Annual Report NCMM

2018

From disease mechanisms to clinical practice

NCMM

NORDIC **EMBL** PARTNERSHIP FOR MOLECULAR MEDICINE

NCMM CO-FUNDERS:

UiO : University of Oslo

The Research Council of Norway

HELSE SØR-ØST

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Introduction from the Director

"The evaluation of NCMM in 2018 gives us a very strong foundation on which to continue to grow as a national centre for molecular medicine research."

Photo: Oda Hveem

Dear friends, colleagues, and supporters of NCMM. It is my pleasure to welcome you to the 2018 NCMM Annual Report. This is my first year as Director and thus I wanted to use this opportunity to introduce myself and to set out some of my hopes and plans for NCMM in the coming months and years.

Since joining NCMM in January 2019, I have been working to get to know the Centre and learn more about the fantastic research taking place here. I hope to continue to build on our research strengths and, during the years to come, refine our expertise in certain areas.

The evaluation of NCMM in 2018 gives us a very strong foundation on which to continue to grow as a national centre for molecular medicine research. We were rated as 'excellent/very good' in many areas and the Centre should be proud of its achievements. We received recommendations to further integrate clinician-scientists into NCMM and to start building interdisciplinary theme-based research programmes during our next five-year period. The recommendations match with my vision for the way forward for NCMM and I will be happy to work to ensure that we make good progress in these areas.

Looking ahead

NCMM is in an excellent place in terms of its research quality and I plan to continue to develop and promote the Centre towards becoming a major global player in molecular medicine and translational research. My main emphasis will be to enhance the Centre's translational research outputs and mindset, and to foster a team-orientated working culture across all levels and disciplines.

To support these aims, I hope to identify common interest areas with Oslo University Hospital and other national hospitals, whilst introducing a small number of large thematic programmes that will help to drive some common research aims. By doing this, I hope to build a critical mass of researchers, increase interactions between the research groups at NCMM, and build stronger links with other research environments and infrastructures; both in Oslo and across Norway.

I also plan to work on strengthening NCMM's genome and precision medicine research, with a particular focus on intensifying the use of genome medicine in diagnostics and precision treatment of rare diseases. Alongside this, I hope to further develop NCMM's research infrastructures, whilst building stronger links with the biobanks, infrastructures, and expertise at Oslo University Hospital and other national hospitals. This will further help to facilitate the translation of NCMM's research.

Nordic EMBL Partnership for Molecular Medicine

The Nordic EMBL Partnership offers us some outstanding opportunities to increase interactions and collaborations with our sister research centres in the Nordics and with the EMBL. From my role as the former Deputy Director at the Institute for Molecular Medicine Finland (FIMM), I see many opportunities where NCMM, FIMM, and the other nodes in the Partnership could work together. With our planned focus on genome and precision medicine, I think there is a lot we can do here and look forward to some exciting collaborations.

Concerning the improvement of interactions across the Nordic EMBL Partnership, we had a very productive meeting with the other Partnership Directors in November 2018. We discussed several ideas for driving more collaboration and I expect some of these initiatives to get underway during the course of 2019. We will once again meet with EMBL Director General, Edith Heard, in early 2020 when she visits the Nordic EMBL Partnership. I believe this will give us an excellent opportunity for raising our visibility when it comes to the EMBL and its partner centres.

I also look forward to the annual EMBL Partnership meeting, "Perspectives in Translational Medicine", which EMBL Barcelona will host in September. These meetings are always an excellent opportunity to meet with our peers across the Partnership and wider EMBL. This year's programme focuses on several topics, such as disease models, networks, and computer modelling, which both NCMM and the wider Partnership have real strengths in. I'm sure that the meeting will help us to widen our research networks and explore opportunities for new collaborations.

April 2019

Janna Saarela,
NCMM Director

NCMM Evaluation

The external evaluation of NCMM took place in Oslo on 18 and 19 June 2018. The evaluation included a site visit from the evaluation committee and a hearing at the Research Council of Norway. The subsequent evaluation report, released in September 2018, rated NCMM as “very good/excellent” overall.

Background
NCMM is currently in its second five-year period (2015-2019), following a successful external evaluation in 2013. In 2018, the Centre received its second external evaluation organised by the Research Council of Norway (RCN). The evaluation was designed to assess the scientific quality of NCMM’s research, alongside the strategic role that NCMM plays as a national molecular medicine and translational research centre.

1. Jens Petter Berg. Photo: Øystein Horgmo
2. Marianne Grønsleth. Photo: John Hughes
3. Kjetil Taskén. Photo: Trond Isaksen

Recruitment, capacity, and future scientific strategy rated highly
Overall, the Centre as a whole was rated as ‘very good/excellent.’ The report highlights areas of particular excellence, including the successful recruitment of high calibre group leaders, the Centre’s growing capacity – as evidenced by its outstanding technological platforms – and also its future scientific strategy. The evaluation committee was especially impressed with NCMM’s lab setup, technology platforms, and the resources available for young group leaders to progress their careers.

Excellent translational research and successful adoption of the EMBL model
Other areas rated highly by the evaluation committee include the translation between basic medical research and clinical practice, and the strong collaborative links established with hospitals. NCMM’s financial strategy, as well as its organisation and the strategic role it plays as a national centre for molecular medicine research, were also rated as ‘excellent/very good’. The way that NCMM has adopted the EMBL model for international recruitment and the integral part that NCMM now plays in the University of Oslo’s Life Science initiative, were also highlighted as areas of excellence.

Funding granted for 2020-2024
The successful evaluation comes with renewed funding for the next five years, with the Research Council of Norway granting a further 65 million NOK for NCMM’s continued operations through the period 2020-2024.

NCMM has been given some recommendations to adopt during the next five-year phase and is now working to implement these.

“I wish to express my gratitude to the RCN for its support over the past 10 years, and for the continued support for the concept of NCMM – as shown by the granting of further funding to continue operations for 2020-2024.”

Professor Kjetil Taskén

① Chair of the NCMM Board, Jens Petter Berg

“I am very happy and proud of NCMM’s recent evaluation report and wish to congratulate everyone at the Centre for their efforts and dedication. The renewal of the Research Council of Norway’s financing for the next five-year period means that NCMM will continue to operate as a greenhouse for the development of young and talented researchers. I am very grateful for the thorough and fair evaluation, and for the continued financial support and trust from the Research Council."

② Special Advisor, Research Council of Norway, Marianne Grønsleth

The Evaluation of NCMM was organized by the Research Council of Norway. Special Advisor Marianne Grønsleth was present at both the site-visit and the hearing in June 2018.

③ Former Director of NCMM, Professor Kjetil Taskén

“I was very pleased to read the 2018 NCMM evaluation report. Having spent 15 years developing the Biotechnology Centre and overseeing its merging with NCMM, and also working for the past 10 years to build NCMM up to its current status as a national centre for molecular research, it is very gratifying to see such recognition from the Research Council”.

Welcome to: Professor Janna Saarela, Director of NCMM and Head of the Human Immune Disorders Group

Professor Janna Saarela joined NCMM as Director and Group Leader in January 2019. She was recruited from the Institute for Molecular Medicine Finland (FIMM) at the University of Helsinki where she was Research Director and Deputy Centre Director. Janna Saarela also has an MD from the University of Oulu, Finland.

Photo: Oda Hveem

Professor Saarela's research concentrates on the genomics of immune disorders, especially autoimmunity and immune dysregulation.

"The aim of my research is to improve our understanding of the disease pathogenesis and mechanisms of human immune disorders. I also work to learn more about normal immune functions and their regulation, which helps for a better diagnosis and treatment for patients suffering from immune diseases."

Having joined NCMM in January 2019, Professor Saarela will work to build the Centre's translational research specialism and to enhance the possibilities for research collaboration.

"I hope to strengthen collaboration opportunities with hospitals and other local stakeholders within Oslo and Norway. I also hope to develop and promote NCMM towards becoming a major player on the world-wide map of molecular medicine, whilst building its profile as a centre with a translational mindset and a team-oriented working culture."

Professor Saarela's research expertise and strong links to FIMM, the Finnish node of the Nordic EMBL Partnership, create opportunities for more research collaborations for NCMM.

"I think there are several great opportunities where we could work more closely together and collaborate in the future, particularly when it comes to precision and systems medicine, as well as in genetics."

Furthermore, Dr Saarela is involved in a number of active collaborations, such as the International Multiple Sclerosis Genetics Consortiums and the international consortia for Primary Immunodeficiencies, alongside involvement with EU projects, like MultipleMS. These links will help NCMM to increase involvement with other research environments in both Europe and further afield.

Professor Saarela will also work with the other Directors within the Nordic EMBL Partnership to help establish more joint activities and initiatives, with the hope of sparking more collaborations and interactions across the four centres.

Welcome to: Marieke Kuijjer, Head of the Computational Biology and Systems Medicine Group

Dr Marieke Kuijjer joined NCMM in October 2018. She was recruited from the Department of Biostatistics and Computational Biology at the Dana-Farber Cancer Institute (DFCI) and Harvard TH Chan School of Public Health (HSPH).

Photo: Oda Hveem

Dr Kuijjer's research focuses on developing tools to model how genes are regulated by other factors in the cell, in so-called 'gene regulatory networks'. She works to develop methods to integrate these networks with other data types, such as cancer mutations. Dr Kuijjer's background in cancer biology means she has a particular interest into the mechanisms that drive the disease.

"I'm particularly interested in using the tools I develop on large-scale cancer datasets to better understand what drives cancer and to hopefully identify new treatment options. The ultimate hope is to find new targets for treating cancer sub-types, or to help find solutions for those patients who are perhaps not responding very well to their current treatment."

Dr. Kuijjer will now work to build up her research group at NCMM, with plans to recruit a team that have different scientific backgrounds. She also hopes to collaborate further with other groups in Oslo and further afield.

"I hope to build up some collaborations with other researchers in Oslo, such as the Institute for Cancer Research at Oslo University Hospital. I previously collaborated with some researchers there when I was a graduate student, and I'd be really excited to try and work with them again."

Dr. Kuijjer hopes that by integrating multiple `omics data types, using a systems approach, it will help to build a better understanding of what drives cancers. For a large percentage of cancer patients, understanding their tumour's genomic alterations doesn't help in identifying new treatment options. Likewise, some patients first respond to targeted treatment, but then relapse because they develop resistance.

"Finding specific alterations that can be treated will help to give answers on why some patients relapse whilst others don't. I hope to better understand the general mechanisms of how gene and protein expressions are being regulated and to be able to integrate more data types into the methods I am developing."

Welcome to: Emma Haapaniemi, Head of the Precision Pediatrics and Gene Editing Group

Dr. Emma Haapaniemi joined NCMM in January 2019. She completed her PhD at the University of Helsinki, followed by a postdoc at the Karolinska Institutet, Sweden. Dr. Haapaniemi also has an MD from the University of Eastern Finland. Her research at NCMM will focus on rare immune diseases, for example, diseases caused by genetics and rare acquired autoimmune diseases.

Photo: Oda Hveem

"In a nutshell, I am trying to find better ways of determining the genetic cause of these diseases, and then identify the right treatment either by finding a better biological therapy or by correcting a genetic mutation. There are a lot of biological drugs available and I think these could be more efficiently targeted. We could, for example, use different RNA-sequencing methods – such as single-cell sequencing and RNA panels- to profile patients immunologically, and use this information to better target these existing therapies."

Dr. Haapaniemi is already a fully-qualified medical doctor. She will use her training to help with her research interests and is highly motivated in improving patient outcomes.

"For me, my main motivation is being able to identify what is making a patient sick and find a way to treat them. I first became interested in the genetics of immune diseases when I carried out my first sequencing on a patient during my medical training."

Whilst at NCMM, Dr Haapaniemi hopes to build a gene-editing system that can safely and efficiently edit blood stem cells and T cells.

"We hope to be able to take any patient mutation and fix it with CRISPR and, thus, ideally to create a platform that can treat a wide spectrum of genetic diseases. It would also be really exciting if we were able to enter clinical trials with the modified CRISPR system."

Dr. Haapaniemi has also previously worked with NCMM Director, Professor Janna Saarela. Their common research interests will allow for more collaboration and sharing of expertise within NCMM, adding to the Centre's plans for building expertise in precision and systems medicine.

