix, single and penta grid holders
- Merlin field emission-SEM, In-lens SE, ET-SE, BSD, EsB, STEM, CCD, EDS detectors systems, operating at 20V to 30kV at room temperature and under cryo conditions
- Talos L120 TEM, LaB6 filament, Ceta CMOS 16 M pix, single -, tomography- and Gatan 626 cryo holders
- Scios DualBeam FIB-SEM, Rinity T1/T2, ET-SE, ICE, DBS, CCD detectors, May 2018 upgraded with Aquilos cryo-stage and cryo-transfer.
- Titan Krios 300 kV Field Emission Gun Cryo-TEM, Ceta CMOS 16 M pix detector, FalconIII 16 M pix direct electron detector, Gatan BioQuantum K2 16 M pix direct electron detector including energy filter, phase plate and cryo- autoloader.

#### EM sample preparation equipment:

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>• Critical Point Dryer Leica EM CPD300</li> <li>• Sputter Coater Quorum Q150T-ES</li> <li>• Cryo Ultra Microtome Leica EM UCF 7</li> <li>• Cryo Ultra Microtome Leica / Reichart Ultracut FC S</li> <li>• Ultra Microtome Leica / Reichart Ultracut S (two x)</li> <li>• High Pressure Freezer Leica EM HPM 100</li> <li>• Automatic freeze Substitution Leica EM AFS S6E</li> <li>• Carbon Coater Leica EM ACE 200 Low Vacuum</li> <li>• Glow discharge system PELCO easiGlow</li> </ul> | <ul style="list-style-type: none"> <li>• Vitrification / Plunge freezing system FEI Vitrobot</li> <li>• Vitrification / Plunge freezing system Manual from EMBL</li> <li>• Microwave for cell and tissue preparation PELCO BioWavePro+</li> <li>• Glass knife maker Leica KMR3</li> <li>• Fume hoods for EM sample preparation (x four)</li> <li>• Dehydrated lab area for cryo sample preparation</li> <li>• Stereo microscopes for dissection (x three), Leica and Zeiss</li> </ul> |
|--|---|

### Equipment used (but not owned) by the infrastructure

#### Electron microscope:

- Evo SEM, LaB6 filament, ET-SE, VPSE-G4, HDBSD, CCD, EDS, WDS, EBSD detector systems, operating at 200V to 30kV, at room temperature and up to 1500°C

#### Preparation equipment:

- Gatan PECS II Broad Ion Beam Miller (BIB)

#### Computer:

- Graphics workstation – Ronnie Berntsson: 256GB RAM, Xeon 2.1 Ghz x64, 3xNvidia GeForce GTX 1080, 9TB Hard drive. EM Programs installed: Scipion, IMOD, Relion, EMAN, Chimera, MotionCor2, CTFFIND4.

#### Equipment at common KBC infrastructures:

- KBC autoclave facilities
- KBC liquid nitrogen service
- Media infrastructure at the “Focus environment” for teaching and facility visits
- Physics workshop support
- Freeze during at UPSC

#### Service provided by the platform

Service and support are offered for all electron microscopy application “doable” on our current instruments and equipment. We have the ambition to be as complete as possible to serve a large community and to meet the demands from all research fields active in Umeå. We are happy to be part of new method development and to establish new EM methods arising from the international EM community.

Facility staff can provide project service, sample preparation and imaging and deliver images and analyses to the users. Alternatively, UCEM provides project support in form of training; users can work with their projects at the facility, learn methods and instrument operation. Frequently used and highlights of EM methods are:

- Chemical fixation of cells and tissue
- Resin infiltration, different resins and staining alternatives
- Microwave assisted fixation and resin infiltration – New 2018
- Cryo fixation, high pressure freezing – service started 2017
- Automatic freeze substitution, different resins and staining
- Ultra-microtome sectioning for EM and light microscopy
- Cryo sectioning – support started 2018
- Tokuyasu sectioning
- Gold immunolabeling
- Negative staining EM of microorganisms and protein complexes
- Correlative Light and Electron Microscopy (CLEM) – New extended staff support 2017
- Cryo fixation, plunge freezing, vitrification for cryo-EM - New 2017
- Critical point drying for SEM
- Cryo lamella preparation for cryo tomography – New 2018
- Cryo EM data collection as national service - New 2018
- SEM element analyses
- Volume imaging and 3D reconstruction of cellular volumes, tomography and FIB-SEM – New 2018
- Intermediate server for image storage and IT support for data transfer – New 2018
- Image analysis support on facility graphics computer workstations – New 2018
- FIB assisted analyses of material
- Sample preparation for soft beam line analyses, specifically cryo preparation, for MAXIV – New VR project funding from 2019

#### Current UCEM staff:

<b>Linda Sandblad</b>	Facility Coordinator, SciLifeLab Cryo-EM Head of facility, NMI facility director. Employment at Molecular Biology
<b>Cheng Choo Lee (Nikki)</b>	First research engineers for SEM, employment at UPSC
<b>Sara Henriksson</b>	First research engineer for TEM and SEM, employment at UPSC
<b>Agnieszka Ziolkowska</b>	First research engineer 80% for TEM, employment at UPSC
<b>Gayathri Vegesna</b>	First research engineer for CLEM and TEM, employment at IMB
<b>Michael Hall</b>	First research engineers for cryo-EM, employment at Chemistry and Molecular Biology
<b>Camilla Holmlund</b>	First research engineer for cryo-EM, employment at Dept. of radiation and oncology
<b>Hussein Haggag</b>	First research engineer for IT, employment at Medical chemistry

#### Steering committee (from spring 2018)

Lars-Anders Carlson	Assistant Professor (Steering board Chair and contact person), Dept of Medical Biochemistry and Biophysics, Wallenberg Centre for Molecular Medicine (WCMM)
Christoffer Boman	Associate Professor, Dept of Applied Physics and Electronics
Magnus Wolf-Watz	Associate Professor, Dept of Chemistry
Hannele Tuominen	Associate Professor, Umeå Plant Science Centre /Dept of Plant Physiology
Karl-Erik Magnusson	Professor, Dept of Clinical and Experimental Medicine, Linköping university
Kristian Riesbeck	Professor, Dept of Medical Microbiology, Lund university, Lund/Malmö

**Contact information**

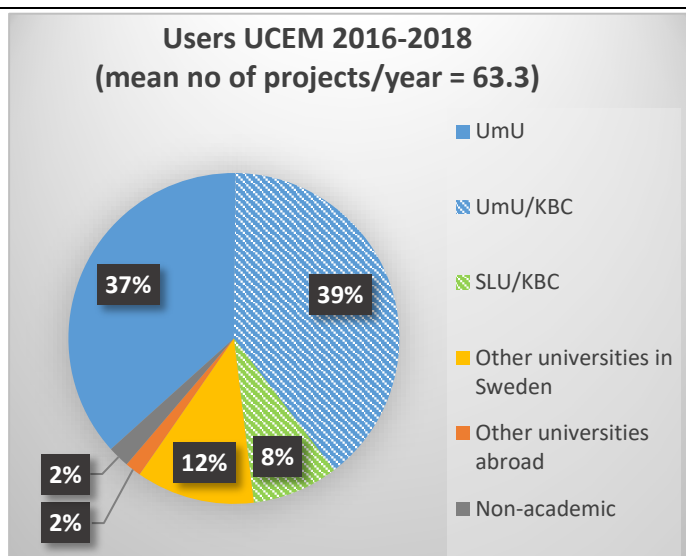
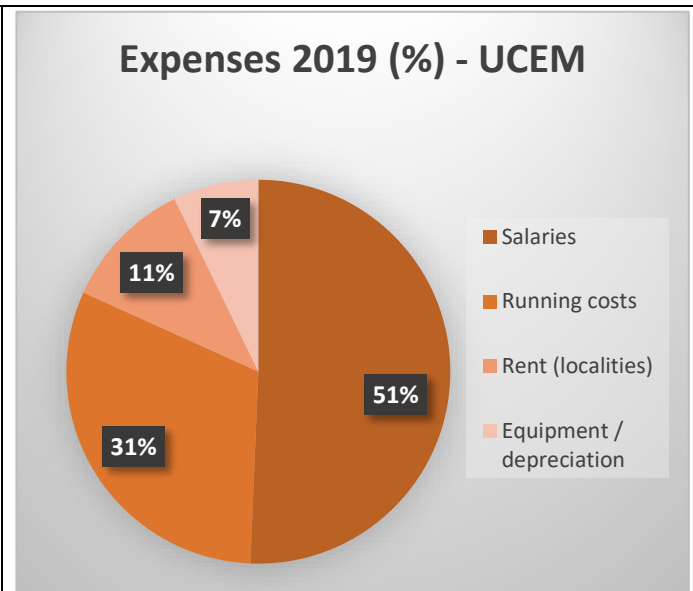
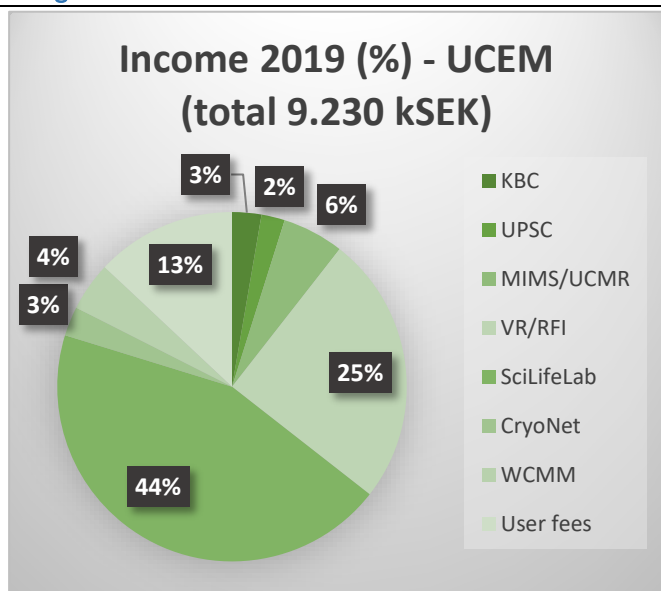
Visiting address: Electron Microscopy building, KB.D, Umeå University

Contact person: Dr. Linda Sandblad  
 Dept of Molecular Biology  
 +46(0)709324936  
 E-mail: [linda.sandblad@umu.se](mailto:linda.sandblad@umu.se)

Homepage:

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

**Budget - UCEM**



Users of Umeå Core facility for Electron Microscopy

### Teaching activities

Teaching activities organized by UCEM and contributed to by UCEM staff are organized on an annual basis. It has been and will be very similar during the recent and coming years, to simplify the activities during 2018 are presented here.

Courses organized by UCEM:

- 20-22 Feb 2018: “Basic course in Electron Microscopy”. The course is always oversubscribed and a selection of 50% the applications with the best motivation is applied. Or aim is to educate all PhD students and postdocs interested in EM, so they understand how electron microscopy is useful in research, have the knowledge to choose appropriate methods for their projects and get the first hands on contact with instruments.
- 2 Feb and 8 Feb: EM as a structure biology toolkit and negative staining practical during the Protein expression and purification course
- 9-13 April: “TEM sample preparation”, a one-week full time course on sample preparation, lab work including fixation methods, resin embedding, ultramicrotome sectioning and Focused Ion Beam (FIB)-SEM
- 13-15 March 2018, Linköping: Microscopy advancement course (NMI course, NL, GV)
- 7-9 May: “Amira workshop”, 3D volume imaging, open lectures and training for staff and facility users.
- 14-16 May 2018: SciLifeLab “Cryo-Electron Microscopy sample preparation and data collection course”. Joint SciLifeLab course, lectures and practical sessions with international teachers and participants.
- 25-27 September 2018, Lund: Advanced microscopy for life sciences (NMI course, NL, GV)
- 24-26 September 2018. SciLifeLab course “Cryo-EM single particle reconstruction” organized by Stockholm Cryo-EM lab, MH is contributing teacher from UmU
- 2-4 October 2018: “Basic course in Electron Microscopy”. Offered second time during 2018, see above.

We also offer individual training on all microscopes on request and demand, as well as assistance in sample preparation techniques in our lab.

Undergraduate teaching activities; lectures and practicals given by UCEM staff:

- 10 Dec 2017: Nobel celebration with Forskaraspirant programmet, Lecture about Nobel prize in Chemistry (LS)
- 22-23 Feb 2018: 4 lectures for the course: Molecular Genetics, 15hp; “Protein localization” and “Microscopy techniques” (LS, MH)
- Biological chemistry course, SEM demonstration. (NL)
- 10 April 2018: 3 lectures for the course: Structure biology 7,5hp; “Electron microscopy” and lab demo (LS, GV)
- 29 November 2018: 2 lectures for the course Protein structure and function “Electron microscopy methods” (LS)
- 13 and 17 Dec 2018, Toolbox course, Chemistry, SEM lecture and demonstration (NL)

### Outreach activities during the past year:

- 8 Dec 2017: Nobel celebration at Dragonskolan, lecture about Noble prize in Chemistry
- 10 Dec 2017: Swedish Television, SVT Nobelstudion, live broadcast presentation of the Nobel prize in Chemistry 2017
- 13 Dec 2017: Umeå University Nobel lecture, invitation of Jaques Dubochet, public lecture and one day program for high school.
- 11 Feb 2018: School visit from Skellefteå lecture and facility tour.
- 27 April 2018: “Dekanbesök” Research infrastructure presentation for Swedish medical faculty deans representing all universities.
- 2 May 2018: Poster presentation and jury member at Dragonskolan Science project examination.
- 30-31 May 2018 Poster presentation for SFMT conference at Sliperiet, Umeå
- 18-20 June 2018: Oral presentation at Swedish Chemistry Association Meeting in Lund
- 28 September 2018: ForskarFredag, microscopy activities and EM lab tours and demo.
- 16 October: Oral presentation at annual SNIC meeting with representatives from all Swedish universities

- 8 November 2018: Facility tour for teachers from Piteå
- 27 November 2018: Oral presentation at Electron Microscopy 80 Years in Uppsala
- 22 November: School visit from Närpes, Finland, facility tour.

UCEM always gives oral or poster presentation, contributes as round table discussions table leaders and offers facility tours in in house meetings such as UCMT day, KBC days, Medical Faculty research day and Umeå Cell Biology symposia 2018.

