Bacteria beware

Andrea **Benediktsdottir** is on to something big

Night shift in the lab

”When it comes to sleep, evidence is not everything”

2024 · A space odyssey

Stem cells on the bright side of the moon

Faculty of Pharmacy

At Uppsala University. Since 1968.

welcome to our faculty of pharmacy

Here, at the heart of Uppsala's Biomedical Center, our more than 1000 researchers, teachers and students meet every day to contribute to a healthier world. This makes our faculty a vital force in one of Europe's finest life science environments, a position that opens up many exciting opportunities.

Our Master of Science Programme in Pharmacy is currently launching a series of improvements that will make Sweden's largest education for future pharmaceutical experts even better. Our course Health-System Pharmacy is in such demand that we have now opened it up to professionals. And this summer, the first students in our Master's Programme in Biopharmaceuticals are up for graduation. Congratulations and the best of luck in your future careers.

We perform a significant share of our work in cooperation with industry and society: Our ongoing mobilising of regulatory forces will benefit Uppsala's expansive pharmaceutical sector. In a PhD project three industry giants are joining in. And recently our faculty was appointed node in the international initiative NordicPharmaTrain.

All this and much more contributed to our recent jump to number 24 in the QS World University Ranking category Pharmacy & Pharmacology. This makes us proud, but we aim higher. Although perhaps not quite as high as Robert Fredriksson, our Professor of Pharmacology who recently sent 50 million stem cells into space. But more on that later in the magazine. Enjoy!

Mathias Hallberg, Dean
Anja Sandström, Deputy Dean

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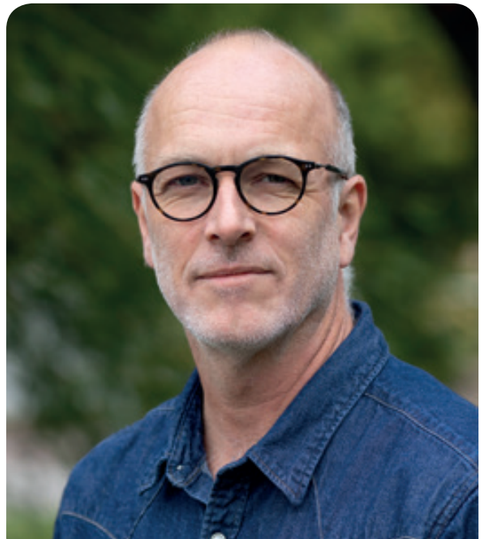


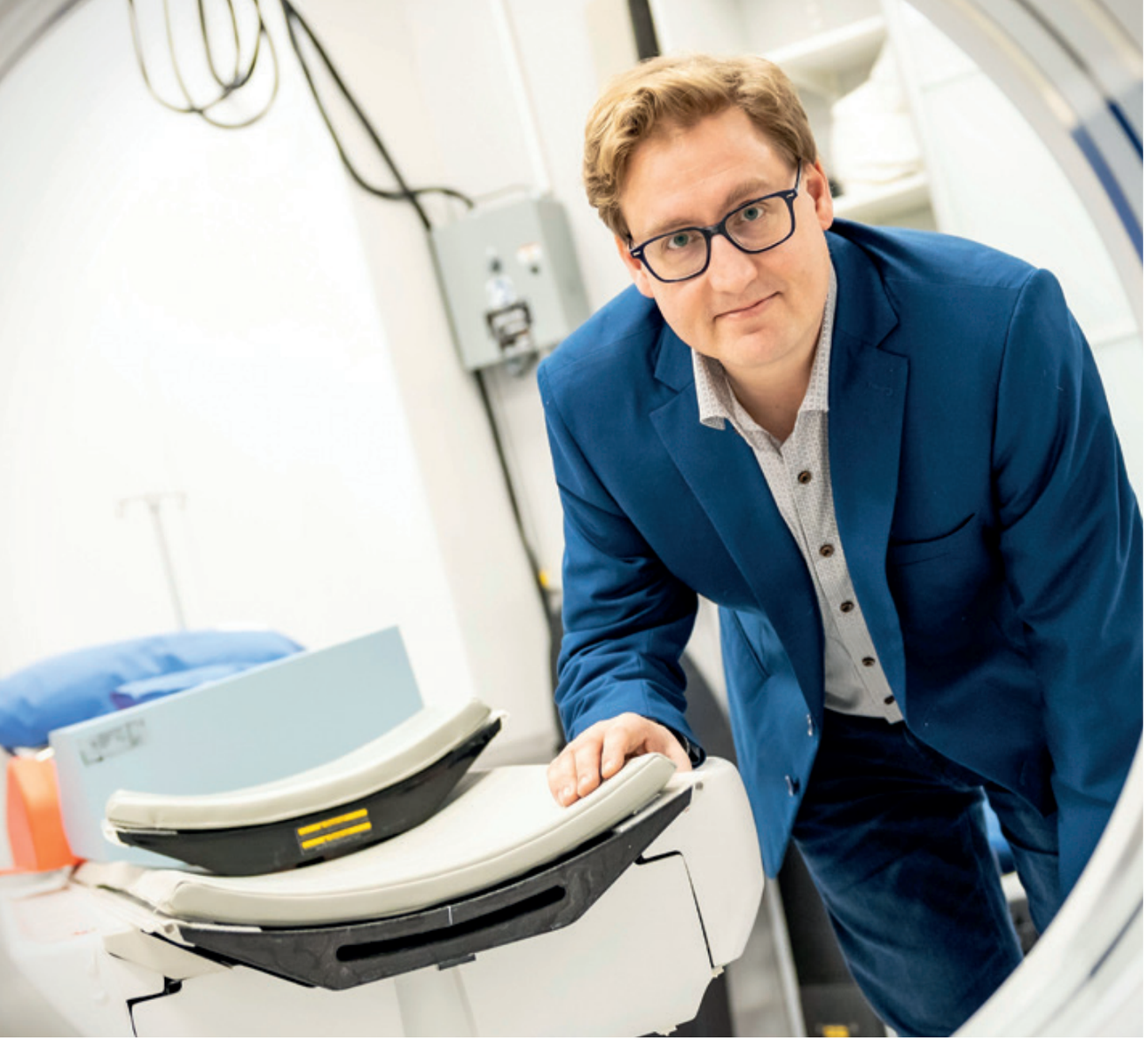
phd student in focus: anton norberg collaborates with three giants of big pharma

The peptide-based drugs bring numerous advantages: Their small components can be reused by the body, and just as importantly, they do not generate toxic breakdown products. These opportunities are attracting the industry and the number of potential drugs in clinical trials is increasing rapidly. Nevertheless, several key challenges remain. This includes the difficulty to predict how the active substances will act when injected into fatty tissue under the skin, today the main route to administer these new drugs.

"Research has long relied on resource-intensive animal models that rarely correlate well enough with the human body. Thus, we need functioning *in vitro* models to enable efficient studies of subcutaneous tissue interaction with the new drugs that can provide qualitative predictions of bioavailability and absorption rate. In my ongoing work, we hope to develop the tools that companies demand," says Anton Norberg, PhD student at the Faculty of Pharmacy and national competence center SweDeliver.