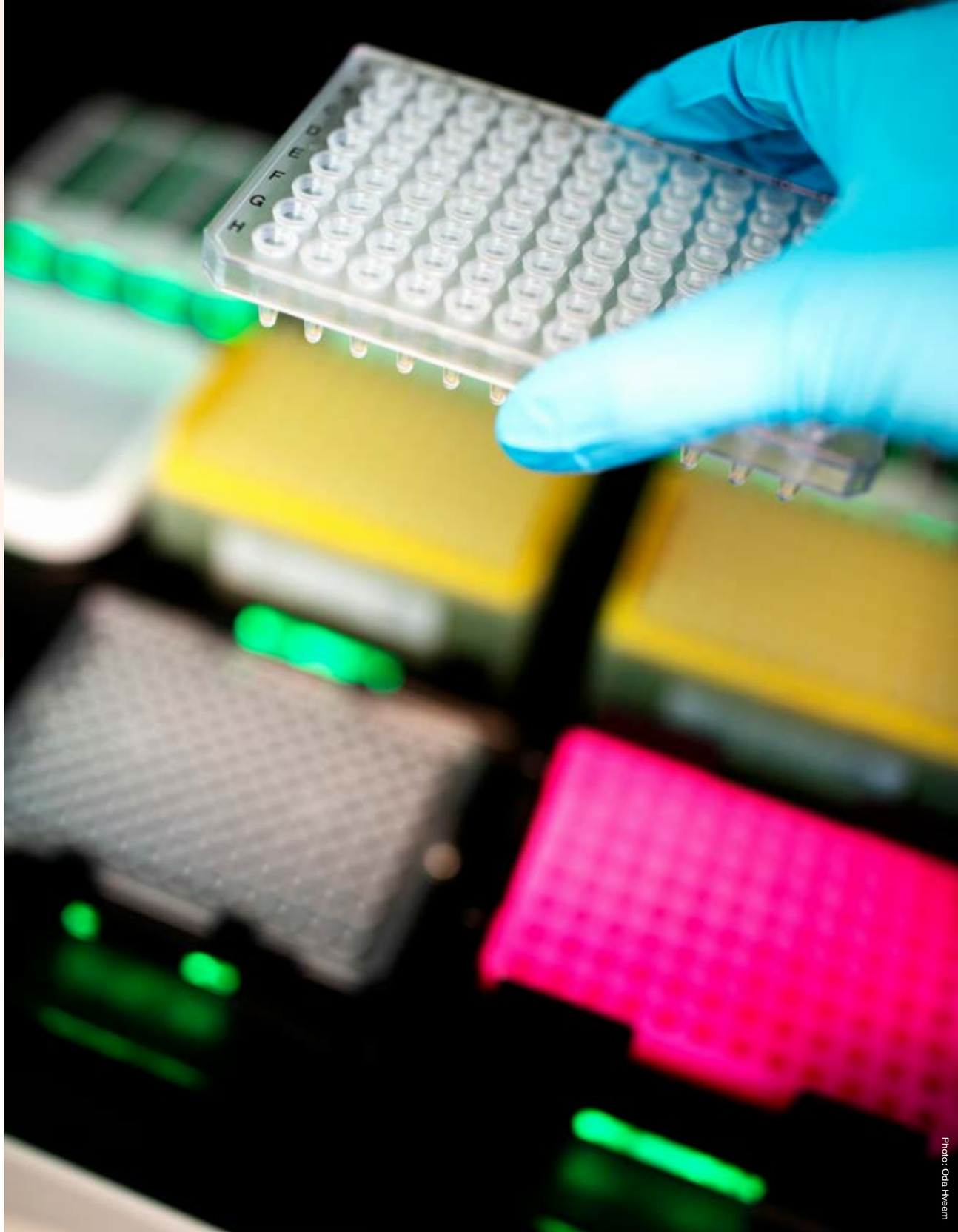

Photo: Oda Hveem

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 Kjetil Taskén, was one of the founding members of NCMM and served as Director from 2008-18. Taskén rotated out of NCMM in autumn 2018, after accepting a new role as Head of the Institute for Cancer Research, Oslo University Hospital.

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 autoimmunity and immune dysregulation and the understanding of biological pathways and mechanisms behind immune disorders.

Professor Jens Preben Morth was recruited from Aarhus University to NCMM in October 2010. His research is in the area of structure and function of membrane transporters. Morth has also started a new programme on pH regulation and structure function studies on bicarbonate transporters. His research has relevance to cardiology, neurobiology, and kidney diseases. Morth accepted a permanent professorship at the Technical University of Denmark (DTU) in 2018 and will rotate out of NCMM in August 2019.

Professor
Janna Saarela
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Professor
Kjetil Taskén
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Professor
Jens Preben Morth
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Photo: Oda Hveem

From the left: Emma Haapaniemi, Judith Staerk, Harmut Luecke, Marieke Kuijjer, Anthony Mathelier, Sandra Lopez-Aviles, Nikolina Sekulic, Camila Vicencio Esguerra, Irep Gözen. (Janna Saarela, Jens Preben Morth and Kjetil Taskén were not present when the photo was taken).

Dr. Judith Staerk trained at the Ludwig Institute for Cancer Research at the Catholic University of Leuven in Brussels, and did her postdoc at Whitehead Institute, MIT, Boston, USA working with stem cells. She 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's appointment as group leader was evaluated in the autumn of 2016 and her position was renewed for a second five-year period (2017-2022).

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.

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 and a Professor of Biochemistry. 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. 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 will focus on determining the genetic cause of rare immune diseases and finding treatments, either through identifying better biological therapies or by safely correcting genetic mutations.

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. Her appointment as group leader was evaluated in autumn 2016, and her position was renewed for a second five-year period (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.

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. 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 at Leiden University Medical Centre (LUMC) in the Netherlands. Her research programme at NCMM will focus on developing computational tools to integrate 'omics data into networks of interacting molecules.

NCMM will begin recruiting for a new research group in mid-2019.

Chemical Neuroscience Group

NCMM Group Leader: Camila Esguerra

Group members:

Head Engineers:
Rønnaug Steen Kolve *(until August 2018)*
Ana C. S. Tavara *(from December 2018)*

Postdoctoral Fellows
David Ramonet-Jimenez *(until August 2018)*
Ettore Tiraboschi *(until December 2018)*
Wietske van der Ent *(from September 2018)*
Kinga Aurelia Gawel

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

Research Technicians
Daniel James Wrobleski *(until October 2018)*
Nelson Thapelo Mathabela

MSc Student
Rosemary Ogwe Nanji *(from February 2019)*

Chemical Neuroscience Group

Camila Esguerra
–

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 with regard to our overall understanding of health and disease, but also to identify novel entry points for therapeutic development.

What were your highlights of 2018?
We have been working on a genetic model of Dravet Syndrome (DS), a severe form of intractable Epilepsy that appears in the first 6-18 months of life. The understanding of how genetic mutations in this gene lead to disease is still not completely understood although the main causative gene for DS was discovered almost a decade ago. We discovered a very early cellular defect that could explain the mechanism underlying seizures in our fish model. When we reached out to other laboratories who had been studying the equivalent genetic mouse models, we were surprised to learn that the same experiments had not yet been done. This was mainly because the same type of analyses in mice was technically very tedious and difficult. In addition, we also discovered that a drug candidate that is currently showing great promise in Phase III clinical trials for the treatment of DS was also highly effective in reversing the early cellular defects that we had identified in our fish model.

Another surprise was that although the drug is highly effective in suppressing seizures in DS patients and our fish model, it had failed in the DS mouse models. Together, our findings highlighted several advantages of using the zebrafish to answer certain biological questions and to predict the efficacy of drug candidates. Our study also yielded additional new results that could not only explain the seizures but also explained the observed dynamic changes in the brain. These affected the overall neural network so that, when rendered dysfunctional, they caused other problems (co-morbidities) such as intellectual disability, movement disorders, and socio-behavioural changes.

Regarding funding, we were awarded an ERANET-Neuron grant to study proteins involved in tethering vesicles (small cellular "sacs" or "bubbles") to nerve cell terminals that allow the release of neurotransmitters; the chemicals that allow nerve cells to communicate with one another. We were also awarded a Marie-Curie postdoctoral fellowship to study new genes found to be associated with Epilepsy.

What are you hoping for your group to achieve in 2019?
Our top priority this year is to publish our findings on several genetic syndromes. Through some of these publications, we aim to show proof of principle that the zebrafish can be used as a powerful model system to identify new drug leads that are not only more effective and safe but also those that are disease modifying. This is particularly important for pharmaceutical companies when selecting new drugs to develop further, as they are keen to identify drugs that not only alleviate symptoms but that also halt disease progression or even achieve disease freedom. Another goal is to (re)position our zebrafish model by focusing our experiments on answering key biological questions that are technically more difficult to answer using other models (e.g. mouse models and cell-based systems such as those using stem cells). In this manner, we can synergise even better with our collaborators to obtain a more in-depth picture of disease mechanisms and progression.

Last but not least, we study disease mechanisms within the context of a developing brain. Our zebrafish findings and expanded toolbox are useful not only in determining how genetic mutations lead to neurological or psychiatric disease but also for determining which environmental toxicants can lead to similar disease states – especially in humans at vulnerable life stages such as infants. With this in mind, we are now working closely with epidemiologists to carry out such studies.

Photo: Oda Hveem

Bionanotechnology and
Membrane Systems Group

NCMM Group Leader: Irep Gözen

Group members:

Postdoc
Inga Põldsalu

PhD Fellows
Elif Köksal
Karolina Spustová *(from October 2018)*
Aysu Kucukturhan Kubowicz
(from February 2019)

Research Assistants
Kira Leitl *(until August 2018)*
Mikkel Killingmoe Christensen *(until August 2018)*
Gizem Karabiyik *(from January 2019)*

Bionanotechnology and Membrane Systems Group

Irep Gözen
–

Could you describe your research in a nutshell?
We are studying biological processes from a materials properties angle. We're trying to understand, without the complex machinery and chemical energy involved, how much biological soft matter, such as biomembranes, tubules or cytoskeleton filaments, can assemble and carry out biological functions on their own. Among a few themes we are working on are the formation and dynamics of endoplasmic reticulum (ER), cellular migration, cell damage and repair, and the origins of life on Earth.

What do you hope to discover with your research?
We would like to understand how:

- Cells perceive interfaces and physically migrate on them;
- Certain organelles e.g. ER form and operate;
- Biomembranes rupture and repair;
- 'Abiogenesis' might have occurred. In other words, how life arose from non-living matter.

What were your highlights of 2018?
We have completed several manuscripts, some of which were accepted and in press at the end of 2018 and then published in early 2019. Some others are posted on preprint servers and currently in review (cf. below).

At the Oslo Life Science Days 2018 I, along with Dr. Gry Oftedal, presented 'Programmable cell-like compartments', a project funded by the UiO:Life Sciences Initiative of which I am the main coordinator. The Norwegian Minister of Research was among the attendees. As a group we also took part in the annual meeting of the American Biophysical Society where our team members presented their research.

One other exciting event was the Oslo Science Fair, 'Forskningstorget'. Every year, thousands of pupils visit downtown Oslo for this event to get some hands-on experience with lab materials and scientific experiments. We set up our stand like a lab and were able to explain our research by demonstrating simple scientific experiments.

Articles mentioned, either published early 2019 or published on preprint servers and in review:

Published:
Köksal, Elif Senem; Belletati, Patrícia F; Reint, Ganna; Olsson, Ragni, Leitl, Kira D; Kantarci, Ilayda; Gözen, Irep. Spontaneous Formation and Rearrangement of Artificial Lipid Nanotube Networks as a Bottom-Up Model for Endoplasmic Reticulum. Journal of Visual Experiments. 2019 Jan 22;(143).

Availble on preprint servicer and in review:

- Köksal, Elif Senem; Lieseb, Susanne; Kantarcia, Ilayda; Olsson, Ragni; Carlson, Andreas; Gözen, Irep. *A nanotube-mediated path to protocell formation.* bioRxiv preprint first posted online Aug. 9, 2018
- Gupta, Abhay; Reint, Ganna; Gözen, Irep; Taylor, Michael. *A cellular automaton for modeling non-trivial biomembrane ruptures.* bioRxiv preprint first posted online Sep. 27, 2018
- Horowitz, Viva R; Chambers, Zachary C; Gözen, Irep; Dimiduk, Thomas G; Manoharan, Vinothan N. *Active colloidal particles in emulsion droplets: A model system for the cytoplasm.* arXiv preprint first posted online June 14, 2018

What are you hoping for your group to achieve in 2019?
We have several manuscripts in the pipeline which we are hoping to publish in 2019. As a group, we have always put significant emphasis on the dissemination of our research, and have been talking to press about our projects, writing popular science articles for journals, newspapers and science blogs, as well as delivering web seminars and massive open online courses (MOOCs). We plan to continue doing this in 2019. We also expect more team members to join in 2019; two PhD positions and one postdoctoral position are currently available. We have multiple collaborative grant applications pending for decision and if approved we expect our research horizons and team to grow further.