#### Future development

- Since 2016 UCEM has developed from a small 2-person core facility to an 8- person state of the art, national facility for advanced imaging and cryo-EM data collection. We are looking forward to have a year of fully operational support and service.
- UCEM will develop the support and service for image processing, also in future collaboration with the centre for image analysis in Uppsala.
- We collaborate with HPC2N and the Jose Miguel de la Rosa Trevin at ScilifeLab cryo-EM node in Stockholm to enable usage of large high throughput clusters for 3D image reconstruction work.
- Offer florescent imaging under cryo condition in collaboration with BICU, which will enable high-resolution correlative imaging methods for 3D visualization of cells. The procurement has already started. An installation by Leica or Zeiss is scheduled Feb 2019
- UCEM research engineers will actively work on method development and continue facility staff training for enhanced facility service quality
- UCEM will set up an on-line project support log book for users and staff to share communication and project protocols.
- The steering group will follow the development of the facility
- The steering group will review the facility management and organisation and suggest improvements or changes that in the future could be a role model for how facilities are organized within KBC, UmU and national facilities.

#### Publications

Publication statistics: average no publications/year during 2016-2018 (co-authored and acknowledged): **17.7**

# Swedish Metabolomics Centre (SMC)

## Short Summary of the Facility

**Swedish Metabolomics Centre (SMC)** is a collaboration between SLU and UmU, and is located at KBC (Umeå Plant Science Centre's localities). The main aim of the facility is to support the researchers at Swedish Universities with mass spectrometry-based analysis of metabolites and lipids in biological tissues, and furthermore, to become a leading knowledge centre in metabolomics and related areas. The purpose is to continuously develop the facility up-to-date with latest techniques and methodology, as well as being transparent and cost effective to reduce the costs for the users. By having open access function with open calls for method development the facility is accessible for a wide range of users in the field of biology and medicine, not only in need for standard metabolomics analysis.

From 2016, SMC is part of the SciLifeLab organization, under the proteomics and metabolomics platform.

## Equipment

*A description of equipment owned by the infrastructure.*

- 2 LC- QTOF/MSMS
- 1 LC-IMS-QTOF/MSMS
- 3 LC-QqQMSMS
- 2 GC-ToFMS
- 1 LC-LTQ-Orbitrap MSMS

*A list of equipment used (but not owned) by the infrastructure*

- 1 GC-QqQMSMS

## Service provided by the platform

- Metabolomics analysis (untargeted metabolite profiling)
- Targeted analysis (analysis of specific metabolite or metabolite classes)
- Method development short (1-3 days of testing)
- Method development long (3-4 weeks of extensive method development)
- Identification of metabolites
- Open access lab

## Personnel

<b>Thomas Moritz</b>	Director
<b>Anders Nordström</b>	Director
<b>Annika Johansson</b>	Head of Facility (from 1st of October, 2018)
Jonas Gullberg	until Sept 2018
Annika Sjöström	(~80%)
Maria Ahnlund	(85%)
Krister Lundgren	(90%)
Hans Stenlund	
Siv Sääf	(part time)
Inga-Britt Carlsson	(part time)
Cecilia Pettersson	June 2018-
Erik Appelblad	March 2018-
Sandra Goueva	2017-Jan 2018

## Contact information

Annika Johansson

Senior research engineer, Department of Molecular Biology

[annika.johansson01@umu.se](mailto:annika.johansson01@umu.se)

Homepage:

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



<p><b>Budget - SMC</b></p> <p><b>Income 2019 (%) - SMC (total 14.490 kSEK)</b></p> <table border="1"> <thead> <tr> <th>Source</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>KBC</td> <td>&lt;1%</td> </tr> <tr> <td>UmU</td> <td>7%</td> </tr> <tr> <td>SLU</td> <td>8%</td> </tr> <tr> <td>KAW</td> <td>25%</td> </tr> <tr> <td>SciLifeLab</td> <td>18%</td> </tr> <tr> <td>User fees</td> <td>42%</td> </tr> </tbody> </table>	Source	Percentage	KBC	<1%	UmU	7%	SLU	8%	KAW	25%	SciLifeLab	18%	User fees	42%	<p><b>Expenses 2019 (%) - SMC</b></p> <table border="1"> <thead> <tr> <th>Category</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Salaries</td> <td>52%</td> </tr> <tr> <td>Running costs</td> <td>30%</td> </tr> <tr> <td>Rent (localities)</td> <td>9%</td> </tr> <tr> <td>Equipment / depreciation</td> <td>7%</td> </tr> <tr> <td>Other</td> <td>2%</td> </tr> </tbody> </table>	Category	Percentage	Salaries	52%	Running costs	30%	Rent (localities)	9%	Equipment / depreciation	7%	Other	2%
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<p><b>Teaching activities</b></p> <ul style="list-style-type: none"> <li>• Introduction courses for new open access users: on demand</li> <li>• Bioanalytical methodologies with emphasis on use of chromatography and mass spectrometry in metabolomics analysis: spring 2018 (2 modules)</li> </ul>																											
<p><b>Future development</b></p> <ul style="list-style-type: none"> <li>• Application to VR-RFI (Feb 2019)</li> <li>• Purchase and Installation (Spring 2019) of high throughput on-line SPE chromatography system (RapidFire) for ultra-high throughput metabolite analysis</li> <li>• During next year's one QTOFMSMS system must be replaced</li> </ul>																											
<p><b>Publications</b></p> <p>Publication statistics: average no publications/year during 2016-2018 (collaborative-service/service): <b>1.3/22</b></p>																											

# Nuclear Magnetic Resonance (NMR) spectroscopy KBC Core Facility

## Short Summary of the Facility

**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 infrastructure is part of the national infrastructure “NMR for Life” ([www.nmrforlife](http://www.nmrforlife)), funded by KAW (2013-2020) and ScilifeLab (2016, 2017-2020) and operated by the Swedish NMR centre at the University of Gothenburg and at Umeå University. As part of “NMR for Life”, the infrastructure grants access to academic and industrial researchers across Sweden.

Users have access to the most powerful liquid and solid-state NMR infrastructure in the country with – in Umeå - instruments at 850, 600, 500 and 400 MHz, respectively. High-field instruments are equipped for biomolecular solution NMR, robotic sample preparation and high-throughput metabolomics of bio-fluids. This facility offers nationwide unique solid-state NMR capabilities at 850 and 500 MHz for studies of membrane proteins, amyloid fibrils, metabolomics on intact tissues, material science and environmental science. Fragment-based screening is also offered as national support for CBCS/LCUBU, including comprehensive substance libraries.

The KBC Core Facility operates all NMR instruments available on campus, and serves a large user group from UMU, SLU and companies; as well as national and international users. Local users span a remarkably wide range of fields, such as materials science, chemical biology and organic synthesis, structural biology, plant- and environmental sciences, biogeochemistry and medical metabolomics.

Local researchers profit strongly from the facility’s status as national infrastructure and from the close collaboration with the Swedish Metabolomics centre (SMC) in the area of MS and NMR combined metabolomics and analysis.

## Equipment

The NMR infrastructure equipment consists of five spectrometers with distinct specialties at different magnetic fields, a field cycling relaxometer and certain sample preparation tools including a pipetting robot and ball mills. All spectrometers are equipped with sample changers for automatic handling of standardized routine or screening type experiments.

**The 850 MHz instrument**, currently (900 MHz at GU down during 2018) the highest available field in Sweden, is used for biomolecular NMR e.g. protein structure and dynamics, in both the liquid and solid state. This instrument is also the most sensitive in the infrastructure, enabling sample concentrations on the low micromolar scale for  $^1\text{H}$  detection. Furthermore it has specialized equipment for deuterium isotope profiling at natural abundance enabling sensitive  $^2\text{H}$  fluxomics.

**The 600 MHz instrument** has an advanced samples changer that can handle more than 500 cooled liquid samples. This spectrometer is thus ideal for NMR metabolomics and fragment based screening, but is also used e.g. for plant cell wall analysis and biomolecular NMR. Furthermore, it is equipped for sensitive heteronucleus detection ( $^7\text{Li}$ ,  $^{13}\text{C}$ ,  $^{19}\text{F}$ ,  $^{31}\text{P}$ ,  $^{23}\text{Na}$  etc.), enabling more specialized applications including phospholipid analysis or diffusion in ionic liquids, still this feature is also very useful in sensitive routine analysis of small molecules.

**The 500 MHz spectrometer** is used for solid state NMR on e.g. lignocellulosic material and bio- / model-membranes, but also more general materials science including minerals. Furthermore, this spectrometer is equipped with a solid state MAS NMR sample changer and detection equipment enabling metabolomics on intact tissue samples.

**The 400 MHz spectrometer** is used mainly for automated routine analysis of small organic molecules in the liquid state and typically runs about 9000 experiments of this type per year. However, the sample changer on this

instrument is more than 15 years old and will need to be replaced soon in order keep a reliable throughput. Moreover, this spectrometer is very suitable for <sup>19</sup>F NMR and can also be used for quantitative <sup>13</sup>C NMR.

**The 360 MHz spectrometer** is of an older type than the other spectrometers and nowadays mainly used in courses. The other spectrometers are of the Bruker Avance III & III HD generation with some interchangeable parts thus simplifying the complex task of maintaining the infrastructure.

Finally, **the field cycling (10 kHz – 40MHz) NMR relaxometer** needs to be mentioned. It can be used to study dynamic properties of the solvent in complex mixtures e.g. to study reorientation dynamics and chemical exchange at hydrated surfaces of e.g. cellulose or modified silica.

*List of equipment used (but not owned) by the infrastructure:*

Users use various local equipment for sample preparation

#### Service provided by the platform

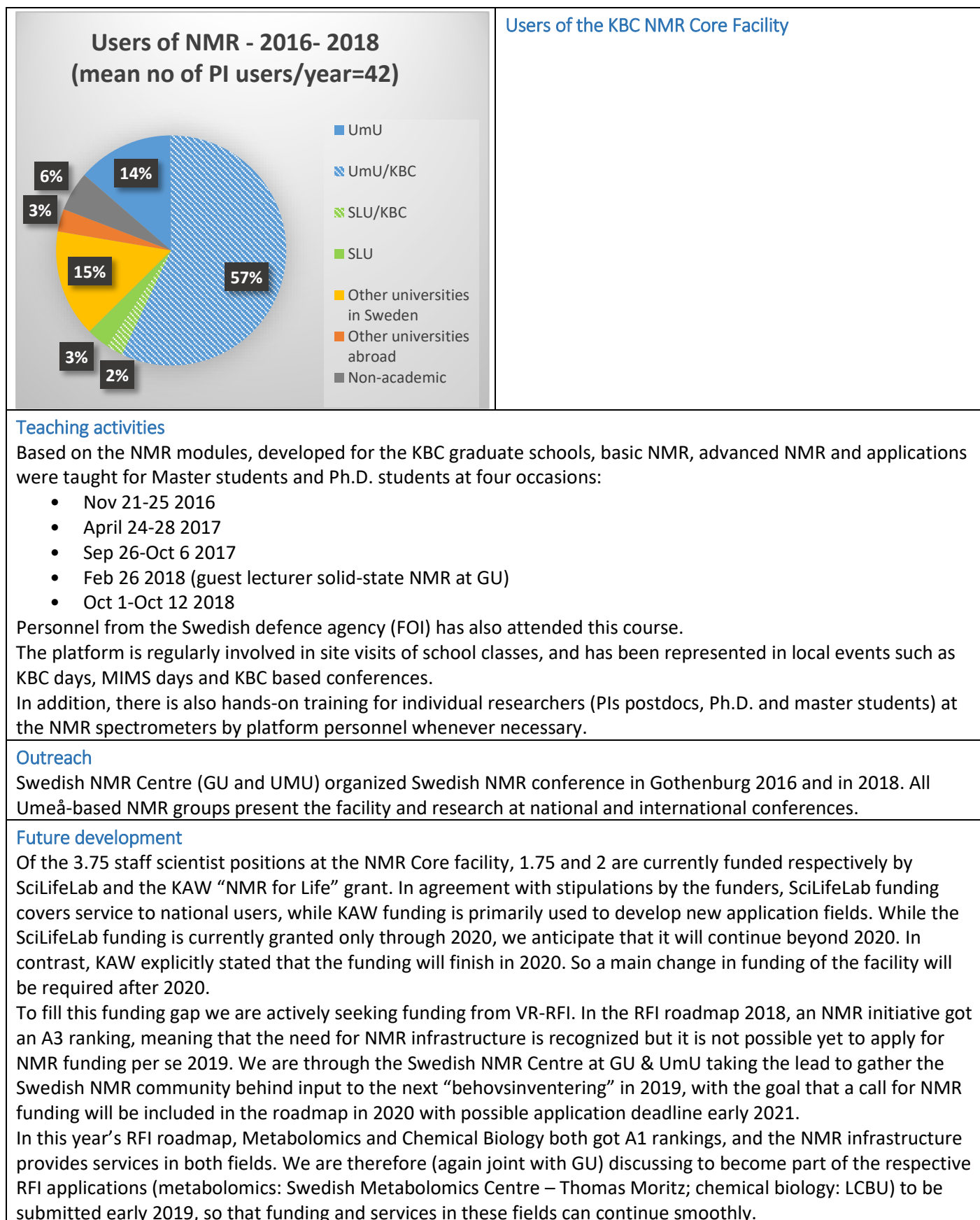
The NMR facility offers liquid and solid-state NMR access and support up to 850 MHz in various areas ranging from life sciences and medicine, materials and environment to green chemistry/biology etc. In general, we provide service for all routine NMR and expert assistance for complex NMR (as main part or as support) projects and for users less proficient in NMR.

