

Annual Report NCMM

2019

From disease mechanisms
to clinical practice

NCMM



NORDIC EMBL
PARTNERSHIP FOR
MOLECULAR MEDICINE

NCMM

Co-Funders:

University of Oslo

The Research Council of Norway

Helse Sør-Øst

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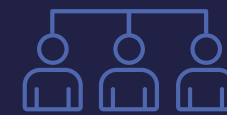
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Welcome Chapter 1



The overall vision for NCMM's next five-year period is to continue strengthening our position as a leading national centre for molecular medicine, with a translational mindset.

Introduction from the Director

Dear friends, colleagues, and supporters of NCMM. It is my pleasure to welcome you to the 2019 NCMM Annual Report. I have spent the past year getting to know the Centre and our research groups' exciting research projects. I'm also becoming familiar with the wider Norwegian research landscape while defining the direction that NCMM will take as we enter our third five-year period of operations.

The past 12 months have seen the Centre focus its research efforts and build on the recommendations made by the Research Council of Norway in our 2018 evaluation report. This has meant identifying theme-based research programmes, with a more defined research focus and a wider plan to build interdisciplinary research teams by integrating more clinician-scientists into NCMM.

Looking ahead to the next five years

The overall vision for NCMM's next five-year period is to continue strengthening our position as a leading national centre for molecular medicine, with a translational mindset. We aim to bring together multidisciplinary teams that can combine basic and translational research. In doing so, we will be well-placed to develop novel, innovative solutions to tackle some of our biggest clinical problems based on a strong basic knowledge of the underlying biology. Together with the research groups and NCMM staff, we also continue to promote

a positive research culture and will focus on building a team-orientated working environment; two aspects that are important for ensuring that NCMM remains successful in producing excellent research. We will also work to improve our standing as an attractive collaboration partner for researchers at national and international institutions, including our sister centres in the Nordic EMBL Partnership.

Strategic recruitment and evaluation

We continue to recruit early-career group leaders using the EMBL model based on research excellence. With a more defined theme-based recruitment programme, we will continue to focus on recruiting talented scientists that deepen our key research areas of precision medicine and systems technologies. We will do this by further strengthening our expertise in computational biology, genome medicine, as well as chemical and structural biology.

This targeted recruitment enables us to build a critical mass of outstanding researchers, whilst strengthening our position as a leading resource for translating basic research into clinical practice. We will also expand our planned recruitment to include more clinician-scientists who can work alongside our existing group leaders, thereby creating a very effective setting in which to take our research from bench to bedside, and back.



Photo:
Oda Hveem

Stronger partnerships

NCMM is seeking new models for collaboration to expand its national role in molecular medicine. This may include shared positions either for young, internationally recruited group leaders of the collaborating national universities at NCMM, or NCMM group leaders in matching hospital or university environments outside the Oslo region. This could also include hospital-based doctors and researchers carrying out research visits and sabbaticals at NCMM; thereby allowing them to become more embedded within the Centre. Other areas to spark collaboration may include joint research programs and the establishment of expertise hubs.

We will also further develop NCMM's research infrastructures and our national roles in the European infrastructure networks. With the support of the University of Oslo and a wide national consortium, NCMM hopes to set up the first cryo-EM facility in Norway, whilst also building stronger links with the biobanks, infrastructures, and expertise at Oslo University Hospital and other national hospitals. Our planned move into the University of Oslo's Life Sciences building in 2024 will also provide an opportunity for us to strengthen our links with other university environments and truly become an integral part of UiO's life sciences community.

Besides strategic recruitment to fulfil our research needs, we will work with the University of Oslo to plan for ways in which we can better retain talented scientists and ensure the continuity of our technological platforms in the event of group leaders rotating out of the Centre.

Nordic EMBL Partnership for Molecular Medicine

I, along with the other Nordic EMBL Partnership directors, met with EMBL Director General Edith Heard in Copenhagen in February 2020. This gave us some valuable insight into how the Nordic EMBL Partnership will fit into the new EMBL strategy, which will reinforce the role of the EMBL's partnership programs. We further discussed how the Nordic EMBL Partnership nodes can better collaborate; both with each other and with EMBL and its outstations. We hope that planned initiatives, such as a joint Nordic EMBL post-doc programme, will get underway in the coming year.

I also greatly enjoyed our annual Partnership meeting in Barcelona in September 2019. The meeting gave some great opportunities to meet with our colleagues from both within the Nordic EMBL Partnership and from EMBL's other partner sites. Of particular importance was the opportunity for our group leaders to meet and

explore potential areas of synergy, and I hope these interactions will help form the basis of some successful collaborations in the coming years.

April 2020

Professor Janna Saarela
Director, NCMM





Greetings from UiO:Life Science

NCMM's highly diverse, talented and international research staff are of great significance when it comes to cultivating one of Norway's leading life science communities.

 Photo: Øystein Horgmo, UiO

Through the UiO:Life Science convergence environment grants I have seen first-hand the quality and breadth of research taking place within NCMM. It has been a great pleasure, for example, to see the progress of one of the initial convergence environment projects funded by UiO:Life Science, Programmable Cell-like Compartments, coordinated by NCMM group leader Dr. Irep Gözen. It has brought together a diverse group of researchers to solve societal challenges, incurable diseases and environmental pollution, but also questions of fundamental importance for understanding life itself. Such projects are of great importance when it comes to enabling collaborative interdisciplinary research, and I hope future schemes will be able to include even more researchers from NCMM.

Additionally, NCMM's focus on translational research alongside its national Associate and Young Associate Investigator network, gives

further opportunities to build connections to other research infrastructures and academic institutions in the Oslo region and throughout Norway. These connections are very useful for the university and help to spark more collaboration and the sharing of expertise and resources, bringing about further research excellence.

Looking ahead, I shall be excited to see how the centre will develop as it enters its third five-year period of operations and how Professor Janna Saarela will further shape the research focus of NCMM as it concentrates more on precision medicine and systems medicine; areas that are of great significance to life science.

Finally, I have also had the pleasure of working closely with Professor Saarela and other NCMM employees in the planning process of the new UiO life science building that will open in 2024. In particular, I would like to

highlight the invaluable contributions they have made in setting up the so-called free life science areas. It is much appreciated. There is no doubt that we have exciting times ahead of us!

Carl Henrik Gørbitz
Director UiO:Life Science



Greetings from the Faculty of Medicine

The Faculty of Medicine is very proud to have hosted NCMM for the last five years. Since its inauguration in 2008, the Centre has developed into a successful and productive national centre for molecular research. It now plays an integral part in the University of Oslo's strategy for the life sciences.

 Photo: Øystein Horgmo, UiO

NCMM has shown itself to be an outstanding greenhouse for fostering young, talented and international researchers. As the Centre enters its third five-year period of operations, I look forward to seeing more excellent contributions to our research community. We also highly value NCMM's links to the Nordic EMBL Partnership for Molecular Medicine, which not only connects us to the EMBL in Heidelberg, but also to other leading research institutions across the Nordics.

Additionally, the Centre has proven itself when it comes to attracting external funding. A great example of this is the number of NCMM group leaders who have been awarded 'Young Research Talent' awards from the Research Council of Norway, alongside other prestigious awards. I understand that several NCMM group leaders have also applied for ERC Starting or Consolidator Grants and hope to see some positive developments in this area in the future.

Looking forward, we hope to see the ownership of the Centre expand into more of Norway's regional health authorities. Alongside this, we would also welcome NCMM's ownership to grow to include other Norwegian universities and their respective medical faculties. These stronger links to university hospitals and academic institutions outside our own region would help to enhance translational research projects, bringing together scientists and infrastructures at the forefront of scientific research.

Collectively, these stronger connections would help to open up new possibilities for more collaborative and innovative research projects, benefitting Norwegian molecular and life sciences research as a whole.

On behalf of the Faculty of Medicine,
Ivar Prydz Gladhaug, Dean



I look forward to seeing more excellent contributions to our research community.

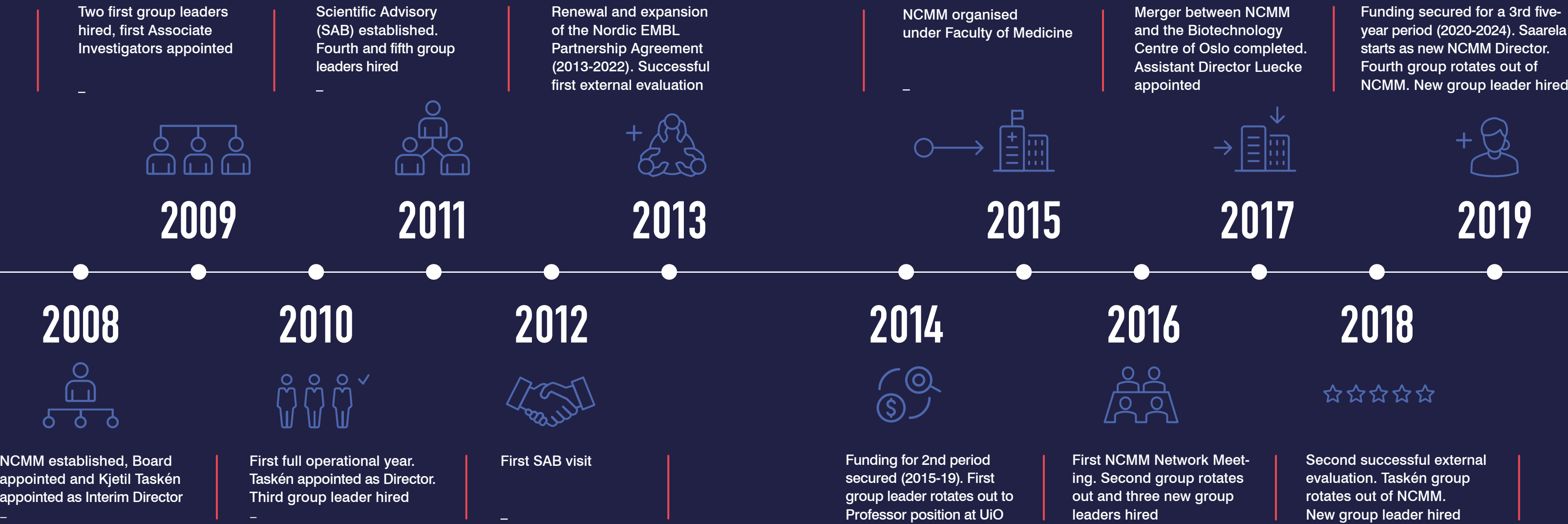
Highlights

2020



New group leader hired, taking total number of groups back up to 11

NCMM 2008–2020





In memoriam Erlend A. Nagelhus

1966-2020



NCMM was deeply saddened to receive the news that our friend and former colleague Professor Erlend A. Nagelhus passed away whilst on a skiing trip on January 10th 2020. Erlend was an important part of NCMM's history, as well as a current Board member and mentor for staff within the Centre.

Professor Nagelhus was an MD with training as a neurologist, and completed his PhD at the University of Oslo. He then spent several years at Rochester University, New York, but returned to Norway when he was recruited to NCMM in 2009. He was one of the very first group leaders appointed at NCMM, and led a highly successful group performing cutting-edge research in the field of neuroscience and the function of glial cells.

In recognition of his many achievements in research, Erlend was appointed as a Professor of Medicine at the University of Oslo in 2013. He therefore rotated out of his group leader position at NCMM at the conclusion of his five-year position in 2014.

He maintained a strong connection to NCMM thereafter, becoming an NCMM Associate Investigator (2014), and member of the NCMM Board (2019). He was also the mentor to current NCMM group leader and Head of the Chemical Neuroscience research group, Camila Esguerra.

Widely recognized as a leader in his research field, Erlend made many important discoveries during an established career.

While at NCMM, he set-up the GliaLab, with a focus on astrocyte function in health and neurological disease. He was also Head of the Letten Centre at the University of Oslo, which hosted the GliaLab and served as a microscopy facility for real-time brain imaging. Within these roles, Erlend was an important and influential colleague to a great number of researchers and students.

Professor Kjetil Taskén was Director of NCMM when Prof. Nagelhus was recruited in 2009. Sharing his memories of Erlend, Kjetil said:

"I was deeply shocked and saddened to learn that Erlend Nagelhus had suddenly and unexpectedly passed away. He was one of the two first group leaders recruited when we started NCMM and a great addition to the environment. He went on to pursue a fantastic career at IMB while continuing to be a true friend of NCMM. He was always willing to help, mentor younger colleagues, and also gave very wise input. His passing away is a great loss for the Faculty of Medicine and the wider research environment."

For those fortunate enough to work with him at NCMM, Erlend will be remembered as a kind, supportive and very popular colleague. He had an infectious positivity and would always go out of his way to help where possible.

Erlend Nagelhus will be sorely missed.



The Nagelhus GliaLab. From left: Rune Enger, Prof. Nagelhus and Wannan Tang. Photo: John Hughes





Photo: EMBL

Welcome to: Dr Sebastian Waszak, Group Leader for Precision Medicine

Dr Sebastian Waszak joined NCMM as a group leader in March 2020 and will be heading the Computational Oncology group.

Dr Waszak received his PhD in systems genetics from the laboratory of Professor Bart Deplancke at the École Polytechnique Fédérale de Lausanne, Switzerland, after which he became a postdoctoral fellow at the EMBL in Heidelberg. Here, he worked in the group of Dr Jan Korb, with a research focus on cancer genetics and cancer genomics.

During his time at the EMBL, Dr Waszak led several innovative studies in cancer research that were published in *The Lancet Oncology* (2018), *The Journal of Clinical Oncology* (2019), and *Nature* (2020), among others.

At NCMM, his group will focus on rare disease genetics, cancer systems genetics, and development of computational methods for integrative analysis of patient and cancer genomes.

“One specific focus of my group will be to work towards the development of precision medicine strategies for pediatric brain cancer patients. I will work to develop novel computational and experimental approaches to investigate mechanisms of transcriptional and translational deregulation in cancer and to identify potential opportunities for novel therapeutic interventions.”

His research will further aim to identify the genetic basis of pediatric brain cancers and to develop prognostic biomarkers for clinical-decision making.

Commenting on his appointment as a group leader at NCMM, Dr Waszak says:

“NCMM provides a fantastic environment to establish a research program in computational oncology. The dual affiliation with Oslo University Hospital will facilitate translation and clinical collaborations.”

Sebastian is the first new group leader recruited to NCMM by current Director Prof. Janna Saarela.

Commenting on the appointment, Professor Saarela says:

“We are extremely happy to welcome Dr Waszak as a new member of the NCMM team. His impressive expertise in cancer genomics will perfectly complement the new focus area of NCMM research – precision medicine – by integrating the rare disease, genome medicine and cancer research themes.”

NCMM looks forward to working with Sebastian and to more exciting research discoveries in the next stage of his career.





NCMM Research

Chapter 2

NCMM Group Leaders

NCMM group leaders should be young, outstanding researchers in an international context. Each has been recruited to non-tenured 5+4 year positions, with a start-up package to set up a research group. These positions are research scientist positions at a level comparable with Associate or Full Professor. Our current Group Leaders include:

NCMM Translational Medicine

Professor Janna Saarela was appointed as NCMM Director in October 2018 and officially joined NCMM in January 2019. She was previously Deputy Director and Head of the Technology Centre at the Institute for Molecular Medicine Finland (FIMM). Her research focuses on the genomics of humane immune disorders, in particular auto-immunity and immune dysregulation and the understanding of biological pathways and mechanisms behind immune disorders.

Professor Hartmut Luecke is a structural biologist and also the Assistant Director of NCMM. He was recruited from the University of California, Irvine in 2017 where he was director of the UC Irvine Center for Biomembrane Systems. Luecke's research focuses on the structure-function investigations of integral membrane proteins. The group also aims to identify and develop more effective drugs through research into how diseases like cancer develop and proliferate.

Dr. Judith Staerk trained at the Ludwig Institute for Cancer Research and Catholic University in Brussels, did her postdoc at Whitehead Institute, MIT, Boston, USA working with stem cells and started in her NCMM Group Leader appointment in 2012. Her research is focused on stem cell biology, hematopoietic stem cells and myelodysplastic and myeloproliferative syndromes. Staerk is in her second and final appointment period as group leader (2017-2022).



Professor
Janna Saarela



Doctor
Sebastian Waszak



Professor
Jens Preben Morth



Dr. Anthony Mathelier is a computer scientist by background who did his PhD at the Pierre and Marie Curie University, Paris. Mathelier was recruited from the University of British Columbia, Vancouver, Canada, which is where he also did his postdoc. Mathelier started his NCMM Group Leader appointment in 2016. His computational biology research programme focuses on gene expression regulation and the mechanisms by which it can be disrupted in human diseases such as cancer.

Dr. Emma Haapaniemi MD did her PhD at the University of Helsinki, followed by a postdoc at the Karolinska Institutet, Sweden. Haapaniemi joined NCMM in January 2019. Her research at NCMM focuses on determining the genetic cause of rare immune diseases and finding treatments, either through identifying better biological therapies or by safely correcting genetic mutations.

Dr. Sebastian Waszak received his PhD in systems genetics from the École Polytechnique Fédérale de Lausanne, Switzerland, after which he became a postdoctoral fellow at the EMBL in Heidelberg. Waszak joined NCMM as a group leader in March 2020. His group will focus on large patient populations, multi-modal data integration, and computational methods to study rare cancers. One specific focus of the group will be to work towards the development of precision medicine strategies for pediatric brain cancer patients.