"Among a few themes we are working on are the formation and dynamics of endoplasmic reticulum (ER), cellular migration, cell damage and repair, and the origins of life on Earth."

Photo: Oda Hveem

Cell Cycle Regulations Group

NCMM Group Leader: Sandra Lopez-Aviles

Group members:

Head Engineer
Mari Nyquist-Andersen

Research Scientists
Ruth Martîn Martîn
Marina Portantier

Postdoctoral Fellow
Nathalia Chica-Balaguera
(until March 2019)

PhD Fellow
Vilte Stonyte

MSc Student
Marcos Veloso-Carril *(until June 2018)*

Student
Freya Rosenberg *(until February 2018)*

Cell Cycle Regulations Group

Sandra Lopez-Aviles
–

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 main focus lies on the role of protein phosphatases regulating events 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 2018?

In 2018 we have:

- Published a review in Current Genetics: *"Express yourself: How PP2A-B55Pab1 helps TORC1 talk to TORC2"*
- Published a paper in the International Journal of Molecular Science in collaboration with the group of Dr. Toni Hurtado: *"High Throughput Chemical Screening Reveals Multiple Regulatory Proteins on FOXA1 in Breast Cancer Cell Lines"*
- Been granted funding from the Norwegian Cancer Society to investigate the mechanisms of gene regulation by PP2A-B55.

"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 are you hoping for your group to achieve in 2019?

In 2019 we expect to submit several works for publication:

- *On the regulation of mitotic exit events by members of the PP2A family*
- *On the control of negative regulators of CDK by PP2A-B56*
- *On the control of gene expression by PP2A-B56.*

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

"We use a genetic model organism, fission yeast, to investigate basic mechanisms regulating cell division, gene expression, and cell differentiation. Our results can, ultimately, shed light onto the underlying causes leading to cancer development."

Photo: Oda Hveem

Structural Biology and Drug Discovery

NCMM Group Leader: Hartmut Luecke

Group members:

Engineer
Bojana Sredic *(shared with Morth Group)*

Research Scientist
Eva Cunha
(from April 2018)

Postdoctoral Fellow
Javier Gutierrez
(from November 2018)

Guest Researcher
Julie E. Heggelund
(from March 2019)

Structural Biology and Drug Discovery

Hartmut Luecke
–

"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."

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."

Photo: Oda Hveem

Computational Biology
and Gene Regulation Group

NCMM Group Leader: Anthony Mathelier

Group members:

Postdoctoral Fellows
Aziz Khan
Jaime Abraham Castro Mondragón
Roza Berhanu Lemma *(from January 2019)*

PhD Fellow
Marius Gheorghe

MSc Students
Kübra Altinel *(until July 2018)*
Solveig M. Knoph Klokkerud *(from February 2019)*

Computational Biology and Gene Regulation Group

Anthony Mathelier
–

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 human diseases such as cancers. In a nutshell, the group develops and applies computational approaches to analyse multi-omics data to study gene expression dysregulation.

What do you hope to discover with your research?
We aim to develop computational resources and software tools to assist in understanding and prioritising personal genomic modifications in the DNA fragments that regulate when and where genes are expressed.

What were your highlights of 2018?
In December 2018, we published a map of direct interactions between transcription factors (TF), key proteins involved in the regulation of gene expression, and DNA in human (Gheorghe et al., *Nucleic Acids Research*, 2018). The map was obtained by uniformly processing a large collection of ~2,000 ChIP-seq data sets with a new computational tool, ChIP-eat, to accurately locate direct TF-DNA interactions. This study provides a critical resource, UniBind, for analyses of transcriptional regulation of gene expression and is freely available to the research community at http://unibind.uio.no.

Furthermore, our project on the characterization of cis-regulatory variants that dysregulate driver microRNAs in cancer has been awarded funding from both the Research Council of Norway (through a prestigious Young Research Talent grant) and the Norwegian Cancer Society.

What are you hoping for your group to achieve in 2019?
Thanks to our recently awarded funding, we will expand our group with one postdoctoral fellow and one PhD student in 2019. We are hoping to update 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.

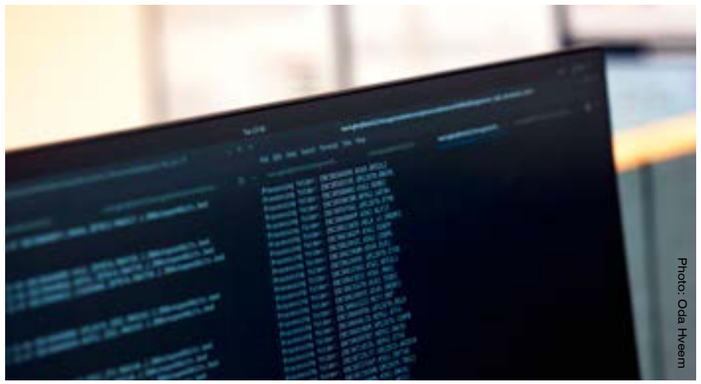

Photo: Oda Hveem

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

Photo: Oda Hveem

Structural Biology and Chromatin Group

NCMM Group Leader: Nikolina Sekulic

Group members:

Principal Engineer
Stine Malene Hansen Wøien

Research Scientist
Dario Segura-Pena

Postdoctoral Fellow
Ahmad Ali Ahmad

Students
Mira Dombi *(from October 2018)*
Oda Selvåg Hovet *(from February 2019)*

Structural Biology and Chromatin Group

Nikolina Sekulic
–

Could you describe your research in a nutshell?

In any living organism, cells will divide constantly throughout its whole 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. In particular, we study the structure of specialized nucleosomes (containing the histone H_3 variant CENP-A) that are present at centromeres. We would like to understand the unique properties of these nucleosomes and their ability to recruit an array of other centromere-specific proteins that finally result in a functional centromere. We are also interested in the structure of proteins that ensure cohesion (and constriction) of duplicated chromosomes and recruit enzymes that trigger different phases of cell division. Finally, we have on-going studies into the dynamics of Aurora B, a key enzyme that regulates several main events during mitosis and is considered to be a drug target in cancer therapy. We hope that our findings will help rational drug design of a specific inhibitor for Aurora B and thus lead to more effective treatments for cancer.

What were your highlights of 2018?

We have established a very fruitful collaboration with Dr. Mario Halic at St. Jude's hospital in the USA, who has expertise in the cryo electron microscopy of nucleosomes. Our collaborative work enabled us obtain the first high-resolution structure of a CENP-A nucleosome 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. Our research is summarised in a publication that is currently under review in a leading peer-review journal.

We have also started to collect the first data on our automated system that measures hydrogen-deuterium exchange in proteins – the first of this kind in Norway. We hope our work will identify important dynamic changes on Aurora B, which may help to find a new specific inhibitor with potential use in cancer treatments.

What are you hoping for your group to achieve in 2019?

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 take advantage of the fast developments in cryo-EM to obtain atomic resolution of these bigger, more complete, complexes which will deepen our understanding of centromere structure and function. We are planning to visit our collaborators in the USA who have a fully-equipped cryoEM facility to learn this powerful technique ourselves and bring the knowledge to Norway. Our expertise and on-going projects with cryo-EM will ensure we can make full use of the powerful cryo electron microscope that is planned for the new University of Oslo Life Science Building.

We are also excited to present our work at several international conferences. Most notably at the EMBO Workshop on Chromosome Segregation and Aneuploidy in Lisbon in May, and also at the Dynamic Kinetochore Workshop in Paris in August.

Furthermore, we look forward to the visit of Dr. Leland Mayne from the University of Pennsylvania who is an expert in hydrogen-deuterium exchange studies. Dr. Mayne will share his expertise with members of our lab and he will also hold lectures on the technique for the wider Oslo science community and students of the BioCat Norwegian graduate school. His three-week long visit is supported by the prestigious Fulbright Specialist Program, sponsored by the US government and Norwegian Oslo Life Science initiative.

Last but not least, we are hoping to grow our lab with our first PhD student to help with nucleosome-based projects.

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

Photo: Oda Hveem

Stem Cell Group

NCMM Group Leader: Judith Staerk

Group members:

Postdoctoral Fellows
Theresa Ahrens *(joint with Taskén Group, until March 2019)*
Safak Caglayan
Artur Cieslar-Pobuda
Adnan Hashim

Students
Burcu Talu *(June – September 2018)*
Madeleine Laudon *(August 2018 – January 2019)*

Stem Cell Group

Judith Staerk
–

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 particularly 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 underly 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 causes of this disease.

What were your highlights of 2018?
We published one manuscript showing that there is a cytokinesis arrest and multiple centrosomes in B cell chronic lymphocytic leukaemia. Moreover, PhD student Julia Madsen-Østerbye successfully defended her PhD thesis in May.

What are you hoping for your group to achieve in 2019?
In 2019, we expect to publish several manuscripts, two of which are currently in submission. In one manuscript, we show that optic atrophy 1 controls human neuronal development by preventing aberrant nuclear DNA methylation. In the second manuscript we show that deficiency in DNMT3B affects mitochondrial fusion and fission balance in human ES cells.

Membrane Transport Group

NCMM Group Leader: Jens Preben Morth

Group members:

Principal Engineer
Bojana Sredic *(shared with Luecke Group)*

Postdoctoral Fellows
Johannes Bauer *(until September 2018)*
Harmonie Perdreau-Dahl *(until October 2018)*
Saranya Subramani

PhD Fellow
Julia Weikum

Membrane Transport Group

Jens Preben Morth
–

Could you describe your research in a nutshell?
We work with proteins involved with metal homeostasis. Our main aim is to understand how environmental factors, such as the composition of lipids, modulates enzymatic activity and the trafficking of our particular model system.

The model system we study includes the magnesium transporter in bacteria. This is a key regulator of internal magnesium levels found in most bacteria; the Mitochondrial Membrane-bound E3 ubiquitin-protein ligase MARCH 5. This is a positive regulator of mitochondrial fission and the isatin hydrolase; a metal-dependent cytosolic enzyme that is able to convert the membrane permeable putative signalling molecule isatin to the impermeable isatinate.

What do you hope to discover with your research?
The majority of therapeutic targets known today are membrane proteins. In fact it is estimated that >60% of current drug targets are membrane proteins. The drug action is dependent on the accessibility of the membrane protein on the surface of cells. The extracellular binding mode often functions by altering the cellular signalling inside the cells. We hope to understand the key component at the membrane interface, or in the membrane, that induces activation and thus triggers a signalling effect across the membrane.

What were your highlights of 2018?
We published two papers:

- Sommer, Theis; Bjerregaard-Andersen, Kaare; Uribe, Lalita; Etzerodt, Michael; Diezemann, Gregor; Gauss, Jürgen; Cascella, Michele; Morth, Jens Preben. *A fundamental catalytic difference between zinc and manganese dependent enzymes revealed in a bacterial isatin hydrolase*. Scientific Reports 2018 ;Volum 8.(13104) s.1-11

- Uribe, Lalita; Diezemann, Gregor; Gauss, Jürgen; Morth, Jens Preben; Cascella, Michele. *Structural origin of metal specificity in isatin hydrolase from Labrenzia aggregata investigated by computer simulations*. Chemistry – A European Journal 2018 ;Volum 24.(20) s.5074-5077

I was also promoted to Professor at the Technical University of Denmark, meaning my group is now in the process of rotating out of NCMM.

What are you hoping for your group to achieve in 2019?
I have hired two new PhD students to work on MARCH5. We have submitted an initial manuscript that describes the key trafficking signals in the MARCH5, and have identified a key regulator of the magnesium transporter also soon to be submitted. I hope to continue the fruitful projects with my Norwegian collaborators and also hope to develop new collaborations in my new position in Denmark.

"The majority of therapeutic targets known today are membrane proteins. We hope to understand the key component at the membrane interface, or in the membrane, that induces activation and thus triggers a signalling effect across the membrane."