- Routine NMR use: characterization of reaction products, purity control
- Metabolomics
  - Urine, blood serum and CSF analysis
  - Tissue samples (HR-MAS)
  - Metabolite identification/quantification and multivariate data analysis
- Plant science and Biogeochemistry
  - Cellulose (crystallinity, degree of substitution)
  - Cell-wall characterization (<sup>1</sup>H-<sup>13</sup>C HSQC)
  - Soil chemistry & carbon cycling
  - Bio isotopomer tracking
  - Phosphorus profiling of soil samples and of archeological sites
- Chemical Biology
  - Protein-ligand interactions
  - Fragment-based screening (with commercial or user-supplied libraries)
  - Structure determination of small organic molecules
- Protein structure and dynamics
  - Structure of soluble proteins
  - Structure of membrane proteins/biological membranes
  - Structure insoluble protein aggregates e.g. fibrils
  - Enzyme kinetics, protein dynamics
- Material chemistry
  - Fullerenes
  - Graphite oxide
  - Separation matrices

#### Personnel

<b>Gerhard Gröbner</b>	Platform Director, Professor, Chemistry
<b>Jürgen Schleucher</b>	Platform Director, Professor, Medical Biochemistry/Biophysics
<b>Mattias Hedenström</b>	PhD, Service, Department of Chemistry
<b>Tobias Sparrman</b>	PhD, Maintenance, solid state NMR Department of Chemistry
<b>Ilona Dudka</b>	PhD, 50/75% ScilifeLab: focus on solid NMR/MS metabolomics: intact biopsies
<b>Joao Figueira</b>	PhD, ScilifeLab: focus on liquid NMR: medicine/environmental science

<b>Steering committee</b>																											
Bernt Eric Uhlin	Professor, Dept of Molecular Biology																										
Fredrik Almqvist	Professor, Dept of Chemistry																										
Pernilla Wikström	Researcher, Dept of Medical Biosciences																										
Vacant	N.N, to be filled with successor of Per Gardeström																										
Jürgen Schleucher	Professor, Dept of Medical Biochemistry and Biophysics																										
Gerhard Gröbner	Professor, Dept of Chemistry																										
Comment: as part of NMRforLife and Scilifelab: external steering committee via GU (Prof. Göran Karlsson at NMR centre is the main responsible for these two NMR infrastructures.)																											
<b>Contact information</b>																											
Nuclear Magnetic Resonance (NMR), KBC building - 1st floor, Linnaeusväg 10 90736 Umeå																											
Homepage: <a href="https://www.umu.se/en/research/infrastructure/nmr/">https://www.umu.se/en/research/infrastructure/nmr/</a> <a href="http://www.nmrforlife.se">www.nmrforlife.se</a>																											
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<p><b>Income 2019 (%) - NMR</b> (total 7.169 kSEK)</p> <table border="1"> <caption>Income 2019 (%) - NMR (total 7.169 kSEK)</caption> <thead> <tr> <th>Source</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>KBC</td> <td>3%</td> </tr> <tr> <td>KBC departments</td> <td>46%</td> </tr> <tr> <td>KAW</td> <td>21%</td> </tr> <tr> <td>SciLifeLab</td> <td>14%</td> </tr> <tr> <td>NMR förståndare (UmU?)</td> <td>6%</td> </tr> <tr> <td>User fees</td> <td>10%</td> </tr> </tbody> </table>	Source	Percentage	KBC	3%	KBC departments	46%	KAW	21%	SciLifeLab	14%	NMR förståndare (UmU?)	6%	User fees	10%	<p><b>Expenses 2019 (%) - NMR</b></p> <table border="1"> <caption>Expenses 2019 (%) - NMR</caption> <thead> <tr> <th>Category</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Salaries</td> <td>50%</td> </tr> <tr> <td>Running costs</td> <td>26%</td> </tr> <tr> <td>Rent (localities)</td> <td>13%</td> </tr> <tr> <td>Equipment</td> <td>7%</td> </tr> <tr> <td>Other</td> <td>4%</td> </tr> </tbody> </table>	Category	Percentage	Salaries	50%	Running costs	26%	Rent (localities)	13%	Equipment	7%	Other	4%
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In terms of instrumentation, we are – again the NMR labs at GU and UmU together acting as Swedish NMR center - pursuing investment in 3 major areas:

1. Ultra-high field NMR ( $\geq 1.2$  GHz, ca 120 MSEK, possible time horizon for installation 2025), we are investigating funding possibilities and operation mode in conjunction with possible RFI funding.
2. Probe for solid-state NMR with ultrahigh spinning speeds (Ultra-high speed MAS NMR  $>100$  kHz spinning speed). This technique is applicable to small ( $\mu\text{g}$ ) samples and is therefore applicable for studies where only restricted quantities are available, such as protein aggregates, membrane proteins, biopsies. This technique achieves far improved spectral resolution, so that qualitatively new structure information can be obtained for e.g. membrane proteins. The technique also provides much improved spectral quality for systems containing paramagnetic substances, such as soils or battery materials. Using KAW “NMR for Life” funds (ca. 2.5 Mkr, installation early 2021), we are in the process of purchasing such a probe for installation at KBC, which will be the first such installation in Sweden.
3. Instrument for hyperpolarized NMR (DNP), as national infrastructure (20 MSEK). The DNP methodology can increase sensitivity of NMR experiments of the order of 100-fold, which offers completely new possibilities for studies of e.g. membrane proteins and of surface-bound species involved in catalysis. The proposed DNP system will be unique in Sweden.

On the KBC level we have to invest into a) new detector (“cryo-probe”) for the 600 MHz machine (ca. 2.5 MSEK) and b) new sample changer for the 400 MHz instrument used for routine spectroscopy (ca. 500 kSEK). The existing sample changes fails frequently and spare parts are no longer available due to its high age. Therefore, we plan to apply to the faculty for support for the sample changer and use part of the remaining KAW funding for investment for purchasing a new cryo probe for the 600 MHz instrument.

#### Publications

Publication statistics: average no publications/year during 2016-2018 (co-authored): **11.7**

The number of publications where the NMR platform is mentioned in the Acknowledgements is difficult to estimate as NMR provides support for many groups at the campus where often NMR is used in a routine way by Ph.D. students (often organic chemistry) and Postdocs who run their own basic NMR experiments using the NMR facility (ca 40 activities during 2016-2018). Also, the users whom we served as a national facility of the Swedish NMR centre with its Node Umeå (NMRforLife / Scilifelab) (183 projects during 2016-2018), mainly acknowledge the national facility in their publications.

# Chemical Biology Consortium Sweden (CBCS)

## Short Summary of the Facility

**The Chemical Biology Consortium Sweden (CBCS) Umeå** (former LCBU) gives Swedish researchers the possibility to identify small molecules with biological effects that can be used to generate insights into complex biological processes or as starting points for drug development. This can be achieved by providing screening services of small drug-like molecules to a biological target, all the way from consultation and guidance to assay development, small-molecule high throughput screening, and follow-up studies, as well as in further development of their identified compounds through chemistry projects involving e.g., synthesis of new derivatives. Top-quality can be assured in all lines of the process by updated and experienced personnel with scientific background in combination with continuously updated compound collections (in total over 200 000 compounds). The CBCS Umeå facilities today include a high-throughput screening lab, a clean cell lab, a bacterial lab, an organic chemistry lab, and offices. Screening projects in CBCS Umeå are labour intensive and, although one employee can run more than one project at the same time, we cannot accept more than two full screening/chemistry projects/full-time employee and year. Furthermore, several small projects are constantly being performed (mainly with local users at UmU) to prepare for a full screen or as additional follow-up after a screen. Another important activity of CBCS is to maintain and service our instrument park (open for users at UmU as described below) and train new users. Finally, CBCS Umeå gives two courses and has been invited to participate in other PhD courses (see below).

The successful projects performed by CBCS have direct applications to solve complex research problems, which have resulted in many high-quality research publications over the last years. Furthermore, the CBCS projects are, and have been, of tremendous importance for young researchers to start up their own research program and in the initiation of start-up companies.

The research infrastructure for chemical biology in Umeå has been operative since 2006, from 2009 it was called the Laboratories for Chemical Biology Umeå (LCBU). Since 2010 it is part of CBCS, Chemical Biology Consortium Sweden, together with a second node at KI. In 2012, CBCS became a national infrastructure integrated in a SciLifeLab platform.

## Equipment

### Description of equipment owned by CBCS Umeå

- Plate readers, Biotek Synergy H4 with Biostacker and Tecan 200
- High Content Screening Microscope – Thermo Scientific Array Scan VTI
- 2 Liquid handling robotics, Beckman Coulter NxP with 96- and 384-well head.
- 2 Microplate (96/384w) liquid dispensers, Matrix Wellmate and ThermoScientific Multidrop
- 2 Gilson 333/334, 322 Prep-Scale systems
- Nexera UHPLC-system connected to diode array detector (SPP M20A) and evaporated light scattering detector (Sedex 85)
- H-Cube (ThalesNano, Budapest, Hungary) continuous-flow hydrogenation system

### List of equipment used (but not owned) by CBCS Umeå

- Waters Acquity UPLC system connected to FLR detector, Waters 2996 DAD and Waters 486 Tunable Absorbance detector
- Agilent 1290 binary LC System connected to an Agilent 6230 Accurate-Mass TOF LC/MS
- Agilent 1260 binary LC System connected to an Single Quad LC/MS
- Rudolph Autopol IV automatic polarimeter
- Mettler Toledo UMT5 Comparator
- Biotage Isolera One Flash chromatograph
- 2 NMR Spectrometers, Bruker DRX-400 and Bruker DRX-600

## Service provided by the platform

CBCS aims to help researchers to identify and develop bioactive small molecules through chemical library screening and follow-up chemistry developments. This can be of interest in basic research in many fields such as life science and plant science. To achieve this, CBCS Umeå offers many different types of services, from scientific collaborations to instrument use and courses. The scientific collaborations are the core of CBCS. These can be in the form of

compound screening of our chemical libraries, assay development to prepare for a screen, or chemistry projects to improve or further develop identified bioactive compounds (e.g. for target identification, improved bioactivity, or to advance their use as research tools for example by introducing fluorescence).

To initiate these types of collaborations, an application has to be sent in, which is evaluated by an external independent project review committee (PRC), see figure above. The PRC assists in prioritizing the applications and the projects are given a rank. The most highly ranked projects are subsequently carried out by CBCS in collaboration with the PI. The PRC meet and rank project applications twice a year.

Smaller projects (not more than 2 weeks work for a full-time employee) can be initiated without sending in an application. A typical small project can be e.g. technical assistance/advanced training for the use of our instrument park, a small screen of a chemical library where the use of our liquid handlers and plate readers are needed, or minor custom synthesis projects.

Since 2018, research groups have the possibility to apply for Assay Development projects, in addition to Screening and Chemistry projects. Assay Development projects were added because of an apparent need from the users to get assistance to develop assays suitable for screening of chemical libraries. In addition, we have also seen an increased interest in chemistry support post screening, which likely is because the power of this support has spread and many users lack expertise or collaboration partners with organic chemistry knowledge.

#### Personnel

<b>Stina Berglund Fick</b>	PhD, Head of Facility, Department of Chemistry
<b>Erik Chorell</b>	Assistant Professor, Facility Director (from 2018), Department of Chemistry
<b>Marcus Carlsson</b>	PhD, Department of Chemistry
<b>Anna Eriksson</b>	PhD, Department of Chemistry
<b>Weixing Qian</b>	PhD, Department of Chemistry
<b>Per-Anders Enqvist</b>	(till 2017)
<b>Mikael Elofsson</b>	(Facility director till 2017)
<b>Jonas Eriksson</b>	(till 2016)
<b>David Andersson (20%)</b>	PhD, Department of Chemistry

#### Contact information

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University

Contact person:  
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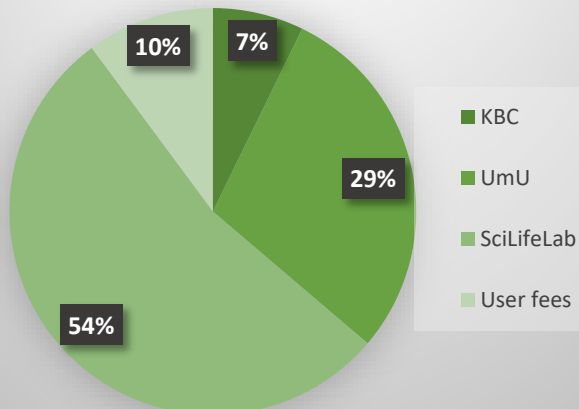
Homepage:

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

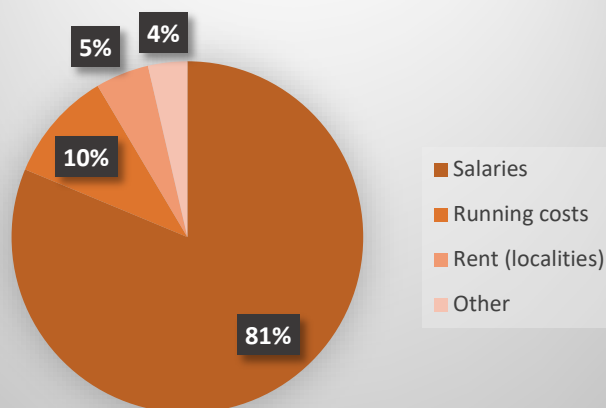


Budget - CBCS

**Income 2019 (%) - CBCS  
(total 3.450 kSEK)**



**Expenses 2019 (%) - CBCS**

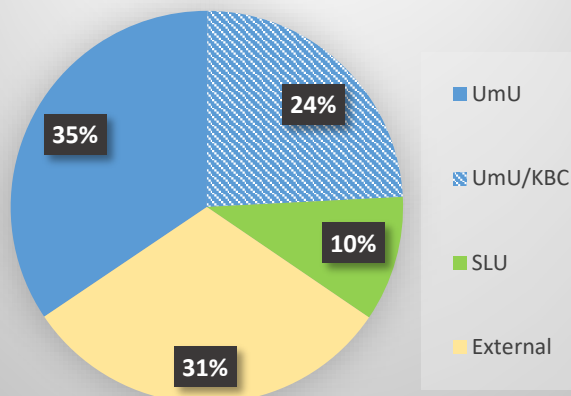


**Users of the Chemical Biology Consortium Sweden (CBCS)  
Umeå**

The projects performed by CBCS can be very labor intensive (2 screening projects/full-time employee and year).

In addition, on average 8 projects/year are using CBCS Umeå Instrument park.

**Users of the CBCS - 2016-2018  
(mean no of PI users/year=9.7)**



**Teaching activities**

LCBU currently gives two courses:

- A web-based introductory course (2 ECTS) to the field; “Introduction to High Throughput Screening”, that runs continuously over the year. The course has been running since 2013 with in total 200 registered students (approx. 40 students/year).
- At advanced level the practical course “Assay development in HTS” (2 ECTS) is given once every other year as a hands-on course for users aiming at starting up a project in collaboration with LCBU/CBCS. The typical number of participants for this course is 8-12 students/occasion and the next occasion is planned for 2019.

In 2018:

- Invited to participate in the Antibiotics and Antibiotic Resistance course in Gothenburg held by the National Doctoral Programme in Infections and Antibiotics (NDPIA).
- Invited speaker in the PhD course “Advances in Enzyme Regulation” organized by SLU in Uppsala.

#### Future development

CBCS was ranked A1 in the “behovsinventering” by the Swedish research council and we will thus be able to apply for funding in the beginning of 2019. Our application includes an expansion of the number of CBCS nodes to reach more researchers from the whole of Sweden and showing them the potential of our services. CBCS Umeå is of course highly involved in this application where we will focus even more on our strengths, such as screening related to infectious diseases and plant research.

An important part of CBCS activities is the courses that we give. Because chemical biology is a research field that is expanding quickly, the material in the on-line course constantly need to be updated. This will be done jointly with the KI node of CBCS.

One of the most central instruments to CBCS Umeå is the ArrayScan instrument, which is used in almost all cell-based screening projects. This instrument is getting older and although it is still working fine, a complete failure of the instrument would be very complicated for our services. For this reason, we plan to start applying for funds to invest in a new instrument from the faculty, the department of chemistry, and the Kempe foundations. The estimated cost for this equipment is 3 million kronor.