Anton was recruited from a position as Research engineer at Cytiva with previous experience from Enphasys and a pharmacist degree at Uppsala University. During his training, Anton was among the first group of students selected for a summer internship in SweDeliver's industrial network. He appreciated the concept of academia and industry working closely together, and when the position at Per Hansson's research group in Pharmaceutical Physical Chemistry was announced, he immediately applied.

"The project unites AstraZeneca, Ferring Pharmaceuticals and Janssen Pharmaceuticals, three giants of Big Pharma that each provide a co-supervisor with no indications that industrial boundaries will be an obstacle, rather the opposite. We meet every two weeks and everyone is showing amazing commitment. Discussions often go on longer than planned and I always bring lots of valuable input back to the lab. Of course, I am only at the beginning of my project, but can already imagine a future career in this field."



olof eriksson is ready for takeoff

Thirty years after father Lasse sparked Olof Eriksson’s fascination with science, he is leading a project with the potential to revolutionise diagnostics of immune diseases. ”This is exactly everything I dreamed of when I was young,” he states on site at Uppsala’s PET-Centrum

”it’s time to put uppsala’s pet on top”

In Uppsala’s Science Park, the intersection between the city’s University, Academic hospital and thriving biotech industry, we find the PET Center: A cutting-edge facility in one of the fastest growing disciplines of the biomedical sciences. With advanced technology and effective collaborations with both basic research and healthcare, it is also the site of a project with potential to revolutionise diagnostics of immune diseases. At the wheel is Olof Eriksson, Associate Professor at the Faculty of Pharmacy and just back from a trip along the American east coast.

“We move in an expansive field where it is essential to stay updated on what is going on at the front. Today, a lot is happening in Positron Emission Tomography in the USA, and visiting their conferences and laboratories often generates exciting ideas and contacts for future collaborations. Last week, for example, I was in a meeting with Scott L. Friedman, one of the world’s foremost researchers in liver diseases, at the Mount Sinai School of Medicine, which was incredibly inspiring.”

Olof Eriksson was recruited to SciLifeLab and Uppsala University in 2017, where he joined a well-established environment to say the least. Already in the 1970s, Professor Bengt Långström laid the foundation for today’s PET center, a pioneering effort that contributed to the technology’s strong growth in both Sweden and globally. To this day, Långström’s work keeps opening important doors across the world and bringing exciting projects to Uppsala, providing the team at Science Park space to reach for even greater heights.

“Absolutely, we recently installed a scanner that brings a range of new possibilities. In the next few years we aim to update our machine park with world-class instruments. These are, of course, extensive investments, but we also know that they will generate great value for both academia, industry and healthcare. In addition, it will make us even more attractive in the recruitment of future excellence, where we are already competing with the best in our field.”

PET technology enables science to study processes and functions in our internal organs. Via radioactive labeling of interesting substances, the camera follows how they act in the human body and then convert the information into images. Before these studies are possible, however, the researchers must find relevant biomarkers, and in the wake of the pandemic, Olof Eriksson has identified a biomarker in our immune cells. A find that could prove extremely valuable for drug developers, healthcare providers and patients alike.

“We are currently conducting a Phase-1 study and will soon present our results. In parallel, we are in international collaboration preparing an upscaling to, if all goes according to plan, initiate the next phase already in 2025. Our areas of use include cancer and diseases of the liver, lung, heart and pancreas, where we hope to enable diagnostics and follow-up without invasive interventions. A unique asset that will reduce the risk of complications and provide more accurate information on how individual patients respond to treatments.”

Alongside the study, several offensive investments are underway to advance Uppsala’s already strong position in the fields of PET. Region Uppsala recently allocated funding for strategic investments. Uppsala University is recruiting a professor in radiochemistry. And as co-founder and scientific director of spinoff company Antaros Tracer, Olof Eriksson takes an active role in developing the increasingly strong ties between the city’s academia and biotech sector.

“Uppsala is a small city with a big university, a research hospital around the corner and a rapidly expanding pharmaceutical industry. This is is exactly everything I dreamed of when my father Lasse, an artist interested in popular science, opened my eyes to research and today I cannot imagine a more prolific environment. This is where it’s all happening, and now we’re going all in to consolidate our team in the Science Park for a very interesting future.”

night shift in the laboratory

new study focuses on women's sleep

Despite our increased knowledge of the importance of rest, sleep problems are spreading epidemic style across the world. In a survey among teens in Uppsala County, every third respondent state that they suffer from impaired sleep. Even bleaker figures are found in a current report from the Public Health Agency of Sweden, where almost every other woman state that they are experiencing sleep depravation. The risks that come with irregular sleep routines may seem well mapped, but since many conclusions are based on observations of men, several important gaps remain to be filled.

"The menstrual cycle has long been perceived as a complicating factor in experimental sleep studies. Instead, we assume that it is almost necessary to take into account. Not least, observations of the hormonal fluctuations women experience can generate important knowledge, and in an ongoing project we hope to answer how levels of estrogen and progesterone affect sleep and consequently a number of related, important health aspects," states Diana Noga Morais, researcher at the Department of Pharmaceutical Biosciences.

In the sleep laboratory at Uppsala's Biomedical Center, approximately one hundred women in various stages of the menstrual cycle will spend two nights and during daytime participate in several tests. The scientific questions are arousing interest: How important are individual hormone levels for sleep? Can favorable levels strengthen protection against known effects of sleep deprivation? And if so, what could the reverse mean for all the women who work night shifts?

"Our initial data indicate that we are right in our approach. Still, a lot of work remain and we expect to start publishing results from the study early next year. This is an incredibly fascinating field with a constantly increasing demand for new knowledge. Our ambition is to, as far as possible, contribute with a scientific voice, but it is equally important to emphasize that when it comes to sleep, evidence is not everything. If you find the method that makes you sleep well, stick to it," says Christian Benedict, sleep researcher at Uppsala University.

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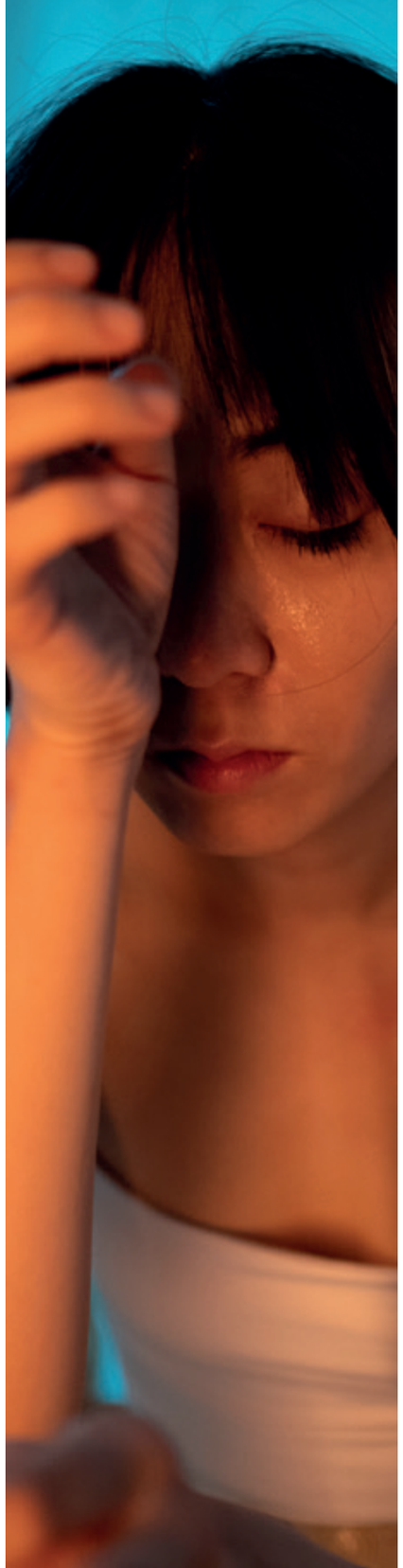

scientists searching for

new tools against primary liver cancer

Primary liver cancer often occur in already damaged organs and is normally diagnosed at a stage where treatment only slows down the process for a few months. This makes it the world's second deadliest tumour disease, and now researchers at Uppsala University in collaboration with the University Hospital are running a study expected to enable new therapeutic possibilities.