Professor Jens Preben Morth was recruited from Aarhus University to NCMM in October 2010. Morth accepted a permanent professorship at the Technical University of Copenhagen (DTU), Denmark in 2018 and he and his group rotated out of NCMM in July 2019.

NCMM Biotechnology

Dr. Sandra Lopez-Aviles did her PhD in Barcelona followed by a postdoc in the laboratory of Frank Uhlman at the London Research Institute. She started as Group Leader at BiO in November 2011. Her research is focussed on the role of phosphatases in the yeast cell cycle. Lopez-Aviles is in her second and final appointment period as NCMM group leader (2017-2022).

Dr. Camila V. Esguerra did her PhD at the University of Leuven, Belgium and was recruited to BiO from the Laboratory for Molecular Biodiscovery, Department of Pharmaceutical and Pharmacological Sciences, University of Leuven, where she worked as a senior scientist. Her research is in the area of chemical neuroscience, using zebrafish as a model system for epilepsy. Esguerra started as Group Leader at BiO in December 2014 and was in 2019 renewed for a second and final period (2019-2024).

Dr. Nikolina Sekulic did her PhD at the University of Illinois in Chicago, followed by a postdoc in the laboratory of Professor Ben Black at the University of Pennsylvania, Philadelphia. She started as Group Leader at NCMM in 2016 and her research is focussed on structural biology and epigenetics.

Dr. Irep Gözen did her PhD in chemical and biological engineering at Chalmers University of Technology in Gothenburg, Sweden followed by a postdoc at Harvard-MIT Health Sciences and Technology, US. She started her group leader appointment in 2016 and her research is focussed on the development and utilization of bionanotechnology-based methods.

Dr. Marieke Kuijjer joined NCMM in October 2018. She was recruited from the Department of Biostatistics and Computational Biology of the Dana-Farber Cancer Institute (DFCI) and Harvard TH Chan School of Public Health (HSPH). Kuijjer has a PhD in cancer genomics from the Department of Pathology in Leiden University Medical Centre (LUMC) in the Netherlands. Her research programme at NCMM is focusing on developing computational tools to integrate 'omics data into networks of interacting molecules.

NCMM Group Leader:
Camila V. Esguerra

Head Engineer:
Ana C. S. Távora

Postdoctoral Fellows
Kinga Aurelia Gawel
Wietske van der Ent

PhD Fellows
Nancy Banono
Nastaran Moussavi (shared with the
School of Pharmacy, from March 2019)
Elham Shojaeinia (from August 2019)

Research Technicians
João Santana (from May 2019)
Karolina Kirstein

MSc Student
Rosemary Ogwe Nanji

Camila V. Esguerra



Chemical Neuroscience Group

Could you describe your research in a nutshell?

Our research primarily focuses on understanding the causes of brain disorders such as Epilepsy, Schizophrenia, and Autism. We achieve this by studying genetic models of these human neurological diseases using the zebrafish, a tropical freshwater fish originating from the rivers and estuaries of South Asia and Southeast Asia. By studying how these genetic mutations affect brain function in very young fish (normally during the first week of development), we can pinpoint the earliest changes in the brain that transform it into a diseased state over time.

What do you hope to discover with your research?

By uncovering new mechanisms that lead to brain dysfunction, we hope not only to contribute new insights regarding our overall understanding of health and disease, but also to identify novel entry points for therapeutic development.

What were your highlights of 2019?

2019 was a very productive year as we published eight papers, several of which describe the discovery of new drug candidates with anticonvulsant activity using zebrafish and rodent seizure models, and the description of a new zebrafish genetic

model for absence seizures. We have also made significant progress in characterizing and validating new zebrafish lines carrying mutations in schizophrenia risk genes.

Regarding funding, one of my postdoctoral fellows, Wietske van der Ent, was awarded a Scientia postdoctoral fellowship to study a new gene associated with a severe, drug resistant form of Epilepsy. We are working closely with an international network of researchers and affected families to help understand the disease mechanisms better and to identify new therapeutic options for patients.

What are you hoping for your group to achieve in 2020?

We hope to continue publishing the results of our research from the past several years. We already have one paper published on our Dravet syndrome model, two more publications under minor revision and at least six more in the pipeline! Our goals in 2020 are to begin drug screens on several zebrafish epilepsy and schizophrenia models and to characterize in more depth several of our now established zebrafish genetic epilepsy models. In particular, those associated with Ohtahara syndrome and Lennox Gastaut syndrome.



We hope not only to contribute new insights with regard to our overall understanding of health and disease, but also to identify novel entry points for therapeutic development.



NCMM Group Leader:
Irep Gözen

Postdoctoral Fellows
Dr. Inga Pöldsalu (from May 2019)
Dr. Lauri Viitala (from May 2019, shared with
Chalmers University of Technology, Sweden)

PhD Fellows
Elif Köksal
Karolina Spustová
Aysu Kucukturhan Kubowicz (from February 2019)

PhD Fellows
Lin Xue (from October 2019)
Anna Stephenson (visiting from Harvard,
USA, from January 2020)

MSc student
Ingrid Jin Schanke

Irep Gözen



Bionanotechnology and Membrane Systems Group

Could you describe your research in a nutshell?

My group employs lipid membranes to study interdisciplinary questions of biology, most recently the unassisted transformation of fatty acid and phospholipid self-assemblies to organized, functional compartments for primitive cell formation. We have distinctly interdisciplinary research interests and concentrate our efforts on integrative bionanoscience, with a special emphasis on molecular lipid films and artificial cells. We develop and routinely utilize microengineering, as well as soft matter nano-concepts, microfluidic and sensor technology, and advanced optical and surface microscopy.

What do you hope to discover with your research?

We would like to understand:

- What the exact role of surfaces in emergence of life on the early Earth is.
- How cells perceive interfaces and physically migrate on them.
- How certain organelles (e.g. the ER) form and remodel themselves.

What were your highlights of 2019?

2019-2020 have been very productive in terms of original research findings. We have published several research articles, one book chapter, one popular science article, and an invited blog (see NCMM publications listed in this annual report). One research article was recently posted on a pre-print server and is currently in review. Some

of our research has also been highlighted on national and international news sites.

The Gözen Group took part in *Forskningstorget* 2019, a two-day national science fair which is held every autumn in the centre of Oslo. *Forskningstorget* is part of the National Science Week in Norway (*Forskningsdagene*), a nationwide event held every year to make science and research available to the public. Participants – mostly school pupils – interacted with research group members and performed hands-on experiments related to soft matter characteristics.

PhD student Karolina Spustová received *the* best poster award at the EMBL PhD Symposium 2019 in Heidelberg, during which she also delivered a flash talk about her project, *Spontaneous Compartmentalization of Artificial Cells on Solid Supports*. PhD student Elif Köksal received a travel award and the Student Research Achievement Award from the American Biophysical Society during their annual meeting in San Diego in 2020. Dr. Inga Pöldsalu received a Scientia Fellowship funded by the European Union's Horizon 2020 Research and Innovation program under the Marie Skłodowska-Curie Actions.

Most recently, the Gözen Group took place in a science-art exhibition called *Nanocosmos*. The exhibition was created as part of the Oslo Life Science Conference in February 2020. The event, organised by the UiO's Programmable Cell-like Compartments

convergence project, was designed to give the public a glimpse into the 'nano world' and spark discussion and questions about the science behind the images.

What are you hoping for your group to achieve in 2020?

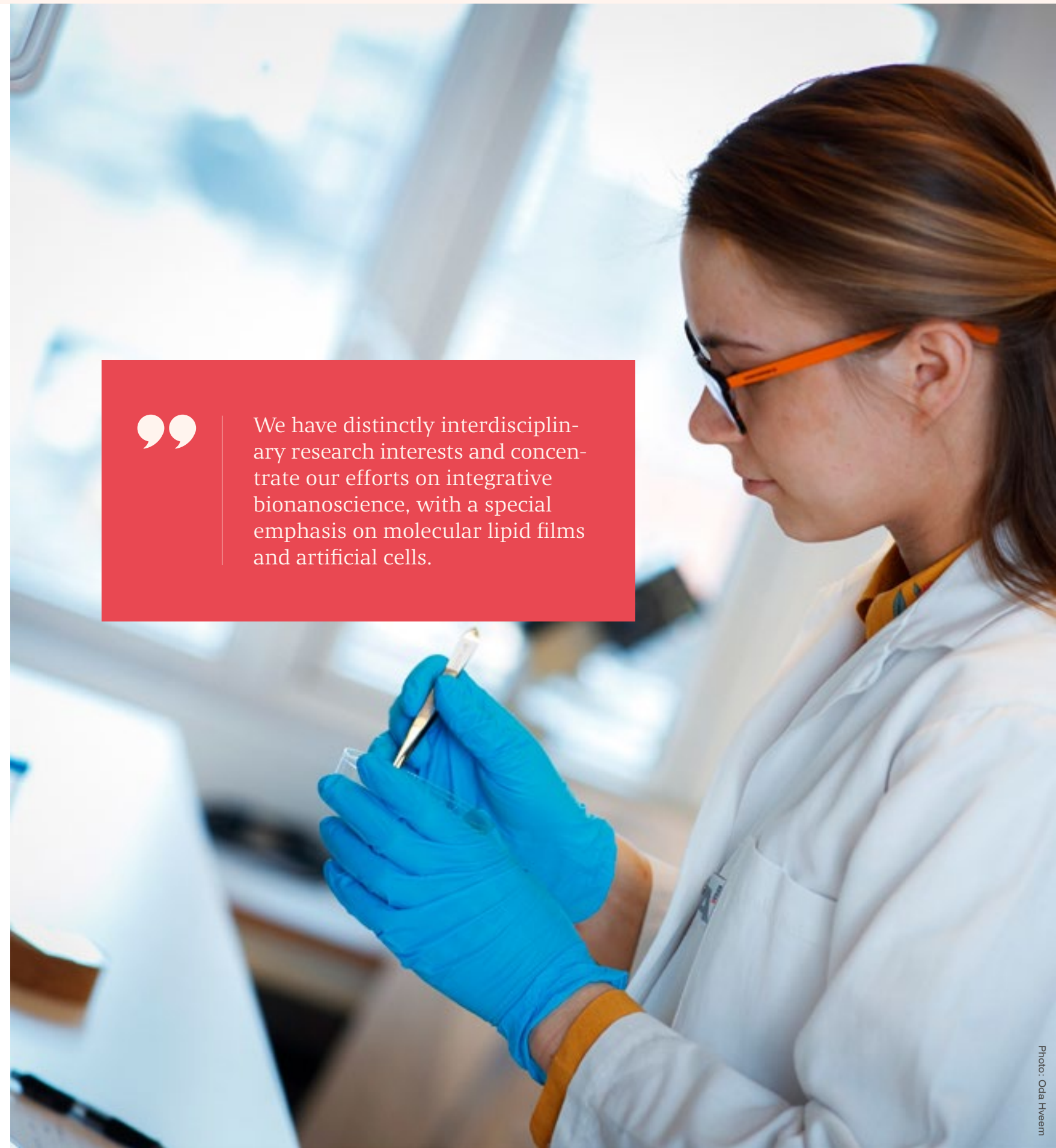
In terms of research, we are on a path to contribute to a deeper understanding of the origins of life. We want to uncover fundamental biophysical transformation processes that allow for the construction of simple replicating structures, which can have practical relevance for bioengineering and translational medicine, for example, cellular repair, artificial cell engineering, drug delivery applications and point-of-care testing technologies.

As a group we have always put significant emphasis on research dissemination and outreach, and we want to continue to take part in science fairs, organize scientific events for the public, write popular science articles, newspaper and science blogs. We are also planning to participate in *Forskningstorget* 2020.

It has been a productive period for all students and postdocs in the group in terms of research progress. Our team members will continue to perform original interdisciplinary research, collaborate with each other, and with experts from other institutions, publish their findings, attend conferences, apply for awards and independent funding.



We have distinctly interdisciplinary research interests and concentrate our efforts on integrative bionanoscience, with a special emphasis on molecular lipid films and artificial cells.



NCMM Group Leader:
Emma Haapaniemi

Lab Manager (shared with Saarela group)
Monika Szymanska (from September 2019)

PhD Students
Ganna Reint
Zhuokun Li (from April 2019)
Katariina Mamia (from June 2020)

MSc Students
Inkeri Soppa (until August 2019)
Oda Almásbak (from June 2020)

ERASMUS Students
Carola Pont Vallés (ERASMUS from
February 2020 until June 2020)
Kathrin Menzner (ERASMUS from
August 2019 until September 2019)
Lisa Lutz (ERASMUS from December 2019
until March 2020)

Research Assistant
Katariina Mamia (from December 2019)
–
Research Intern
Thapelo Mathabela (from June 2019
until January 2020)

Emma Haapaniemi



Precision Pediatrics and Gene Editing Group

Could you describe your research in a nutshell?

We work on optimizing CRISPR for monogenic immune disease treatment. My particular interest is in rare immune diseases, for example, diseases caused by genetics and rare acquired autoimmune diseases.

What do you hope to discover with your research?

We hope to find therapies for rare monogenic diseases that are commercially uninteresting and outside the standard drug development pipelines. The therapies don't need to be curative - often incremental advances can have a significant effect on the quality of life for the patients and their families.

What were your highlights of 2019?

I initially started my group in late 2018 at the Karolinska Institute, Sweden, before joining NCMM in early 2019. It has therefore been a relief to see some order to emerge from the initial chaos. We have had some great rotating students who graduated and moved on to stable jobs, which has been satisfying to see.

We also received the Research Council of Norway (RCN) Young Research Talent award, as well as funding for a PhD student from Helse Sør-Øst (HSØ). These helped to stabilize us financially and took some of the pressure off.

Furthermore, I became a partner in a new KG Jebsen Centre for Autism and Developmental Disorders. It will be interesting for my group to start working with neurodevelopmental diseases and look at the different comorbidities, including immunological disturbances, in these diseases.

What are you hoping for your group to achieve in 2020?

We hope to hire a postdoc, and move from cell lines to patient cell editing in the next year. We're also submitting our first manuscript, and it would be great to get it published in 2020.



We hope to find therapies for rare monogenic diseases that are commercially uninteresting and outside the standard drug development pipelines.



Photo: Nadia Franssen



NCMM Group Leader:
Marieke Kuijjer

Postdoctoral Fellows
Tatiana Belova (from June 2019)
Annikka Polster (from February 2020)

PhD student
Ping-Han Hsieh (from May 2019)

Students
Tess Brunner (May-September 2019,
co-supervised with Camila Lopes-Ramos
at Harvard Chan School of Public Health)

Students
Genís Calderer Garcia (July-August 2019)
Hallvard Wæhler (April-July 2019)

Marieke Kuijjer



Computational Biology and Systems Medicine Group

Could you describe your research in a nutshell?

We work on developing computational tools to model and analyze gene regulation in individual patients in the context of gene regulatory networks. We apply these tools to better understand what drives the development and progression of cancer and other complex diseases.

What do you hope to discover with your research?

We believe that the clinical phenotypes we observe in complex diseases cannot be adequately defined by individual genes, but that we instead should consider the underlying network of regulatory interactions between multiple different biological components. By analyzing genome-wide networks, we hope to identify new, clinically relevant, regulatory subtypes, as well as biomarkers and potential new therapeutic targets for treating cancer and other complex diseases.

What were your highlights of 2019?

As I had just started my group at NCMM, the most important highlight of 2019 was hiring a wonderful group of researchers. We published our individual sample network method in iScience and presented an application of it at the Network Biology track of the ISMB/ECCB. We also published an R package of the method, which was the first paper I co-authored with a group member. We also received two NCMM collaborative grants to start projects with NCMM Young Associate Investigators, which was a great way to start new collaborations.

What are you hoping for your group to achieve in 2020?

The group will grow in 2020! We have just recruited a new group member through the Marie Curie Scientia Fellow II program and are also in the process of hiring a new PhD student. We are also very excited to be hosting two students in the group over the summer.



We develop computational tools to better understand what drives the development and progression of cancer and other complex diseases.

Sandra Lopez-Aviles



Cell Cycle Regulations Group

Could you describe your research in a nutshell?

We use a genetic model organism, fission yeast, to investigate basic mechanisms regulating cell division, gene expression, and cell differentiation. Due to the high degree of conservation of the key components controlling these events, our results can shed light onto the underlying causes leading to cancer development.

What do you hope to discover with your research?

Our focus lies on the role of protein phosphatases regulating vents during cell cycle progression and in response to nutrient starvation. In our group, we hope to show that the regulated activity of protein phosphatases belonging to the PP2A family play instrumental roles in the ordering of cell cycle events, the control of transcriptional programs, and the regulation of Cyclin-dependent kinase (CDK) activity. PP2A activity is often lost during cancer progression, but the impact of this loss on cancer cells is not completely understood. By fully understanding the biological functions of these enzymes, we believe we can then understand the implications of their inactivation and how to exploit their regulation in the treatment of cancer.

What were your highlights of 2019?

In 2019, we have:

- Published a review in the *International Journal of Molecular Science*: "Protein phosphatases in G1 regulation".
- Presented our work at a plenary session in the 10th International Fission Yeast Meeting in Barcelona, Spain in July 2019.
- Initiated a collaboration with Prof. Anne Simonsen (UiO) to study mechanisms of autophagy in fission yeast.

What are you hoping for your group to achieve in 2020?