"Our main aim is to understand how environmental factors, such as the composition of lipids, modulates enzymatic activity and the trafficking of our particular model system."

Photo: Oda Hveem

Signalling Networks in Health and Disease Group

NCMM Group Leader: Kjetil Taskén

Group members: *(group moved to Oslo University Hospital in October 2018)*

Scientific Officers
Marianne Enger
Martine Schrøder

Research Scientists
Einar Martin Aandahl
Sigrid Skånland

Postdoctoral Fellows
Theresa Ahrens *(joint with Staerk group, until March 2019)*
Deepak Balaji Thimiri Govinda Raj
Ana I. Costa Calejo
Stalin Chelappa
Dinh-Toi Chu *(until November 2018)*
Andrea Cremaschi

Aleksandra Dukic
Håvard Foyn
Kushi Kushekar
Anna-Mari Lone
Kristina B. Lorvik
Qian Wei

PhD Fellow
Mariaserena Giliberto *(from February 2018)*

Signalling Networks in Health and Disease Group

Kjetil Taskén
–

Could you describe your research in a nutshell?

As the group is moving to the Institute of Cancer Research and joining the Department of Cancer Immunology at Oslo University Hospital, we have focused our research programme to have three main lines of research.

We will continue our activities on signalling and signalling scaffolds, particularly focusing on cancer cell signalling. Furthermore, we will pursue work on immune regulation looking at T cell immunoregulatory pathways from PGE2, adenosine and other signals that go through cAMP, as well as regulatory T cells and how these tumour immune evasion mechanisms can be blocked to restore anti-tumour immunity.

Lastly, we will proceed with cancer drug sensitivity screening (CDSS) to explore individual drug responsiveness and resistance patterns in patient cancer cells. Here we aim to develop models to assist individualised clinical decisions in precision medicine.

What do you hope to discover with your research?

We're working to discover the following:

- New drug targeting strategies by tearing apart signalling complexes with small molecule protein-protein interaction (PPI) inhibitors (our drug screening programmes);
- New methods to perturb tumour immune evasion mechanisms;
- New precision medicine strategies that can be tested in clinical trials derived from work with CDSS, and particularly identifying effective drug combinations.

What were your highlights of 2018?

Our highlights include winning a 20-million NOK grant from the RCN Biotek2021 Digital Life Norway programme for a systems pharmacology project to model on our data from CDSS to see if we can predict drug combinations that will synergize (Project PIs are Taskén, Enserink, Frigessi, OUH/UiO). This is a pending research question and important to make the best use of a patient sample for patient benefit, as we cannot test all combinations.

Another highlight and milestone included the establishment of a new company SERCA Pharmaceuticals by Inven2 which is based on a project that my lab has been running for 10 years at NCMM. Here we have developed small molecule PPI disruptors that target a heart signalling complex and with application in ischemia reperfusion injury after myocardial infarction. SERCA went on to sign a deal with the Indian company Cadila, which has secured plans to take the project forward to clinical testing in humans.

Publication highlights include papers in *Oncotarget* on CLL patients from our precision medicine programme and in the *Journal of Immunology* on regulatory T cells and tumour immune suppression in CLL and on signalling complexes in MBC. Furthermore, in co-authored papers we have contributed to understanding the autoimmune phenotype of patients with CTLA4 deficiency (JACI 2018), a metabolic regulatory programmes for aerobic glycolysis (*Nature* in press) and NK cell education (*Nature Communications.*)

"We will proceed with cancer drug sensitivity screening to explore individual drug responsiveness and resistance patterns in patient cancer cells. Here we aim to develop models to assist individualised clinical decisions in precision medicine."

Photo: Oda Hveem

From Disease Mechanisms to Clinical Practice

Photo: Øyvind Eide

NCMM's overall vision is to improve the molecular understanding of health and disease to facilitate improved medical practice.

Translational research depends on close contact between both basic research and hospital environments. To address this, NCMM has established strong links with Oslo University Hospital (OUH). The Centre is also exploring the possibility to develop closer links to other university hospitals.

Since 2015, NCMM group leaders have reported some 30 ongoing observational and interventional clinical studies in the fields of therapy and disease mechanisms, as well as in the molecular markers, diagnostic and monitoring areas.

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 located 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 infrastructure, including databases, facilities, and instrumentation, as well as clinical materials and networks across the Nordic countries.

NCMM Director Professor Janna Saarela:
"Many NCMM group leaders are already involved in translational research projects and I see the potential for growing this further. Additionally, our recent group leader appointments in precision medicine and systems medicine will certainly bring added value to our translational vision and future collaboration opportunities."

"I also believe that by establishing clearer theme-based research programs that help to integrate more group leaders into translational research initiatives and by building stronger collaborations and partnerships with other research institutions and hospitals in Oslo and the other health districts, we can further strengthen NCMM's standing as a leading national centre for translational research."

"I'm looking for strong future partnerships aiming to better the diagnostics and treatment of patients by combining basic and translational research to improve the molecular understanding of health and disease."

NCMM Associate Investigators and Young Associate Investigators

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

Associate Investigators

NCMM's Associate Investigators are drawn from a group of outstanding scientists currently based in Norway, with expertise that is 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 Young Associate Investigators through mentoring activities.

Young Associate Investigators

NCMM has an additional programme for young, talented researchers that are recruited as Group Leaders at other institutions. Young Associate Investigators are recruited through one of the two following channels:

1. Direct application to NCMM in response to open calls
2. Through universities and other research institutions that wish to recruit young, talented Group Leaders and where the conditions are similar to those offered to NCMM Group Leaders. An affiliation to NCMM can then be offered during the call and NCMM will be involved in the recruitment process.

Associate and Young Associate Investigators continue to work at their host institutions, but are credited an affiliation to NCMM and the Nordic EMBL Partnership for molecular medicine.

In 2019, 4 mNOK seed money funding was made available for 11 new collaborative projects. The projects that were awarded funding are listed below:

Associate Investigator(s)/ Young Associate Investigator(s)	Collaborating NCMM group	Project Title
Ole A. Andreassen	Camila Esguerra	Combined computational and *in vivo* modeling to predict genotype-phenotype correlations for schizophrenia risk variants
Lynn Butler	Marieke Kuijjer	Dynamic temporal network analysis of the induction, evolution and resolution of endothelial cell transcriptional responses to inflammatory stimuli
Simona Chera	Irep Gözen	Regulating cell-differentiation potential through mechanical forces and adhesion
Nils Halberg/Karl-Johan Malmberg	Marieke Kuijjer	High-dimensional and spatial analysis of osteosarcoma
Dirk Linke	Irep Gözen	Investigations on molecular and mesoscale interactions between styrene maleic acid copolymers and lipid membranes for bio-applications
Dirk Linke	Hartmut Luecke	Inhibitor screening and structure-based drug discovery for targeted eradication of gastrointestinal bacteria
Reidar Lund	Nikolina Sekulic	Small angle neutron scattering for analysis of nucleosomes
Hilde Nilsen	Nikolina Sekulic	SMUG1 – DNA base excision repair in the context of chromatin
Johanna Olweus	Emma Haapaniemi	A modified CRISPR-Cas9 system for gene editing of primary T cells
Hege Russnes	Anthony Mathelier	In-depth characterization of the transcriptional impact of transition from diploid to aneuploid cells in breast cancer
Rolf Skotheim	Anthony Mathelier	Transcription factors driving prostate cancer

Photo: Oda Hveem

NCMM Associate Investigators

Professor Lars Akslen, Centre for Cancer Biomarkers (CCBIO), University of Bergen and Haukeland University Hospital

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

Professor Bjørn Tore Gjertsen, Department of Clinical Science, University of Bergen and Haukeland University Hospital

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

Professor Eivind Hovig, Department of Tumor Biology, Institute of Cancer Research, Oslo University Hospital and Institute of Informatics, University of Oslo

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

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

Professor Per E. Lønning, Section of Medicine, University of Bergen and Department of Oncology, Haukeland University Hospital

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

Professor Erlend Nagelhus, Department of Molecular Medicine, Institute of Basic Medical Sciences, University of Oslo and Department of Neurology, 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

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 Anders Sundan, Department of Cancer Research and Molecular Medicine, Norwegian University for Science and Technology (NTNU)

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 Young Associate Investigators

Dr Sören Abel, Department of Pharmacy, University of Tromsø and Harvard Medical School

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

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

Adjunct Professor Jorrit Enserink, Department of Molecular Cell Biology, Institute for Cancer Research, Oslo University Hospital

Professor Trude H. Flo, Centre of Molecular Inflammation Research (CEMIR) and Dept. of Cancer Research and Molecular Medicine, Norwegian University for Science and Technology (NTNU)

Dr Nils Halberg, Department of Biomedicine, University of Bergen

Dr Richard K Kandasamy, Department of Clinical and Molecular Medicine, Norwegian University of Science and Technology (NTNU)

Dr Ida G Lunde, Institute for Experimental Medical Research, Oslo University Hospital

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

Associate Professor Siver A. Moestue, Department of Circulation and Medical Imaging and Department of Laboratory Medicine, Norwegian University for Science and Technology (NTNU)

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

Dr. Pia Abel zur Wiesch, Department of Pharmacy, University of Tromsø and Yale School of Public Health, US

Photo: Oda Hveem

Research Collaborations with Oslo University Hospital

NCMM's objectives are to conduct cutting-edge research in molecular medicine and to facilitate 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 (HSØ) 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 a number of 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:

"All NCMM Translational Research group leaders have adjunct positions in clinical or para-clinical departments at OUH."

Photo: Oda Hveem

Department of Medical Genetics (OUH)
NCMM PI: J Saarela
–

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 Infectious Diseases (OUH)
NCMM PI: K. Taskén
–

The department covers the entire field of infectious medical conditions, such as tropical medicine, HIV, and tuberculosis, as well as severe and life-threatening bacterial and viral infections. The Department of Infectious Diseases runs an extensive research programme, especially related to the diseases HIV/AIDS and hepatitis. The department is also responsible for a variety of advanced educational courses in infectious diseases. It is organised under the Medicine Division at OUH.

Department of Cancer Genetics, Institute for Cancer Research (OUH)
NCMM PI: A. Mathelier
–

The main goal of the department is to follow the linear time course of predisposition, initiation, early stage and advanced disease, and to dissect the molecular mechanisms triggered at each stage. Furthermore, the department focuses on how to follow the multi-dimensional interactions at various levels in a systems biology approach to better perform risk estimation, prognostication, and prediction.

Institute for Experimental Medical Research (OUH)
NCMM PI: J. P Morth
–

The Institute for Experimental Medical Research primarily focuses on heart disease research and teaching. In particular, the institute performs research on congestive heart failure, with a special interest in heart electrophysiology and membrane pumps. The institute is involved in extensive collaborations with other laboratories in clinical departments at OUH, and interacts with colleagues nationally and internationally. The institute is organised under the Division of Cardiovascular and Pulmonary Disease at OUH.

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.

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

NCMM hosts the 9th annual Nordic EMBL Partnership Meeting

New perspectives on Nordic research

60+ scientific posters presented

23 scientific talks –

07 EMBL group leaders attended

150+ attendees at the Nordic EMBL conference

The 2018 Nordic EMBL Partnership meeting, the 9th annual meeting in the Partnership's history, saw over 150 participants gather at the Soria Moria Hotel, Oslo.

Visitors from DANDRITE (Danish Institute for Translational Neuroscience), MIMS (Molecular Infection Medicine Sweden), FIMM (Institute for Molecular Medicine Finland) and the EMBL (European Molecular Biology Laboratory) joined NCMM's group leaders and researchers for the two-day meeting in September.

Following a recommendation from Director General of the EMBL, Iain Mattaj, a number of EMBL group leaders, from EMBL Heidelberg, EMBL Grenoble, and EMBL Rome, were also invited to speak at the meeting.

Farewell and welcome

Kjetil Taskén, former Director of NCMM, and Bernt Eric Uhlin, who retired as Director of MIMS in October 2018, were honoured for their time as Directors, with warm thanks also given to Iain Mattaj, who departed from his role as Director General of the EMBL in late 2018. Newly appointed directors; the new Director of FIMM, Mark Daly, and the new Director of MIMS, Oliver Billker, along with recently appointed Nordic EMBL Partnership group leaders also each presented short overviews of their research.