"Primary liver cancer is primarily treated with doxorubicin, which can cause harsh side effects. Now, the University Hospital has switched to idarubicin, and by analysing tissue samples from patients we hope to identify predictors that can guide caregivers and optimise therapeutic effects," says Hans Lennernäs, Professor of Biopharmacy.

The work unites a number of research teams: At the Faculty of Medicine, Charlotte Ebeling Barbier conducts Interventional radiology while Femke Heindryckx maps how platelets entering a cancerous liver affect tumor growth and metastases. At the Faculty of Pharmacy, Mikael Hedeland is investigating the interactions between drug-induced cell death and metabolism:

"We have treated three cell lines based on tumor samples with both doxorubicin and idarubicin, and our results suggest that the addition of polyunsaturated fatty acids contributes to increased cell death in the treatment of liver cancer. Next, we will examine proteins and small molecules, and it is stimulating to see our competence in Analytical Pharmaceutical Chemistry add such relevant value to this extremely important work."

Treatment of liver cancer is often carried out locally via injection in the groin. The drug is transported to the tumor in an emulsion of water and oil, alternatively via microparticles loaded with the active substance. Currently, Hans Lennernäs' group is analysing how these two methods are best utilized to optimise the concentration of cell-killing substances in the tumor tissue:

"This is a project that would not be possible without proximity to healthcare and interdisciplinary generosity. Although much work remain, I am convinced that we will find the results to enable earlier diagnosis, individualised treatments and significantly improved survival rates."

sweden’s leading pharmacist education moving forward

Every year, more than 200 new students enroll in our University’s Master of Science Programme in Pharmacy. This makes us Sweden’s largest educator of pharmaceutical experts. A unique position that also entails great responsibility, and in autumn 2022 our faculty launched a committee with the task to take the programme to the next level.

“Working with pharmacist training at Sweden’s only Faculty of Pharmacy is a privilege. Here, all teachers are firmly established in frontline research. We conduct a very positive collaboration with the Pharmaceutical Student Union and everyone knows that Uppsala offers a world-class university life. Still, there is always room for improvement, and last year a programme evaluation was carried out. The results confirm that we are doing many things right, but also pinpoint a distinct direction forward,” says Jörgen Bengtsson, Chair of the Committee.

Many initiatives are already off the blocks. These include the intensified skill training with a focus on communication. Also parts of the internship have been moved to term six. The changes are met with praise from students and teachers alike. A response that is in turn providing inspiration for measures to come: To attract students with the will and capacity to complete the programme, to optimise their conditions to obtain a degree and to provide knowledge about the ample career possibilities that lies ahead with a pharmacist license.

“We have a high number of talented first choice applicants, but must communicate a clearer picture of what a pharmacy education actually entails. That several courses require interest in chemistry and biology, and here we have to find smart channels to upper secondary school. Recently, we invited all applicants for our programme to an online information meeting, which turned out great and will likely be part of the mix we are currently composing,” says Programme Coordinator Lisa Fredriksson Carreras.

Also on the agenda is increased cooperation with STUNS, the foundation for collaboration between Uppsala’s universities, business and society. At a first meeting, opportunities for students to do study visits and degree projects at the region’s vital life science sector were on the table. A prospect that would further intensify the interactions between Uppsala’s companies and the pharmacists of the future.

“Here, faculty and industry share an ambition fully in line with what our students ask for and that – together with a strengthened focus on internationalisation and sustainability – is a priority in the journey we have now begun. The fact that our committee also has the resources and organisation we need makes us convinced that our Master of Science Programme will improve its already advanced position,” states Jörgen and Lisa.

> working with pharmacist training at Sweden’s only Faculty of Pharmacy is a privilege

uppsala skyrockets to number 24 in the world in pharmacy & pharmacology

This year’s QS World University Ranking is official. In the Pharmacy & Pharmacology category, Uppsala climbs ten places, leaving behind many of the world’s top universities and now occupy place 24, our university’s single highest position and a few inches above both Yale and Columbia.

Also in terms of individual researchers, this year’s rankings provide inspiring reading as Research.com award, among many, Per Artursson and Robert Fredriksson prominent positions with 35,000 and 15,867 citations respectively. Among this year’s newcomers, we find Anna Orlova and Ola Söderberg in the Biology and Biochemistry category.

“As Dean, I experience the enthusiasm and curiosity that characterise our faculty on a daily basis. This impressive work reaches far beyond our lecture halls and laboratories and is reflected in the increasingly central roles we play in a number of fruitful collaborations, not least with Uppsala’s Faculty of Medicine. That we continue to climb the global rankings is proof that we are moving in the right direction,” states Dean Mathias Hallberg.

topuniversities.com/world-university-rankings

space oddity: fifty million stem cells on the bright side of the moon

In January, Marcus Wandt became Sweden's third astronaut when his space craft took off from Florida and Cape Canaveral. Travelling with him during his two weeks at international space station ISS were 50 million stem cells, sprung from a mouse embryo and grown especially for the purpose at Uppsala's Biomedical Center.

"The Kennedy Space Center was a different environment, and although the launch probably looked better on TV, it was an awesome experience. Then it became, if possible, even more thrilling as weather delayed the return home for five days and we didn't know if our cells would survive, but in the end they landed in perfect condition," says Robert Fredriksson, Professor of Pharmacology.

The stay at the ISS was not the first adventure in space for Robert's stem cells. In 2023, he and Elena Kozlova, Professor of Regenerative Neurobiology, were given the opportunity to send cells with a sounding rocket, spending a total of six minutes in weightlessness above Kiruna's Esrange Space Center.

"We are just about to publish some very interesting results based on observations of cells from that trip. They divide faster, are more robust and differentiate slower. They have simply become more stem cells. Analysing the cells that recently returned from the USA, we identify similar tendencies and now exciting research awaits."

One aim is to determine how weightlessness affects protein production and bio-chemistry. If the team succeed in growing nerve cells using their space travellers, possibilities might open to treat neurodegenerative diseases. And if the stars are right, hope is to send human stem cells on the next trip. The future has begun.

fanny lundmark

designs molecules tumors dread

So what's up at Lab Lundmark?
At the moment I am purifying molecules up for evaluation in the final phase of my PhD project. Based on results from previous studies, we have modified the molecule and now I hope that it will have even better properties.