In 2020 we expect to submit for publication several projects:

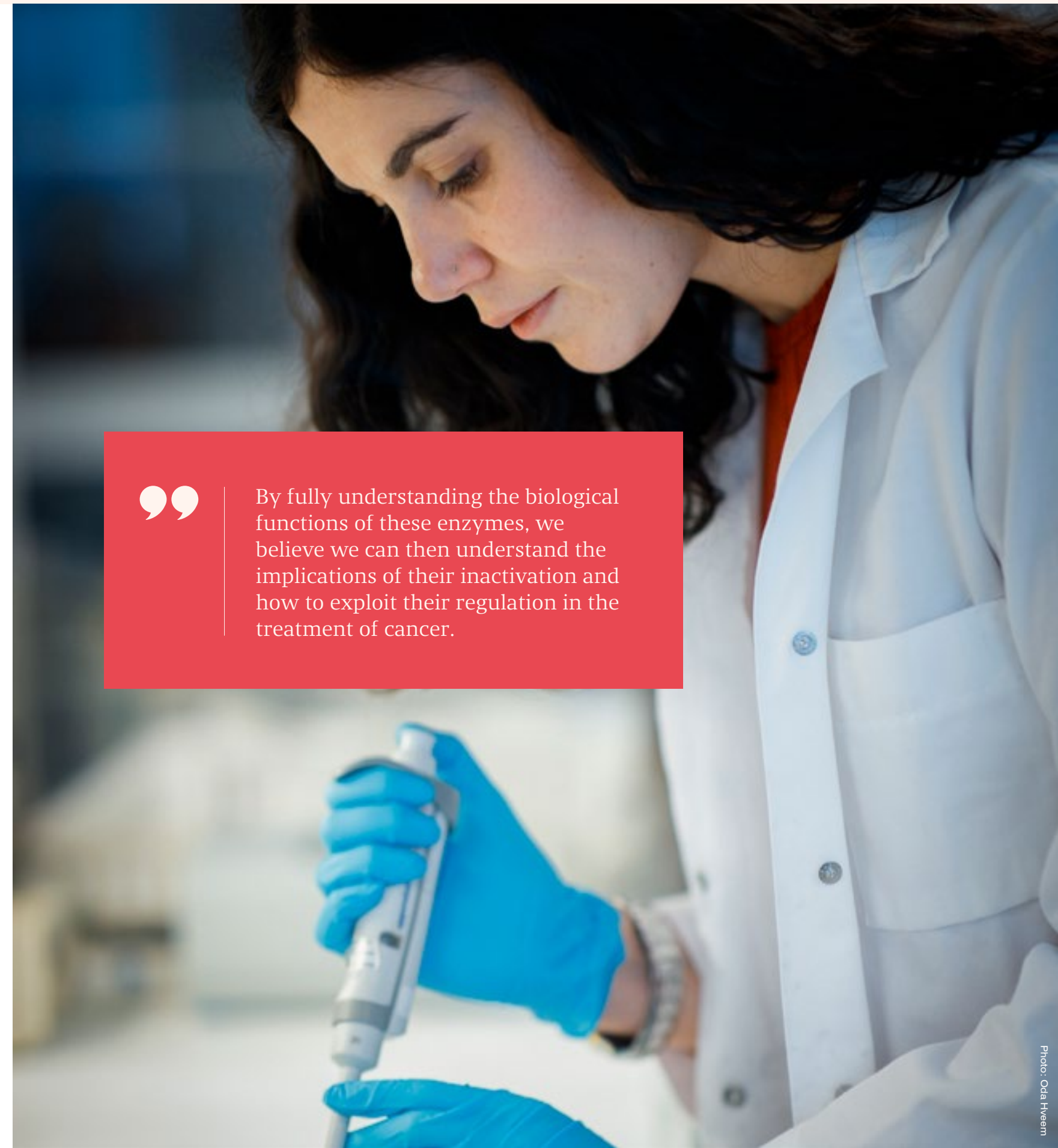
- On the control of negative regulators of CDK by PP2A-B56
- On the control of gene expression by PP2A-B55 during quiescence and differentiation.
- On the roles of a 4-EBP protein in *S. pombe* during the response to oxidative stress.
- On the role of PP2A-B56 during mitotic slippage.

Furthermore, a PhD fellow in our group, Vilte Stonyte, will defend her PhD.

We also expect to start new collaborations and to secure new funding for the group.



By fully understanding the biological functions of these enzymes, we believe we can then understand the implications of their inactivation and how to exploit their regulation in the treatment of cancer.



NCMM Group Leader:
Hartmut Luecke

Research Scientist
Eva Cunha

Principal Engineer
Bojana Sredic

Postdoctoral Fellows
Javier Gutierrez-Fernandez
Marta Sanz Gaitero (from May 2019)
Joel Benjamin Heim (from September 2019)

PhD Fellows
Flore Kersten (from August 2019)
Mateu Montserrat Canals (from February 2020)

Guest Researcher
Julie E. Heggelund (from March 2019)
-
MSc Student
Elisa Lamottke (from November 2019)

Hartmut Luecke



Structural Biology and Drug Discovery Group

Structure-function studies of integral membrane proteins

Though most genomes contain 20-30% of membrane proteins, to date we only know the atomic structures of just over 2,000 membrane proteins (vs. over 140,000 for soluble proteins). Our approach has been to employ and refine a host of specialized crystallization methods, and more recently we have begun cryo electron microscopy studies of the complex of a membrane protein with a large soluble enzyme.

Central to more than half of all human cancers is the tumor suppressor protein p53. A subset of five single-site mutations in the DNA-binding domain of p53 is found in the vast majority of these cancers (top three are ovarian, lung and colorectal). The Luecke group aims to identify compounds that restore the function of mutant p53, using structural studies.

Infection of the gastric mucosa by *Helicobacter pylori* affects about half the world's population and is the primary cause of gastritis, peptic ulcer disease and gastric cancer. Gastric colonization by *H. pylori* depends on the expression of a proton-gated urea channel and a cytoplasmic urease unique to this pathogen. We have determined the structure of this channel which is essential for *H. pylori* survival in the low-pH medium of the stomach and is thus an attractive cancer target. More recently we determined the structure of 1.1 MDa urease by cryo EM to 3.2

Å resolution. We have also identified compounds that inhibit the channel or the urease at submicromolar concentrations. Thus, the second general area of our research interest is structure-based drug discovery.

Structure-based drug discovery

Structural knowledge is fundamental for understanding the underlying mechanisms involved in cancer onset and proliferation. This therefore aids in the identification and the development of new and more effective drugs.

We use a multidisciplinary approach that involves crystallography, nuclear magnetic resonance, cryo electron microscopy and computational techniques to obtain structural and mechanistic insights on numerous systems.

One of our projects focuses on annexins that constitute a family of proteins that interact with phospholipid bilayers in a Ca^{2+} -dependent manner. Mediating membrane aggregation and fusion, annexins play important roles in endo- and exocytosis, actin polymerization, inflammatory response, cancer metastasis, and the generation of plasmin. Structural studies of annexins have been essential for understanding their properties and interactions with binding partners at the atomic level. We are now characterizing several lead compounds that modulate annexin-mediated polymerization of actin, some of which have demonstrated anti-angiogenic activity.



The Luecke Group aims to better understand the structure and function of integral membrane proteins. We also aim to identify and develop drugs that inhibit or re-activate our targets.

NCMM Group Leader:
Anthony Mathelier

Postdoctoral Fellows
Aziz Khan (until December 2019)
Jaime Abraham Castro Mondragón
Roza Berhanu Lemma
Vipin Kumar (from January 2020)

PhD Fellows
Marius Gheorghe (until September 2019)
Rafael Riudavets Puig (from August 2019)
Ieva Rauluseviciute (from March 2020)

Software Developer
Paul Boddie (from February 2020)

MSc Students
Peter Arnesen (from September 2019)
Solveig M. Knoph Klokkeud (until June 2020)
Timothée Launay (February-August 2020)

Anthony Mathelier



Computational Biology and Gene Regulation Group

Could you describe your research in a nutshell?

Our computational biology research programme focuses on gene expression regulation and the mechanisms by which it can be disrupted. In a nutshell, the group develops and applies computational approaches to analyse multi-omics data to study gene expression dysregulation in cancers.

What do you hope to discover with your research?

We aim to develop computational resources and software tools to help understand and prioritise personal genomic modifications in the DNA fragments that regulate when and where genes are expressed.

What were your highlights of 2019?

Our project “Characterisation of cis-regulatory variations that dysregulate driver microRNAs in cancer”, which is funded by both the Research Council of Norway (through a Young Research Talent grant) and the Norwegian Cancer Society, officially started in August 2019. To date, the capacity to analyse personal mutations in regulatory regions of the human genome has been limited. This project aims at filling the gap in the development of computational and theoretical tools in modern biology for the analysis and interpretation of patients’ personal mutations in the context of personalised medicine. It will produce

critical resources and tools that will be beneficial to the development of basic research on gene expression regulation and applications, such as clinical diagnostics and treatment.

As part of this project, we already published the update of the JASPAR database (Fornes, Castro-Mondragon, Khan, et al., *Nucleic Acids Research*, 2020). JASPAR is a widely used database of curated transcription factor (TF)-DNA binding profiles. With about 10,000 users per month, the database serves as a critical resource for the research community, particularly for researchers studying the regulation of gene transcription. This work results from a fruitful collaboration between our group and groups in Canada, Denmark, UK, France, and Switzerland.

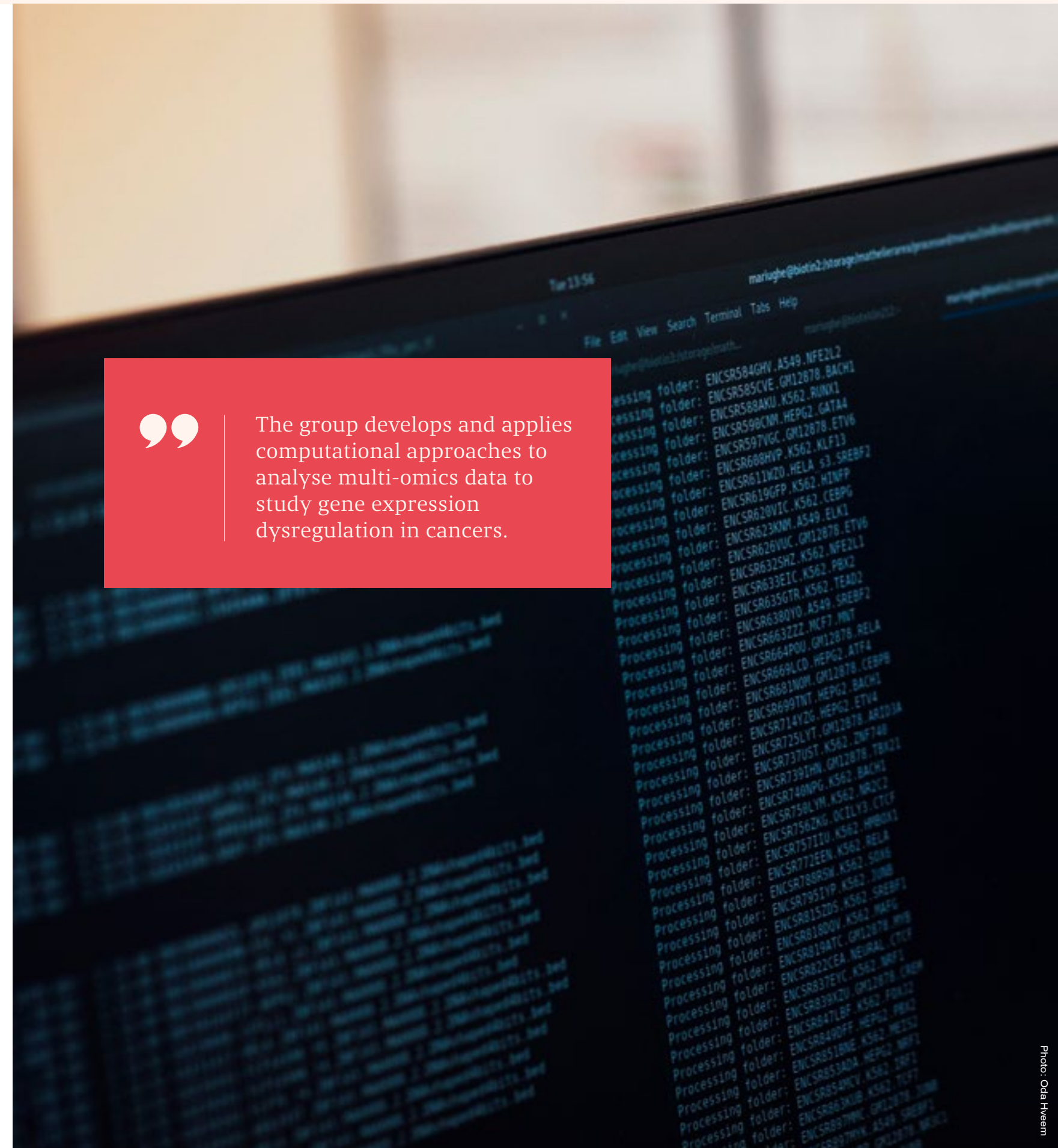
What are you hoping for your group to achieve in 2020?

We hope to continue the update of our resources (JASPAR and UniBind) to study transcriptional regulation of gene expression, as well as developing a new computational tool to identify microRNAs that are dysregulated with a cascading effect on the disruption of the gene regulatory program in cancer cells.

In 2020, Marius Gheorghe will defend his PhD. This will be our first PhD defence, and will represent a milestone for the group.



The group develops and applies computational approaches to analyse multi-omics data to study gene expression dysregulation in cancers.



Group Members at NCMM

NCMM Group Leader:
Janna Saarela

Lab Manager

Monika Szymanska (shared with Haapaniemi
Group, from September 2019)

Group Members at FIMM

Postdoctoral Researcher
Javier Nuñez Fontarnau

PhD Students

Mehreen Ali
Pu Chen
Meri Kaustio
Johanna Lehtonen

Commercial Expert

Kari Lehtipuu

Information Systems Manager

Timo Miettinen

Project Planner

Tuomo Pentikäinen
–
Research Coordinator Kimmo Pitkänen
–
Project Coordinator Kimmo Pääkkönen

Janna Saarela



Human Immune Disorders Group

Could you describe your research in a nutshell?

The aim of my group's research is to improve our understanding of the disease pathogenesis and mechanisms of human immune disorders. At the same time, we are working to learn more about normal immune functions and their regulation. This understanding helps in developing better diagnostics and treatment for patients suffering from immune diseases. We also work to develop innovative tools for sharing and analysis of sensitive human health data, which is a prerequisite for strong genome medicine research.

Background

The human immune system is a complex and sophisticated system, which has a simple, yet very important mission: to seek and kill attackers. While a defective immune system, such as severe combined immunodeficiency or a lack of immune system cells predisposed to life-threatening infections, other immune disorders result from either an excessive immune response or an "autoimmune attack". The same genes are frequently associated with multiple autoimmune diseases and some of them are also known to cause primary immune deficiencies.

Translational genome research involving sensitive human data requires expertise and tools for safe data management, shar-

ing and analysis. In collaboration with the FIMM IT team and research and biobank infrastructures, the group has a long history in developing tools for handling and analysing sensitive data. Some of the tools are utilized by the Finnish biobanks and also further developed into commercial innovations.

Research Strategy

The group's research focuses on improving the understanding of biological pathways and pathogenic mechanisms behind rare and common immune diseases, especially primary immune deficiencies (PID) and multiple sclerosis. To further the understanding of immune deficiencies and dysregulation that underlie rare immune diseases, we focus on identifying novel gene defects causing rare disorders followed up by studying the functional consequences of the identified mutations. We have shown that dysregulation of the two key immunological pathways, the STAT3 and NFKB1 pathways, cause severe human diseases presenting with immune dysregulation and immunodeficiency, and more recently identified novel PID genes with roles in the function of the cytoskeleton.

In our long-term scientific collaboration with the international MS Genetics Consortium and the Nordic MS Genetics

network, we have built a comprehensive picture of the genetic landscape of one common autoimmune disease, Multiple Sclerosis. Our ongoing EU project, Multiple-MS, aims at developing novel personalised medicine approaches for MS patients by combining the genetic data with multi-omics, clinical, imaging, lifestyle, and DMT response data. We are utilizing the publicly available large-scale multi-omics data, in particular high-resolution maps of immune cells, in combination with multi-omics data from MS patients to identify the biological pathways underlying stratified patient populations.

For the needs of the clinical and multinational research collaborations processing and sharing sensitive data, we are developing innovative tools for anonymizing and synthesizing data. In our recent Novo Nordisk Foundation-funded collaboration project with the University of Copenhagen and Turku University Hospital, we are developing new methods for generating artificial datasets that keep the statistical characteristics of the original data but that do not withhold any of the identifiable characteristics of the original data subjects. Such synthetic data provides an interesting opportunity for working with health data across multiple domains and borders within the existing European GDPR framework.



The group operates in two EMBL Partnership institutes (NCMM and FIMM) and focuses on improving the understanding of biological pathways and pathogenic mechanisms behind rare and common immune diseases. At the same time the group is developing innovative tools allowing sharing and analysis of sensitive health data.



Nikolina Sekulic



Structural Biology and Chromatin Group

Could you describe your research in a nutshell?