Selection of scientific talks from the EMBL and Nordic partners

Along with progress updates from each centre director, a number of researchers from across the network were also invited to give scientific talks. The variety of presentations aimed to help give attendees a taste of all the different research taking place across the Partnership. These presentations came alongside talks from the EMBL group leaders, who gave insights into their work. Furthermore, around 60 scientific posters were presented by all nodes during an evening poster session, with prizes awarded for the best four posters.

Young Investigator Meeting (YIM)

The Young Investigators were invited to attend the meeting for two extra days prior to the main programme. The Young Investigator Meeting (YIM) is organised by young researchers themselves, and has been part of the Nordic EMBL Partnership meetings since 2012. The 2018 YIM saw talks from Professor Inger Sandlie, from the University of Oslo, and Karoline Schjetne, Vice President of Scientific Affairs at Oslo-based biopharmaceutical company, Vaccibody. The Young Investigators also took part in an intensive workshop from presentation and science communication expert, Jean-luc Doumont. The group was further tested on their teamwork and problem-solving skills by Oslo's Escape Games, who challenged them save their computers and phones from data hackers.

A huge thank you to all who attended the 2018 meeting in Oslo. We look forward to seeing all of you in Barcelona this September!

1. Poul Nissen, Speaker of the Nordic EMBL Partnership. Photo: Øystein Horgmo
2. Emma Haapaniemi. Photo: Nadia Frantsen
3. Anthony Mathelier. Photo: Nadia Frantsen

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"Along with progress updates from each centre director, a number of researchers from across the network were also invited to give scientific talks."

4. Bernt Eric Uhlin. Photo: Nadia Frantsen
5. Escape room. Photo: Annabel Darby
6. Kjetil Taskén and Iain Mattaj. Photo: Øystein Horgmo
7. Poster session. Photo: Nadia Frantsen
8. Group photo. Photo: Nadia Frantsen

Research from the Gözen Group could help researchers understand how life on earth may have originated

Research led by Irep Gözen, head of the Bionanotechnology and Membrane Systems Group, was presented at the Biophysical Society Annual Meeting in Baltimore, USA. The findings were also highlighted in the Norwegian national newspaper, Aftenposten.

For life on Earth to form, a series of spontaneous events had to happen. Whilst this has been known for some time, exactly how these events happened has been a question that has long puzzled researchers. Now, research by the Gözen Group has helped to shed some light on how this process may have happened.

Findings could hold the key to the origins of life

Through modelling various chemicals that were thought to exist on earth shortly after it was formed, the group has been working to understand the easiest way to form so-called 'protocells' – self-organised collections of lipids thought to play a crucial role in the origins of life.

The group found that when lipids land on a surface, they self-organise into tiny cell-like containers without any external input. The significance of these findings, in terms of how life on earth may have started, is that the formation of these cell-like containers is a very simple process. All that is needed is a sufficient number of lipids, a suitable surface, and water. Lipids could have easily existed in the very early stages of Earth, as suggested by lipid traces found in fossils and meteorites.

In terms of how genetic material may have then entered these protocells, the group found that large organic molecules similar in size to DNA's building blocks can spontaneously enter these protocells while they grow. Both of these events are crucial steps towards forming a functioning cell.

Research highlighted at the Biophysical Society Annual Meeting

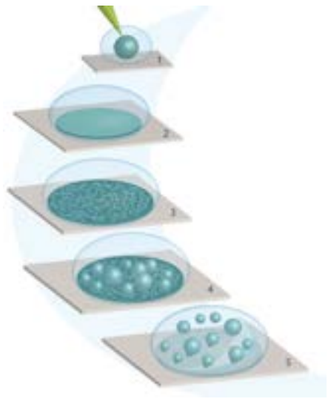
Dr Gözen and members of her group presented their research at the 63rd annual meeting of the Biophysical Society in Baltimore, Maryland, USA in March 2019. The research was highlighted by the Biophysical Society's news team and included in the organisation's 'Newsroom' round-up of the most exciting research presented at the meeting. Norwegian national newspaper, Aftenposten, also featured an in-depth article on the research in March 2019, with further articles featured online across many media outlets.

Findings may help us to understand how other planets developed

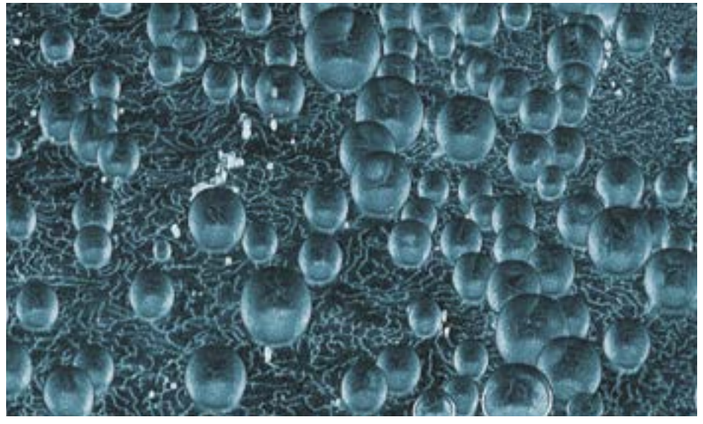
The group will now work with biologists and geologists to further investigate the combinations of minerals and fat molecules derived from the oldest bacterial cultures known on earth.

The original publication is currently available on the pre-print server bioRxiv

Elif Senem Koksal, Susanne Liese, Ilayda Kantarci, Ragni Olsson, Andreas Carlson, Irep Gözen. *A nanotube-mediated path to protocell formation. https://doi.org/10.1101/388405*



The process of how a fat droplet enclosed in water is deposited on a surface, and the five steps it undergoes to become fully-formed protocells. Image: Irep Gözen.



Spontaneously-formed protocells, which resemble balloons anchored to a surface by a network of ropes, are visualized by 3D confocal microscopy. Image: Irep Gözen

Research by Taskén group at the heart of international drug development initiative between Norway and India

A drug development project started by the Taskén Group at NCMM is at the centre of a new and unique co-development agreement between a Norwegian start-up and an Indian pharmaceutical company.

The co-development agreement, established between the Norwegian company SERCA Pharmaceuticals, and Cadila, an FDA-approved Indian pharmaceutical company, will now work to further develop the findings initiated by the Taskén Group and researchers at the University of Oslo (UiO) and Oslo University Hospital (OUH). The agreement was officially recognised at a signing ceremony in January 2019 in New Delhi, India, in connection with a state visit by Norwegian Prime Minister Erna Solberg.

Project now has the opportunity to enter human trials

The original project, which started some 20 years ago, involves drug development research into ischemia-reperfusion injury in myocardial infarction – more commonly known as a heart attack. The research relates to the discovery of a signalling complex in heart cells that mediates one specific effect of adrenalin, findings which were originally published in *EMBO Reports* in 2007. The new co-development agreement between SERCA and Cadila means that the project now has a real chance to begin human trials.

The findings have now been taken forward to a drug candidate and the effects have been documented biochemically in heart cells, via electrophysiology, on normal rat hearts, and in rats with ischemia-reperfusion injury, showing a cardioprotective effect.

Commenting on the development, Professor Kjetil Taskén says:

"Since 2008, we have been working on the development of small molecules that disrupt this regulation and that block this particular effect inside heart cells. The findings have progressed through chemical biology and drug screening, and then the hit-to-lead process to verify the compounds suitable for further testing.

"We now have a disease model that shows that our small molecules are cardioprotective in the acute phase of myocardial infarction when presented with ischemia-reperfusion injury. We are very pleased that within this new setting offered by SERCA Pharmaceuticals, the project can now be taken further."

Collaborative project has involved researchers at NCMM, University of Oslo, Oslo University Hospital, and Inven2

The project has been 10 years' hard work in the making, involving members of the Taskén group: former postdoc, Birgitte Lygren; former PhD student, Ellen Østensen; and former postdoc and now research-er Ana Calejo, who is supported by a UiO SPARK grant. The primary drug screen ran first at the EMBL (European Molecular Biology Laboratory), with the secondary and tertiary screens running on the NCMM Chemical Biology Platform, which is currently led by Johannes Landskron.

The project team has now patented the research and the findings are expected to be submitted for publication in the coming months.

Signing of Cadila agreement: Kristin Sandereid, Executive Fund & Business Developer, Inven2 (centre), Kjetil Hestdal, CEO, SERCA pharmaceuticals (second from right), and Ole Kristian Hjelstuen, CEO, Inven2 (right). Photo: Inven2

NCMM Network Meeting

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.

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Day One

The meeting saw presentations from NCMM Director, Janna Saarela, and recently appointed PIs; NCMM group leaders Marieke Kuijjer and Emma Haapaniemi, and Lynn Butler Odeberg, Assistant Professor at the University of Tromsø and the Karolinska Institute.

The meeting's keynote session focused on 'Big Data' and its uses in basic research, with presentations from 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 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 Brænde, who spoke about how good and effective communication can help to get the best out of your colleagues and team; skills very important when running a research group.

Day Two

Young Associate Investigators and some NCMM Group leaders took part in a 'Negotiation and Communication' workshop, led by Oslo-based consultants Moment AS. The interactive workshop 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.

Thank you to all of our speakers and attendees; we look forward to seeing you all again soon!

1. Mingling. Photo: Annabel Darby
2. Hege Russnes and Therese Sørlie. Photo: Øystein Horgmo
3. Elana Fertig. Photo: Øystein Horgmo
4. Negotiation Workshop. Photo: Annabel Darby
5. Francesca Buffa. Photo: Øystein Horgmo

3

"The meeting's keynote session focused on 'Big Data' and its uses in basic research."

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Funding successes for NCMM 2018 & Q1 2019

Sandra Lopez Aviles, Head of the Cell Cycle Regulations Group, and Anthony Mathelier, Head of the Computational Biology and Gene Regulation Group, were honoured at a special event organised by the Norwegian Cancer Society (Kreftforeningen) in October 2018. The funding was allocated as part of an annual open call for project proposals by the Norwegian Cancer Society.

Sandra Lopez-Aviles

Project summary: Dr. Lopez-Aviles' project aims to translate research findings in yeast to breast cancer cell lines, with the aim of developing new avenues for breast cancer treatment. The project will look at how certain genes involved in the development of breast cancer are regulated, and under what circumstances they are able to function. By understanding the mechanisms of regulation, Dr. Lopez-Aviles' project will help to provide new avenues for the treatment of breast cancer.

Anthony Mathelier

Project summary: There is no 'one size fits all' treatment for cancer patients; each will respond differently to a given treatment. An element of personalisation is therefore required to enable cancer treatments to be as effective as possible. Dr Mathelier's project will focus on the development of computational resources and software that can assist clinicians in understanding and prioritising a patient's personal variations in the DNA fragments that act as 'switches' for gene expression.

Young Research Talent Grant

Dr. Mathelier, head of the Computational Biology and Gene Regulation Group at NCMM, has also been awarded a prestigious grant by the Research Council of Norway.

Project Summary: The primary project objective is to predict somatic cis-regulatory variations that dysregulate driver microRNA expression in cancer. This aim will be achieved through the characterization of transcription factor binding sites (TFBSs) in humans that are involved in the regulation of microRNA expression.

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. Such tools will provide means to reduce costs by decreasing the number of expensive laboratory tests performed in search of diagnosis, and also the means to improve quality of outcomes for patients.

Marie Curie Fellowships

Kinga Aurelia Gawel, a postdoc in the Esguerra Group, and Eva Cunha, a researcher in the Luecke Group, were both awarded an MSCA Fellowship in 2018.

The Marie Skłodowska-Curie (MSCA) Individual Fellowships are designed to help the most talented and promising researchers to further develop their skills and to diversify their experience, through advanced training and international working.

> "There is no 'one size fits all' treatment for cancer patients; each will respond differently to a given treatment."
>
> – Anthony Mathelier

NCMM Group Leaders Sandra Lopez-Aviles and Anthony Mathelier both awarded grants as part of Norwegian Cancer Society's annual open call.

Kinga Aurelia Gawel

Project: Genetic Epilepsy Models in Zebrafish.

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Background

Epilepsy is a devastating neurologic disease which affects approximately 1% of people worldwide. 30% of these sufferers are resistant to available drugs. The project aims to generate new models of epilepsy in zebrafish with a focus on specific channel mutations. Work will characterize these models and describe how known mutations affect the phenotype of the animal and the type of seizures detected. This will help to identify new therapeutic options for the patient suffering from this rare mutation.

Eva Cunha

Project: Structural studies of the full-length human Vitamin C transporters: unravelling Vitamin C transport across the membrane.