What do you expect it to accomplish?
Our goal is to visualise prostate tumors, so hopefully our modified molecules are capable to identify both tumors and metastases. If we succeed, they can become useful tools for the diagnosis of prostate cancer and to evaluate the effects of a treatment, which would make an important contribution to one of the great challenges of cancer research.

Wow, what have you contributed in the process?
I have actually been active in all parts, from design, synthesis and radiolabeling to *in vitro* and *in vivo* studies. Being involved all the way from lab to preclinical trial is what I appreciate the most at the Faculty of Pharmacy, and is definitely something I would like to continue doing after my dissertation.

ilk.uu.se/research-groups/pmc_en/

andrea benediktsdottir

aims to disarm bad bacteria

What's happening in that container?
I am synthesizing a molecule capable of attacking gram-negative bacteria without, as far as we can see, causing any undesired side effects. I follow a parallel track to a project at the ENABLE-2 platform and if things go according to plan, I hope to contribute valuable tools in the search for new antibiotics.

Plural... as in you got more things in the works?
On a course in France, I got inspiration to a concept where the molecule, by binding to iron, can lure the bacteria into opening its protective capsule, which is one of the big challenges in our field. So far, I only have early results to lean on, but if we succeed, potential will be huge.

But for the bacteria things look grim?
Not necessarily. After my dissertation, I will join The Wright Lab at McMaster University to study semisynthesis, a technique to use bacteria to develop new molecules. In addition, I have an idea on how to disarm the infecting abilities of the dangerous bacteria without affecting their beneficial relatives.

ilk.uu.se/research-groups/ldlu_en/

cheating athletes and horses behold: ”facing a very interesting future”

What does an Analytical Pharmaceutical Chemist actually do? Join on a visit to the laboratory that helped expose a cheating Olympic gold medalist, frightened Sweden’s urban swimmers, and currently is central in creating a treatment for the world’s second deadliest tumor disease.

Recently, media turned their spotlights to Uppsala as Emelie Sedvall, PhD student in Analytical Pharmaceutical Chemistry, found traces of 33 pharmaceutical substances while studying insects in the Fyris river. Many of them appearing in more than 80 percent of the samples, Emelie found herself answering countless questions about her results. At least until SVT asked how insects’ moods are affected by antidepressants.

“Our team develops sophisticated analysis methods for complex sample materials. Tools that we use both in our own research and in interdisciplinary collaborations where chemical analysis is central to knowledge acquisition. Our results often arouse great interest. The problem is that the journalists’ questions often focus on other than the methods we create, so here we face a pedagogical challenge,” notes Professor Mikael Hedeland.

Five years after Mikael arrived at Uppsala University, his group is engaged in several multidisciplinary projects. Among the more high profiled is a collaboration to find new ways to treat primary liver cancer, one of the world’s deadliest tumor diseases. The interdisciplinary group includes Hans Lennernäs, Professor of Biopharmacy:

“The development of new drugs and treatments requires increasingly sensitive methods to analyse active substances, their metabolites and effects on the body’s metabolites and markers. This goes for both engineer designed microsystems and patient samples, and access to expertise in Analytical Pharmaceutical Chemistry enables Uppsala University to streamline pharmaceutical research and extends healthcare’s scope to follow and individualise drug therapies.”

The team also makes headlines far beyond the pharmaceutical sphere. Using the fungus Cunninghamella, they discovered that anabolic steroid oxandrolone, which the body rapidly excretes, leaves behind another, more long-lived and traceable substance. The results contributed to the World Anti-Doping Agency re-analysing 105 samples from the Olympic Games in Athens in 2004. With the new knowledge, several cheaters were exposed and a number of medals revoked. Today, researcher Malin Nilsson Broberg leads the trail forward:

“I am searching for metabolites that signal presence of illegal doping substances among humans and horses, a work that for me has strong ethical incentives. Still, If I am to describe our group, I above all think of the great commitment put into our educational efforts,” says Malin, herself receiver of the 2022 Pharmaceutical Student Union’s pedagogical award.

The subject has a strong position at Uppsala’s pharmaceutical educations with the highest number of mandatory courses among Sweden’s Master of Science Programmes in Pharmacy, providing insight into the Analytical Pharmaceutical Chemistry toolbox and how it is best used. More complex problem are solved in the course lab with many students returning to deepen their knowledge.

“Every semester we receice a large number of applications to do degree projects in our group. Many choose to conduct their project in collaboration with external partners and more or less everyone goes directly from graduation to employment, and that some choose to stay with us as PhD students is of course very gratifying,” says Jakob Haglöf, Distinguished teacher at the Faculty of Pharmacy.

Recently, the group initiated a two-day meeting with disciplinary colleagues at the Universities of Oslo and Copenhagen. Highlighing opportunities for developed collaboration, the conference turned out a success and preparations are already underway to introduce oral exams in Uppsala, a system achieving great success in Oslo. In autumn, the Faculty of Pharmacy will host the next meeting place.

“Now we have the foundation for Scandinavian cooperation. Soon, with support from the Swedish Research Council, we will recruit a PhD student to develop methods for more accurate lipid analyses, which will open several important doors for us. In addition, we have several applications out that give every reason to believe in continued success, so our group is undoubtedly facing a very interesting future,” states Mikael Hedeland.

UPPSALA
UNIVERSITET

life science according to a new generation

”My time at SweDeliver has been nothing but excellent from the start. I have learned enormous amounts, both in terms of research and working in complex projects. Not to mention enjoying going to work every single day. This is truly an environment where there are always exciting things going on.”
Marcus Wanselius, future leader of Swedish life sciences

SweDeliver • Shaping the future of drug delivery
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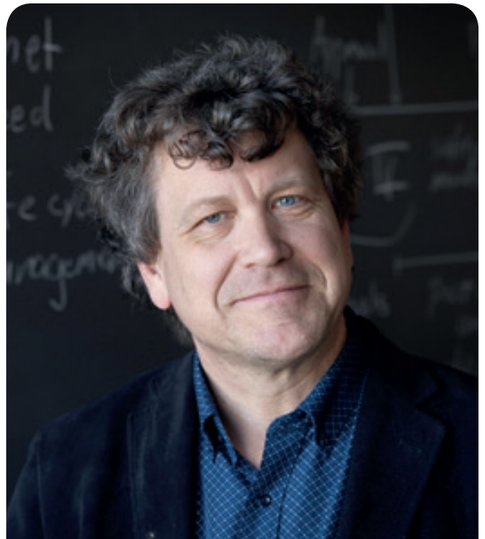


master’s programme in biopharmaceuticals the hottest spot in uppsala

Protein-based drugs already make up more than 20 percent of all new drugs reaching the market. Despite strong growth, European universities offer only a handful of courses in the subject, and when the Faculty of Pharmacy launched the Master’s Programme in Biopharmaceuticals, it quickly gained a position among Uppsala University’s most popular.