In any living organism, cells divide constantly throughout their lifetime. Preserving genetic information in each newly made cell is essential for the life and functioning of an organism. Our lab is trying to understand the molecular determinants that ensure chromosomes are equally distributed in daughter cells during cell division.

What do you hope to discover with your research?

We hope to reveal the molecular organisation of the centromere, a part of the chromosome that serves as a foundation for the attachment of microtubule fibres that pull the duplicated chromosomes into daughter cells. We study the structure of specialized nucleosomes (containing the histone H3 variant, CENP-A) that are present at centromeres. We want to better understand these nucleosomes and how they are able to recruit other centromere-specific proteins that finally result in a functional centromere.

We're also interested in understanding how the key regulatory mitotic enzyme 'Aurora B' is recruited to centromeres, and what the molecular basis is for its activation. More knowledge in this area will mean we can understand the basic principles of genetic stability through cell division, a process that is usually altered in cancerous cells.

What were your highlights of 2019?

Our lab published its first paper in 2019. The study was a collaboration with Dr. Mario Halic at St. Jude Children's Research Hospital in the USA. Our collaboration enabled us to obtain the first cryo-EM high-resolution structure of a CENP-A nucleosome in isolation, and in complex with, the centromeric protein CENP-C which directly interacts with it. This interaction is one of the founding events for centromere formation and our results provide new insight into the formation of a specialized centromeric chromatin. We presented our work at two international conferences.

We have started to build our own cryo-EM expertise at NCMM through a collaboration with our sister Nordic EMBL Partnership institute, MIMS, in Umeå, Sweden. Part of the Swedish national cryo-EM infrastructure, MIMS hosts a 300 kV Titan Krios microscope. Our postdoc, Dr Ahmad Ali-Ahmad, has been awarded an RCN fellowship to travel to Umeå to learn how to collect and process cryo-EM data. Strengthening cryo-EM competencies in Norway will help to establish a Norwegian national infrastructure with a cryo-EM microscope, which is planned for the new University of Oslo's Life Science building.

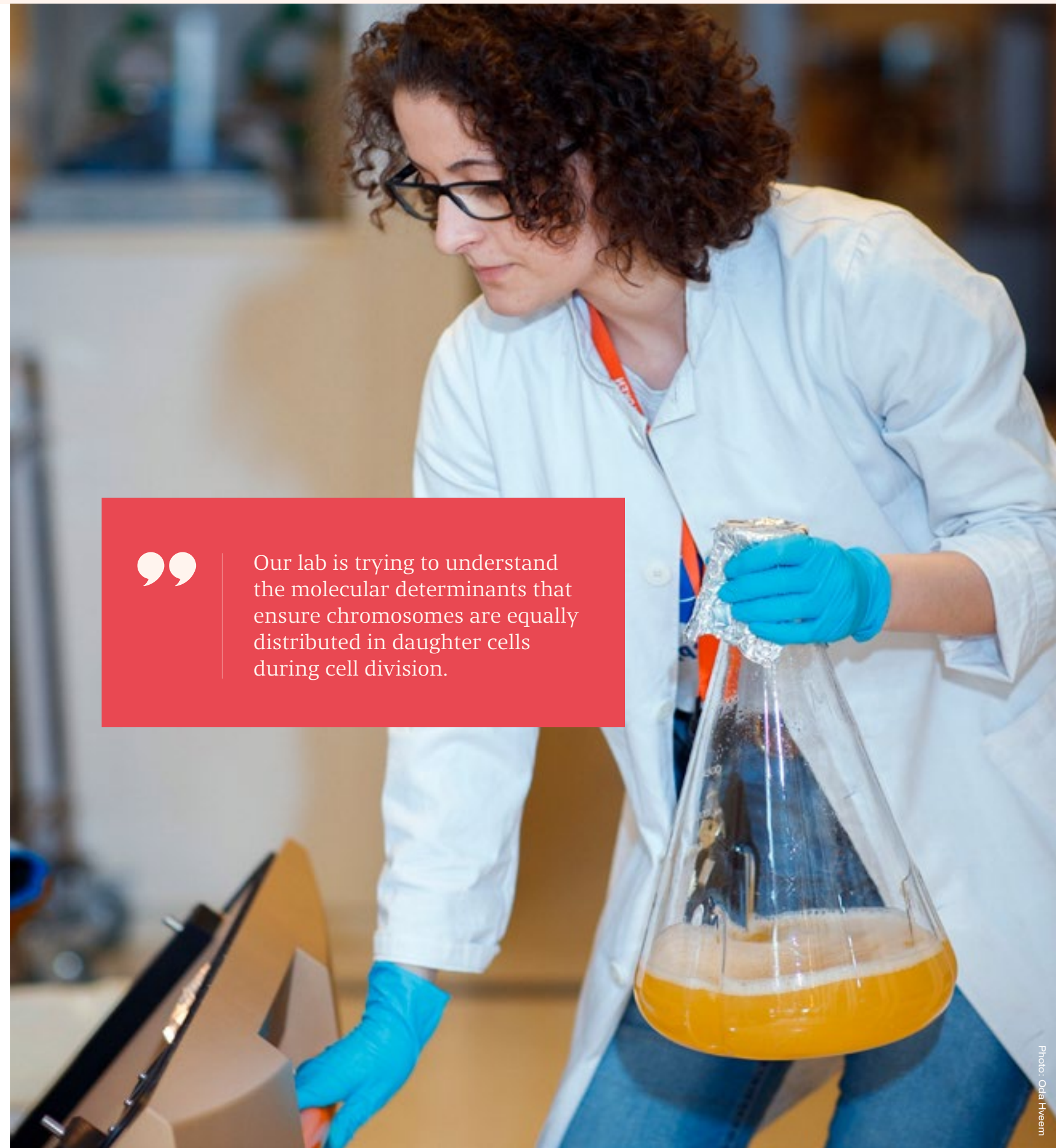
We are also proud to have contributed to a study led by our NCMM colleague, Sandra Lopez-Aviles, on the role of phosphatase PP2A-B56 in regulating its exit from the cell cycle.

What are you hoping for your group to achieve in 2020?

We hope to extend our studies on the CENP-A nucleosome by incorporating other important centromeric proteins in our in-vitro system. We also hope to publish our findings on the mechanism of the activation of Aurora B kinase. Dr. Dario Segura-Pena, a researcher in the lab, has used hydrogen-deuterium exchange (HDX) to characterize protein dynamics in the phosphorylated (active) and unphosphorylated (inactive) state of the enzyme. We have teamed up with Prof. Michele Cascella, Department of Chemistry, UiO, and Oda Hovet, master's student, to complement these experimental data with molecular dynamic simulations towards a better understanding of the conformational changes necessary for enzymatic activation. Our findings could be used to design Aurora-B specific anti-cancer therapy in the future. We are also establishing new national and international collaborations using the HDX platform installed in our lab. To support this, we are starting a project with research group at University of Bergen and Institute of Organic Chemistry and Biochemistry in Prague.



Our lab is trying to understand the molecular determinants that ensure chromosomes are equally distributed in daughter cells during cell division.



NCMM Group Leader:
Judith Staerk

Postdoctoral Fellows
Safak Caglayan (until March 2020)
Artur Cieslar-Pobuda
Adnan Hashim
Joao Santos (from November 2019)

PhD student
Oksana Svärd (until March 2019)

Judith Staerk



Stem Cell Group

Could you describe your research in a nutshell?

Our research revolves around deciphering the molecular processes that govern human pluripotent stem cell renewal and differentiation, as well as physiologic and malignant hematopoietic and neural development.

More recently, based on results obtained from our research, we became interested in the interplay of mitochondrial biogenesis and epigenetics and its impact on cell fate decisions.

What do you hope to discover with your research?

We hope to discover key molecular events that underlie cell fate decisions in the hematopoietic and neural lineage. In addition, we have now started a project using iPS cells from patients suffering from autosomal dominant optic atrophy. We hope to further elucidate the underlying molecular pathways contributing to this disease.

What were your highlights of 2019?

My PhD student Oksana Svärd successfully defended her PhD thesis in March 2019. In addition, we published two articles with our collaborators and two book chapters on stem cell biology.

What are you hoping for your group to achieve in 2020?

We have two of our main manuscripts in revision, and we also submitted the first of two manuscripts describing a novel, IFN-independent function of STAT2. We expect the second study to be finalized within the summer. We hope that they all get accepted and that we can secure more funding to continue with these exciting research projects.



We hope to discover key molecular events that underly cell fate decisions in the hematopoietic and neural lineages.



Core facilities at NCMM

NCMM is home to two of the University of Oslo's core facilities; the Zebrafish core facility and the high-throughput Chemical Biology Screening platform. Many research projects rely on advanced and expensive research infrastructure and require core facilities to meet this need.

Photo: Øyvind Eide



The High-Throughput Chemical Biology Screening Platform

The High-Throughput Chemical Biology Screening Platform offers a range of services to researchers who wish to discover small molecules to probe, explore, and modulate biological systems. Here, head of the facility, Johannes Landskron shares some insight into the platform and the services on offer.

What is the High Throughput Chemical Biology Screening Platform?

We offer all kinds of high-throughput Chemical Biology screening services to academic groups and industry, mainly SMEs. Chemical Biology High-Throughput Screening (HTS) is the rapid, automated testing of thousands of chemical substances on biological systems to identify so-called “hit compounds” that show a desired effect. The biological system can therefore be anything from blocking a specific enzymatic activity, to inducing distinct phenotypes in certain cells. Screening is therefore a standard first step in drug development campaigns.

What services can the High Throughput Chemical Biology Screening Platform at NCMM offer?

The main service we provide at NCMM is the implementation of screening for users for their specific targets. This includes developing and automating the assay, performing the screen, data analysis, creation of a hit list, and hit validation. We support a comprehensive and constantly growing spectrum of different assays and detection platforms, ranging from standard plate readers to cell-based multi parameter screens, also termed “high content screens”, like HT flow/imaging cytometry.

The compound collection we offer consists of ~70 000 different compounds, organised in various collections for distinct purposes, like drug repositioning – to mention just one. For new projects we can be involved as early as the grant writing stage, where we can give input for the ‘Materials and Methods’ sections and provide letters of support.

How do you help researchers?

In addition to offering a “full HT screening package”, we also help users with different types of lab automation, liquid handling, storage of chemical substances, data analysis or simply provide access to our instrumentation (plate readers, HT flow cytometer, imaging cytometer...) as well as access to our networks.

The services we offer are very specialised and require very costly laboratory equipment (both in purchase and maintenance), large chemical compound collections, bio-informatics solutions and highly specialised personnel. In other words, the types of analyses we are performing for our users are only do-able in a dedicated infrastructure, and would otherwise not be accessible for academic research groups and SMEs.

Furthermore, we are part of the Norwegian National Research Infrastructure, NOR-OPENSREEN (also managed here at NCMM) which again is part of the Nordic Chemical Biology Consortium, along with Sweden, Denmark and Finland, and EU-OPENSREEN. Our users benefit from this network directly and indirectly in many ways; after finishing a screening project in our facility it can be taken further at one of our partnering sites.

Contact: Head of Facility
Johannes Landskron
Phone: +47 22 84 05 09
johannes.landskron@ncmm.uio.no

The Zebrafish Core Facility

The Zebrafish core facility offers access to fish housing, breeding and use of several instruments specific for research on zebrafish.

Head of the facility and NCMM group leader, Camila Esguerra, shares some insight into why zebrafish are used for research, and how her team can help other researchers.

Why are zebrafish used for research?

Zebrafish embryos and larvae are small, which makes them a practical tool for biomedical research. For example, they are amenable to both large-scale drug and phenotype-based screening, using an automated microtiter plate format. They are also vertebrates and therefore closer in physiology to humans than fruit flies. The greatest advantage of the zebrafish, however, is its optical transparency during the first weeks of development. This allows researchers to perform non-invasive imaging of internal organs in live animals in real time – including brain activity monitoring, even in freely moving larvae.

What disease areas can be studied?

Studying zebrafish helps researchers to understand human brain function, health and disease. Thanks to their optical transparency, it is possible to monitor neural activity patterns associated with specific behaviours; for example when they are having convulsions as a result of seizures. The small size of zebrafish embryos and larvae make them a great tool for large-scale screening approaches commonly used to answer a range of fundamental biological questions. Zebrafish have therefore been used to model many human diseases such as various cancers (e.g. leukemia, hepatocellular carcinoma, melanoma), muscular dystrophy, deafness, epilepsy, Parkinson's disease and even type 1 diabetes. Zebrafish are also an excellent model system for studying rare genetic disorders.

How can you help other researchers?

Our team at the zebrafish core facility can help other researchers without the necessary expertise to perform experiments using zebrafish. We have experience within aquaculture, fish health, screening and characterization of new lines, GMO, 360° live-imaging of larvae, chemical screening, behavioural tracking, and microinjection (automatic/manual). Users can come to us to do their research, or they can buy services and analyses from us.

Contact: Principal Engineer
Ana Carolina Sulen Tavara
Phone: +47 22 84 05 42
ana.tavara@ncmm.uio.no

Photo: Trond Isaksen



Research collaborations

Chapter 3

From Disease Mechanisms to Precision Medicine



Since I joined NCMM in 2019, our research focus has sharpened further when it comes to translational research and precision medicine projects. Our most recently appointed group leader, who has strong expertise in rare disease and cancer genomics, is helping to broaden the Centre’s research interests in these areas.

NCMM Director Professor Janna Saarela

NCMM’s overall vision is to improve our molecular understanding of health and disease to facilitate improved medical practice. As a world-class international molecular medicine centre with a translational mind-set, NCMM is bringing together multidisciplinary teams to combine basic and translational research approaches to clinically relevant problems. NCMM works to provide the basis for development of improved diagnostics and more efficient and targeted therapies.

Translational research depends on close contact between basic research and hospital environments, and NCMM has established strong links to Oslo University Hospital (OUH). The Centre is also actively exploring the possibilities to build closer links to Åhus and other university hospitals around the country.

NCMM is the Norwegian node in the Nordic EMBL Partnership for Molecular Medicine. The Partnership includes approximately 60

research groups and teams, with a staff of 600 employees and students across the four national nodes in Oslo, Helsinki, Umeå, and Århus. The Partnership has created a joint Nordic powerhouse for molecular medicine and translational research, with shared access to scientific infrastructures, including databases, facilities, and instrumentation, as well as clinical materials and networks across the Nordic countries.



I am confident that this, and the previous appointments in precision medicine and systems medicine, along with plans to recruit more clinician scientists, will further help us meet our translational research objectives. They also mean that NCMM is becoming even more attractive and active partner for collaborating with other research institutions and hospitals across Norway.

NCMM Director Professor Janna Saarela



Research Collaborations with Oslo University Hospital

NCMM's objectives are to conduct cutting-edge research in molecular medicine and to enable the translation of discoveries in basic medical research into clinical practice. To facilitate translational research, NCMM has developed strong links to South-Eastern Norway Regional Health Authority (HSE) and its subsidiary Oslo University Hospital (OUH).

All NCMM Translational Research group leaders have adjunct positions in clinical or para-clinical departments at OUH. These affiliations help to facilitate clinical collaborations, giving Group Leaders better access to patient materials, biobanks, and clinical trials. They are also crucial for facilitating translational research. These research collaborations have resulted in

several joint publications. NCMM group leaders also report on several joint applications for the funding of new collaborative projects.

NCMM group leaders currently hold adjunct appointments at the following departments:

Research Collaborations with University of Oslo

NCMM Biotechnology group leaders hold adjunct positions at the following university departments:

School of Pharmacy
NCMM PI: Camila Vicencio Esguerra

Department of Chemistry
NCMM PIs: Irep Gözen and Nikolina Sekulic

Department of Biosciences
NCMM PI: Sandra Lopez-Aviles



Department of Medical Genetics (OUH)

NCMM PIs: J Saarela and A. Mathelier

The department has research groups working in various fields of medical genetics, including the genetics of autoimmune, neurological, cardiovascular and psychiatric disorders. Additionally, there are groups focusing on the epigenetic causes of disease and bioinformatics. The main activities of the department are clinical genetic testing, genetic counselling, genetic laboratory diagnostics, and genetic research and teaching.



Department of Haematology (OUH)

NCMM PI: J. Staerk

Patients with all types of blood diseases are treated at the Department of Haematology. The department's goal is to deliver excellent patient care, provide advanced teaching in the field of blood diseases and perform research of high international standard. Furthermore, the department conducts research in most of the areas in which treatment is provided. The department is organised under the Division of Cancer Medicine, Surgery, and Transplantation at OUH.



Department of Medical Biochemistry (OUH)

NCMM PI: H. Luecke

The Department of Medical Biochemistry analyses blood, urine, cerebrospinal and other body fluids. The department studies how diseases alter the concentration of, or add, new biomarkers to the blood, that with high precision can tell us what kind of disease the patient has or is at risk at getting, what treatment to give in each case, and how the patient responds to this treatment.



Department of Pediatric Research, Division of Pediatric and Adolescent Medicine (OUH)

NCMM PI: E. Haapaniemi

The Pediatric Research Institute (PFI) is committed to promoting pediatric research through advanced science in combination with clinical practice. The aim is to obtain scientific knowledge for a better understanding, treatment, and prevention of pediatric diseases. Current research focuses on pediatric cancer, infections and immunology, hypoxia and oxidative stress as well as the liver, kidney, and gastroenterology. PFI collaborates extensively with a number of national and international research groups.