Background

The project aims at unravelling the mechanism of Vitamin C transport and regulation by determining the three-dimensional structures of both SVCT1 and SVCT2, thereby providing mechanistic understanding of the different activities of these transporters. The project will use a multidisciplinary approach of high-resolution cryo-electron microscopy (Cryo-EM), X-ray crystallography and biophysical methods to understand SVCT function and interactions. This work will contribute to elucidating the mechanism of Vitamin C transport by SVCTs and may ultimately lead to drug discovery.

EU-OPENSCREEN officially recognised as European Research Infrastructure Consortium (ERIC)

The EU-OPENSCREEN ERIC consists of 20 research institutes from eight European countries, including Norway. The official opening ceremony was held in September 2018 at the Max Delbrück Centre for Molecular Medicine in Berlin. State secretary in the Ministry of Education and Research, Rebekka Borsch, represented Norway together with former NCMM Director, Kjetil Taskén.

EU-OPENSCREEN integrates high-capacity screening platforms throughout Europe and offers researchers from around the world open access to a uniquely broad range of high technologies and tools for the systematic screening of chemical substances for their biological effects. The award of ERIC status to EU-OPENSCREEN means that the participating institutes will cooperate within a legal framework that eliminates regulatory barriers and simplifies access to shared resources. So far, ERIC status has been granted to 21 consortia across Europe. Germany hosts EU-OPENSCREEN, whilst Norway, the Czech Republic, Latvia, Finland, Poland, and Spain are the other founding members. Denmark became a full member at the beginning of 2019 and more countries are preparing their participation.

The Norwegian node of EU-OPENSCREEN is NOR-OPENSCREEN, coordinated by NCMM and the University of Oslo.

About NOR-OPENSCREEN

NOR-OPENSCREEN consists of four nodes located at the University of Oslo, the University of Bergen, SINTEF Trondheim and the University of Tromsø and represents the Chemical Biology and marine bioprospecting expertise in Norway. It is a national infrastructure network that aims to offer high-throughput screening technologies and resources to public or private users. Since 2016, NOR-OPENSCREEN has been on the Norwegian Roadmap for Research Infrastructure.

The NCMM Chemical Biology Platform.
Photo: Øyvind Eide

Photo: Julie Nybakk Kvaal, University of Oslo

Forsknings-torget 2018

Irep Gözen and her group took part in Oslo's largest popular science fair, Forskningstorget, which is organised each year as part of Norway's 'Forskningsdagene' events.

Elif Köksal at Forskningstorget.
Photo: Julie Nybakk Kvaal, University of Oslo

Forskningstorget, or 'Research Square' is an opportunity for scientists and researchers from the University of Oslo to connect with the wider public and tell them more about their research.

The Gözen Group took part in the two-day event in September 2018 as part of the Faculty of Medicine's exhibition of research. Schoolchildren make up a large proportion of visitors to the event, and there is an emphasis on exhibitors to provide 'hands-on' experience of research that children can try out for themselves. The Gözen Group provided lots of interactive experiments using balloons, paper marbling, and dyes in water to help show how soft matter behaves under different conditions.

Long queues of visitors eager to test out the experiments formed on both days of the event, making Forskningstorget an excellent opportunity for the Gözen Group to demonstrate and explain their research to the public.

The Nordic EMBL Partnership

The Nordic EMBL Partnership for Molecular Medicine was founded in 2008 as 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 and NCMM (Centre for Molecular Medicine Norway) at the University of Oslo. A fourth node, DANDRITE (Danish Research Institute of Translational Neuroscience) at Aarhus University, joined the Partnership in 2013.

1. Poul Nissen. Photo: Lars Kruse, Aarhus University
2. Mark Daly. Photo: Veikko Somerpuro, Helsinki University
3. Janna Saarela. Photo: Oda Hveem, Visuello
4. Oliver Billker. Photo: Mattias Pettersson, Umeå University

In 2013, the Nordic EMBL Partnership was renewed for a further 10 years, with a fourth node (DANDRITE) joining the Partnership.

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:

- DANDRITE: Molecular and translational neuroscience
- FIMM: Human genomics, systems and precision medicine
- MIMS: Microbial pathogenicity and molecular infection medicine
- NCMM: Molecular mechanisms of disease

In addition to the partnership between the 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.

1 DANDRITE

Director: Poul Nissen

Since its inauguration in 2013, DANDRITE has been led by Professor Poul Nissen. Prof Nissen is also a Core Group Leader, and in 2018 was appointed as Speaker for the Nordic EMBL Partnership. As Speaker, Prof Nissen is responsible for representing the four Nordic nodes in any general matters, and also for helping to promote the international visibility of the Partnership.

2 FIMM

Director: Mark Daly

Professor Mark Daly was appointed as Director of FIMM in February 2018, succeeding Interim Director Jaakko Kaprio. Prior to joining FIMM, Prof Daly was Institute Member and co-director of the Medical and Population Genetics Program at the Broad Institute of MIT and Harvard, USA.

3 NCMM

Director: Janna Saarela

Professor Janna Saarela joined NCMM in January 2019, succeeding founding NCMM Director, Professor Kjetil Taskén. Prof Saarela was previously Head of the Technology Centre at the Finnish Nordic EMBL Partnership node FIMM, where she was also Deputy Director.

4 MIMS

Director: Oliver Billker

Professor Oliver Billker has been Director of MIMS since October 2018, when he succeeded founding MIMS Director Professor Bernt Eric Uhlin. Professor Billker joined MIMS from the Wellcome Trust Sanger Institute in Cambridge.

63

Group and team leaders

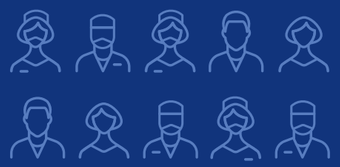
60

Different nationalities of staff and researchers

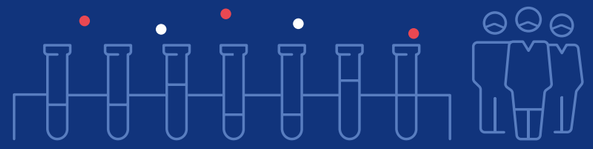
The EMBL currently has 11 partnerships: Ten in Europe and one in Australia

50 MILLION EUROS raised across the four Nordic EMBL Partnership sites, through core and extramural funding

600+ Researchers and staff –



Nordic EMBL Partnership Research Groups broadly focus on molecular medicine, which spans fields that include amongst others: cancer, molecular infection medicine, translational neuroscience, genomics, precision medicine, bioinformatics, systems medicine, structural biology, and drug discovery.



NCMM PhD Defences

Julia-Kristina Jensen Madsen-Østerbye
Julia defended her thesis titled, *"Studies of hematopoiesis – physiologic and malignant development"* at the Faculty of Medicine, University of Oslo in May 2018. Madsen-Østerbye's work was carried out in the group of Judith Staerk and was funded by NCMM.

Julia Madsen-Østerbye is now a postdoctoral researcher in the Collas Lab at the Institute of Basic Medical Sciences, University of Oslo. The group, led by Professor Phillippe Collas, conducts research into the principles of 3D genome architecture which pattern lineage-specific stem cell differentiation in health and disease.

Morten Luhr
Morten Luhr defended his thesis titled, *"The unfolded protein response and the ATG8 protein family in autophagy"* at the Faculty of Medicine, University of Oslo in December 2018. Luhr's work was carried out in the research group of former NCMM group leader Ian G Mills (who rotated out of NCMM in 2016) and he was supervised by Nikolai Engedal, project leader of the Autophagy Team. The project was funded by the Research Council of Norway.

Morten Luhr has now taken up a new role at the R&D Cell Therapy Group at Thermo Fisher Scientific, Oslo. As a PhD fellow, Luhr was awarded a Fullbright Scholarship and spent six months working at the Dana Faber Cancer Institute, Boston, USA.

Oksana Svärd
Oksana defended her thesis titled, *"Using single cell sequencing to understand healthy and malignant hematopoiesis"* at the Faculty of Medicine, University of Oslo in March 2019. Svärd's work has been carried out in the research group of Judith Staerk and was funded by the Norwegian Cancer Society.

Oksana Svärd's project focused on using the hematopoietic system to investigate how chromatin interacts with two major components of the nuclear lamina: Lamin B1 and Lamin B receptor (LBR). The research provides an important resource for studying chromatin organization by LaminB1 and LBR in healthy and malignant blood development.

Photo: Oda Hveem

Photo: Oda Hveem

NCMM Board

Chair of the NCMM Board, Jens Petter Berg:
"My first year as Chair of the Board was marked by a number of milestones for the Centre, most significantly by the successful evaluation of NCMM in spring 2018. The renewal of Research Council of Norway financing for the next five-year period means NCMM can continue as a greenhouse for fostering excellent scientific achievements and for developing the careers of young talented researchers. We have been given some recommendations to adopt during the next five-year phase and will now work to implement these."

"I also welcome our Director, Professor Janna Saarela. Professor Saarela's scientific capacity, strong leadership, and vision for the future development of the Centre's research in biotechnology and translational medicine are sure to open new and exciting possibilities for NCMM. I very much look forward to working with her over the coming years. I would also like to take this opportunity to thank the NCMM Board for their ongoing collaboration, and also thank former NCMM Director Kjetil Taskén and Assistant Director Hartmut Luecke for their support and collaboration over 2018."

Current Chair of the NCMM Board.
Photo: Øystein Horgmo

Chair:

Professor Jens Petter Berg, UiO/Oslo University Hospital
–

NCMM Board:

The Board consists of the Chair and five members representing NCMM's host, the University of Oslo and the consortium partner South-Eastern Norway Regional Health Authority (HSØ), as well as a national representative.

Members:

Professor Finn-Eirik Johansen
Faculty of Mathematics and Natural Sciences, UiO

Members:

Professor Philippe Collas, Faculty of Medicine, UiO
(until January 2019)

Members:

Øystein Krüger, Acting Director of Research and Innovation, South-Eastern Norway Regional Health Authority (HSØ)

Professor Bente Halvorsen, South-Eastern Norway Regional Health Authority (HSØ) and Oslo University Hospital

BOARD

Maria Perander, UiT The Arctic University of Norway (national representative)

Deputy Members:

Professor Hilde Nilsen, Faculty of Medicine, UiO and Akershus University Hospital

Torunn Berge, Special Advisor, South-Eastern Norway Regional Health Authority (HSØ)

Professor Ola Myklebost, University of Bergen (UiB)

Scientific Advisory Board (SAB)

Chair:

Professor Richard Treisman, Research Director, Francis Crick Institute London, UK

SAB (Scientific Advisory Board):

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

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 12-24 months. These meetings allow for the review of recent progress and advice on future strategies.

The most recent SAB visit took place in February 2018, with the next visit planned for October 2019.

Photo: Oda Hveem

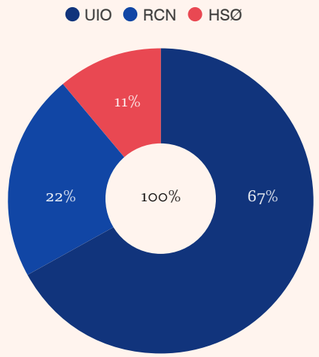
NCMM Funding

NCMM is in its second five-year period (2015-2019) and was externally evaluated by the Research Council of Norway in 2018. The international evaluation committee recommended the continuation of NCMM for a third five-year period (2020-2024).

In January 2017, the merger between NCMM and the Biotechnology Centre of Oslo (BiO) formally came into effect. NCMM now 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 South-Eastern Norway Regional Health Authority (HSØ). NCMM Biotechnology in 2018 had a core funding of 28.5 mNOK funded by UiO. Furthermore, overheads, income from core facilities, and production-based income are in addition to this.

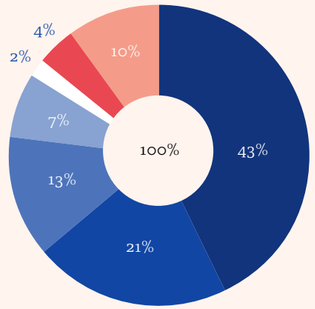
NCMM extramural funding, in the form of grants to group leaders and other competitive funding, reached 34 mNOK in annual grants in 2018. This includes grants from the Research Council of Norway, the Norwegian Cancer Society, HSØ, competitive grants at UiO and the European Commission. Other sources are private foundations and organisations, such as the Lundbeck Foundation, World Cancer Research, and Barncancerfonden, amongst others.