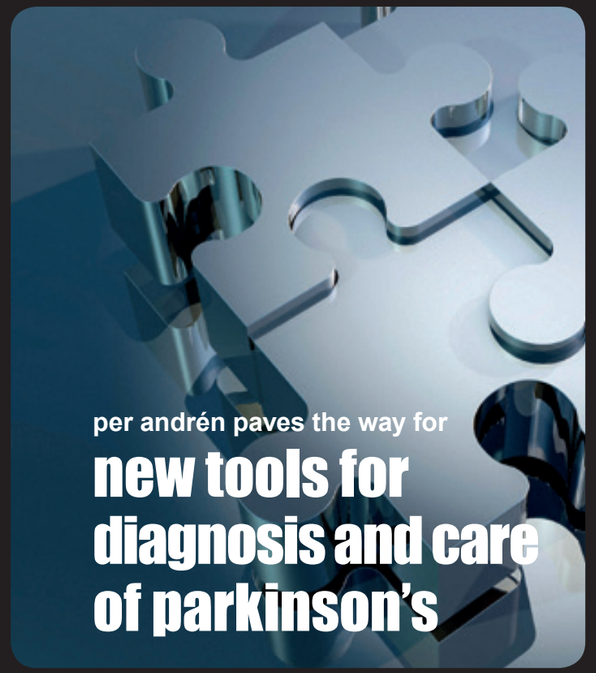
“We welcome highly commited students from across the world. Our course Life Cycle Analysis of Biologicals is characterised by vivid discussions on complex topics and study visits that generate value for all parties. When we recently evaluated the second round, we received a very positive response,” says course leader Maria Melinder.

With a focus on the drug’s full cycle from first study in humans to treatment, many students experience their first contact with the aspects of pharmacy relating to the drug’s path into healthcare. ”Highly valuable”, ”Passionate teachers” and ”Phenomenal study visits” is just some of their praise.

“In cooperation with the Medical Products Agency, TLV, Region Uppsala and the industry, we convey knowledge to assess a drug’s effect and safety, which is required for optimal introduction and use. Such a broad perspective is relatively unique, and when we recently invited researchers from five countries to a panel discussion, they showed great interest in our work,” says Professor Björn Wettermark.

The programme is already uniting several Faculty research teams and constitutes a shared platform with the many external partners who actively contribute with guest lecturers, supervise degree projects and identify great value in interacting with potential employees.

“Sweden is in need of Biopharmaceutical competence, and this programme provides an international recruitment base. In parallel, there is abundant interest outside the academy to acquire these skills, and over time it would be interesting to translate parts of our programme into freestanding courses.”



per andrén paves the way for

new tools for diagnosis and care of parkinson's

Across the world, researchers are searching for treatments for Parkinson's disease. By applying Spatial omics technologies, Per Andrén is adding new and important pieces to the puzzle.

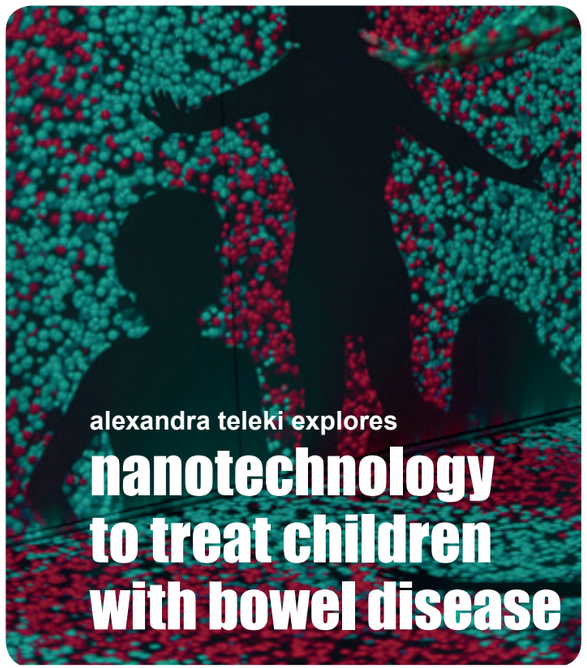
Every year, two thousand swedes are diagnosed with Parkinson's disease, a chronic movement disorder that worsens over time and increases the risk to develop dementia. Parkinson's is caused by the body's dopamine-producing nerve cells slowly dying, but with the right treatment, symptoms can be eased. Unfortunately, other neurological diseases have symptoms similar to Parkinson's dementia, making it difficult for physicians to establish the correct diagnosis.

"There is a great need for methods to differentiate various parkinsonian-like dementias at an early stage.

With support from the Swedish Research Council, we are running an interdisciplinary, six-year project, where we use Spatial omics technologies to map the underlying mechanisms, which can in the long run provide us with the necessary biomarkers," says Per Andrén, Professor of Mass Spectrometry Imaging.

Parkinson's disease is currently treated with L-Dopa, a precursor to dopamine that initially gives good results, but the effect deteriorates over time and can cause increasing involuntary movements. In a highly recognized article in Science Advances, Per Andrén shows that brain tissue from a Parkinson's model affected by such side effects contains excessive levels of L-dopa and 3-O-methyl-dopa, a product formed when L-Dopa is broken down. A find expected to add new and important knowledge to the treatment of advanced Parkinson's disease.

"Healthcare needs tools against Parkinson's and we recently published results in Nature Communications that show how altered prosaposin levels correlate with motor impairments in Parkinson's patients. Using mouse models, we also noted that a deficiency of prosaposin leads to behavioral changes and a reconfiguration of lipid metabolism in the brain, opening the doors to an exciting future for research in our field," states Per Andrén.



alexandra teleki explores

nanotechnology to treat children with bowel disease

Chronic inflammatory bowel diseases have long been a challenge throughout Europe and North America and are now spreading across Asia. Science needs to increase its knowledge of what causes the disease and find new tools for diagnosis and treatment. Not least in the care of children as available methods entail great risks for young bodies, and since three years Alexandra Teleki, researcher in drug delivery, is leading a collaboration to create a technology that will enable care without physical intervention or ionizing radiation.

"Every fourth patient develops the disease already as a child, and today anesthesia and biopsies are required to identify where in the intestine an inflammation is and how active it is, whereupon treatments at best alleviate the disease. With ERC funding, we are currently developing a method to use nanoparticles to both localise the inflammation and administer the drugs required to cure it."

In a previous study, the group presented a mapping of preclinical biomarkers with the potential to indicate inflammatory bowel disease and to which the nanoparticles can bind. The particle the team has chosen to proceed with is in turn easy to produce and flexible in size and composition, and Alexandra recently received the Viking Olof Björk's scholarship. A grant presented to "promising researchers expected to become future leaders in their field".

"This will fund a stay at the Athens Biomedical Sciences Research Center where I, together with Vasiliki Koliaraki, one of the absolute foremost in our field, hope to take big and important steps forward in the development of the particle we are working with."

In parallel, the Foundation for Strategic Research has announced that Alexandra Teleki, as one of only thirteen researchers, is granted funding for an Industrial Doctoral Project. With this grant, Alexandra will recruit a PhD student who will share its working hours between Uppsala University and AstraZeneca's site in Mölndal.