NCMM Associate Investigators

NCMM aims to continuously develop its scientific community and knowledge capabilities, through establishing strong collaborative links with key scientists and research groups across Norway. These links and collaborations support translational networking.

NCMM's Associate Investigators are drawn from a group of outstanding scientists based in Norway, with expertise compatible with NCMM's research areas and who are interested in collaborating with NCMM. Associate Investigators contribute their expertise in molecular and translational medicine, and support newly recruited young NCMM Group Leaders and earlier-career Associate Investigators through mentoring activities.

NCMM Associate Investigators continue to work at their host institutions, but are credited with an affiliation to NCMM and the Nordic EMBL Partnership for Molecular Medicine. They are eligible to apply for seed-funding grants for collaborative projects with NCMM group leaders. In 2019, 4 million NOK seed money funding was made available for 11 new collaborative projects with NCMM group leaders.

NCMM has now entered its third five-year period (2020-2024) which has resulted in an evaluation of the Associate Investigator network. A new call is also planned for spring 2020. The evaluation of the network will mean new Associate Investigators can apply, whilst allowing an update of the scientific profile. This will ensure Associate Investigators' research interests match the renewed focus of NCMM and other molecular medicine environments, as well as complementing the current NCMM group leaders and research taking place at the Centre.

All existing NCMM Associate Investigators were invited to apply for renewal to ensure that the research interests and focus of the Associate Investigator network remains relevant for all.

The following Associate Investigators were reappointed in April 2020:

Professor Ole A. Andreassen, Division of Mental Health and Addiction, Oslo University Hospital and Institute of Clinical Medicine, University of Oslo

Dr Thomas Arnesen, Department of Molecular Biology, University of Bergen and Department of Surgery, Haukeland University Hospital

Dr Lorena Arranz, Department of Medical Biology, University of Tromsø and Department of Hematology, University Hospital of Northern Norway (UNN)

Dr Lynn Butler Odeberg, University of Tromsø (UiT) and the Karolinska Institutet

Dr Simona Chera, Department of Clinical Science, University of Bergen

Professor John-Bjarne Hansen, KG Jebsen – Thrombosis Research and Expertise Centre (TREC), Department of Clinical Medicine, UiT, The Arctic University of Norway and University Hospital of North Norway

Dr. Nils Halberg, The Department of Biomedicine, University of Bergen

Professor Arne Klungland, Department of Microbiology, Division of Diagnostics and Intervention, Institute of Clinical Medicine, Oslo University Hospital and Institute for Basic Medical Sciences, University of Oslo

Professor Dirk Linke, Section for Genetics and Evolutionary Biology, University of Oslo

Professor Karl-Johan Malmberg, Department of Cancer Immunology, Institute for Cancer Research, Oslo University Hospital and Institute for Clinical Medicine, University of Oslo

Professor Hilde Loge Nilsen, Department of Clinical Molecular Biology, University of Oslo and Akershus University Hospital

Professor Ragnhild Lothe, Department of Cancer Prevention at Oslo University Hospital Department of Molecular Biosciences at the University of Oslo

Dr. Reidar Lund, Section for Chemical Life Sciences – Biomolecules, Bio-inspired Materials and Bioanalytics, Department of Chemistry, University of Oslo

Dr. Espen Melum, Norwegian PSC Research Center, Department of Transplantation Medicine, Oslo University Hospital

Professor Pål R. Njølstad, KG Jebsen Centre for Diabetes Research, University of Bergen and Department of Pediatrics, Haukeland University Hospital

Professor Johanna Olweus, KG Jebsen Center for Cancer Immunotherapy, Department of Cancer Immunology, Institute for Cancer Research, Oslo University Hospital and University of Oslo

Dr. Hege Russnes, Department of Pathology and Department of Cancer Genetics, Institute of Cancer Research, Oslo University Hospital

Professor Anne Simonsen, Department of Molecular Medicine, Institute of Basic Medical Sciences, University of Oslo

Professor Rolf Skotheim, Department of Molecular Oncology, Institute of Cancer Research, Oslo University Hospital and Institute of Informatics, University of Oslo

Professor Kjetil Taskén, Institute for Cancer Research, Oslo University Hospital (OUH)

Associate Professor Emre Yaksi, Kavli Institute for Systems Neuroscience/Centre for Neural Computation, Norwegian University of Science and Technology (NTNU)



NCMM's Associate Investigators are drawn from a group of outstanding scientists based in Norway, with expertise compatible with NCMM's research areas and who are interested in collaborating with NCMM. Associate Investigators contribute their expertise in molecular and translational medicine, and support newly recruited young NCMM Group Leaders and earlier-career Associate Investigators through mentoring activities.



2008

Founding of partnership between the nordic countries

NORDIC NETWORK collaboration for molecular medicine

2008–2020 →

The Nordic EMBL Partnership

The Nordic EMBL Partnership for molecular medicine is a major strategic player in Europe's molecular understanding of disease mechanisms, thanks to its complementary research expertise, outstanding research infrastructures and industry collaborations.

The Partnership was founded in 2008 and constitutes a collaboration between the EMBL (European Molecular Biology Laboratory) and FIMM (Institute of Molecular Medicine Finland) at the University of Helsinki, MIMS (Laboratory for Molecular Infection Medicine Sweden) at Umeå University, NCMM (Centre for Molecular Medicine Norway) at the University of Oslo as well as DANDRITE (Danish Research Institute of Translational Neuroscience) at Aarhus University.

By extending the EMBL's recognized research strengths in areas such as cell biology and biophysics, developmental biology, genome biology, and bioinformatics and structural biology; the individual nodes of the Nordic EMBL Partnership for Molecular Medicine consist of the following:

1. DANDRITE: Molecular and translational neuroscience
2. FIMM: Human genomics, systems and precision medicine
3. NCMM: Molecular mechanisms of disease
4. MIMS: Microbial pathogenicity and molecular infection medicine

In addition to the Partnership between the Nordic nodes, each of the research centres collaborates locally and nationally with their host universities, public health institutes, hospitals, and research councils. This has resulted in a strong and far-reaching Nordic network for molecular medicine.

 Director & Speaker for the Nordic EMBL Partnership: Poul Nissen. Photo: Lars Kruse, Aarhus University



Nordic EMBL Partnership hosts EMBL Director General, Edith Heard

EMBL Director General Edith Heard met with the Nordic EMBL Partnership directors and other EMBL representatives in Copenhagen in February 2020. DANDRITE Director, Professor Poul Nissen, who is currently the speaker for the Partnership, organised and hosted the meeting.

Key stakeholders from within the Nordic region, including EMBL Council delegates from the Nordic countries and representatives from EMBL Heidelberg and EMBL-EBI Hinxton, were also in attendance. The two-day meeting brought together key players in the Nordic research environment for strategic discussions about the unique strengths and opportunities within the region and to

explore how these align with the EMBL and its future research and objectives.

Professor Heard presented the EMBL's current and future research programme, alongside her vision for the organisation. The Nordic EMBL Partnership directors and other stakeholders offered their input and insight into how their organisations can complement and support this vision, alongside discussions about the bigger research questions that the EMBL and its partners are well placed to explore. The meeting also gave the Nordic EMBL Partnership directors the opportunity to discuss how to facilitate more joint-working across the Partnership, with initiatives such as a joint postdoc programme planned for the future.



This meeting was a great success and we reached a common understanding on how we can strengthen our mutual research interests through a post-doctoral scheme that we now hope to fulfil.

Professor Poul Nissen



Group photo includes EMBL Director General Edith Heard, Silke Schumacher (Director of International Relations, EMBL), Plamena Markova (Joint Head of Government & EU Relations at EMBL), Ewan Birney (Director of EMBL-EBI), Poul Nissen (Speaker of Nordic EMBL Partnership for Molecular Medicine), Oliver Bilker (MIMS Director), Mark Daly (FIMM Director), Janna Saarela (NCMM Director), and Jacob Wang and Oddmund Bakke (Norwegian EMBL Council delegates), with other representatives from EMBL, EMBL Council, the Nordic EMBL Partnership for Molecular Medicine and the European Spallation Source.



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Nordic EMBL Partnership awarded NordForsk funding

Grant awarded as part of Nordic Research Infrastructure Hubs call

2.5mNOK has been awarded to the Nordic EMBL Partnership by NordForsk as part of their 'Nordic Research Infrastructure Hubs' initiative. The decision came after review by an international expert panel, who rated the Nordic EMBL Partnership's application as 'outstanding'. The application was highlighted for its strengths in linking research in the Nordic countries with molecular medicine and the EMBL, and in its proposed training strategy.

The panel also highlighted the level of the Partnership's internationalism and research quality and innovation as being of particular value to the Nordics. The grant will

allow the Partnership to better coordinate infrastructures, whilst making them more accessible and facilitating better knowledge exchange. Thanks go to the team at DAN-DRITE for coordinating and submitting the application. NCMM looks forward to more possibilities for collaboration with the other Nordic EMBL Partnership nodes.

A Nordic Research Infrastructure (RI) Hub is a long-term partnership between Nordic universities, universities of applied sciences, university colleges and research institutes in a consortium that provides a framework for enhancing and/or expanding RI cooperation in the Nordic region.



The overall objective of Nordic RI Hub is to strengthen international competitiveness and facilitate the development of world-leading Nordic RI environments based on relevant research and research infrastructure priorities.

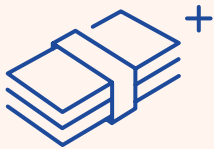


With the Nordic EMBL Partnership we have established outstanding research centers for molecular medicine in the Nordic countries – NCMM in Oslo, FIMM in Helsinki, MIMS in Umeå, and DANDRITE in Aarhus. With the NordForsk grant, we can further coordinate our actions and strengthen research and training initiatives in molecular medicine across the Nordic countries. Great thanks go to all nodes for putting a lot of thought and dedication into this infrastructure network program to the benefit of all the Nordic countries.

Poul Nissen, Director of DANDRITE and Speaker for the Nordic EMBL Partnership

To the EMBL Partnership
2,5 MNOK.

has been awarded through the NordForsk 'Nordic research Infrastructure Hubs' initiative

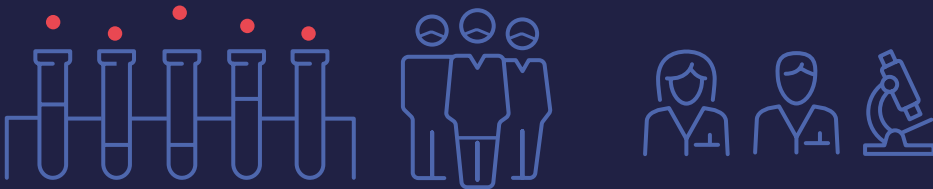


18 Core facilities

18 CORE FACILITIES

across the nodes, who broadly incorporate:

Digital and Electron Microscopy, Cryo-electron microscopy, High Throughput Screening, Sequencing, Bioinformatics, Genotyping, Animal models and Information Technology



The nodes have put together a lot of thought and dedication into this infrastructure network program to the benefit of all the Nordic countries.

Some of the applied research methods



Digital and Electron Microscopy



Cryo-electron microscopy



High Throughput Screening



Sequencing



Bioinformatics



Genotyping



Animal models



Information Technology





News and Events

Chapter 4

Research from the Sekulic Group provides new molecular insights into the structure and function of the centromere

The study sheds light on the structure of nucleosomes contained within the centromere; findings that will help to improve our understanding of the important molecular events that drive cell mitosis. The findings were published in *EMBO Reports* 2019*

Research Highlights

Nucleosomes within the centromere: different, but how?

The centromere is a chromosomal locus that directs accurate segregation of DNA into two new daughter cells during mitosis. Defects in this process can lead to an abnormal number of chromosomes in cells, so called ‘aneuploidy’, which is linked to a number of disorders, including cancer.

It was previously thought that specific DNA sequences, particularly those rich in adenine (A) and thymidine (T), defined the centromeric locus on chromosomes. However, it is now clear that functional centromeres can form on other parts of the chromosome in the absence of these A- and T-rich DNA sequences. This leads to the notion that centromeres are defined by other factors that are not encoded within DNA sequences themselves, so-called ‘epigenetic’ changes. More specifically, the presence of a specialized nucleosome containing a centromere-specific variant of histone H3 called CENP-A (centromere protein A) is now known to be sufficient to establish functional centromeres.

The Sekulic group set out to answer the following questions:

1. What is so special about CENP-A nucleosomes that enables them to recruit other centromeric proteins and form a functional centromere?
2. Given that CENP-A containing nucleosomes are still in the minority at the centromere (they are interspersed by high numbers of ‘normal’ nucleosomes), how does this small population of CENP-A nucleosomes dictate centromere organization?

Cryo-EM provides new insights into CENP-A nucleosomes

To answer these questions, the Sekulic group used cryogenic electron microscopy (cryo-EM) to confirm that the DNA wrapped around the CENP-A-containing nucleosome is more flexible; a propensity that is orchestrated solely by CENP-A, and occurs independently of the DNA sequence involved.

The group demonstrated that the binding of CENP-C to CENP-A nucleosomes further exaggerates this DNA flexibility, probably generating unique chromatin features required for centromere formation. They established that two different regions of CENP-C both make complexes with CENP-A, and not normal nucleosomes. This led to the proposal that CENP-C works as a “cross-linker” between CENP-A nucleosomes and organizes them so to make a platform for a functional centromere.

*Ali Ahmad, Ahmad; Bilokapic, Silvija; Schafer, Ingmar B; Halic, Mario; Sekulic, Nikolina. CENPC unwraps the human CENPA nucleosome through the H2A C-terminal tail. *EMBO Reports* 2019



These findings represent an important milestone in our attempts to gain a comprehensive understanding of the important molecular events that drive mitosis. The better we understand these processes, the better we can potentially treat the conditions that arise when they go wrong.

Nikolina Sekulic

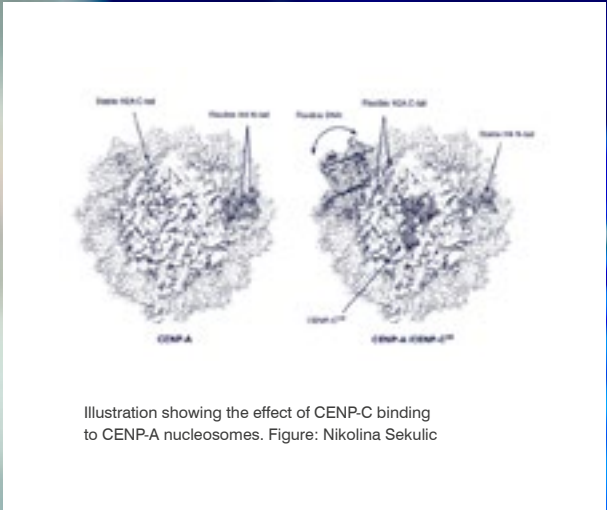


Illustration showing the effect of CENP-C binding to CENP-A nucleosomes. Figure: Nikolina Sekulic



How did the first cell division event take place?

Research Highlights

NCMM group leader Irep Gözen published a perspectives article in *ACS Nano*, where she presents a new hypothesis for how cells were first able to divide on the early earth. This article follows the Gözen group’s original publication, “Nanotube-Mediated Path to protocell Formation”, Köksal et al., published in *ACS Nano* in June 2019.

The cells that make up all living material on the earth today possess sophisticated internal machineries that enable cell division. This fundamental ability – turning one ‘parent’ cell and its genetic components into two identical ‘daughter’ cells – is a mainstay of life on earth. If cells had not learned how to divide billions of years ago, we (and all other living matter) would not be around today.

But how did cells first develop this skill? A consistent, simple and robust mechanism that can address this question has long challenged scientists.

Protocells: the division mystery

Dr Irep Gözen and her group at NCMM have been working towards solving the cell division question. Their research involves studying the formation and behaviour of vesicular structures related to ‘protocells’. It is widely believed among scientists that the spontaneous division of a simple protocell in aqueous solution, without the involvement of force or energy, is not a realistic concept. However, new work from the Gözen group now challenges that theory.

Formation and division in unison

In their initial publication in *ACS Nano*, the Gözen group provided intriguing new insights into how protocells were first formed (2). These discoveries could help to explain how protocells were first able to divide, as the first division event may have occurred immediately following protocell generation. In their paper, the Gözen group reported the spontaneous and straightforward formation of membrane-enclosed vesicles, much like protocells, from networks of interconnected nanotubes.

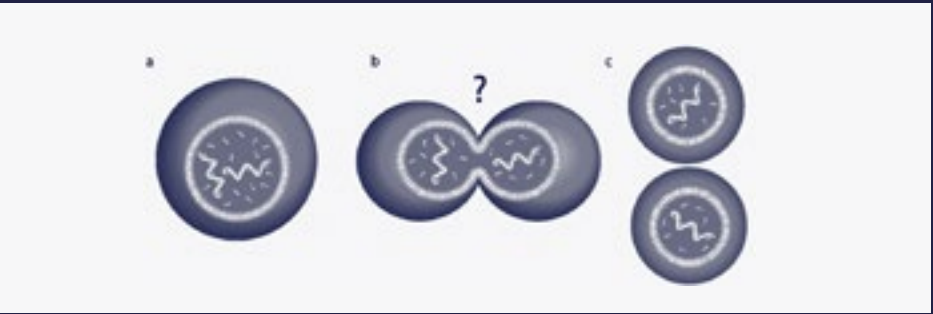
This process required the simple addition of lipids to a solid silicon oxide (SiO₂) surface in an aqueous environment and eventually led to the detachment of fully formed protocells from the nanotube networks under gentle flow. Detached protocells were able to migrate to remote locations, in principle enabling interconnection with protocells distal to the site of origin.