Extramural funding for 2019 is so far stipulated to be 30 mNOK. The estimated reduction is a result of the rotation out of two established research groups in 2018/2019. Three new research groups have been recruited to NCMM end of 2018/beginning of 2019 and we expect to see an increase in extramural funding from 2020.

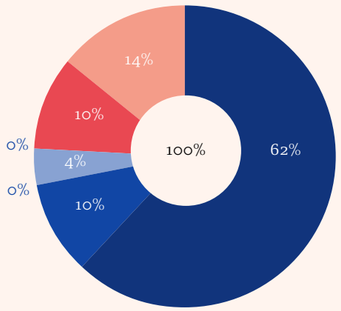


NCMM Core Funding Sources 2018

Funding statistics



External Funding 2018



Est. External Funding 2019

The 2019 overview is an estimate of extramural funding sources based on budget and on secured grants.

Photo: Oda Hveem

NCMM Affiliated Publications 2018 & Q1 2019

2018

Ahrens, Theresa Dorothee; Caglayan, Safak; Staerk, Judith; Cieslar-Pobuda, Artur. *Transdifferentiation – changing cell identity*. Academic Press 2018 iSBN 9780128122785) 249

Aourz, Najat; Serruys, Ann-Sophie K.; Chabwine, Joelle N.; Balegamire, Pascal Byenda; Afrikanova, Tatiana; Edrada-Ebel, RuAngelie; Grey, Alexander I.; Kamuhabwa, Appolinary R.; Walrave, Laura; Esguerra, Camila V.; van Leuven, Fred; De Witte, Peter A.M.; Smolders, Ilse; Crawford, Alexander D. *Identification of GSK3 as a Potential Therapeutic Entry Point for Epilepsy*. ACS Chemical Neuroscience 2018

Bernal Mera, Aurora; Arranz, Lorena. *Nestin-expressing progenitor cells: function, identity and therapeutic implications*. Cellular and Molecular Life Sciences (CMLS) 2018 ;Volum 75.(12) s.2177-2195

Caglayan, Safak; Ahrens, Theresa Dorothee; Cieslar-Pobuda, Artur; Staerk, Judith. *Modern ways of obtaining stem cells*. Academic Press 2018 (ISBN 780128122785) 249 s

Distefano, Marita Borg; Haugen, Linda Hofstad; Wang, Yan; Perdreau-Dahl, Harmonie; Kjos, Ingrid; Jia, Da; Morth, Jens Preben; Neefjes, Jacques; Bakke, Oddmund; Progida, Cinzia. *TBC1D5 controls the GTPase cycle of Rab7b*. Journal of Cell Science 2018 ; Volum 131.(17) s.1-13

Dugarte, Maria Eugenia Chollet; Andersen, Elisabeth; Skarpen, Ellen; Myklebust, Christiane Filion; Koehler, Christian; Morth, Jens Preben; Chuansumrit, Ampaiwan; Pinotti, Mirko; Bernardi, Francesco; Thiede, Bernd; Sandset, Per Morten; Skretting, Grethe. *Factor VII deficiency: Unveiling the cellular and molecular mechanisms underlying Three model alterations of the enzyme catalytic domain*. Biochimica et Biophysica Acta – Molecular Basis of Disease 2018; Volum 1864.(3) s.660-667

Engedal, Nikolai; Luhr, Morten; Szalai, Paula; Seglen, Per O. *Measurement of bulk autophagy by a cargo sequestration assay*. Methods Mol. Biol. 2019;1880:307-313.

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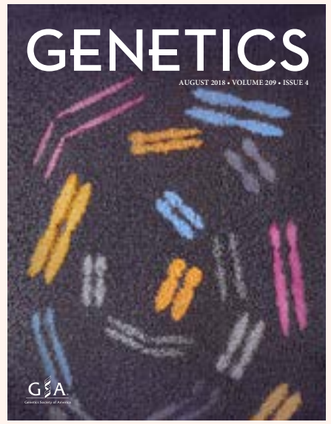


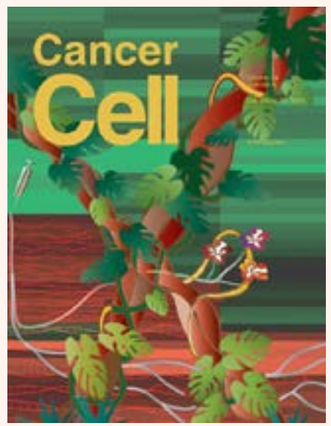


Photo: Oda Hveem

Press items for NCMM 2018 & Q1 2019

A selection of press items from 2018 & Q1 2019

2018

Taskén Group research

- Dagbladet, February, *Slik blir fremtidens kreftbehandling*
- Fagbladet Forskningsetikk, June, *Offentlig finansiert forskning til salgs*
- Forskning.no, October, *Offentlig finansiert forskning til salgs*
- Fagpressenytt, October, *Offentlig finansiert forskning til salgs*

NCMM Evaluation

- Forskningsrådet, September, *Norsk senter for molekylærmedisin evaluert*
- Uniforum, October, *Molekylærmedisinsk senter får toppkarakter i evaluering*

Appointment of Janna Saarela as NCMM Director

- Titan.uio.no, October, *Janna Saarela er ny direktør for NCMM*
- Forskning.no, October, *Janna Saarela blir ny direktør for Norsk senter for molekylærmedisin*
- UiO.no, October, *Ekspert i genomikk ved humane immunsykdommer ansatt som ny direktør for NCMM*
- Dagens Medisin, October, Helsefolk *(Janna Saarela bli ny direktør for NCMM)*

Esguerra Group Research

- Digi.no, October 2018, *Er i gang med å la maskinene ta over for legene: – Nå jobber vi med de digitale modellene, sier norsk forsker*
- Titan.uio.no, October 2018, *Du har fått time hos den digitale doktoren*

Funding News

- Med.uio.no, December 2018, *Fri prosjekt-støtte til 12 MED-forskere (Anthony Mathelier awarded FRIPRO funding)*

2019

Funding News

- Dagens Medisin, January, 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)*

Taskén Group Research

- Hindu Business Line, January, *Cadila Pharma inks pact with Norwegian start-up to develop new treatment for heart patients*
- HMT, January, *Norsk-indisk avtale om unik hjertebehandling*
- Inven1, January, *Norsk-indisk avtale om unik hjertebehandling*
- PharmaBiz, January, *Cadila Pharma inks agreement with Norway based Serca Pharma to develop new treatment for heart patients*
- Medical Buyer, January, *Cadila Pharma inks agreement with Norway based Serca Pharma to develop new treatment for heart patients*
- OUH, January, *Research at Oslo University Hospital basis for international drug development initiative between Norway and India*

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*
- 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*


Aftenposten

Slik kan livet på Jorden ha oppstått

Forskere ved Universitetet i Oslo kan ha oppdaget en avgjørende bit i puslespillet det er å forstå livets opprinnelse.


HMT

Norsk-indisk avtale om unik hjertebehandling


18 Viten

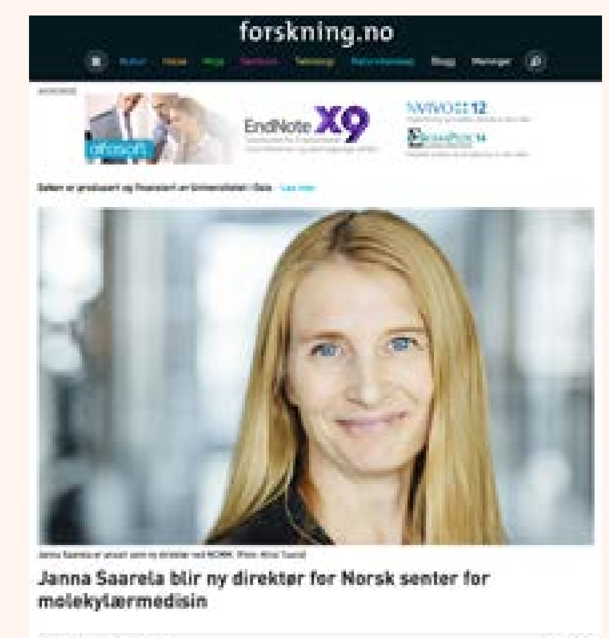
Slik kan livet på Jorden ha oppstått

Forskere ved Universitetet i Oslo kan ha oppdaget en avgjørende bit i puslespillet det er å forstå livets opprinnelse.

FAKTA

Om forsknings-prosjektet


Digital doktor Er i gang med å la maskinene ta over for legene: - Nå jobber vi med de digitale modellene, sier norsk forsker


forskning.no

Janna Saarela blir ny direktør for Norsk senter for molekylærmedisin

NCMM Press cuttings from 2018 and 2019

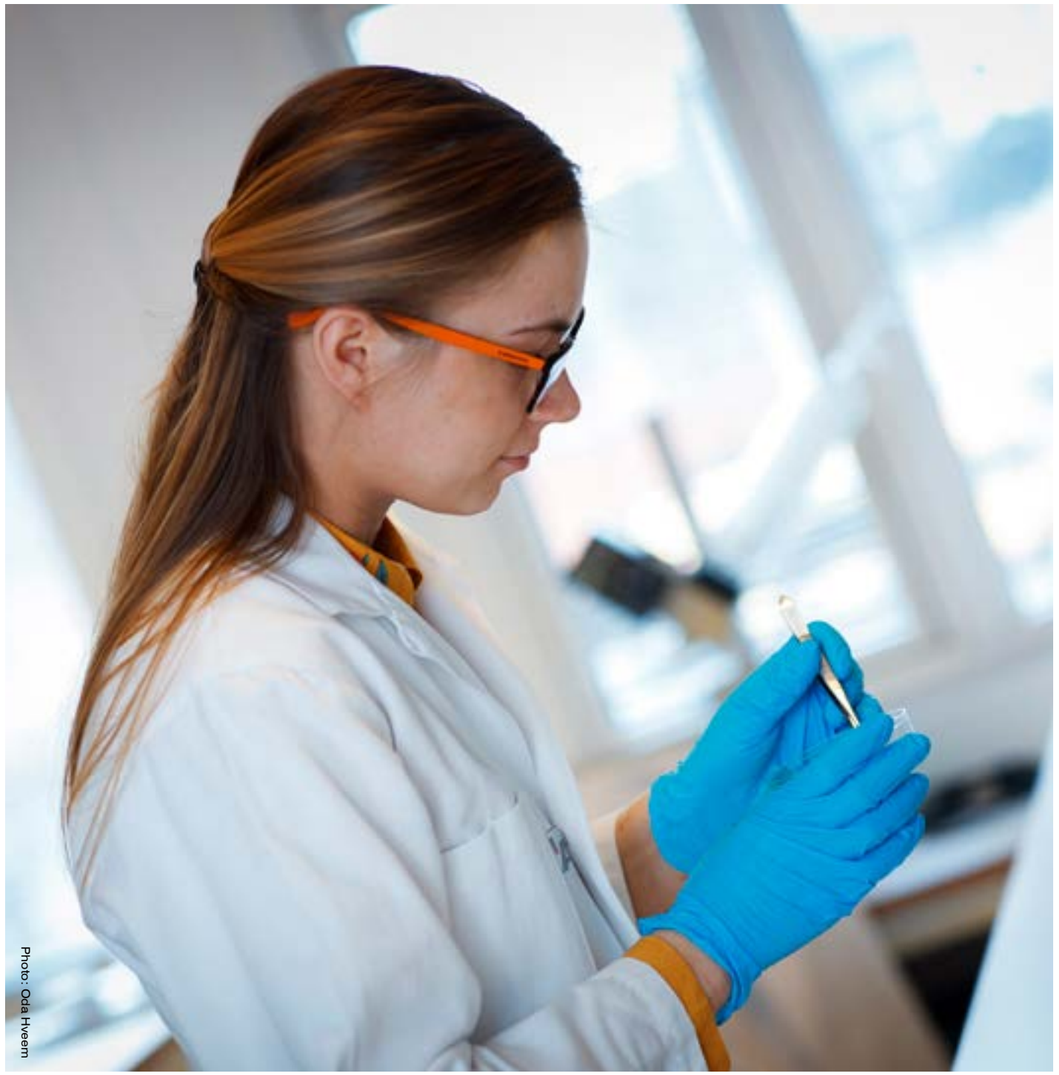


Photo: Oda Hveem

Personnel at NCMM 2018 & Q1 2019

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
Kjetil Taskén *(until July 2018)*
Janna Saarela *(from January 2019)*