"It is inspiring to be selected in such significant contexts, and although our initial goal is to simplify the demanding and traumatic experiences the affected children go through, we hope that our results will eventually also be transferred to adult patients as well as to several other intestinal diseases."

regulatory forces on the move ”collaboration is the way forward”

Access to regulatory competencies: to understand and apply regulations surrounding a drug throughout its entire lifecycle is a prerequisite for Sweden to consolidate a long-term position as a leading life science nation. Historically, industrial giants trained their employees in the field, but with the entry of smaller, niche companies, the need for knowledge is increasing, and now the Faculty of Pharmacy is mobilising forces to train a new generation of experts.

“In dialogue with the Medical Products Agency, the industry and a number of other organisations, we have mapped the needs for competence and space to combine our strengths in the fields of regulatory. We recently presented a report that identify both a desire for broad cooperation and potential ways forward,” states Anja Sandström, Deputy Dean for first and second cycle education.

Among the initiatives that have already found their form is the free-standing course Drugs: Quality Assurance and Regulatory Requirements. Here Uppsala University, in collaboration with industry and authorities, conveys knowledge about control systems and processes in drug development. The course is arousing great commitment, not least among the many pharmacy students meeting their future employers.

“The participants really appreciate our guest lecturers who provide up-to-date knowledge and important networks for summer jobs and degree projects. Another highlight is our study visit to Astra-Zeneca, showing the students that what they learn is exactly what the industry is asking for. In short, this is an opportunity to both broaden perspectives and add weight to your CV,” say course leaders Ann-Sofie Persson and Josefina Nordström.

More joint platforms are underway in Uppsala Science Park. At a meeting arranged by the Faculty of Pharmacy, Agneta Larhed, Senior Consultant at RegSmart, pinpointed the Master of Science Programme in Pharmacy as the foundation to build on. In parallel, Monica Lidberg at the Medical Products Agency, advocated adjunct employees as an effective way to bridge academia and authorities.

“All parties agree that collaboration is the way forward, and next we will optimise the format for the journey we have already set out on. The fact that we are doing this with broad commitment and a well-founded action plan gives us every reason to look optimistically at the important work that lies ahead,” states Dean Mathias Hallberg.

> our report identifies a desire for broad cooperation

health-system pharmacy new path for prescriptionists

Health-System pharmacists have in a short time established themselves as a natural part of Swedish healthcare. Hundreds of experts are already working in our country’s wards to optimise the drug chain from storage to patient, and to meet the increasing need for skills, Uppsala University in 2022 launched the new course Health-System Pharmacy.

“Our goal is to provide knowledge for a career as ward pharmacist, and we can now see how former participants are recruited to the positions we prepared them for. The labor market is growing with a very positive prognosis, and today we offer the course to both pharmacy students and professionals,” says course leader Matts Balgård.

The course mixes lectures with workshops. The teachers come from both the Faculty of Pharmacy and several Swedish Regions. Participants also have the opportunity to do three days of clinical attachment at a hospital ward, accompanied by a professional health-system pharmacist.

“This summer we will also complete our new clinical training facilities at the Uppsala Biomedical Center with, among many things, three practice pharmacies and a ward drug stock room. These are environments that will further strengthen our students’ opportunities to prepare for their step into a professional life at the clinic.”

Things bode well for a course already rated 5.4 on a six-point scale and evaluations filled with praise as Super interesting, Challenging without being overwhelming, Very educational and, as one student notes: Thank you so much. This fall semester a new group of students will enroll this much-coveted course, which will undoubtedly open up exciting career paths for our future pharmaceutical experts.

video on demand • streaming now

faculty of pharmacy the movie

Can you be a pharmaceutical expert and pop star at the same time? Join as Alice, David, Nadia & Valter from Uppsala Music Classes visit the Faculty of Pharmacy to find out if it is true that some of the world's leading scientists work in their own hometown.

Scan QR-code or visit ilk.uu.se/faculty-of-pharmacy

uppsala university main auditorium • autumn 24

lust for life a day with (your name) in focus

School, friends, sleep, diet, snapchat, exercise. There is a lot we have to fit in the mix to feel on top. But how do you reach all the way? This autumn, we welcome Uppsala's high schools to a unique arena where students, teachers, researchers and experts will team up to focus on a sustainable lifestyle. Your invitation is coming soon...

experts want to give teens the tools to do right online

Screens and social media are occupying increasingly more of our time. In the US, the CEOs of the global platforms are questioned in the senate. In Denmark, the National Board of Health is campaigning to persuade children to leave their mobile phones outside the bedroom at night. And when U-FOLD invited to seminar TikToks • Addictions for a new generation, all 900 seats were booked immediately.

"Addiction and abuse cause complex challenges without simple answers. With U-FOLD, we have created a platform uniting the good forces of society in our task to contribute to a positive environment to grow up in Uppsala and Sweden. The fact that we, with a focus on a new generation, have the pleasure to welcome 400 high school students of course provides extra inspiration," states Chair Mathias Hallberg.

The audience learned several remarkable facts. Among many things, 60 percent of Sweden's fifteen-year-olds only read when forced to. 73 percent of all aged 15 to 24 feel they spend too much time online. And most important: Teens who spend less than half an hour a day on social media regain self-esteem and well-being after just a few weeks.

"Many people my age are aware of this, but listening to experts that present the facts helps me to think about it in terms of my own everyday life. So I will definitely try to reduce my screen time, especially when I study in order to focus better," says Elin, student at Katedralskolan.

Also present was Jale Poljarevius, Head of intelligence in Police Region Central, who gave an account of the work to curb the criminal gangs' attempts to recruit via social media:

"U-FOLD builds its forums on evidence-based research combined with practical work. Thus, adding enormous strength to the message we convey. My hope is for the students to use what they have learned here today to reason further about what they can actually encounter online."

ufold.uu.se

new children's book explains what happens when the brain gets sick

Once upon a time... most bedtime stories begin. But wouldn't it be exciting to start at least one evening with "The brain is made of a hundred billion nerve cells that talk to each other". Now all curious children and grown-ups get the chance with new book When the Brain Gets Sick, a tale far from princesses and unicorns, but instead featuring Zebras with superpowers and a grandmother who finds it increasingly difficult to recognise her grandchildren.

"I often lecture at schools about the diseases of the brain and know that many children live close to affected people and want to understand what is going on. I also know that there is a lack of books explaining at a child's level what actually happens when a brain gets sick. Now we have written it, and mixing play with seriousness we aim to de-dramatize and arouse the children's curiosity," says Åsa Konradsson Geuken, researcher and co-author with Klas Kullander.

"Describing illnesses to children involves the challenge of being as truthful as possible without scaring or belittling. With a focus on the brain, we also have to make it clear that not even adults have all the answers, even if most children prefer to get the hard facts. But with the finished book in hand, I think we have succeeded in conveying important knowledge within the framework of an exciting bedtime story."

The book also offers imaginative images by Kalicharan Patra and an introductory painting by Mats Konradsson, artist and

the older brother of Åsa. In early adulthood, Mats was diagnosed with schizophrenia, and in the book he, together with Aila Ibanez Mengüc and Mathias Larsson, a former Swedish champion in bandy, explains life with a brain disease.

"We're thrilled they've agreed to be involved, showing that anyone can be affected, and above all that it is possible to live a good life even when the brain feels bad," says Åsa.

When the Brain Gets Sick has already reached Swedish bookstores and will soon be published in English. In parallel, a new project focusing on children's questions about the brain awaits.