Dr Gözen believes this process provides a model by which spontaneous protocell formation and division occurred in unison, where the nanotubes connecting two newly formed

protocells provide the ‘bridge’ that connects two dividing cells. In this model, the passing of genetic material and other substances between dividing protocells occurs via the inter-connecting nanotubes. Interestingly, Dr Gözen’s model opens up the possibility that protocell division occurred *before* genetic polymers were available to protocells, as nanotube-based protocell formation/division can occur in the absence of genetic material.

So how could genetic material eventually be incorporated into the nanotube-based division model?

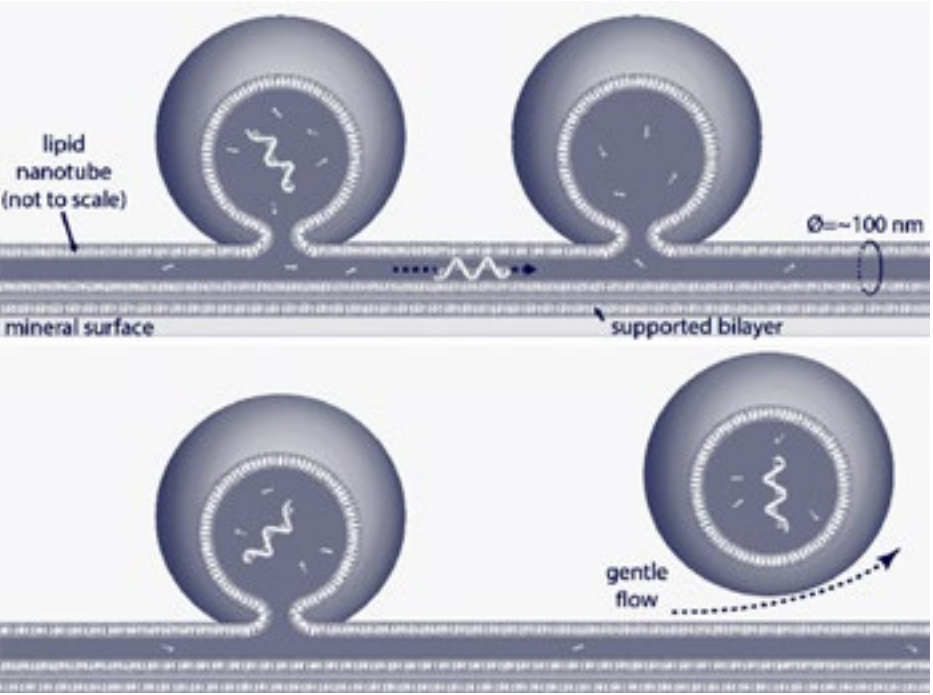
Dr Gözen’s group found that growing nanotube-linked protocells were capable of taking up and encapsulating chemical compounds via small pores in their cell membrane. Compounds that could cross the cell membranes included those similar in size to nucleotides (the building blocks for genetic material). This indicates that nanotube-linked protocells were capable of absorbing surrounding genetic material that existed on the early earth. Subsequently, replication and redistribution of the genetic material could occur through nanotube-based protocell division.



Simple protocell division in aqueous solution. Membranous vesicles (a) elongate and divide (b), resulting in two smaller vesicles (c). Illustration used with permission from (1)

References

- (1) A Hypothesis for Protocell Division on the Early Earth. Gözen, I. *ACS Nano* (2019). The full perspectives article from Dr Gozen. (2) Nanotube-Mediated Path to Protocell Formation. Köksal, E. et al. *ACS Nano* (2019). The original research article reporting the nanotube-based formation of protocells.



Nanotube-based model for spontaneous division of protocells. Membrane-enclosed vesicles form on mineral surfaces (e.g. SiO₂) and remain interconnected through nanotubes (upper image). Vesicles detach from nanotubes upon gentle hydrodynamic flow (lower image). Illustration used with permission from (1).

Questions remain unanswered

Discussing the division hypothesis, Dr Gözen said:

“We now want to work towards addressing the multitude of questions that remain unanswered on this topic, including how stable the nanotube networks are under different conditions and whether the protocells are able to undergo unlimited formation-detachment cycles”.

Another intriguing aspect to the Gözen group’s findings relates to the nature of the solid surface used in their experiments. Dr Gözen continues:

“In addition to its known presence on the early earth, silicon oxide has recently been detected in abundance on Mars in the form of tridymite. It’s tempting to speculate that protocell formation and division might not be limited to planet Earth!”.

New work from the Esguerra group provides novel insight into disease mechanisms of Dravet syndrome

A new article from NCMM’s chemical neuroscience group, headed by Dr Camila V. Esguerra, sheds light on the early mechanisms underlying seizure onset in Dravet syndrome

Research Highlights

Dravet syndrome is a severe and devastating type of epilepsy that occurs in children and infants and is very difficult to treat. A better understanding of the mechanisms within neuronal cells that promote disease progression could potentially improve our ability to treat this syndrome, which would have a substantial impact on patients and their families.

To address this need, the Esguerra group at NCMM have been working towards a better understanding of the earliest cellular defects driving the onset of seizures (the so-called ‘epileptogenic period’). In their latest article, published in the journal *Epilepsia*, the group analyzed brain development in a new zebrafish model of Dravet syndrome, enabling new insight into the mechanisms associated with disease development.

Establishing a zebrafish model: SCN1A mutations

One gene strongly associated with Dravet syndrome is SCN1A. This gene produces a protein that provides a channel for sodium ions to cross neuronal cell membranes, which plays a role in neuronal cell signaling. Approximately 70-80% of Dravet syndrome patients possess mutations in SCN1A,

but how these mutations lead to disease progression is not fully understood.

The Esguerra group therefore analyzed a new zebrafish model of Dravet syndrome generated by using the gene-editing tool CRISPR-Cas9 to introduce a mutation in the zebrafish gene *scn1lab* – the zebrafish equivalent of SCN1A in humans. They then performed behavioral analyses and measured different symptoms associated with seizures, followed by molecular profiling of neurons within the zebrafish to gain a better understanding of the events that cause seizures to take place.

Neurotransmitter imbalance treated with fenfluramine

These approaches revealed a potentially important imbalance between excitatory and inhibitory neurotransmitters that contributes to seizures and enhanced brain activity in zebrafish possessing the *scn1lab1* mutation. Treatment with the drug fenfluramine (pending approval for treatment of Dravet syndrome by the US Food and Drug Administration) reversed the neurotransmitter imbalance induced by *scn1lab1* mutations and returned the zebrafish neurons to a healthy state.

Tiraboschi , Ettore; Martina, Silvia; van der Ent, Wietske; Grzyb, Kamil; Gawel, Kinga; Cordero-Maldonado, Maria Lorena; Kumar Poovathingal, Suresh; Heintz, Sarah; Satheesh, Somisetty Venkata; Brattespe , Jarle; Xu, Ju; Suster, Maximiliano; Skupin, Alexander; Esguerra, Camila V.

New insights into the early mechanisms of epileptogenesis in a zebrafish model of Dravet syndrome. *Epilepsia* 2020

These findings not only provide important new insights into the early stages of the development of Dravet syndrome, but provide first-time evidence for potential disease modification by fenfluramine. In addition, the zebrafish model established through this work offers a valuable new tool for studying the mechanisms underlying Dravet syndrome progression.



Novel insights into cell death-inducing signals activated by ER stress

The study, published in the open access journal *Cell Communication and Signaling*^{*}, was led by the autophagy team at NCMM.

The researchers' findings have important implications for cancer-related therapies that work by inducing a process in cells known as the 'unfolded protein response' (UPR). The publication comes as a product of collaborative work between NCMM and researchers from various research institutes in Denmark, including our Nordic EMBL Partnership sister node DANDRITE (Aarhus, Denmark). The first author of the paper, Paula Lindner is a joint PhD student between UiO and Aarhus University and funded by the Lundbeck Foundation. She will defend her thesis later in 2020.

Keeping proteins folded

New proteins are constantly being synthesized by our cells. The endoplasmic reticulum (ER) works to ensure all newly synthesized proteins are properly folded and ensures unfolded, faulty proteins do not accumulate in the cell.

However, sometimes the number of new proteins produced by the cell might exceed the ER's capacity to oversee correct protein folding. 'ER stress' can then occur. To keep misfolded protein levels to a minimum, the cell reacts to ER stress by triggering an internal emergency alarm known as the 'unfolded protein response' (UPR).

Activating the UPR in cancer cells

The system of triggering apoptosis via ER stress and the UPR is one approach for treating diseases such as cancer. By exposing cancer cells to drugs that induce ER stress, it is hoped that the UPR will induce cancer cell death and so help to shrink tumours.

Current understanding of the signaling mechanisms involved in UPR activation is incomplete, which restricts researchers' ability to design drugs that can activate these processes in cancer cells.

In their recent study, the autophagy team at NCMM aimed to improve our understanding of ER stress and the UPR in cancer cells. They investigated an ER stressor drug called thapsigargin.

The researchers aimed to identify which cellular proteins were required for thapsigargin to induce cancer cell death. The results revealed that thapsigargin-induced cancer cell death depended on two proteins that had not previously been shown to be essential for the cell death associated with thapsigargin.

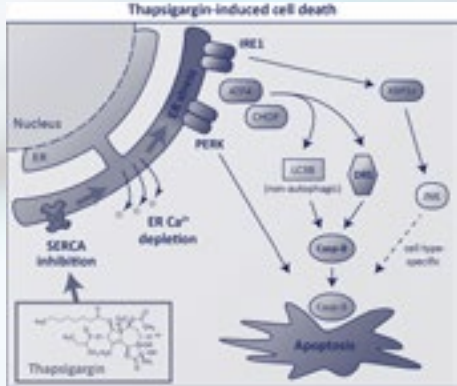


Interestingly, the researchers also found that one protein, IRE1 α , was required for thapsigargin-induced cell death in the prostate cancer cells, but not in the colon cancer cells. This demonstrates that the important players in regulating cell death and survival can differ between different cancers. Scientists therefore need a good understanding of the factors driving tumour growth in all different cancers to treat patients effectively.

The findings provide new insights into the induction of cell death by ER stressors such as thapsigargin and suggest that this compound could serve as a basis for new drugs designed for targeted killing of cancer cells.

^{*}Lindner, Paula; Christensen, Søren B; Nissen, Poul; Møller, Jesper V; Engedal, Nikolai.

Cell death induced by the ER stressor thapsigargin involves death receptor 5, a non-autophagic function of MAP1LC3B, and distinct contributions from unfolded protein response components. *Cell Communication and Signaling* 18, 12 (2020).



The publication's graphical abstract shows the signaling pathways involved in cell death following treatment with the ER stressor thapsigargin. Credit: Lindner et al. 2020

NCMM Network Meeting 2019

NCMM’s group leaders, Board members, stakeholders, and Associate and Young Associate Investigators gathered at the Thon Hotel Opera in central Oslo for the 4th annual NCMM Network Meeting on 26 and 27 February 2019.



1

The meeting saw presentations from NCMM Director Janna Saarela along with recently appointed PIs and Associate Investigators.

The meeting’s keynote session focused on ‘Big Data’ and its uses in basic research. Great presentations were made by invited speakers Elana Fertig, Associate Professor of Oncology and Applied Mathematics & Statistics and Assistant Director of the Research Programme in Quantitative Sciences John Hopkins University, USA, Francesca Buffa, PI at the Department of Oncology, University of Oxford, and Oleksandr Frei, Postdoctoral Researcher at CoE NORMENT, K.G. Jebsen Centre for Psychosis Research, Institute of Clinical Medicine, Oslo University Hospital. Guests also enjoyed a talk from communications expert and motivational speaker, Bård Brønde.

Nordic EMBL Partnership Administrators meeting 2019, Umeå



3

MIMS (Centre for Molecular Infection Medicine Sweden) hosted the annual Nordic EMBL Partnership Administration meeting. Administrators from the four Nordic EMBL Partnership nodes and the EMBL’s Government and EU Relations team met for a two-day meeting in Umeå in April 2019.



3. The Nordic EMBL Partnership admin team and EMBL Government & EU relations team. Photo: MIMS

NCMM events 2019

2



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Moreover, a ‘Negotiation and Communication’ workshop, led by Oslo-based consultants Moment AS, helped participants to tackle real-life situations requiring negotiation to solve a difficult issue.

The meeting ended with a tour of NCMM’s labs and core facilities, allowing those interested to see the opportunities available at the Centre and help to spark ideas of where collaboration or joint working might be possible.



1. Francesca Buffa. Photo: Øystein Horgmo
2. Negotiation workshop. Photo: Annabel Darby

NCMM Scientific Retreat 2019

4



5



4. Preben Morth. Photo: NCMM
5. The Escape Room challenge. Photo: NCMM

The 2019 NCMM scientific retreat took place at the Sundvolden Hotel on 12 & 13 June 2019. The two-day programme featured short scientific talks from each NCMM research group, alongside presentations from NCMM Young Associate Investigator Simona Chera, UiB, (involving a collaboration with the Gözen group), and two postdocs from the group of NCMM Associate Investigator Dirk Linke (who are collaborating with the Luecke and Gözen Groups). Group leader J Preben Morth, who rotated out of NCMM at the end of July 2019, also summarised his past eight years at the Centre, sharing both personal and career highlights. The retreat ended with an Escape Room-style team-building challenge, where teams were tasked with saving their computer servers and data from being hacked and leaked by an unhappy ex-colleague.

National EATRIS meeting 2019



NCMM was pleased to host several representatives from the European Research Infrastructure for Translational Medicine (EATRIS) for the first national EATRIS Norway meeting on 7 October. The meeting was attended by researchers and administrative staff from various Norwegian institutions that are members of EATRIS Norway, representatives from the Research council of Norway and Helse Sør Øst, and members of the EATRIS coordination and support (C&S) team based in Amsterdam.

A communications workshop for EATRIS national coordinators followed the main meeting, with an open seminar run by EATRIS Operations and Finance Director Anton Ussi on 8 October.

 EATRIS representatives at the national meeting in Oslo. Photo: Joe Robertson

NCMM events 2019

Group led by Dr Camila V. Esguerra extended for four years

As part of the EMBL non-tenure rotation model used by NCMM and all the other Nordic EMBL Partnership nodes, all research groups must undergo an external evaluation within five years of their establishment at the Centre. A positive evaluation results in a second and final 4-year period at the Centre.

NCMM group leader Camila V. Esguerra joined the Centre in December 2014, and the chemical neuroscience group's evaluation in the fall 2019 was in part based on a dossier prepared by Dr Esguerra and let-

ters of recommendation from scientific experts within her research field. In addition, Dr Esguerra met with NCMM's Scientific Advisory Board (SAB) during their visit to NCMM in October. Here, she delivered a presentation on the group's progress so far and plans for the future, after which she was interviewed by the SAB panel members. The SAB recommended to extend the research group for a second period and the extension was approved by the NCMM board in November 2019.



NCMM attends annual EMBL Partnership Conference 'Perspectives in Translational Medicine'

70

Scientific posters were presented

25

NCMM members attended

03rd

EMBL Partnership Conference

02

NCMM PhD fellows were awarded poster prizes

3rd annual EMBL Partnership Conference

Hosted by EMBL Barcelona, the 3rd annual EMBL Partnership Conference took place from 25-27 September 2019. Altogether 25 NCMM members attended the meeting, including those who delivered talks and presented posters.

The conference included attendees from both local and remote EMBL partnerships, including EMBL Rome, EMBL Australia, BRAINCITY, Hubrecht Institute, EMBL Heidelberg and also the four Nordic EMBL nodes (DANDRITE, FIMM, MIMS and NCMM). The 2019 conference took place at the impressive Barcelona Biomedical Research Park PRBB building, located adjacent to Hospital del Mar and Barcelona's promenade, which made for a great conference setting.

Networking opportunity for EMBL-affiliated institutes and researchers

The purpose of the Partnership conference was to support interaction and networking between EMBL-affiliated researchers at all levels. This involved encouraging knowledge-exchange, initiating scientific collaborations across organizations and re-

search areas, and also learning more within the main conference topics: translational neuroscience, host-pathogen interaction and immunity, model systems and disease modelling, genome organization as well as networks and computer modelling.

The conference programme, opened by EMBL Director General Edith Heard, included keynote lectures, partnership updates, flash talks, and poster sessions involving around 70 scientific posters, making room for plenty of scientific discussions, collaborative initiatives and interaction. Two postdoctoral researchers from NCMM, Wietske van der Ent and Javier Gutierrez-Fernandez, were both awarded poster prizes. NCMM Director Janna Saarela and group leader Anthony Mathelier both presented their research.

The Young Investigators Meeting (YIM) immediately followed the main conference, running from September 27-28. This event aimed to bring together PhD students and postdocs from across EMBL and its partnerships. Included in the YIM program was a panel discussion titled 'A journey to becoming a successful scientist', featuring NCMM group leader Irep Gözen as one of six panel members. Dr Gözen summarised her career experiences so far and answered questions from the audience about how to become a successful young scientist.

1. Attendees at the EMBL Partnership Conference Barcelona, 2019. Photo: Christine Panagiotidis



20-21 September 2019

Forskningsstorget 2019

In Oslo over 30 stations are run by various research centres and facilities

NCMM was represented by Irep Gözen and her research group at the Forskningsstorget event at the University Square in central Oslo on 20 & 21 September 2019.