Another instrument that we hope to be able to invest in during the next 3-years is a pipetting robot from Hamilton that could be used for sterile pipetting of 96 and 384 well plates and thus avoid contamination. The cost for this instrument is around 1.5 million kronor.

We also need to invest in an inverted cell microscope to our clean cell lab to avoid contamination, the cost for this is around 35 thousand kronor.

#### Publications

Publication statistics: average no publications/year during 2016-2018 (co-authored/acknowledged): **3.7/0.7**

# Computational Life Science Cluster (CLiC)

## Short Summary of the Facility

**Computational Life Science Cluster, CLiC**, is the bioinformatics platform for research and support in genomics, proteomics (incl. protein modelling) and metabolomics at Umeå University. CLiC researchers and experts work in close contact with experimentalists and other KBC core facilities. CLiC is part of the Swedish National Bioinformatics Infrastructure Sweden (NBIS), a national research infrastructure supported by the Swedish Research Council, Science for Life Laboratory, all major Swedish universities, and the Knuth and Alice Wallenberg Foundation, providing bioinformatics support to life science researchers in Sweden. NBIS is also the Swedish contact point to the European infrastructure for biological information ELIXIR. Through the National Bioinformatics Infrastructure Sweden (NBIS), CLiC gives short and long-term bioinformatics support and offers every Thursday drop-in bioinformatics support sessions in Umeå.

## Service provided by the platform

- Bioinformatics drop-in sessions
- Consultation meetings
- Short- and Medium-term support
- Long-term support
- In addition to general services, platform offers also bioinformatics support in focus areas: Genome Assembly and Annotation and Integrative Omics

## Personnel

<b>Joakim Bygdell</b>	PhD, Department of Chemistry
<b>Allison Churcher</b>	Department of Molecular Biology, WABI, Wallenberg Advanced Bioinformatics Infrastructure
<b>Jeanette Tångrot</b>	PhD, Department of Molecular Biology, NBIS, National Bioinformatics Infrastructure Sweden
<b>Nina Norgren</b>	Department of Molecular Biology, (from 2017)

## Contact information

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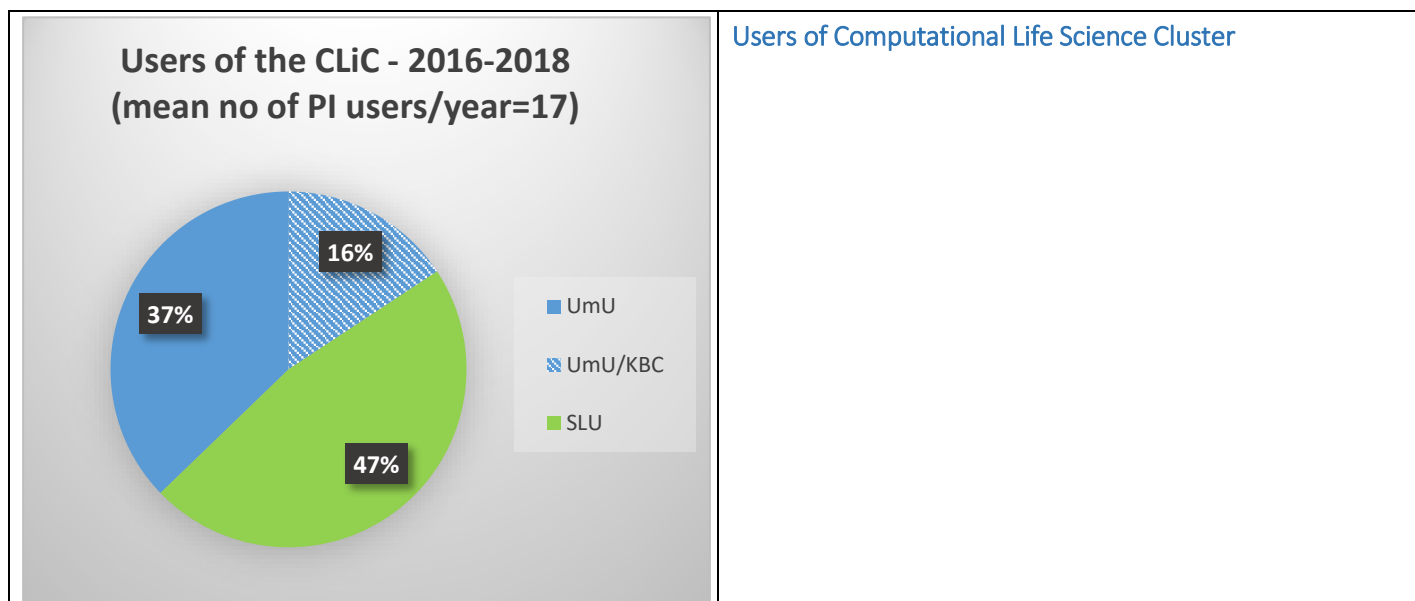
**Johan Trygg**, Professor,  
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Homepage:

<https://www.umu.se/forskning/infrastruktur/clic/>  
[www.nbis.se](http://www.nbis.se)

## Budget – CLiC

No current KBC support, but was supported by 400 kSEK/year during 2016-june 2018.



#### Teaching activities

Teaching contributions for both local and NBIS/SciLifelab organized courses:

- RNASeq course (Umea University, Nov 14-16, 2018)
- Introduction to Linux course (UmU, Feb 13-15, 2018 and March 27-29, 2017)
- Introduction to Bioinformatics using NGS data (UmU Nov 12-16, 2018 and Nov 28 - Dec 2, 2016)
- Python, Programming with Application to Bioinformatics (SciLifeLab Uppsala, Nov 19-23, 2018)

Lectures on UmU courses:

- Molecular Genetics, lecture, years: 2016-2018
- Bioinformatics and Genome Analysis, lecture and exercises, years 2016-2017

#### Future development

Together with TekNat/Medical/University leadership, we are planning to increase the activities regarding promotion of NBIS and expand the scope of bioinformatics from genomics focus to Deep learning, AI and Mechanistic modelling/Simulation.

#### Publications

Publication statistics: average no publications/year during 2016-2018 (co-authored/acknowledged): **0.7/0.3**

# Vibrational Spectroscopy Core Facility (ViSp)

## Short Summary of the Facility

This uniquely equipped core facility provides FT-IR and Raman spectroscopy and microspectroscopy services. It has state-of-the-art instrumentation and methodology to detect (and localise at micron and submicron level) chemical changes in a wide range of samples, at high speed and low cost, non-destructively and label-free. Due to the exceptional versatility of the techniques, example projects cover a wide range of scientific disciplines and applications, from materials sciences (nanotechnology, semiconductors) to plant sciences (high-throughput chemotyping/screening, investigating the effects of gene manipulations or environmental factors), from chemistry (absorption on mineral surfaces, real-time, in situ monitoring of reactions, protein conformational changes) to medicine (assessing tissue compositional changes under various pathological conditions, diagnosing and monitoring disease onset and progression, drug targeting and molecular mechanistic studies).

## Equipment

- Bruker IFS 66 v/S vacuum bench FT-IR spectrometer, with accessories (including oil and dry pumps, different detectors and sampling units)
- Bruker Vertex 80v vacuum bench FT-IR spectrometer, with accessories (including a dry pump, different detectors and sampling units)
- Bruker Equinox 55 FT-IR spectrometer with Hyperion 3000 microscopy unit, with accessories (including ATR and grazing angle microscopy accessories, single element and FPA detectors and various sampling units)
- Bruker Tensor 27 FT-IR spectrometer with Hyperion 3000 microscopy unit, with accessories (including ATR and grazing angle microscopy accessories, single element and FPA detectors and various sampling units)
- Bruker BRAVO portable Raman spectrometer, including docking station and various sampling heads
- Renishaw inVia confocal Raman microscope, including 5 different laser lines (458, 488, 514, 633, 785 nm), polarizers, different magnification lenses (normal, long working distance, water and oil immersive, 5x – 100x) and fiber optic probe
- Additional auxiliary components: Computers controlling each instrument, a standalone desktop computer for users to process their data and backup storage; a Large screen TV for demonstration purposes, a peristaltic pump, an autotitrator, a sterile bench, a refrigerator and a freezer for storing samples and consumables

## *Equipment used (but not owned) by the infrastructure in 2016- 2018*

The equipment of the Cell Wall Analytical Facility was used in a project to complement the work done by ViSp, and paid for using the regular user fees. The interactive focus environment of KBC has been used on several occasions, including teaching and conferences.

## Service provided by the platform

### *Training:*

Users can take part in a weeklong, full time user license course (run twice a year) to gain access to the facility and the e-booking system.

### *Services:*

Users can always get assistance in setting up and running their own measurements as well as in experimental design and data analysis. On a pure service level, users can simply submit their samples to be analysed for them, without their direct involvement. The level of service support depends on the need as well as on the nature of the project and priorities set within ViSp.

### *Method Development:*

In addition to providing standard service for a large number of users, resulting in a steadily increasing number of publications, there is continuous, active method development at ViSp. This includes both hardware (such as instrument accessories, prompting commercial interest from a large international instrument manufacturer and attracting users from outside Umeå) and software (a free, open-source software package, which set the de facto standard in the field, and resulted in a Nature Protocols publication and wide international interest). These are either driven by user projects, or initiated by ViSp in order to attract new users. Taken together, they grant ViSp an exceptional reputation, reaching far beyond Umeå and Sweden, and even outside of academia.

<b>Personnel</b>																	
<b>András Gorzsás</b>	PhD, Platform Manager, Department of Chemistry, Umeå University,																
<b>Steering committee</b>																	
Madeleine Ramstedt	Associate Professor, Dept. of Chemistry, UmU																
Thomas Moritz	Professor, Dept. of Forest Genetics and Plant Physiology, SLU, UPSC																
Thomas Wågberg	Professor, Dept. of Physics, UmU																
<b>National Advisory Board</b>																	
Björn Sundberg	Stora Enso																
Per Persson	Center for Environmental and Climate Research, Lund University																
<b>Contact information</b>																	
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Homepage: <a href="https://www.umu.se/en/research/infrastructure/visp/">https://www.umu.se/en/research/infrastructure/visp/</a>																	
<b>Budget - ViSp</b>																	
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### Teaching activities

ViSp is regularly involved in several courses at Umeå University and SLU (and even abroad, albeit less frequently). In addition, ViSp provides its own one week long user license course, twice a year. It frequently attracts users from beyond Umeå, often international participants as well. In fact, some instrument manufacturers recommend their customers to take this course instead of providing their own training.

Other, educational activities include participation in e.g. Lärarnas Fortbildning and Forskarfredag, but these are not listed here.

Teaching activities 2016-2018:

- Wood Biology (SLU, responsible: Ewa Mellerowicz)
- Molecular Spectroscopy (UmU, responsible: Thomas Wågberg)
- Natural Products Chemistry (UmU, responsible: Leif Jönsson)
- Advanced Experimental Tools (UmU, responsible: Erik Björn)
- Hyperspectral Imaging (SLU, responsible: Mårten Hetta)
- Environmental Analytical Chemistry (UmU, responsible: Madeleine Ramstedt)
- Genetics and Biotechnology in Forest Production systems (SLU, responsible: Rosario Garcia Gil)
- Vibrational Spectroscopy User License Course (UmU, responsible: András Gorzsás)
- PhD course on plant cell walls (University of Helsinki, Finland, responsible: Anna Kärkönen)

### Future development

In order to **stay up-to-date and maintain a high research profile** (i.e. avoiding to become a service-only facility), **method development** will continue. Currently, such work is free of charge for the users and thus adds to the budgetary strains of ViSp. In the future, we hope to secure a few dedicated research grants and projects to contribute to such activities, or involve companies supporting such kind of method developments. In the best of case, such project support can manifest already in 2019 via novel medical applications (cancer research).

**Outreach to still underrepresented research areas** (such as microbiology and medicine) will continue.

ViSp plans to capitalize on its international reputation and status by **attracting new users from abroad and to be involved in international collaborative projects**, as the local user base (particularly in the fields of physics, chemistry and plant sciences) appears to be saturated. The organized 1st International Plant Spectroscopy Conference was part of this effort and ViSp will also be represented during the upcoming 2nd International Plant Spectroscopy Conference (scheduled for March 2019, in Berlin). A novel collaboration is being outlined within the framework of European space research as well, although it is still in an embryonic stage (initial test runs are scheduled to commence in March 2019)

Another clearly underrepresented fraction is **non-academic users**. ViSp will try attract these via direct contact with companies and by identifying and participating in shared projects where at least one partner is non-academic. This is facilitated by the **recently acquired portable Raman spectrometer**, which is especially suitable for industrial applications and testing (process monitoring). Several project applications are in place for this. András Gorzsás has started collaborations with forestry companies and related ventures via Uminova Innovation and Processum, which can potentially attract non-academic users. These would be especially beneficial since they would contribute via unsubsidised user fees.

In addition to increasing incomes, ViSp tries to cut some expenses via retiring an old instrument (the Bruker Equinox 55 system), possibly via donating it to another university as an act of charity. This instrument, albeit mostly functional, is no longer supported by the manufacturer. Thus, its maintenance costs (service and reserve parts) are high, whereas it has not generated any user fee income over the past 3 years (since a newer, better and faster alternative already exists within ViSp, the Tensor 27 system).

### Planned upgrades and services in the coming 3 years:

Due to unforeseen breakdowns over the summer (most likely caused by repeated severe unscheduled power outages), several computers and electronic circuit boards were damaged to a level that they had to be replaced already in 2018, although their upgrade was initially planned for a later date.

Following this, one of the instruments (the Bruker Vertex 80v system) is still not fully functional, and will have to be serviced in 2019.

In addition, two dry pumps will have to be serviced for a total cost of ca. 60,000 SEK in 2021. These costs will be covered from the budget of ViSp.

**Potential upgrades and services:**

The Raman inVia microscope can potentially be upgraded with a provisional endoscopic probe to facilitate in vivo tissue measurements in medical model systems (mostly mice / rat) in the coming 3-year period. This upgrade is subject to securing specific, dedicated grants (applications in progress), thus will not burden the budget of ViSp. Lasers in the Raman inVia microscope will likely require service/replacement within the next 3 years. Since these costs could be substantial, the budget of ViSp alone will not be able to cover for them. The possibility of involving external financing (e.g. via Kempe Foundations) to cover (at least part of) these costs, are being discussed within the Steering Board, potentially as part of a larger, major instrument overhaul / modernisation. However, no details are in place yet.