"We had so much fun writing this book and hope that as many children as possible will read it with parents or in classrooms. We are both passionate about spreading knowledge and replacing prejudice with curiosity and knowledge. So if schools contact us with requests for us to visit and talk to the students, we will do everything to make it happen."

> "important knowledge within the framework of a bedtime story

faculty of pharmacy hub for new nordic consortium nordicpharmatrain

NordForsk is allocating NOK 20 million to the newly formed consortium Nordic Pharmaceutical Translation and Innovation, NordicPharmaTrain, where ten top-ranked universities in the Nordic countries are collaborating with focus on translational research and innovation in the pharmaceutical sciences. With node at Uppsala University's Faculty of Pharmacy, Professor Christel Bergström is leading the operations.

"NordicPharmaTrain builds on the foundation we laid with Nordic POP, a collaboration with a focus on patient-oriented pharmaceutical products. With NordForsk's support, we are raising the bar yet another level and will take on the entire process from manufacturing and delivery of drugs to clinical implementation," says Christel Bergström.

The grant from NordForsk will extend until 2029. For establishment and initial operations, the ten partner universities of NordicPharmaTrain are contributing an additional NEK 40 million. Among future activities being prepared are strengthened cooperation in education and research, increased mobility for researchers and mentoring programs to equip PhD students and postdocs for leading positions in the Nordic life science sector.

"We will also collaborate with other EU-based consortia and global top-ranked universities, which, combined with our own close contacts with healthcare and the pharmaceutical industry, will play an important role in securing the supply of competence required to bring the Nordic countries to the absolute front line of life sciences."

my erasmus term at the faculty of pharmacy was simply the best

So, Henrike Lawrence, pharmacy student who recently returned to the Ludwig-Maximilians-Universität in Munich after an Erasmus term at the Faculty of Pharmacy. What is Uppsala compared to Bavaria's finest?
Wow, Uppsala has so many things to offer and a great number of student activities. It has never been easier making so many new friends, there is always an event happening somewhere and everyone makes you feel welcome.

What made you apply for an internship at Uppsala University?
In Germany, pharmacy is one of few academic subjects where you pursue a "State exam" instead of a bachelor or master's degree. Without going into detail, this can be somewhat tricky if you want to study abroad. But with a little help, I was able to locate a lab project at the Faculty of Pharmacy, which was simply the best thing that could happen to me

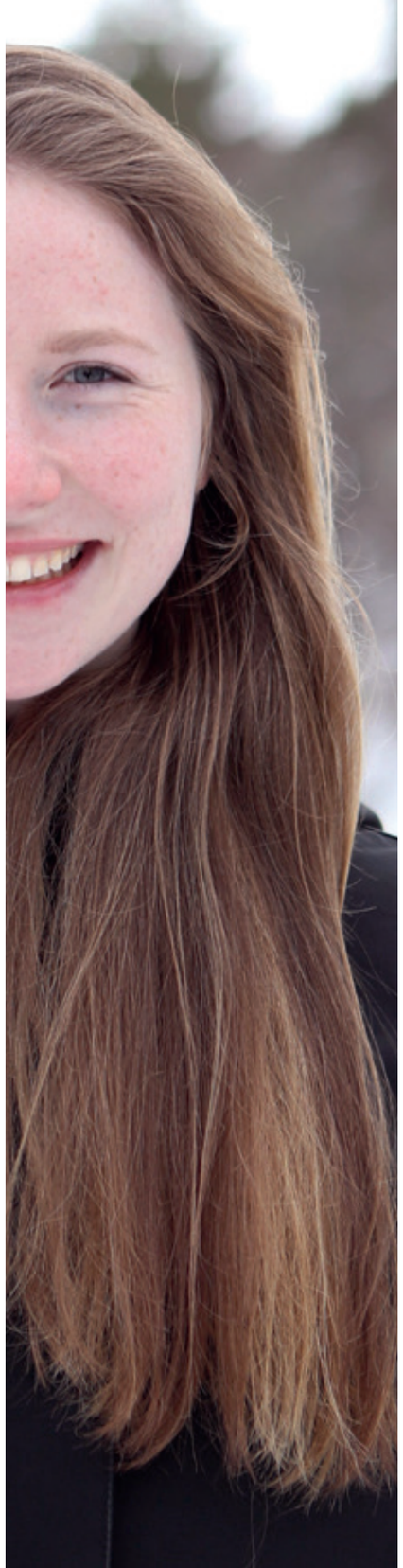
What accommodation did you choose during your stay in Uppsala?
A student housing, which turned out to be very international and lots of fun. I knew that Uppsala was a small town with a big university, famous for its concept of Student Nations – and this suited me just perfect.

Did you have time to experience Sweden beyond labs and student life?
Absolutely, Sweden is a great country for a student exchange. It is so easy to get around even if you don't speak any Swedish. Being a big fan of the outdoors, I did a lot of hiking, skiing and weekend travels with the other exchange students.

Any advice for all students considering an exchange at our Faculty?
Sure: Don't worry if you should ever experience any challenges, you'll figure everything out and it is so much worth every possible effort.

So your recommendation is Go For It
Definitely. In these few months, I learned so much and I grew a lot as a person. I will never forget all the wonderful friends and memories I made in Uppsala.

> I will never forget all the wonderful friends and memories I made in Uppsala



the faculty of pharmacy is all set for almedalen week

Tuesday 25 June, the Faculty of Pharmacy arrives at this year's Almedalen Week, often referred to as the world's largest democratic meeting place. Based at Campus Gotland in central Visby, numerous faculty employees will be on site to contribute evidence-based knowledge to the many seminars covering research and pharmacy.

"The Almedalen week is an important arena in our work to direct the spotlight to subjects that need to climb on our society's agenda. This year we will for example highlight the Bachelor of Science Programme in Pharmacy, where a declining number of applicants is an urgent challenge for both universities and pharmacies," states Anja Sandström, Deputy Dean for first and second cycle education.

Also present in Visby is U-FOLD, counting to its twelfth consecutive Almedalen week. Like previous summers, the forum will offer a series of high-profile panels.

"As a hub for addiction-related issues, it is our job to give them a prominent position in the program. This year, we highlight, among many things, Gambling disorders, the Drug Commission of Inquiry and how to prevent criminal gangs from recruiting young people. Challenges that concern our entire society," says Senior Advisor Fred Nyberg.

In parallel, intensive efforts are underway with focus on subjects highlighted at last year's Almedalen week. These include the widely publicized seminar on regulatory competencies, currently resulting in a regional mobilisation of forces to meet the needs of Swedish life sciences.

"It is every university's responsibility to participate where the social debate is conducted, and at Campus Gotland we have the platform to gather politicians and professionals at our table. That we are travelling to Visby with a well-composed program makes me convinced that we will make an impact," says Dean Mathias Hallberg.

uu.se/almedalen

christel bergström: uppsala's life science hub is at the highest international level

With a virtual intestine and an amped up 3D printer, Christel Bergström is on her way to alter pharmacy as we know it. ”We are on an incredibly inspiring journey that would not be possible anywhere but here in Uppsala,” she states from her own laboratory in the heart of the Swedish life sciences.