Forskningsstorget is an annual nation-wide event where members of the public can learn about the exciting scientific research that takes place within Norway. Forskningsstorget is part of the National Science Week in Norway (Forskningsdagene), a national event held every year to make science and research more accessible to the public.

In Oslo, over 30 stations are run by various research centres and facilities. Visitors not only learn about the broad range of research topics being studied within the Oslo region, but can also gain hands-on experience in some fun research-based activities. Participants, mostly school pu-

pils, interacted with the Gözen group and performed hands-on experiments related to soft matter characteristics.

A few examples of soft matter-specific popular science experiments performed included: creating mini lava lamps; water-oil emulsions; ebru; how can you make a painting on water?; dancing starch; cubical soap bubbles, amongst others.

Photo: Thomas Olafsen, UiO



Gözen Group participates in NanoCosmos contemporary art exhibition

As part of the Oslo Life Science Conference in February 2020, the Gözen group at NCMM exhibited a range of their engaging microscopy images at Oslo's Kunstplass Contemporary Art Exhibition Space. The event was established by the Programmable Cell-like Compartments interdisciplinary research environment at the University of

Oslo, which features NCMM's Irep Gözen along with other researchers from the fields of Mathematics, Philosophy and Medical Science. The event was opened by UiO Rector, Svein Stølen and also featured speeches from UiO: Life Science director, Carl Henrik Gørbitz, and Irep Gözen.

- 1. Irep Gözen speaking at the event. Photo: Lin Xu
- 2. Some of the artwork on display. Photo: Lin Xue
- 3. Left to right: Harald Stenmark, Gry Oftedal, Svein Stølen, Andreas Carlson and Irep Gözen. Photo: Lin Xue



NCMM events 2020

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2



3



Funding successes for NCMM

2019 & Q1 2020

Emma Haapaniemi

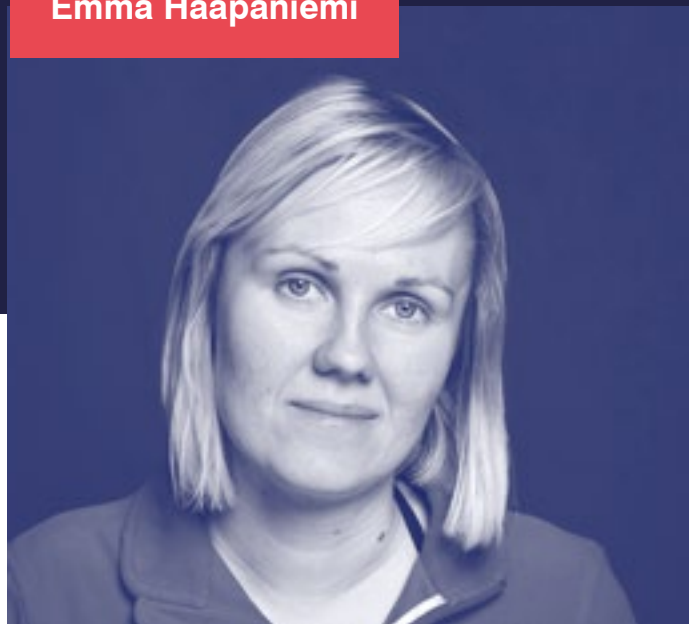


Photo: Oda Hveem

Hartmut Luecke



Photo: Oda Hveem

Young Research Talent Grant and funding from South-Eastern Norway Regional Health Authority (Helse Sør-Øst)

Dr Haapaniemi was awarded a 'Young Research Talent' award from the Research Council of Norway (RCN) in late 2019. The project, "CRISPR-Cas9-mediated gene therapy for monogenic blood disorders", was awarded just under 8 million NOK.

Furthermore, Dr Haapaniemi was also awarded funding for three years by Helse Sør-Øst. This funding will pay for a new PhD student to join the lab in 2020.

These two grants will enable Dr Haapaniemi to continue to build her group and will enable her to further move her project towards clinical translation.

New K.G Jebsen Centre for Autism and Developmental Disorders

Dr Haapaniemi was also selected as a research partner for the new K.G Jebsen Centre for Autism and Developmental Disorders in February 2020. The centre will investigate the mechanisms involved in the progression of developmental disabilities by generating new knowledge in genetics and brain development. The new K.G Jebsen Centre is a highly collaborative initiative, involving Norwegian medical faculties and affiliated University Hospitals in Bergen, Trondheim, Tromsø, and Oslo.

HELSE SØR-ØST

The Research Council of Norway

Horizon 2020-MSCA-ITN

A Horizon 2020-MSCA-ITN European Training Network was awarded to a collaboration between several research groups and organisations which include the group of NCMM Assistant Director, Professor Hartmut Luecke.

The project, PROTON, involves 12 different laboratories from across Europe including several leading universities, research institutes, and the pharmaceutical companies Boehringer Ingelheim Pharma and Intana Bioscience.

The project aims to better understand the mechanisms behind proton transfer, a crucial element involved in numerous biological and chemical processes. Obtaining better insight into how this

proton transfer works will have applications in many fields, including cancer treatment, obesity, chronic gastritis, and gastric and duodenal ulcers. There are also applications for developing new and sustainable biofuels.

The grant means that funding is secured for 15 PhD students, two of whom are based with the Luecke Group at NCMM. The students will receive multidisciplinary training to equip them with the skills necessary to generate high-impact scientific knowledge.



Approximately MNOK

08



to Dr. Haapaniemi after being rewarded 'Young Research Talent' award

Collaboration awarded a Horizon

2020



MSCA-ITN European Training Network, this includes the group of Dr. Luecke

NCMM is proud to be

1/19



partners being awarded the European Commission Funding for the EATRIS-Plus proposal



The 'EATRIS-Plus' proposal, represented locally by EATRIS Norway, has been funded by the European Commission under the INFRADEV-3 call, which concerns the development and long sustainability of new pan-European research infrastructures. NCMM is one of 19 partners in the four-year project.

EATRIS Norway



European Commission Funding awarded

The 'EATRIS-Plus' proposal, represented locally by EATRIS Norway, has been funded by the European Commission under the INFRADEV-3 call, which concerns the development and long sustainability of new pan-European research infrastructures.

NCMM is one of 19 partners in the four-year project, which aims to build capabilities and deliver innovative scientific tools to support the long-term sustainability of EATRIS as one of Europe's key research infrastructures. The proposal, titled "EATRIS-Plus: Consolidating the capacities of EATRIS-ERIC for personalised medicine" was launched in Lisbon in February

2020, and is scheduled to run for 48 months.

The proposal relies on a scientific and technological programme combined with capacity-building activities across 16 EU countries, with the support of two umbrella organisations representing patient organisations and SMEs. EATRIS-Plus will help with pooling and exploiting the translational academic capacities of the infrastructure in 'omics technologies to enable researchers to better address the scientific and societal challenges of personalised medicine.

The coordination office and 13 existing national nodes of the infrastructure will participate in implementing joint outreach,

training, industry engagement and international collaboration activities to further build national capacity, increase users' trust and strengthen EATRIS and the ERA global scientific leadership.

Press items for NCMM 2019 & Q1 2020

Press items 2019

Funding News

- Dagens Medisin, January, Jobb: Helsefolk (Anthony Mathelier awarded Young Talent Grant from Research Council of Norway)
- Med.uio.no, January, Årets forsknings-tildeling fra Kreftforeningen (Anthony Mathelier and Sandra Lopez-Aviles awarded funding from Norwegian Cancer Society)

Gözen Group Research

- Aftenposten (print and online), March, Slik kan livet på Jorden ha oppstått
- Titan.uio.no March, Sheds new light on how life on earth may have originated
- Earth.com, March, Scientists find new clues in the mystery of how life began on Earth
- Europapress, March, Cómo las superficies pudieron ayudar al inicio de la vida en la Tierra
- Daily Galaxy, March, Occam's Razor" – Stickiness of Early Earth's Surface & the Emergence of Life
- Phys.org, March, Scientists discover how surfaces may have helped early life on Earth begin
- NewsWise, March, Scientists discover how surfaces may have helped early life on Earth begin

Press items 2019

- Ineffable Island, March, *How Surfaces May Have Helped Early Life on Earth Begin Discovered*
- Astrobiology, March, *How Surfaces May Have Helped Early Life on Earth Begin Discovered*
- News Beezer.com, September, *How did life on earth come about?*
- Forskning.no, September, *Hvordan oppsto livet på jorda?*
- Med.uio.no/Medisinbloggen, October, *Are surfaces the missing link in the origin of life?*

Esguerra Group Research

- Fagpressenytt, September, *The Zebra-fish – a small fish that will get you hooked*

Haapaniemi Group Research

- Forskningsparken.no, April, *Hun vil reparere ødelagt arvemateriale*
- The Scientist, September, *New "Prime Editing" method makes only single-stranded DNA cuts*

Press items Q1 2020

Gözen Group research

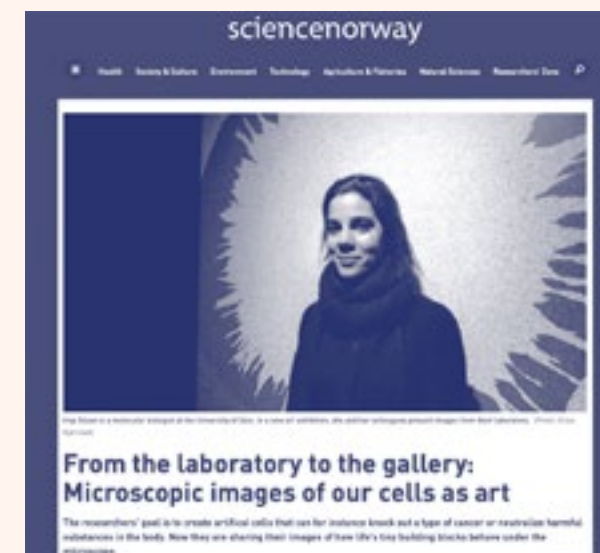
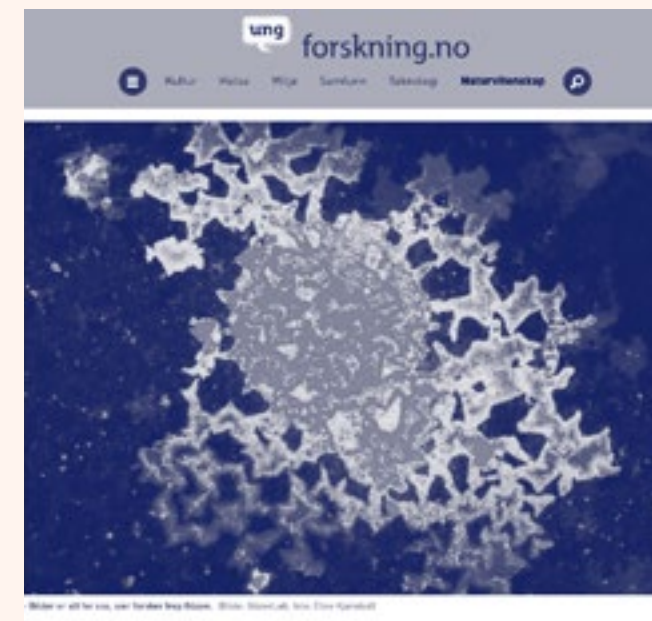
- Forskning.no, February, *Viser frem kunst fra cellenes mikroverden*
- ScienceNorway, February, *From the laboratory to the gallery: Microscopic images of our cells as art*
- UngForskning.no, February, *Cellene våre blir kunst i mikroskopet*

Esguerra Group research

- ScienceNorway, January, *The fish helping scientists to understand the human brain*
- Philippine Canadian News, January, *Science: Dr Camila Esguerra is world's leading researcher on epilepsy*
- UiO homepage, January, *Fisken som hjelper forskerne å skjonne menneskejernen*
- Oslo University Hospital news, January, *Fisken som hjelper forskerne å skjonne menneskejernen*
- Forskning.no, February, *Fisken som hjelper forskerne å skjonne menneskejernen*

Haapaniemi Group research

- Therefor.life, March, *How does prime editing work*



← ↑ NCMM Press cuttings from 2019 and 2020

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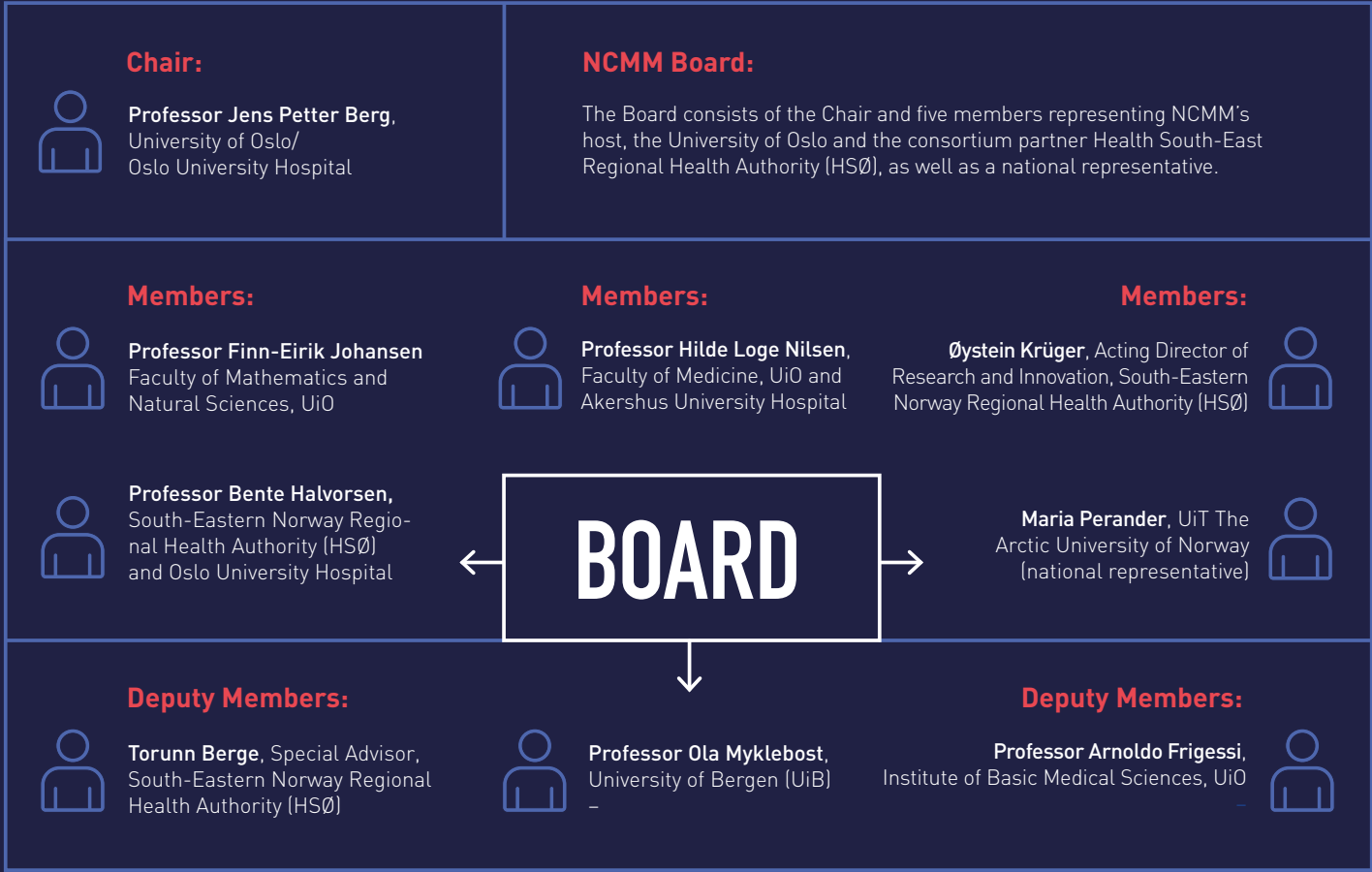
NCMM Operations

Chapter 5



NCMM board

The NCMM Board is, in collaboration with the Director, responsible for the Centre’s overall coordination and progress. The Board steers and supervises NCMM’s activities and finances, and approves the Centre’s strategic plans, objectives, and budget. The Board’s decisions contribute to promoting excellence in the Centre’s recruitments, research, collaborations, and translational value.



A message from the Chair of the Board of NCMM, Jens Petter Berg:

It has been a pleasure to continue in my role as Chair of the Board of NCMM. Under the leadership of Professor Saarela, the Centre has enjoyed a busy and successful year and, as NCMM enters its third five-year period of operations, I look forward to seeing Professor Saarela’s vision for the Centre in action. In particular, her focus on precision and systems medicine, and the building of a more team-orientated research culture, will ensure that NCMM continues to act as a greenhouse for young, talented scientists, attracting the brightest and best international recruits.

In support of this, I wish to welcome NCMM’s most recently recruited group leader, Dr. Sebastian Waszak, who will lead the computational oncology group. Dr Waszak’s research will complement the Centre’s existing expertise, and his focus on large patient populations, multi-modal data integration, and computational methods to study rare cancers will also support our continued focus on translational molecular research and precision medicine. Furthermore, I would like to congratulate Dr Camila Esguerra on a successful evaluation and the subsequent renewal of her group for a further four years.