**Publications**

Publication statistics: average no publications/year during 2016-2018 (co-authored/acknowledged): **3.3/11**



# Proteomics Core Facility

## Short Summary of the Facility

**The Proteomics Core Facility** at Umeå University and the Swedish University of Agricultural Science in Umeå provides infrastructure, scientific services and education for research in protein science and proteomics. We are used to work with many different sample matrices, if you can extract the proteins from your sample we can analyse them for you. We do the analysis by digesting the proteins into peptides, the peptides are then analysed using liquid chromatography tandem mass spectrometry (LC-MS/MS), in the end the identified peptides are reassembled into proteins.

## Equipment

The main equipment at the platform has been consisted of three mass spectrometers;

- Bruker HCT (iontrap MS, placed at the Dept of Chemistry)
- Waters SynaptG2-Si
- TQ-S, (HDMS and triple quad MS, placed at the Dept of Forest Genetics and Plant Physiology). The TQ-S has been used in cooperation with Malin Nording, Dept of Chemistry (the responsible person for the TQ-S).

## Service provided by the platform

The facility offers several services to the life science community.

- **Proteome Profiling** – quantitative, data independent analysis.
- **Proteogenomics** – find novel proteins and splice variants.
- **Targeted Proteomics** – absolute quantification.
- **Protein Identification** – what's in my sample?
- **Post Translational Modification Discovery** – protein activity state.

## Personnel

<b>Thomas Kieselbach</b>	PhD, Department of Chemistry (80% Platform work and 20% education at Dept of Chemistry).
<b>Gunnar Wingsle (-2018)</b>	Professor, Director Umeå Plant Science Centre, Dept of Forest Genetics and Plant Physiology, SLU
<b>Joakim Bygdell (-2018)</b>	PhD, Computational Life Science Cluster, CLIC, Dept of Chemistry

## Steering committee

Wolfgang Schröder	Dept of Chemistry, UmU
Anders Byström	Dept of Molecular Biology, UmU
Pernilla Wikström	Dept of Medical Biosciences, UmU
Andrei Chabes	Dept of Medical Biochemistry and Biophysics, UmU
Miles Trupp	Dept of Pharmacology and Clinical Neuroscience, UmU

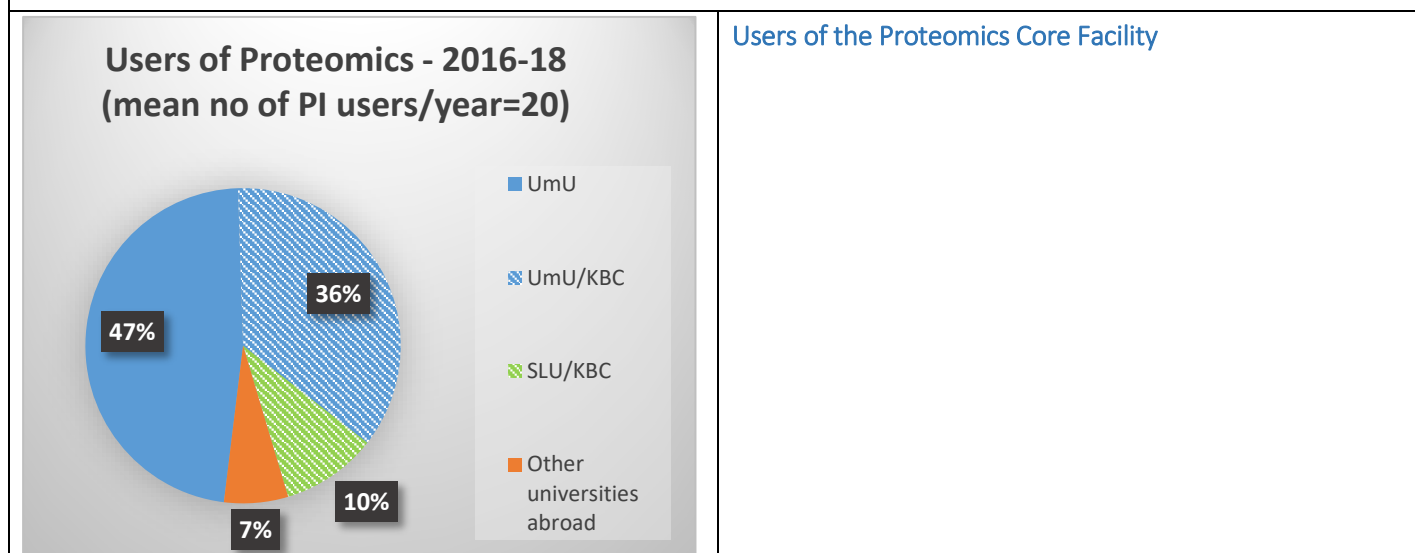
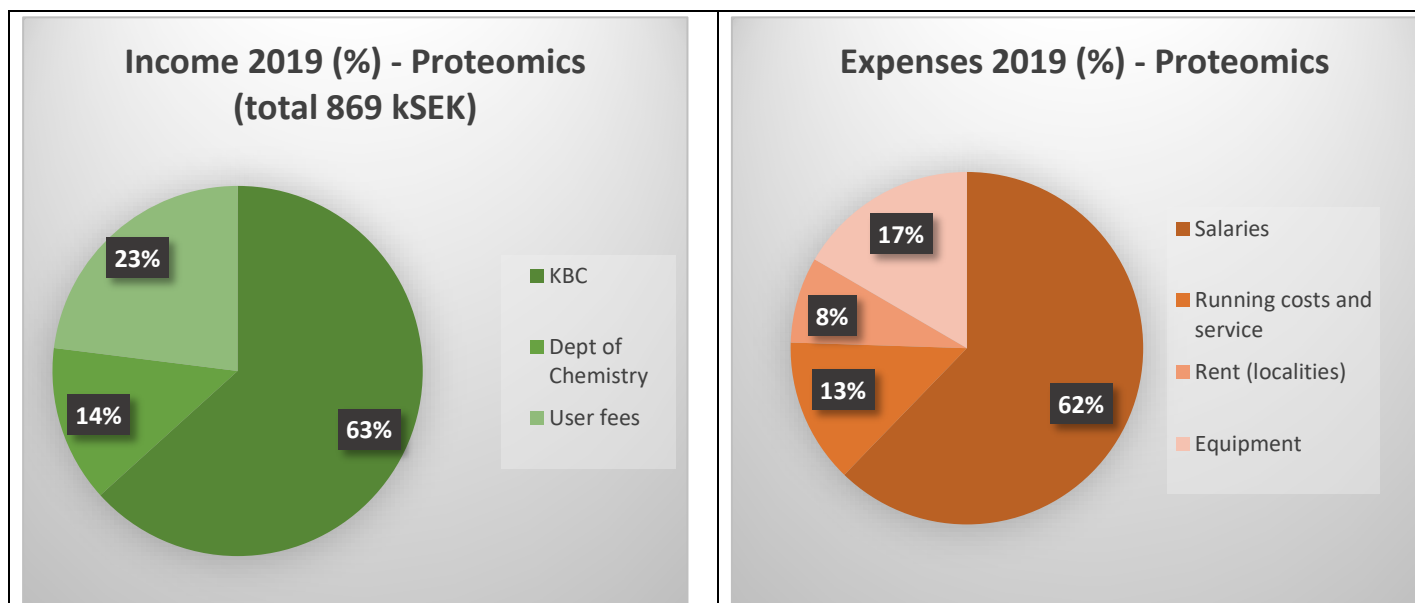
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Homepage:

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

## Budget – Proteomics



#### Future development

A reduction in service in 2019 will be introduced to only include:  
 Proteogenomics – find novel proteins and splice variants.  
 Protein Identification – what’s in my sample?  
 Post Translational Modification Discovery – protein activity state.

#### Publications

Publication statistics: average no publications/year during 2016-2018 (co-authored/acknowledged): **2.3/na**

# Protein Expertise Platform (PEP)

## Short Summary of the Facility

**The Protein Expertise Platform, PEP**, provides local researchers with needed expert advice and advanced services in questions of bioinformatics, cloning, bacterial growth optimization and protein production. The PEP keeps a stock of different ready to use vectors, bacterial strains, competent cells, media, antibiotics and solutions.

## Equipment

### Equipment owned by PEP:

- Tabletop shaker incubator N-BIOTEK NB-205 (for 15 mL, 50 mL tubes)
- Centrifuge Beckman Avanti J-26 XP
- Centrifuge Eppendorf 5415R (tabletop)
- QSONICA Sonicator
- GE HealthCare Äkta pure 25M (large scale protein purification, delivered Sept. 2018)
- GE HealthCare Äkta start (small scale protein purification)
- Eppendorf Thermomixer Comfort (shaker incubator for 1.5 mL Eppendorf tubes)
- PCR machine "BIOER"
- Ice machine

### Equipment used (but not owned) by PEP:

- Termaks 37°C incubator
- Müve cooled incubator ES110
- Shaker incubator Kühner Climo Shaker ISF-1-V (two shakers, for Erlenmeyer flasks up to 2L)
- Shaker incubator Kühner Lab-Therm LT-X (incubator for smaller flasks)
- Shaker incubator HT Infors Unitron (or Erlenmeyer flasks up to 2L)
- Centrifuge Sorvall RC 12 BP (2L bottles)
- Centrifuge Beckman Coulter Optima L-100K Ultracentrifuge
- Centrifuge Beckman Coulter Allegra X-15R (two centrifuges for 15 mL, 50 mL tubes and plates)
- GE HealthCare Äkta FPLC
- GE HealthCare Äkta purifier
- Beckman Coulter UV/Vis spectrophotometer DU 730
- DeNOVIX DS-11 spectrophotometer (Nano-drop)
- Alpha Innotech Imager HP (gel imager)
- Aculab Antilon scale (high accuracy scale)
- Millipore Synergy UV (deionized H<sub>2</sub>O)
- Miele Professional (dish washing machine)
- Thermo Scientific -80°C freezer
- Arpege 70 (Liquid N<sub>2</sub> large sample storage dewar)
- Mass-spectrometer Agilent
- MALVERN Zetasizer Nano (dynamic light scattering, DLS)

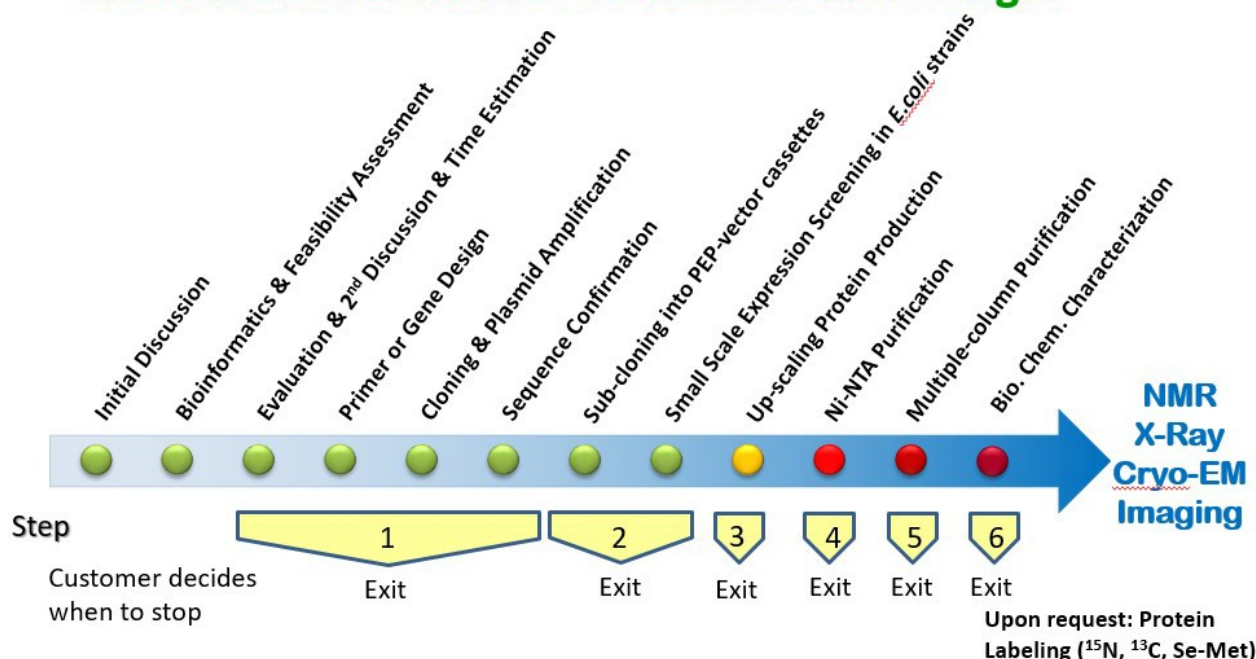
## Service provided by the platform

- **Materials:** The PEP provides necessary materials for cloning and protein expression. (See PEP home page)
- **Project feasibility check and planning:** a project usually starts with an in-depth consultation of the researcher/customer.
- **Bioinformatics analysis:** sequence analysis & alignments, codon optimization, secondary structure predictions, construct design, data base searches, comparative 3D structural modelling, etc.
- **Molecular cloning:** standard and advanced cloning and mutagenesis, ligations, sub-cloning, transformations and plasmid preparations.
- **Protein expression screening (small scale):** protein expression and solubility screening to quickly test several different bacterial host cells, various growth conditions (temp., media, OD at harvest, etc.) and protein fusion partners that lead to enhanced expression levels and/or solubility.

- **Protein expression (scale-up):** Successful conditions are transferred to larger culture volumes for scaled-up protein production.
- **Protein purification:** 6xHis-tagged proteins purified with single or double step Ni-NTA matrix (incl. cleavage of the 6xHis-tag with a protease such as TEV, SUMO, 3C, Caspase 7) followed by Size Exclusion Chromatography (SEC).
- **Protein characterization:** UV based protein concentration determinations, CD measurements, dynamic light scattering, full length protein mass-spectrometry and also possible NMR spectroscopy.