How long is the leap from ancient wisdom to a virtual intestine with the potential to revolutionise modern drug development? Exactly 2480 kilometers if you follow the crow's flight from Pergamon where Klaudios Galenos, who gave his name to Galenic pharmacy, was born to Uppsala Science Park, where Christel Bergström two thousand years later has created an effective alternative to animal testing. Add a detour to childhood Småland and you are looking at an extra 180 kilometers.

“Growing up in Småland's entrepreneurial region, an academic career is seldom top of mind. Personally, I was determined to become a saxophonist, but sometimes life takes unexpected turns. For me, it led to Uppsala and the Master of Science Programme in Pharmacy. Before I knew it, the pharmaceutical industry was my goal. At least until I discovered galenics,” says Christel Bergström, Professor of Molecular Pharmacutics.

Her newfound interest swept her 7440 kilometers west to the American prairie and the University of Kansas. On site in the laboratory, the assigned project proved difficult to navigate and results were scarce. Still, word of the ambitious student reached across the Atlantic, and once back on the Uppsala plains, Christel was recruited to a PhD position in Per Artursson's research team.

“Being a PhD student in Per's corridor meant a lot of both responsibilities and freedom. At his level, scientific issues are complex and each member is expected to take initiatives. In parallel, I got access to advanced infrastructures and a network populated by the foremost in my field. As a junior researcher, this was an extremely educational and valuable experience.

Today, two decades after her dissertation, Christel leads her own group with employees from fourteen countries. In parallel, she runs SweDeliver, a research center with a focus on drug delivery and the world as a recruitment base. Within the foreseeable future, the center aim to stand firmly at the absolute front line of science. Several assessors certify that the horizon is within reach.

“To me, the strength of both SweDeliver, that gather eighteen industrial partners, and my own team, is that we share and strive towards a common goal. If we want to recruit top talent, we must look beyond Uppsala. But without a distinct foundation of values, the synergy effect in the meeting between different cultures is easily lost.”

Christel herself entered yet another foreign culture as she in 2010 moved with her family the 15,610 kilometers to Australia's Monash University. When she returned two years later, she brought with her new ideas, international networks and, just as important, a deeper understanding of the values offered at Uppsala Science Park.

“If you are going to conduct pharmaceutical research in Sweden, Uppsala is the perfect place. Just a few steps from BMC are the Ångström and Rudbeck laboratories, the Medical Products Agency, the University Hospital and UU Innovation. We are interacting in an environment at the highest international level, that is still somewhat an unknown gem to the outside world. Properly packaged, it gives us an offer hard to beat in the global competition for excellence and attractive projects.”

Perhaps the Bergström Lab provides the best proof of her hometown's scientific potential. Within the corridor, the team is developing one of Sweden's most exciting innovations: A 3D printer the size of a coffee maker that within a few years is expected to produce individually adapted drugs in patients' homes. In collaboration with Maria Strömme, Professor of Nanotechnology, Gunnar Liminga and Gustaf Ljungman, Physicians in pediatric neurology and oncology, and Mattias Paulsson, Deputy Chief Pharmacist, the group is currently adjusting the technology to adapt drugs for seriously ill children.

“We experience great synergy effects in the diametrically different projects we work on. By, for example, applying our virtual intestine, we can without animal testing calculate how substance combinations and doses will affect release and absorption in the intestine of the 3D printed drugs we develop. Today we focus on children, but will in due time tune the printer for elderly, multi-medication care recipients whose metabolism change over time. This is an incredibly inspiring journey that would not be possible anywhere else but in Uppsala. And raised in a family of entrepreneurs, few things make me as proud as when we can give something valuable in return to all those whose tax money make our research possible.”

at the pharmada: candy and career opportunities

At Uppsala's Biomedical Center, eager post-teens are lining up in ways most festivals can only dream of. The Pharmada, Sweden's largest labor market day for pharmacists, is on and everywhere conversations are underway between industry representatives and a new generation of pharmaceutical experts. The pace is intense and the volume high.

"I will take my Pharmacist degree this summer and am here to overview the opportunities that await on the job market and where my skills will come to best use. In the future, a career as a researcher is on top of my list, but first I want to try my ways in the industry and just had a very good talk with Pfizer," says student Julia Lidar.

More than thirty companies and organisations are here to introduce themselves to potential employees. The front staff work hard to get the students' attention. They are armed with everything from goodie bags to candymachines, but as soon as the conversations start, it is full focus from all parties.

"Pharmada is perfect to meet students and arouse their curiosity about the opportunities we offer. We answer questions about summer jobs, internships, degree projects and future employment. I especially appreciate that so many students show interest in work environment and personal development," says Pharmacy manager Marie Lidman.

A bit away from the crowded hall, Contact talks are taking place, an opportunity to private conversations between employer and student which, in fruitful cases, can launch a new career. The demand for places is high and to get one of the hot spots, students must send in both cv and application to the company they hope to meet. Now the recruiters have made their choices and schedules are tight.

"After six months of planning it is amazing to experience the students' interest and the companies' commitment. Today the hall is filled with a mix that offers something for everyone and show the wide career opportunities a pharmacist degree open," states Project manager Aysha Siddika.

frontline research. first-rate education.

The Faculty of Pharmacy at Uppsala University conducts frontline research and first-rate education. We perform a significant share of our work in collaboration with industry and society.

our research areas

Department of Medicinal Chemistry
- Analytical Pharmaceutical Chemistry
- Drug Design and Discovery
- Pharmaceutical Physical Chemistry
- Preparative Medicinal Chemistry
- Theranostics
- Translational Imaging

Department of Pharmaceutical Biosciences
- Biopharmacy
- Medicinal Mass Spectrometry
- Neuropharmacology and Addition research
- Pharmaceutical Bioinformatics
- Pharmaceutical Cell Biology
- Pharmaceutical Physics
- Pharmaceutics
- Pharmacology
- Pharmacognosy
- Toxicology and Drug Safety

Department of Pharmacy
- Biopharmaceuticals
- Drug Delivery
- Molecular Pharmaceutics
- Pharmacoepidemiology
- Pharmacokinetics & Pharmacodynamics
- Pharmacometrics
- Social Pharmacy

our education

First cycle programmes
- Master of Science Programme in Pharmacy (300 hp)
- Bachelor of Science Programme in Pharmacy (180)

Second cycle programmes
- Master's Programme in Biopharmaceuticals (120 hp)
- Master's Programme in Clinical Pharmacy (60)
- Master's Programme in Drug Discovery and Development (120)
- Master's Programme in Drug Management (120)
- Master's Programme in Pharmaceutical Modelling (120)

- Complementary Programme for Pharmacists with a Foreign Degree
- Proficiency test for pharmacists

contact & information

Faculty of Pharmacy
Uppsala University
Box 256
751 05 Uppsala (SE)
ilk.uu.se/faculty-of-pharmacy
facebook.com/FarmaceutiskaFakultetenUppsala
linkedin.com/company/farmaceutiska-fakulteten
twitter.com/FFakulteten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can create a
healthier world
The pharmaceutical sciences are facing major global challenges.
From slowing an accelerating antibiotic resistance to enhancing
the effects of increasingly complex drug treatments. This is why we
follow our curiosity, explore frontiers and commit without boundaries.
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