As Chair of the Board, I am very grateful for the collaboration and support from The Research Council of Norway, The South-Eastern Norway Regional Health Authority and the University of Oslo. Finally, I would also like to take this opportunity to thank the NCMM Board for their ongoing collaboration; I look forward to seeing what the next five years will bring for the Centre.



Current Chair of the NCMM Board,
Professor Jens Petter Berg
Photo: Øystein Horgmo, UiO

SAB

Scientific
Advisory Board

Chair: Professor Richard Treisman, Research Director, Francis Crick Institute London, UK	SAB (Scientific Advisory Board): SAB The SAB's main mission is to offer academic and strategic advice, as well as benchmark the performance of NCMM's research groups and the Centre internationally.	
Members: Dr. Alvis Brazma EMBL Senior Scientist & Senior Team Leader, EMBL-EBI Hinxton Cambridge, UK Professor Margaret Frame* Science Director and Chair of Cancer Biology, Edinburgh Cancer Research Centre, Edinburgh, UK	Members: Professor Olli Kallioniemi Director SciLifeLab Stockholm, Sweden Professor Titia Sixma Group Leader and Head of Division for Biochemistry, Netherlands Cancer Institute, Amsterdam, The Netherlands	Members: Dr. George Vassiliou Group Leader and Honorary Consultant Haema- tologist at Cambridge University Hospitals, Wellcome Sanger Institute, Hinxton, UK The SAB consists of six internationally- renowned scientists

* Professor Margaret Frame rotated out of the SAB at the end of 2019. NCMM will recruit a new SAB member in 2020.

The SAB's main mission is to offer academic and strategic advice, as well as benchmark the performance of NCMM's research groups and the Centre internationally. The SAB meets with NCMM core members every 18-24 months. These meetings allow for the review of recent progress and advice on future strategies. The most recent SAB visit took place in October 2019, with the next visit planned for March 2021.



SAB members: (left to right): Prof Margaret Frame, Prof Olli Kallioniemi, Dr Titia Sixma, Prof George Vassiliou, Dr Alvis Brazma, Prof Richard Treisman (Chair). Photo: Joseph Robertson

NCMM funding



NCMM in 2019 was in its final year of the second five-year period (2015-2019). After an external evaluation in 2018, funding for a third five-year period (2020-2024) has also been secured.

Core funding

Extramural Funding Sources

Core funding for 2019

31,5 MNOK.

NCMM Translational Research

Core funding for 2019

27,2 MNOK.

NCMM Biotechnology

Extramural funding 2020

38 MNOK.

Stipulated

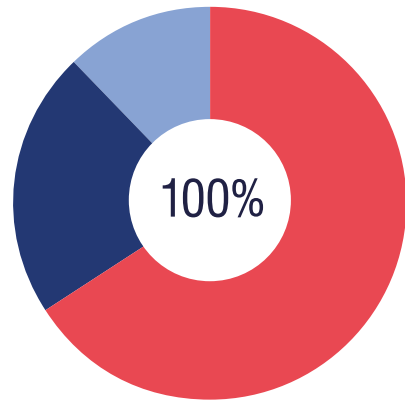
The 2020 overview is an estimate of extramural funding sources based on budget and on secured grants.

After the merger between NCMM and the Biotechnology Centre of Oslo (BiO) in 2017, NCMM consists of two departments: NCMM Translational Research (former NCMM) and NCMM Biotechnology (former BiO) with altogether 11 research groups. The *core funding* for NCMM Translational Research is 31.5 mNOK per year from the three consortia partners UiO, the Research Council of Norway (RCN), and the South-Eastern Norway Regional Health Authority (HSØ), whereas NCMM Biotechnology in 2019 had a core funding of 27.2 mNOK funded by UiO. Furthermore, overheads, income from core facilities and production-based income comes in addition.

NCMM *extramural funding*, in the form of grants to the group leaders and other competitive funding, has increased steadily from 7 mNOK in 2010 to 42 mNOK in 2015. In 2019, NCMM only reached 26 mNOK in annual grants, reflecting the fact that two established research groups rotated out of the centre in 2018-2019.

Extramural funding for 2020 is so far stipulated to 38 mNOK. This includes grants from the Research Council of Norway, the Norwegian Cancer Society, HSØ, competitive grants at UiO, European Commission, and private foundations and organisations such as the KG Jebsen Foundation, World Cancer Research, Barncancerfonden amongst others. In 2020, we see a clear increase in EU-based funding, reflecting the focus of NCMM to submit and secure funding from the European Commission.

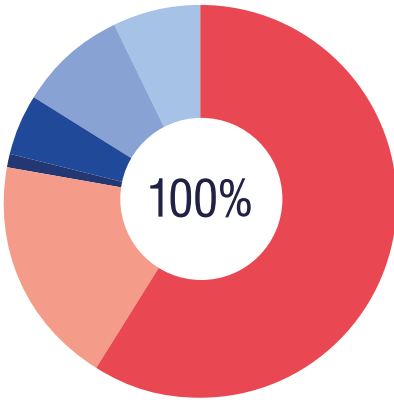
Core funding 2019



NCMM Core Funding Sources 2019 (%)

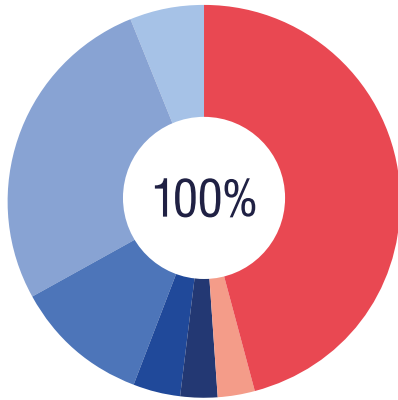
● UIO 66 ● RCN 22 ● HSØ 12

Extramural Funding Sources



Extramural Funding Sources 2019 (%)

● 59 ● 19 ● 1 ● 5 ● 9 ● 7



Extramural Funding Sources 2020 (%)

● 46 ● 3 ● 3 ● 4 ● 11 ● 27 ● 6

- RCN
- UIO
- HSØ
- The Norwegian Cancer Society
- Other national grants
- EU grants
- Other International grants

Personnel statistics

of NCMM in 2019



NCMM Staff

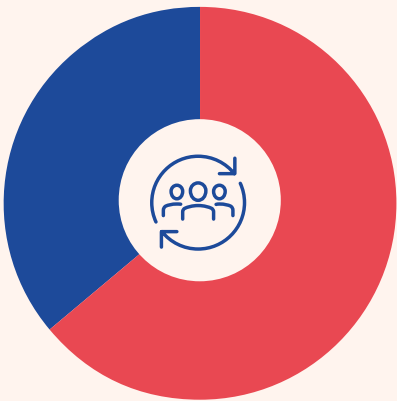
The numbers from 2017 represent NCMM after the merger with the Biotechnology Centre. For 2018, the research group of former NCMM Director Kjetil Taskén was included. This research group moved to Oslo University Hospital in November 2018. Two new research groups joined NCMM in 2019 and a third research group was recruited in March 2020. These groups will grow in size over the coming years.

NCMM Staff according to type of employment



There were 107 people employed at NCMM in 2019

NCMM Staff Gender Balance

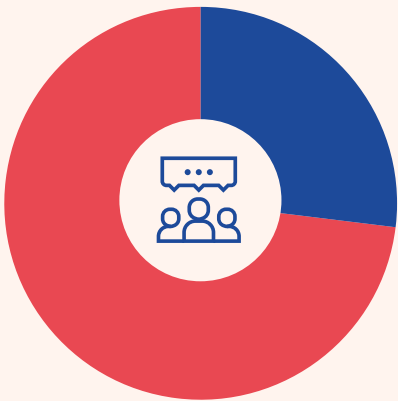


APPROX. 2/3

of the NCMM staff are female

Female 64% Male 36%

NCMM Group Leader Gender Balance

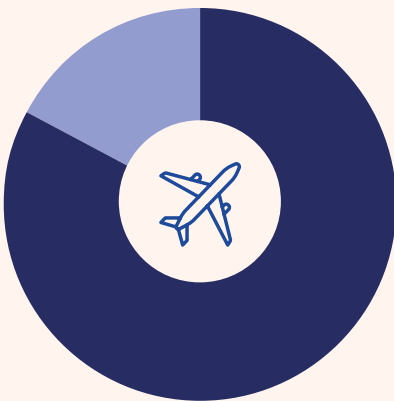


8 FEMALES

amongst the 11 group leaders

Female 73% Male 27%

NCMM International staff



89/107 STAFF

members are of international origin

International 83% Norwegian 17%

NCMM Staff according to type of employment



Staff distribution

As of Q1 2020, NCMM staff from

37 NATIONS ARE REPRESENTED

89 PEOPLE

in total are from outside of Norway



Countries represented by one person

Argentina, Austria, Bangladesh, Belgium, Cameroon, Colombia, Cuba, El Salvador, Estonia, Ghana, India, Iran, Mexico, Romania, Russia, Slovakia, South Africa, Taiwan and Ukraine

Countries represented by NCMM employees

02

Represented by two people

Croatia, Ethiopia, Greece, Lithuania, Pakistan, Serbia, The Netherlands, UK



03

people

Poland, Portugal, USA



04

people

China, Finland



05

people

Turkey



10

people

Germany, France



12

people

Spain





Personnel at NCMM 2019 & Q1 2020

NCMM’s staff includes researchers of all levels, from Master students to group leaders and senior researchers. All administrative and support functions, including laboratory operations and core facilities, are provided by a dedicated in-house administration department.

Director and administration

Director
Janna Saarela

Assistant Director
Hartmut Luecke

Head of Office
Ingrid Kjelsvik

**Administrative Coordinator
and Deputy Head of Office**
Elisa Bjørgo

Financial Officers
Mette Kvernland
Anita Elisabeth Skolem

Human Resources Officers
Nina Modahl
Ragni Indahl (until April 2019)

Communications Officers
Annabel Darby
Joseph M. Robertson
(from July 2019 until March 2020)

EATRIS Coordinators
Laetitia Abdou Garonne
(until December 2019)
Anita Kavlie (from April 2020)

Higher Executive Officer
Carlos Romeo Rodriguez

IT Team
George Magklaras (Head of IT)
Gang Cheng
Melaku Tadesse
George Marselis

Administrative Officer
Berit Barkley

**Laboratory Operations
and Core Facilities**

HSE Coordinator
Liv E. Alver Bjørland

Research Technician
Luis Alberto Quintero Linares

Chemical Biology Platform
Johannes Landskron (Platform manager)
Eirin Solberg (HTS Scientific Officer,
Screening & Robotics)
Alexandra Gade (HTS Scientific Officer,
Screening & Chemistry)
Kazi Alam (from February 2019 until
December 2019)

Zebrafish Core Facility
Camila V. Esguerra (Core Facility Leader)
Ana C. Sulen Távora (Head Engineer)
João Ribeiro Proença Santana
(Technician, from May 2019)

Senior Engineer
Gladys Tjørhom

Research groups

Human Immune Disorders Group

NCMM Group Leader
Janna Saarela

**Head Engineer / Lab manager
(shared with Haapaniemi Group)**
Monika Szymanska (from September 2019)

Stem Cell Group

NCMM Group Leader
Judith Staerk

Postdoctoral Fellows
Theresa Ahrens (until March 2019)
Safak Caglayan (until March 2020)
Artur Cieslar-Pobuda
Adnan Hashim
João Santos (from November 2019)

PhD Fellow
Oksana Svärd (until March 2019)

Computational Biology and Gene Regulation

NCMM Group Leader
Anthony Mathelier

Postdoctoral Fellows
Aziz Khan (until December 2019)
Jaime Abraham Castro Mondragón
Roza Berhanu Lemma
Vipin Kumar (from January 2020)

PhD Fellows
Marius Gheorghe (until September 2019)
Rafael Riudavets Puig (from August 2019)
Ieva Rauluseviciute (from April 2020)

Software Developer
Paul Boddie (from February 2020)

MSc Students
Peter Arnesen (from September 2019)
Solveig M. Knoph Klokkeud
(until June 2020)
Timothée Launay
(February-August 2020)

Structural Biology and Drug Discovery

NCMM Group Leader
Hartmut Luecke

Research Scientist
Eva Cunha

Principal Engineer
Bojana Sredic

Postdoctoral Fellows
Javier Gutierrez
Marta Sanz Gaitero (from May 2019)
Joel Benjamin Heim (from September 2019)

PhD Fellows
Flore Kersten (from August 2019)
Mateu Montserrat Canals
(from February 2020)

Guest Researcher
Julie E. Heggelund (from March 2019)

MSc Student
Elisa Lamottke (from November 2019)

Precision Pediatrics and Gene Editing Group

NCMM Group Leader
Emma Haapaniemi

**Lab Manager (shared with
Saarela Group)**
Monika Szymanska (from September 2019)

PhD Fellows
Ganna Reint
Zhuokun Li (from April 2019)
Katariina Mamia (from June 2020)

Master Students
Inkeri Soppa (until August 2019)
Oda Almåsbak (from June 2020)

Research Assistant
Katariina Mamia (from December
2019-June 2020)

Students
Carola Pont Vallés (ERASMUS from
February 2020 until June 2020)
Kathrin Menzner (ERASMUS from
August 2019 until September 2019)
Lisa Lutz (ERASMUS from December
2019 until March 2020)

Research Interns
Thapelo Mathabela
(from June 2019 until January 2020)

Computational Oncology Group

NCMM Group Leader
Sebastian Waszak *(from March 2020)*

Cell Cycle Regulations Group

NCMM Group Leader
Sandra Avilez-Lopes

Head Engineer
Mari Nyquist-Andersen

Research Scientist
Ruth Martín Martín

Postdoctoral Fellow
Marina Portantier

PhD Fellow
Vilte Stonyte

MSc Student
Silvia B. Espada *(until November 2019)*

Chemical Neuroscience Group

NCMM Group Leader
Camila Vicencio Esguerra

Head Engineer
Ana C. S. Tavara

Postdoctoral Fellows
Kinga Aurelia Gawel
Wietske van der Ent

PhD Fellows
Nancy Banono
Nastaran Moussavi *(shared with School of Pharmacy, from March 2019)*
Elham Shojaeinia *(from August 2019)*

Research Technicians
João Ribeiro Proença Santana *(from May 2019)*
Karolina Kirstein *(until May 2019)*
Alejandro Pastor Remiro *(from March 2020)*

MSc Students
Rosemary Ogwe Nanji *(from February 2019)*
Clara Marguerite Pugin-Bron *(until October 2019)*
Justine Amandine Laulin *(until October 2019)*
Linus De Witte *(from January 2020)*

Structural Biology and Chromatin Group

NCMM Group Leader
Nikolina Sekulic

Principal Engineer
Stine Malene Hansen Wøien

Research Scientist
Dario Segura-Pena

Postdoctoral Fellows
Ahmad Ali Ahmad
Saranya Subramani

Research Associate
Mira Dombi

MSc Students
Oda Selvåg Hovet *(from September 2019)*

Bionanotechnology and Membrane Systems Group

NCMM Group Leader
Irep Gözen

Postdoctoral Fellows
Inga Pöldsalu *(from May 2019)*
Dr. Lauri Viitala *(from May 2019, shared with Chalmers University, Sweden)*

PhD Fellows
Elif Köksal
Karolina Spustová
Aysu Kucukturhan Kubowicz *(from February 2019)*
Lin Xue *(from October 2019)*
Annie Stephenson *(visiting from Harvard) (from January 2020)*

MSc Student
Ingrid Schanke *(from January 2020)*

Research Assistant
Gizem Karabiyik *(until June 2019)*

Computational Biology and Systems Medicine Group

NCMM Group Leader
Marieke L. Kuijjer

Postdoctoral Fellows
Tatiana Belova *(from June 2019)*
Annikka Polster *(from February 2020)*

PhD Fellow
Ping-Han Hsieh *(from May 2019)*

MSc Students
Tess Brunner *(shared with Harvard Chan School of Public Health) (from May 2019-September 2019)*
Hallvard Wæhler *(April- July 2019)*
Genís Calderer Garcia *(July-August 2019)*

Membrane Transport Group

NCMM Group Leader
Jens Preben Morth *(until July 2019)*

PhD Fellow
Julia Weikum

Breast Cancer Team

NCMM Project Leader
Antoni Hurtado *(until November 2019)*

Postdoctoral Fellow
Shixiong Wang

Autophagy Team

NCMM Project Leader
Nikolai Engedal *(until June 2019)*

PhD Fellow
Paula Lindner

Guest Researcher
Per O. Seglen *(until June 2019)*

Visiting Group from UiT: Stem Cell Aging and Cancer Group

Group Leader
Lorrena Arranz

Postdoctoral Fellows
Aurora Bernal Mera *(until October 2019)*
Luis M. Gonzáles Alonso
Marko Ristic *(from September 2019)*

PhD Fellow
Alicia Villatoro González

Research Assistant
Vincent Cuminetti



NCMM CO-FUNDERS:



NORDIC EMBL PARTNERSHIP FOR MOLECULAR MEDICINE:



NATIONAL AND INTERNATIONAL COLLABORATORS:



VISITING ADDRESS:

Centre for Molecular Medicine Norway,
Oslo Science Park, Gaustadalléen 21,
0349 Oslo, Norway

POSTAL ADDRESS

Centre for Molecular Medicine Norway, Nordic EMBL
Partnership for Molecular Medicine, University of Oslo,
P.O. Box 1137 Blindern, NO-0318 Oslo, Norway



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