## PEP Service & Support Pipeline

**Close customer contact is essential at all stages**



### Personnel

<b>Uwe H. Sauer</b>	Associate professor, Platform Coordinator
<b>Mikael Lindberg</b>	PhD, Platform Manager,
<b>Christin Grundström</b>	Protein specialist (20%),

### Steering committee

Uwe H. Sauer	Associate professor, Platform Coordinator,
Stefan Björklund	Professor, Dept of Medical Biochemistry and Biophysics
Åsa Strand	Professor, Dept of Plant Physiology
Linda Sandblad	Dept of Molecular Biology
Richard Lundmark	Associate professor, IMB & MIMS
Niklas Arnberg	Professor, Clin. Mikrobiol. & MIMS
Magnus Wolf-Watz	Associated professor, Dept of Chemistry

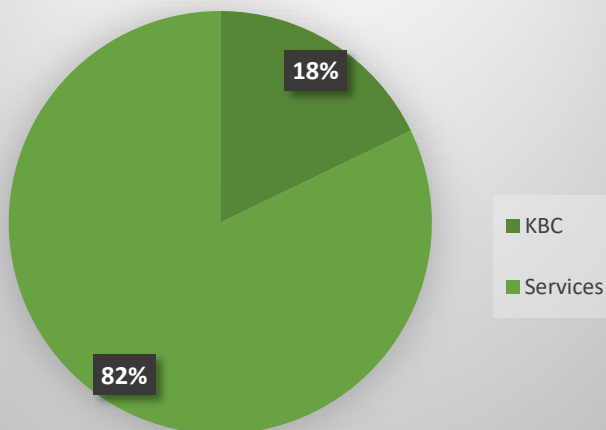
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 Umeå universitet, 901 87 Umeå  
 E-mail: [mikael.lindberg@umu.se](mailto:mikael.lindberg@umu.se)

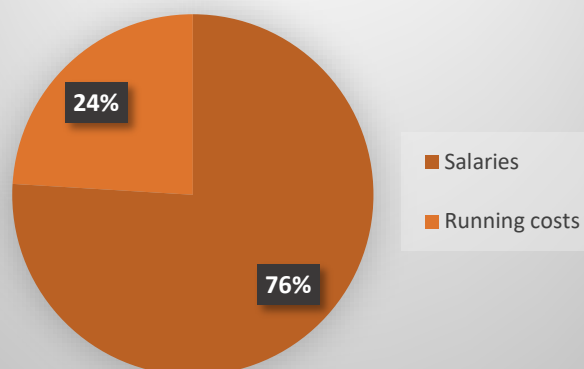
Homepage: <https://www.umu.se/en/research/infrastructure/pep/>

Budget - PEP

Income 2019 (%) - PEP  
 (total 1.120 kSEK)

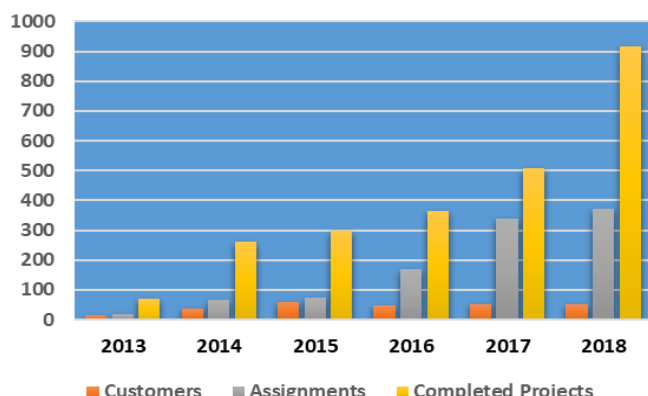


Expenses 2019 (%) - PEP

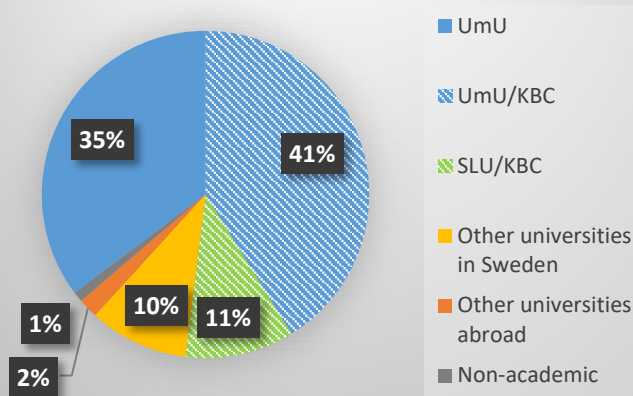


Users of Protein Expertise Platform

PEP Statistics



Users of PEP - 2016-2018  
 (mean no of PI users/year=34)



The PEP has strategically strengthened the life science research at Umeå University, which is reflected in the increasing demand for PEP's services (see Figure on statistics above). During 2016 PEP served 33 PI's and finished 365 projects. The number increased during 2017, when PEP served 34 PI's and finished 509 projects. This was surpassed during 2018 (incl. Oct.), where had PEP served 35 PI's and already finished 917 projects. Many of these projects required the development of new protein expression protocols, which means solving many optimization and large-scale purification problems, which are usually very time-consuming tasks. The majority of projects came from PI's belonging to Umeå University's two faculties and were distributed over 15 different departments/institutions/research centres. About 58% of the PI's came from the KBC environment. In addition, PEP had customers from 5 Swedish universities (SLU Umeå, KI, Uppsala Univ., SLU Uppsala and Chalmers), one Finnish University (University of Turku) and from the Swedish Defence Research Agency (FOI).

Teaching activities

PEP co-organizes the popular and intense practical course on advanced methods in "Cloning, Protein Expression and Purification" (CPEP). The CPEP courses were previously taught once or twice a year until 2013 when financing from the UCMR & UPSC graduate schools ceased. In 2014, after the graduate schools were closed down, the CPEP course

was entirely financed by the PEP. After a break, renewed funding for a CPEP course could be secured in 2017 with a contribution of 50 kSEK from the KBC and 50 kSEK from the Dept. of Chemistry. This renewed funding made it possible to organize a CPEP course that was held from Feb. 28th to March 9th, 2018. The interest in the CPEP courses is overwhelming with 2-3 times as many applicants than can be accepted. Therefore, a new CPEP course is planned for early 2019.

So far, more than 170 PhD-students and post-docs have participated. In addition to the involvement in the CPEP courses, personnel from PEP has also contributed to the "Protein Crystallization" and the "Basic Bioinformatics" courses.

#### Future development

New service planned for 2019: PEP will establish protein production in plant cell suspensions to better serve researchers from the plant science community.

Several researcher have also requested protein production in yeast and mammalian cells. PEP has experience with these expression systems, but not the required personnel to handle the demand. Each of these expression systems will require a full time employee. PEP will try everything possible to secure further funding, especially from the Umeå University faculties (Faculty of Medicine and Faculty of Science and Technology) and SLU in order to expand its services.

#### Publications

Publication statistics: average no publications/year during 2016-2018 (co-authored/acknowledged): **1.7/8.3**

In addition, during 2016-2018, PEP's services and materials were used in 5 PhD theses, 6 Bachelor theses, and 3 published/refereed conference proceedings.

# NanoLab

## Short Summary of the Facility

**NanoLab's** environment is classified as cleanroom class 100 in rest and class 1000 during operation, which offers 10 000 times less airborne particles compared to a normal laboratory environment. In such an environment, it is possible to manufacture and study materials with notably high standard and precision. The facility is currently an invaluable tool for the University's rapidly expanding research in the fields of microelectronics, optics and photonics, and nanotechnology, but it is also of obvious interest for scientists that, e.g., are interested in: the fabrication, characterization and usage of thin films, materials that feature structures on the micrometer or sub-micrometer level, or the appropriate characterization of different surfaces. As such, its potential users encompass experimental researcher in a wide variety of fields in natural science and medicine.

The NanoLab was established in late 2012, and has since its inception been in continuous development. Today, it comprises a variety of advanced fabrication and characterization systems.

At the moment the NanoLab is used mainly for research in the fields of biotechnology, sustainable energy, electronics and photonics. Some specific focus areas include microfluidic devices for detection of Alzheimer and Parkinson disease using electrochemistry, nanocatalysts for fuel cells, solar-driven water splitting, and organic light-emitting devices and solar cells.

## Equipment

### Equipment owned by the infrastructure:

- Mask aligner (Karl Süss Mask Aligner MJB3)
- Plasma processing system (Diener ATTO)
- Nanoimprinter (Obducat NIL 2.5)
- Thin-film deposition system (PVD75 thermal evaporator)
- Optical tensiometer (Attension Theta)
- X-ray diffractometer (PANalytical Xpert3 Powder)
- Optical microscopes (Olympus BX41, BX51, GX71)
- Spin coaters (SPIN150-NNP)

- Vacuum drying oven (BIOBASE)
- Ultrasonic cleaners
- Hotplates
- UV-curing box
- Analytical scale

### Equipment used (but not owned) by the infrastructure:

- Fluorescence spectrometer LS45
- UV/VIS spectrometer Lambda 35
- Dektak XT
- ORIEL Sol 3A
- Photonic Multichannel analyzer PMA-12
- NanoScope IV scanning probe microscope

## Service provided by the platform

The NanoLab facility is conditionally (trained personal) open for everyone. Besides the opportunity to use the facility equipment, the clean room environment is possible to be used by users for their own experiments, i.e. temporary moving in a user's equipment for a certain period for a certain experiment. Technical assistant for new-trained users are always available.

## Personnel

<b>Roushdey Salh</b>	PhD, The manager of NanoLab, Department of Physics ( facility maintaining and equipment trainings)
<b>Ludvig Edman</b>	Professor, Department of Physics (supervision of PhD students)
<b>Thomas Wågberg</b>	Professor, Department of Physics (supervision of PhD students)

## Steering committee

Ludvig Edman	Chair, Professor, Department of Physics
Thomas Wågberg	Professor, Department of Physics
Magnus Andersson	Associate professor, Department of Physics
Linda Sandblad	PhD, Department of Molecular Biology (from 2017)
Christoffer Boman	Associate professor, Department of Applied Physics and Electronics (from 2017)

#### Contact information

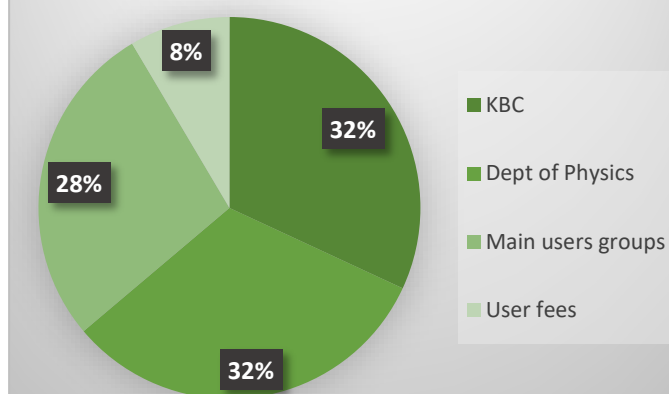
Roushdey Salh, Senior research engineer,  
 Department of Physics  
 Fysikhuset plan 2, Linneausväg 20,  
 Umeå universitet, 901 87 Umeå  
 E-mail: [Roushdey.Salh@umu.se](mailto:Roushdey.Salh@umu.se)

Homepage:

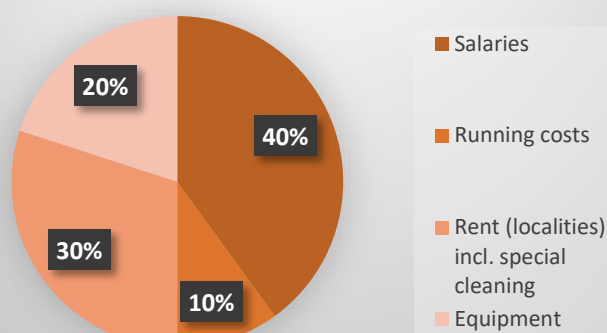
<https://www.umu.se/en/research/infrastructure/nanolab/>

#### Budget -NanoLab

**Income 2019 (%) - NanoLab  
 (total 470 kSEK)**



**Expenses 2019 (%) -NanoLab**



#### Users of NanoLab

The NanoLab users (on average, **23** PI users/year) are currently mainly from the Department of Physics and Department of Chemistry, KBC, Umeå University.

#### Teaching activities

NanoLab is used for both undergraduate education (grundutbildning) and graduate teaching. Two advanced courses on the undergraduate level (Nano Science 7.5hp and Advanced Materials 7.5hp) currently using NanoLab as their laboratory facility in which the experiments are carried out. Two courses on the graduate level (Cleanroom technology 1.5 ECTS and Physical thin film deposition 1.5 ECTS) are also offered annually and are announced at the KBC website. These courses have primarily attracted participants from the Departments of Physics, Chemistry and Applied Physics, but participants from the international business program and the Department of Clinical Microbiology have also attended. Specific teaching and training sessions have also been offered on a regular basis to interested users. The courses are given in English, and the numbers of students range between 17 and 25 in each undergraduate course, and between 5 and 10 in each graduate course. For the coming years, courses are planned in Nano-imprinting and Material surface modification.

#### Future development

NanoLab has established a strong capacity in the fabrication and characterization of various nano- and micro-sized structures, using the methods outlined in the previous sections. Within the next few years, the goal is to expand NanoLab's capacity to make it more attractive for researchers in the fields of chemistry, biology and agriculture. A recently purchased modern instruments (X-ray diffractometer) have been added/implemented in the NanoLab. The development plan includes the application of funding for a sputter deposition system, which can be used for precise coating of a wide range of materials on essentially any substrate. A select number of applications that will be



realized by such an acquisition include: gold or carbon coatings for electron microscopy samples, silver and dielectric layer coatings for laser spectroscopy lenses, indium-tin-oxide coatings for transparent conducting substrates and bio-compatible ceramic coating for medical implants.

It is also intended to replace the existing 15 years old scanning probe microscope with a modern up-to-date one with much better resolution and possibility to probe even wet samples. This instrument will be very attractive for scientists from other institutes, such as chemistry, applied physics and electronics, and microbiology.

Expected investment for each of these instruments is over 1 Mkr.

We further plan to strongly advertise the existence and capacity of NanoLab both internally at the University and externally to academic and industrial parties, and also to investigate how we can achieve synergistic collaborations with other infrastructures at the University, e.g., the Umeå Core Facility for Electron Microscopy (UCEM) and the Vibrational Spectroscopy Platforms at Umeå University (VISP).

#### Publications

Publication statistics: average no publications/year during 2016-2018 (co-authored/acknowledged): **17/0**

# Biogeochemical Analytical Facility (BAF)

## Short Summary of the Facility

**The Biogeochemical Analytical Facility (BAF)** started in 2017 and is located at the Department of Ecology and Environmental Science (EMG), Umeå University (UmU). BAF infrastructure hold 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 now opens up for other users at Umeå and other universities.

## Equipment

- Gas chromatograph
- TOC analyser
- Nutrient analyser
- Fluorometer
- Liquid Scintillation counter
- Respicond
- Flow cytometer
- Microbalance

BAF has the possibility to use a flow injection analyzer (FIA) owned by the teaching lab. We primarily use this to measure nutrients in samples with high concentrations of salt, as e.g., in KCl - extractions of soil samples. BAF also has access to the instrument platform placed at CIRC in Abisko if needed.

## Service provided by the platform

BAF provides an important service and enable analysis of key chemical parameters in terrestrial and aquatic biogeochemical research with low detection limits and high precision conducted at reduced costs when comparing to commercial laboratories.