Assistant Director
Hartmut Luecke

Chief Administrative Officer
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 *(from September 2018)*

Communications Officer
Annabel Darby

EATRIS Coordinator
Laetitia Abdou Garonne

Higher Executive Officer
Carlos Romeo Rodriguez

IT Team
George Magklaras *(Head of IT)*
Gang Cheng
Melaku Tadesse
George Marselis *(from September 2018)*

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 January 2019)*

Zebrafish Core Facility
Camila V. Esguerra *(Core Facility Leader)*
Rønnaug Kolve Steen *(Head Engineer) (until August 2018)*
Ana C. Sulen Tavara *(Head Engineer) (from December 2018)*
Daniel J. Wrobleski *(Technician) (until September 2018)*

Senior Engineers
Eshrat Babaie *(until January 2019)*
Gladys Tjørhom

Research groups

Membrane Transport Group

NCMM Group Leader
Jens Preben Morth

Principal Engineer
Bojana Sredic *(shared with Luecke Group)*

Postdoctoral Fellows
Johannes Bauer *(until September 2018)*
Harmonie Perdreau-Dahl *(until October 2018)*
Saranya Subramani

PhD Fellow
Julia Weikum

Signalling Networks in Health and Disease (group moved to Oslo University Hospital in October 2018)

NCMM Group Leader
Kjetil Taskén

Scientific Officers
Marianne Enger
Martine Schrøder

Research Scientists
Einar Martin Aandahl
Sigrid Skånland
Postdoctoral Fellows
Theresa Ahrens *(joint with Staerk group)*
Deepak Balaji Thimiri Govinda Raj
Ana I. Costa Calejo
Stalin Chelappa
Dinh-Toi Chu *(until November 2018)*
Andrea Cremaschi
Aleksandra Dukic
Håvard Foyn
Kushi Kushekar
Anna-Mari Lone
Kristina B. Lorvik
Qian Wei

PhD Fellows
Mariaserena Giliberto *(from February 2018)*

Stem Cell Group

NCMM Group Leader
Judith Staerk

Postdoctoral Fellows
Theresa Ahrens *(joint with Taskén Group, until March 2019)*
Safak Caglayan
Artur Cieslar-Pobuda
Adnan Hashim

Students
Burcu Talu *(June – September 2018)*
Madeleine Laudon *(August 2018 – January 2019)*

Computational Biology and Gene Regulation

NCMM Group Leader
Anthony Mathelier

Postdoctoral Fellows
Aziz Khan
Jaime Abraham Castro Mondragón
Roza Berhanu Lemma *(from January 2019)*

PhD Fellow
Marius Gheorghe

MSc Students
Kübra Altinel *(until July 2018)*
Solveig M. Knoph Klokkerud *(from February 2019)*

Structural Biology and Drug Discovery

NCMM Group Leader
Hartmut Luecke

Engineer
Bojana Sredic *(shared with Morth Group)*

Research Scientist
Eva Cunha *(from April 2018)*

Postdoctoral Fellow
Javier Gutierrez *(from November 2018)*

Guest Researcher
Julie E. Heggelund *(from March 2019)*

Cell Cycle Regulations

NCMM Group Leader
Sandra Lopez-Aviles

Head Engineer
Mari Nyquist-Andersen

Research Scientists
Ruth Martîn Martîn
Marina Portantier

Postdoctoral Fellow
Nathalia Chica-Balaguera
(until March 2019)

PhD Fellow
Vilte Stonyte

MSc Student
Marcos Veloso-Carril *(until June 2018)*

Student
Freya Rosenberg *(until February 2018)*

Chemical Neuroscience

NCMM Group Leader
Camila Vicencio Esguerra

Head Engineers
Rønnaug Steen Kolve *(until August 2018)*
Ana C. S. Tavara *(from December 2018)*

Postdoctoral Fellows
David Ramonet-Jimenez
(until August 2018)
Ettore Tiraboschi *(until December 2018)*
Kinga Aurelia Gawel
Wietske van der Ent *(from September 2018)*

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

Research Technicians
Daniel James Wrobleski
(until October 2018)
Nelson Thapelo Mathabela

MSc Students
Rosemary Ogwe Nanji
(from February 2019)

Structural Biology and Chromatin

NCMM Group Leader
Nikolina Sekulic

Principal Engineer
Stine Malene Hansen Wøien

Research Scientist
Dario Segura-Pena

Postdoctoral Fellow
Ahmad Ali Ahmad

Students
Mira Dombi *(from October 2018)*
Oda Selvåg Hovet *(from February 2019)*

Bionanotechnology and Membrane Systems

NCMM Group Leader
Irep Gözen

Postdoc
Inga Põldsalu *(from May 2019)*

PhD Fellows
Elif Köksal
Karolina Spustová *(from October 2018)*
Aysu Kucukturhan Kubowicz
(from February 2019)

Research Assistants
Kira Leitl *(until August 2018)*
Mikkel Killingmoe Christensen
(until August 2018)
Gizem Karabiyik *(from January 2019)*

Computational Biology and Systems Medicine

NCMM Group Leader
Marieke L. Kuijjer *(from October 2018)*

Postdoctoral Fellows
Tatiana Belova *(from June 2019)*

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

Precision Pediatrics and Gene Editing

NCMM Group Leader
Emma Haapaniemi *(from January 2019)*

PhD Fellows
Ganna Reint *(from January 2019)*
Zhuokun Li *(from April 2019)*

MSc Student
Inkeri Soppa *(from January 2019)*

Human Immune Disorders

NCMM Group Leader
Janna Saarela *(from January 2019)*

Breast Cancer Team

NCMM Project Leader
Antoni Hurtado

Postdoctoral Fellow
Shixiong Wang

MSc Students
Madhuri Manivannan *(until July 2018)*
Jose Angel Palomeque Alarcon
(from August 2018)
Anna Khalizieva *(from February 2019)*

Autophagy Team

NCMM Project Leader
Nikolai Engedal

PhD Fellows
Morten Luhr *(until December 2018)*
Paula Szalai

Guest Researcher
Per O. Seglen

Visiting Group from UiT: Stem Cell Aging and Cancer

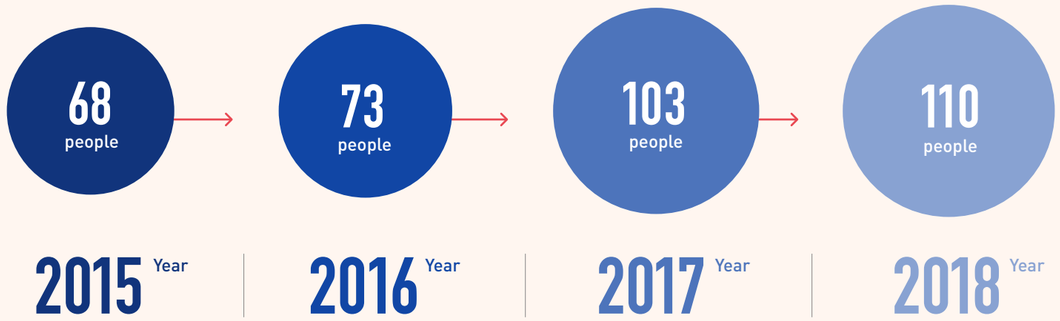
Group Leader
Lorrena Arranz

Postdoctoral Fellows
Aurora Bernal Mera
Luis M. Gonzáles Alonso

PhD Fellow
Alicia Villatoro González

Photo: Oda Hveem

Personnel Statistics 2018

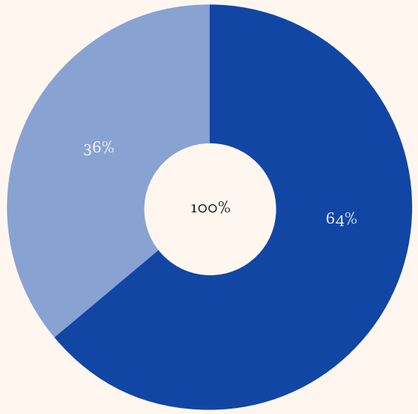


NCMM Staff

NCMM staff distribution in the second five-year period (2015-2019).

The numbers from 2017 represent NCMM after the merger with the Biotechnology Centre. For 2018, the research group of former NCMM Director Kjetil Taskén is included. This research group moved to Oslo University Hospital in November 2018. Three new research groups were recruited to NCMM at the end of 2018/ beginning of 2019 and these groups will grow in size over the coming years. In addition, the Centre is planning to recruit one more research group in 2019/2020.

NCMM Staff – Gender Balance

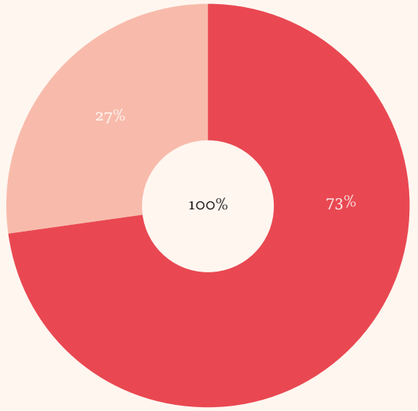


- Female
- Male

Approx. 2/3 of the NCMM staff is female.

–

NCMM Group Leaders – Gender Balance

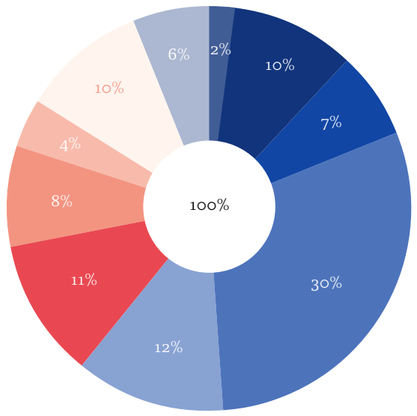


- Female
- Male

Eight of the current eleven group leaders are female.

NCMM Staff according to type of employment

- Director/Assistant Director
- Group Leaders
- Researchers
- Postdocs
- PhD fellows
- Engineers
- Administration
- IT
- Students
- Other Personnel



The overview represents the merged NCMM.

NCMM International Staff

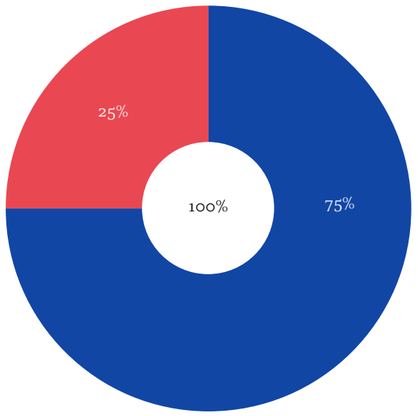
NCMM currently has employees from 38 different countries. 75% of staff are from outside of Norway.

38

diffent countries are represented

–

- International
- Norway



NCMM international staff distribution

As of Q1 2019, staff from

38 NATIONS ARE REPRESENTED

83 PEOPLE

in total are from outside of Norway

01 Countries represented by one person

Argentina, Austria, Bangladesh, Cameroon, Canada, Cuba, Denmark, El Salvador, Estonia, Ghana, Iran, Lithuania, Mexico, Romania, Slovakia, South Africa, Taiwan, The Netherlands, UK and Vietnam

02 Represented by two people

Colombia, Croatia, Etiopia, Greece, Pakistan, Poland, Portugal, Serbia, Ukraine

–

03 people

Finland, Italy, USA

–

04 people

China, France

–

05 people

India

–

06 people

Turkey

–

07 people

Germany

–

10 people

Spain

–

Photo: Oda Hveem

NORDIC EMBL PARTNERSHIP FOR MOLECULAR MEDICINE:

FIMM
Institute for Molecular Medicine Finland
Nordic EMBL Partnership for Molecular Medicine

MIMS
Molecular Infection Medicine Sweden
Nordic EMBL Partnership for Molecular Medicine

NCMM
Centre for Molecular Medicine Norway
Nordic EMBL Partnership for Molecular Medicine

DANDRITE
Danish Research Institute of Translational Neuroscience
Nordic EMBL Partnership for Molecular Medicine

EMBL
European Molecular Biology Laboratory

NORDIC **EMBL**
PARTNERSHIP FOR
MOLECULAR MEDICINE

NATIONAL AND INTERNATIONAL COLLABORATORS:

ESFRI

eu-openscreen

eatris
European infrastructure for translational medicine

Postal Address:

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

Visiting Address:

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