## Personnel

<b>Anders Jonsson</b>	PhD, Department of Ecology and Environmental Science. Technician within BAF, in charge of the lab facilities and a majority of the instruments at BAF
<b>Reiner Giesler</b>	Professor, Department of Ecology and Environmental Science, in charge of the Respikond at BAF
<b>Sonia Brugel</b>	PhD, Department of Ecology and Environmental Science. In charge of the Flow cytometer BAF

## Steering committee

Ann-Kristin Bergström	Professor, Department of Ecology and Environmental Science
Reiner Giesler	Professor, Department of Ecology and Environmental Science
Anders Jonsson	PhD, Department of Ecology and Environmental Science
Jan Karlsson	Professor, Department of Ecology and Environmental Science
Jurgen Schleucher	Professor, Department of Medical Biochemistry and Biophysics

## Contact information

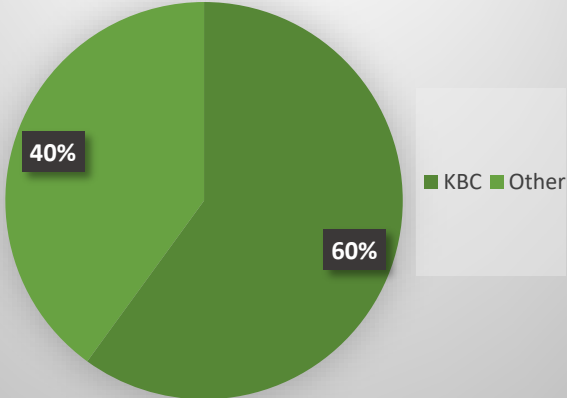
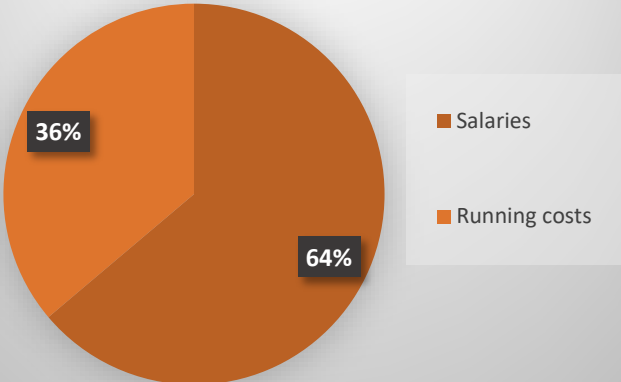
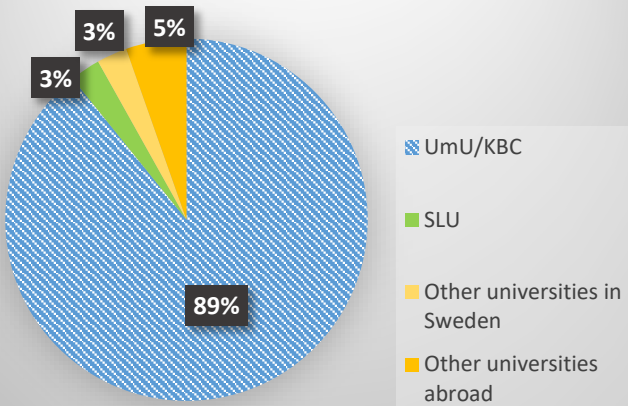
Chemical Biological Centre KBC - Department of Ecology and Environmental Sciences  
Umeå University, 901 87 Umeå

### Visiting Address:

KBC building, Linnaeusväg 6, Umeå University

### Homepage:

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

<p><b>Budget - BAF</b></p> <p><b>Income 2019 (%) - BAF (Total 250 kSEK)</b></p>  <table border="1"> <thead> <tr> <th>Category</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>KBC</td> <td>60%</td> </tr> <tr> <td>Other</td> <td>40%</td> </tr> </tbody> </table>	Category	Percentage	KBC	60%	Other	40%	<p><b>Expenses 2019 (%) - BAF</b></p>  <table border="1"> <thead> <tr> <th>Category</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Salaries</td> <td>36%</td> </tr> <tr> <td>Running costs</td> <td>64%</td> </tr> </tbody> </table>	Category	Percentage	Salaries	36%	Running costs	64%
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<p><b>Users BAF 2017-2018 (mean no of PI users/year = 18.5)</b></p>  <table border="1"> <thead> <tr> <th>Category</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>UmU/KBC</td> <td>89%</td> </tr> <tr> <td>SLU</td> <td>3%</td> </tr> <tr> <td>Other universities in Sweden</td> <td>5%</td> </tr> <tr> <td>Other universities abroad</td> <td>3%</td> </tr> </tbody> </table>	Category	Percentage	UmU/KBC	89%	SLU	3%	Other universities in Sweden	5%	Other universities abroad	3%	<p><b>Users of the Biogeochemical Analytical Facility</b></p>		
Category	Percentage												
UmU/KBC	89%												
SLU	3%												
Other universities in Sweden	5%												
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<p><b>Teaching activities</b>          Analyses have been run for ungraduated and graduated courses, as well as for master thesis. Several PhDs' and post-docs' have also been taught to run several of the instruments.</p>													
<p><b>Future development</b>          Planned activities for the nearest future involve upgrading software and computers on our inverted phase contrast microscopes so these can be connected to the web for easy and safe handling and storage of analytical results. We are also planning to include an appliance for automatic counting of zooplankton using a stereo microscope. This equipment (Zooscan) is already at the department but planning for including this, and the inverted phase microscopes, in the environment needs to be made. We will also plan how to incorporate the new method for analyzing hydrogen isotope ratios (2H) in solid samples in BAF:          Beside planned services on our instruments we aim to invest in a new spectrophotometer (cost approximately 250 000 SEK). We intend to apply to the Faculty of Science and Technology (UmU) for grants for these investments and depending on outcome part of these cost may be taken from accumulated funds within BAF.</p>													
<p><b>Publications</b>          Publication statistics: average no publications/year during 2017-2018 (co-authored): <b>1.5</b>. No statistics on publications where the platform is mentioned in Acknowledgements is available.</p>													

# Biopolymer Analytical Platform (BAP)

## Short Summary of the Facility

**The Biopolymer Analytical Platform, BAP**, (former UPSC Plant Cell Wall and Carbohydrate Analytical Facility) has become an official KBC facility in 2018. BAP is dedicated to support research among KBC groups on cell walls of terrestrial and aquatic plants, and biopolymer materials. BAP offers necessary knowledge and analytical methods/tools to examine cell wall materials such as lignin, cellulose and hemicellulose, as well as in fine detection of other carbohydrate compounds by applying a large range of conventional wet chemistry methods and analytical instruments such as gas chromatography/mass spectrometry (GC/MS). We have extended our competence not only on plant cell walls but also on non-land plant materials such as algae, peat and sediment with several KBC research groups during the last three years. For example, identification of organic compounds in soil, sediment and peat were performed using Pyrolysis-GC/MS with KBC research groups.

## Equipment

- Pyrolysis-GC/MS (Pyrolyzer: PY-2020iD and AS-1020E, FrontierLabs, Japan and GC/MS: Agilent 7890A/5975C, Agilent Technologies, Inc. USA)
- 2x GC/MS (Agilent 7890A/5975C, Agilent Technologies, Inc. USA)
- Size exclusion chromatography (SEC) (OMNISEC RESOLVE & REVEAL, Malvern, UK)
- Matrix- Assisted Laser Desorption/Ionization - Time-Of-Flight Mass Spectrometer (MALDI-TOF MS) (Waters Corporation)
- Microplate Spectrophotometer (Epoch, BioTek Instruments, Inc., USA)
- 2x balances (Mettler Toledo, Switzerland)
- centrifuge (Hettich, Germany)
- sample concentrator together with heating blocks (Techne, Barworld Scientific Ltd. UK)
- vacuum desiccator
- soxhlet

### Equipment owned by UPSC:

- Freeze-dryer (Coolsafe, ScanVac, Labogene, DK)
- centrifugal mill (ZM 200, Retsch, Germany)
- ball-mill (MM 400, Retsch, Germany)
- sonication bath (Sonorex, Bandelin, Germany)

### Equipment owned by Umeå University:

- sieve shaker (AS200, Retsch, Germany)

## Service provided by the platform

Our services include carbohydrate/lignin composition and lignin structure analysis in various lignocellulose materials such as wood, pellets, plant litters, soil and tar. Selected examples of applications are:

- 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, thioglycolic acid and acetylbromide lignin assay for lignin determination
- Enzymatic assays for soluble sugar (sucrose, glucose and fructose) and starch detection
- SEC for determination of MW, DP and viscosity of lignocellulose polymers. The table below shows available analyses and the charge.

In 2017, we have included acetylbromide lignin analysis as one of the standard methods in lignin determination. This is a very practical method to analyze samples in a small scale (less than 1 mg). In addition, Multi Angle Laser Light Scattering (MALLS) detector was purchased and implemented into our SEC system in the end of 2017. Unfortunately, another part of the SEC system (autosampler, pump, degasser and column oven) broke down in early 2018 and will be replaced with the new system, OMNISEC RESOLVE, in Nov 2018. After initial training and optimization, we plan to offer analysis with SEC MALLS as part of the platform service in 2019.

Personnel																							
<b>Totte Niittylä</b>	Associate Professor, director of the platform, Dept. of Forest Genetics and Plant Physiology, SLU																						
<b>Junko Takahashi-Schmidt</b>	PhD, the laboratory manager, Dept. of Forest Genetics and Plant Physiology, SLU																						
Steering committee																							
Totte Niittylä	Associate Professor, Dept. of Forest Genetics and Plant Physiology, SLU																						
Ewa Mellerowicz	Professor, Dept. of Forest Genetics and Plant Physiology, SLU																						
Hannele Tuominen	Associate Professor, Dept. of Plant Physiology, UmU																						
Leif Jönsson	Professor, Dept. of Chemistry, UmU																						
Junko Takahashi Schmidt	PhD, Dept. of Forest Genetics and Plant Physiology, SLU																						
Ola Sundman	PhD, Dept. of Chemistry, UmU																						
Contact information																							
Totte Niittylä, Responsible scientist, Department of Forest Genetics and Plant Physiology Phone: +46 (0)90 786 8434 E-mail: <a href="mailto:Totte.Niittyla@slu.se">Totte.Niittyla@slu.se</a>	Junko Takahashi-Schmidt, Laboratory manager, Department of Forest Genetics and Plant Physiology Phone: +46 (0)90 786 8458 E-mail: <a href="mailto:Junko.TS@slu.se">Junko.TS@slu.se</a>																						
Homepage: <a href="https://www.upsc.se/platforms/cell-wall-analysis/4845-biopolymer-analytical-platform.html">https://www.upsc.se/platforms/cell-wall-analysis/4845-biopolymer-analytical-platform.html</a>																							
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<p><b>Income 2019 (%) - BAP</b> (total 1.682 kSEK)</p> <table border="1"> <caption>Income 2019 (%) - BAP</caption> <thead> <tr> <th>Source</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>KBC</td> <td>12%</td> </tr> <tr> <td>SLU</td> <td>15%</td> </tr> <tr> <td>Bio4Energy</td> <td>15%</td> </tr> <tr> <td>TC4F</td> <td>29%</td> </tr> <tr> <td>User fees</td> <td>29%</td> </tr> </tbody> </table>	Source	Percentage	KBC	12%	SLU	15%	Bio4Energy	15%	TC4F	29%	User fees	29%	<p><b>Expenses 2019 (%) - BAP</b></p> <table border="1"> <caption>Expenses 2019 (%) - BAP</caption> <thead> <tr> <th>Category</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Salaries</td> <td>53%</td> </tr> <tr> <td>Running costs</td> <td>25%</td> </tr> <tr> <td>Rent (localitis)</td> <td>17%</td> </tr> <tr> <td>Depreciation</td> <td>5%</td> </tr> </tbody> </table>	Category	Percentage	Salaries	53%	Running costs	25%	Rent (localitis)	17%	Depreciation	5%
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<p><b>Users of the BAP - 2016-2018</b> (mean no of PI users/year=16)</p> <table border="1"> <caption>Users of the BAP - 2016-2018</caption> <thead> <tr> <th>Category</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>UmU/KBC</td> <td>33%</td> </tr> <tr> <td>SLU/KBC</td> <td>21%</td> </tr> <tr> <td>SLU</td> <td>21%</td> </tr> <tr> <td>Other universities in Sweden</td> <td>6%</td> </tr> <tr> <td>Other universities abroad</td> <td>17%</td> </tr> <tr> <td>Non-academic</td> <td>2%</td> </tr> </tbody> </table>	Category	Percentage	UmU/KBC	33%	SLU/KBC	21%	SLU	21%	Other universities in Sweden	6%	Other universities abroad	17%	Non-academic	2%	<p>Users of the Biopolymer Analytical Platform</p>								
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### Teaching activities

We teach conventional wet chemistry-based cell wall analysis and modern instrumental techniques using GC/MS on cell wall materials and soluble carbohydrates as a part of the following courses:

- Bioresource engineering (Bioresursteknik), UmU/SLU (HT2016)
- Biogeochemistry and physics of ecosystem (Ekosystemets biogeokemi och fysik), SLU (VT2016; VT2017; VT2018)
- Wood biology and biotechnology, international NOVA PhD course, SLU (HT2017)
- Plants as producers of renewable resources (Växter som råvaruproducenter), UmU/SLU (VT2018)
- Biology and Biotechnology in Forest Production Systems, UmU/SLU (HT2018)
- Genetics and Biotechnology in Forest Production Systems (HT2018)
- Bioresurs-TEST (HT2018)

### Future development

Our strategy is to develop analytical techniques for biopolymers in general, a new area we are expanding to is oligosaccharide analysis and biopolymer size determination. The two new technique developments during the next three years are polymer analysis using SEC and oligosaccharide analysis using MALDI-TOF MS. The investments to these two instruments were done in 2017-2018.

The department of chemistry has purchased the MALLS detector (OMNISEC REVEAL, Malvern, UK) for implementing our SEC system in the end of 2017. MALLS enables the detection and analysis of different types of polymers.

However, as described earlier, other parts of the SEC system (autosampler, pump, degasser and column oven) were broken in early 2018 and the replacement with OMNISEC RESOLVE (Malvern, UK) that is compatible with MALLS detector was recently financed with BAP's own funds saved from user fees. After initial training and optimization, we plan to offer analysis with MALLS SEC as part of the BAP services in 2019. Currently we are not planning to buy any new equipment during the next three-year period but depreciation will continue until the end of Oct 2021 (74 000 kr/year).

The MALDI-TOF MS was previously placed in the KBC Proteomics Facility, however, the instrument was broken and not used in recent years. In order to develop techniques of oligosaccharide analysis, we have taken over the instrument and the defective laser was repaired in 2018 after a successful application from the UPSC VINNOVA competence (200 000 kr) centre and BAP' own funds (90 000 kr). The depreciation for the repair cost (22 000 kr/year) will last for the next three years.

We were not in time to send out information and application for 2018, however we plan to give an individual course (ca. 2 weeks) to cover the wide range of analytical methods on cell wall biopolymers including laboratory experiments in 2019. The following techniques will be covered:

- Wood sequential extraction – determination of non-volatile extractives, holocellulose and Alpha-cellulose
- Acid insoluble (Klason) and acid soluble lignin determination
- Hemicellulose monosaccharide composition analysis by GC/MS
- Carbohydrate/lignin qualitative analysis by Py-GC/MS

### Publications

Publication statistics: average no publications/year during 2016-2018 (acknowledged): **7.3**

# Fluorescence In Situ Hybridization (FISH)

## Short Summary of the Facility

The goal of the **Fluorescence In Situ Hybridization (FISH)** research facility is to apply and develop novel cultivation-independent procedures to identify genes in intact whole cells or viruses in their natural environment based on phylogenetic markers. FISH can therefore complement not only other microscope based studies (e.g. fluorescence microscopy, electron microscopy) based on non-phylogenetic stains, but also disruptive molecular biological methods, which rely on the extraction of cellular components such as DNA. Thus, FISH can retrieve the information that is lost when extracting DNA for gene sequencing, for example 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 at least certain viruses. The most common gene target for cell identification is the ribosomal gene, but also housekeeping genes, functional genes, pathological genes, or even whole genomes can be targeted. FISH can be combined with other analytical methods, such as radioactive/isotope methods, flow cytometry, RAMAN spectroscopy, mass spectrometry, spectral imaging.

The FISH research facility was approved to become a KBC Facility in 2017 and is located at the Department of Medical Biochemistry and Biophysics, and is managed by the Department of Ecology and Environmental Science.

## Equipment

The research facility is equipped with 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.

## Personnel

<b>Natuschka Lee</b>	PhD, Department of Ecology and Environmental Sciences
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## Contact information

Natuschka Lee

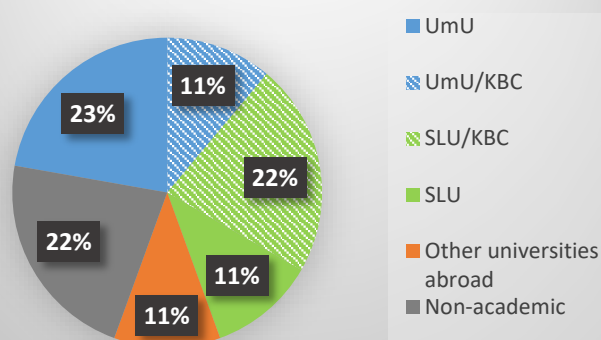
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## Users of FISH

Today, FISH is included in different research projects, e.g. in plant, fungal and animal biology, microbial geocology, pathogen detection, and different industrial applications, e.g. wastewater treatment, cellulose-paper industry, and food production.

**Users of the FISH facility - 2018  
(9 projects)**



## Teaching activities

- FISH was taught for the first time at UmU on the European COST course "Detection and identification of microorganisms in plants and arthropods (DIMPA)" 8-10 October 2018, organized by UPSC (Benedicte Albrechtsen, <https://endophytes.eu/news/>). This included lecturers, a full day lab part and one day with brain storming seminars/lab discussions. No course fees were demanded from the students and all 12 invited

students (selected from 30 applications) obtained each a grant of 500 Euro to cover part of the costs for travel and accommodation. No reimbursement was provided for the FISH teaching.

- FISH has been taught individually to several persons at UmU:
  - Two UmU undergraduate students (Cecilia Åström; Han Nguyen):
  - Four French ERASMUS students Antoine Pierson; Laurie Chaisse-Leal; Solenne Petit, Colin Guetemme)
  - One PhD student from Copenhagen University (Oliver Lykke, supervised by AnneSofie Vestad Hammer).
  - One postdoc (Richard Lundqvist), at Department of clinical microbiology, UmU

#### Future development

- In 2019, an interdisciplinary FISH course will be organized at KBC Umeå with different FISH experts within and outside UmU, for both students and researchers. This course will last a week (40 h) and will be based on two parts:
  - A general part for participants from all science fields: theory on FISH, microscopy, digital image analysis, bioinformatics, lab exercises.
  - A specific part depending on the science field (environmental, clinical, industrial).
- Additional suggestion: Include the FISH technique in some of UmUs undergraduate courses in microbiology/molecular biology.
- Development of a professional FISH facility website (together with the KBC science communicators) on the KBC or EMG website, so that this can also be used for advertisement on a national/international scale, both for research collaborations as well as for teaching – in different science fields (environmental, medical, food, industry), and where possible also together with the SciLife Lab (based on previous discussions with e.g. Stefan Bertilsson at Uppsala University/SciLife Lab). The prime goal is to make this research facility to a national facility\* for various FISH applications in different science and industrial fields, possibly also as a complementary method to national security biological studies (e.g. in collaboration with the European CBRNE center, according to initial discussions with Svenja Stöven and Per-Erik Johansson).
- I also suggest to combine FISH with other equipment or facilities at UmU. First attempts have already been made with:
  - the Flow cytometry unit (Kristina Leijon at the medical faculty),
  - the UCEM (Cheng Choo Lee at KBC)
  - the Vibrational spectroscopy unit (Andras Gorzas at KBC)
  - a selection of clinical researchers at UmU who employ chromosomal FISH on human cells
  - bioinformatics – either in collaboration with UPSC as the bioinformatics software often used for FISH applications (“arb”) has already been installed at the UPSC bioinformatics network to enable anybody to access this software through their local computers. However, the costs for the usage of this must yet be negotiated (with Nat Street, Nicolas Delhomme); or at some other national/northern Swedish bioinformatics unit.
- I also suggest to initiate plans for writing a joint proposal within UmU for purchasing a new equipment to the UmU campus, as this may expand the application possibilities in several science fields where advanced multi imaging is needed: spectral imaging. This equipment allows the detection of a higher amount of fluorophores than a confocal fluorescent microscope can do, and can therefore serve as a valuable complement to other high-throughput methods in various system-biological projects.



## Appendix 2. Conferences, workshops, symposia, and other events organised by/at KBC environment 2016-2018

Name of the event	Dates	Organising department/unit
Umeå Renewable Energy Meeting UREM 2016	23-25 February 2016	Chemistry, SLU
Workshop: Nutrient Cycling in Arctic: Integrating Plant-microbe-Herbivore interactions	16-17 March 2016	EMG, ARCUM, KBC
SciLifeLab Day at KBC	06 April 2016	KBC-Departments
Electron Microscopy Symposium	22 September 2016	UCEM
Electron Microscopy Symposium at KBC	22 September 2016	UCEM, Chemistry, UCMR, MIMS
Swetox: Workshop on human health and chemicals – from exposure to female fertility and epigenetics	10 October 2016	Chemistry
UCMR Mini-symposium: Structural dynamics of biological membranes	27 October 2016	UCMR
Workshop on Accelerated breeding of aspen	27 October 2016	UPSC
KBC Days	8-9 November 2016	KBC
NBIS Annual Symposium and User Meeting	15 December 2016	NBIS
Structural Biology Minisymposium	9 February 2017	Chemistry
Umeå Renewable Energy Meeting UREM 2017. Artificial photosynthesis, and solar fuel production from algae	14-17 February 2017	KBC-Departments
Amira 3D Software Presentation at KBC	16 February 2017	Thermoscientific
Illumina I Bio-Rad Single-Cell Sequencing Solution Bio-Rad digital droplet PCR system – Tips & Tricks workshop	5-6 April 2017	Illumina, Biorad, KBC
Science Communication Workshop	2 May 2017	EMG, KBC
Exploring the Complexity of Life by Cryo-Electron Microscopy. The Swedish National Cryo-EM Facility Inaugural Symposium	8-9 May 2017	SciLifeLab, UCEM
8th International Symposium on Root Development	29 May - 1 June 2017	UPSC
Symposium Plant Science 50 years in Umeå	21-23 August 2017	UPSC
1st International Plant Spectroscopy Conference	29-30 August 2017	VISP, KBC
Mini Symposium in Proteostasis at KBC	27 September 2017	Pharmacology and Clinical Neuroscience
Harness the Power of Metabolomics, Global Metabolomics Seminar Tour	2 October 2017	Thermo Fisher Scientific and SMC
Life on Earth and in the Universe Current State and Future Visions; Annual Meeting of the Swedish Astrobiology Network (SWAN)	16-18 October 2017	Swan, Umevatoriet, UmU
KBC Days and innaguration of KBCon Focus Environment at KBC	7-8 November 2017	KBC
Extra Seminar by postdoctoral candidates	12 December 2017	UPSC

Visit of Nobel Prize Laureate in Chemistry 2017 Jacques Dubochet	13 December 2017	KBC, UCEM
SPPS seminar (Scandinavian Plant Physiology Society)	24 January 2018	UPSC
Workshop "Welcome to discuss the future use of the EISCAT_3D Infrastructure"	12 February 2018	Physics
Climate Impacts on Northern Lakes - open lecture by John Anderson, the holder of King Carl XVI Gustaf Professorship in Environmental Science 2017/2018, and	14 February 2018	Climate Impact Research Centre, EMG
Mini-workshop on evolutionary ecology and genetics	26 February 2018	EMG
Amira Software Workshop at KBC	7 May 2018	Thermoscientific
SAFETY & SECURITY TEST ARENA, LIVE-DEMO	9 May 2018	CBRNE
MIMS/UCMR Mini-Symposium	29 May 2018	MIMS, UCMR
Umeå Cell Biology Symposium	30-31 May 2018	KBC-Departments, KBC
Open lectures in the frame of the DIMPA – COST Training School	10 October 2018	UPSC
UPSC Cell Wall Minisymposium	11 October 2018	UPSC
KBC Days	6-7 November 2018	KBC
Bioinformatics mingle at KBC	21 November 2018	NBIS, KBC
FLIM and Confocal demo	22-23 November 2018	BICU
Workshop on Mass spectrometry based Protein/Proteomic analysis		KBC Proteomics Core Facility

### Appendix 3. Research courses organised at KBC 2016-2018

Courses	Year	ECTS	Dates	Organising departments / units
Applied NMR Spectroscopy	2017 spring	2 ECTS	24-28 Apr 2017	NMR
Assay development in high throughput screening	2017 spring	2 ECTS	20-24 Feb 2017	LCBU
Assay development in high throughput screening	2018 spring	2 ECTS	5-9 Feb 2018	LCBU
Basic Course in SEM and TEM	2016 fall	1 ECTS		UCEM
Basic Course in SEM and TEM	2017 spring	1 ECTS	31 Jan - 2 Feb 2017	UCEM
Basic Course in SEM and TEM	2017 fall	1 ECTS	20-22 Sept 2017	UCEM
Basic Course in SEM and TEM	2018 spring	1 ECTS	20-22 Feb 2018	UCEM
Basic Course in SEM and TEM	2018 fall	1 ECTS	2-4 Oct 2018	UCEM
Bioanalytical methodologies with emphasis on metabolomics analysis	2017 fall	6 ECTS	19-22 Oct; 31 Oct - 1 Nov; 21-24 Nov 2017	SMC
Bioanalytical methodologies with emphasis on use of chromatography and mass spectrometry in metabolomics analysis	2018 spring	6 ECTS	26 Feb – 2 Mar; 19-23 Mar 2018	SMC
Bioimaging, PhD course	2016 spring	1.5 ECTS	15-19 Feb 2016	BICU
Bioimaging, PhD course	2017 spring	1.5 ECTS	13-17 Feb 2017	BICU
Bioinformatics workshop: High Throughput Sequencing Analysis for Plant Breeding	2018 spring	6 credits	12-23 Mar 2018	UPSC, SLU
Cleanroom technology – User License Course	2016 fall	1.5 ECTS	24 -25 Nov 2016	NanoLab, Dept of Physics
Cleanroom technology – User License Course	2017 fall	1.5 ECTS	16 -17 Nov 2017	NanoLab, Dept of Physics
Cleanroom technology – User License Course	2018 fall	1.5 ECTS	22-23 Nov 2018	NanoLab, Dept of Physics
Cryo-EM sample preparation and data collection	2018 spring		14-16 May 2018	SciLifeLab, UCEM
IceLab Camp 2016	2016 fall	2 ECTS	12-15 Sept 2016	IceLab, KBC
IceLab Camp 2017	2017 fall	2 ECTS	11-14 Sept 2017	IceLab, KBC
IceLab Camp 2018	2018 fall	2 ECTS	10-13 Sept 2018	IceLab, KBC
Introduction to high throughput screening	Continuous Web-based	2 ECTS		LCBU
Introduction to Intellectual property rights (IPR) with focus on patents and research utilization	2018 spring		23-24 Apr 2018	Innovation Offices UmU and SLU
Practical course TEM sample preparation course part II	2017 spring	1.5 ECTS	20-24 Mar 2017	UCEM
Practical course at UCEM: TEM sample preparation course part II	2018 spring		9-13 Apr 2018	UCEM
Practical Course on Rapid Cloning, Protein Expression, and Purification - CPEP 18	2018 spring	3 ECTS	28 Feb - 9 Mar 2018	PEP
Poster Workshop	2017 fall	1 ECTS	30 Oct 2017	UPL, KBCon

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Swedish course for beginners	2017			KBC comm. Office
Thin Film Deposition technology (Physical Vapor Deposition)	2016 fall	1.5 ECTS	8-9, 12 Dec 2016	NanoLab, Dept of Physics
Thin Film Deposition technology (Physical Vapor Deposition)	2017 fall	1.5 ECTS	28-30 Nov 2018	NanoLab, Dept of Physics
Thin Film Deposition technology (Physical Vapor Deposition)	2018 fall	1.5 ECTS	5-7 Dec 2018	NanoLab, Dept of Physics
Vibrational Spectroscopy - User Licence Course	2016 fall	2 ECTS	17-21 Oct 2016	ViSp
Vibrational Spectroscopy - User Licence Course	2017 fall	2 ECTS	20-24 Nov 2017	VISP
Vibrational Spectroscopy User License Course	2017 spring	2 ECTS	3-7 Apr 2017	ViSp
Vibrational Spectroscopy User License Course	2018 fall	2 ECTS	12-16 Nov 2018	ViSp
Vibrational Spectroscopy User License Course	2018 spring	2 ECTS	26 Feb - 2 Mar 2018	ViSp
Wood Biology and Biotechnology	2017 fall	3 ECTS	30 Oct - 3 Nov 2017	UPSC, ViSp