Skisser med relevans innenfor Bioteknologi

Tabell: Oversikt over skisser med relevans for området **Bioteknologi**

Prosjekt-nummer	Prosjekttittel	Søkerinstitusjon	Prosjektleder	Estimert søkt beløp fra NFR
316175	NorMet – Norwegian Infrastructure for Metabolomics	NTNU (UiB, UiO, UiT)	Per Bruheim	105 250 000
316393	NOR-Openscreen II – The Norwegian node of EU-OPENSCREEN ERIC	UiO (UiB, UiT, SINTEF)	Johannes Landskron	45 416 000
316403	Life Science Electron Microscopy Center (LSEMC)	UiO (NMBU, UiT)	Norbert Roos	178 644 000
316405	National network of Advanced Proteomics Infrastructure phase 2	UiO (OUS, UiO, UiB, NTNU, UiT, NMBU)	Tuula Nyman	90 000 000
316409	Norwegian Nuclear Magnetic Resonance Platform 2	NTNU (UiO, UiB, UiT, SINTEF)	Olav Haraldseth	90 000 000
316414	Norwegian Infrastructure for Microbial Genomics	FHI (OUS, UiO, UiB, HUS, NTNU, St. Olav hospital, NMBU, UiT, UNN, NVI, Nofim)	Dominique A. Caugant	90 400 000
316427	Norwegian Advanced Light Microscopy Imaging Network Phase II (NALMIN-II)	UiO (UiB, NTNU, UiT, OUS)	Harald A. Stenmark	69 100 000
316428	The Norwegian X-ray Diffraction and Scattering Resource Centre (RECXII)	UiO (NTNU)	Helmer Fjellvåg	30 000 000
316432	National Human iPS Cell Biobank	OUS (UiO, HUH/UiB, St.Olavs/NTNU, Biobank Norway)	Joel C. Glover	26 600 000
316440	Centre for Biodiversity genomics	UiO (NTNU, UiB, UiT, OUS)	Kjetill Sigurd Jakobsen	58 480 000
316443	Norwegian Bioscreening Platform for Laboratory Fish	NMBU (UiO, NTNU, UiB, Nord Universitet)	Peter Aleström	92 245 000
316445	Norwegian Rheology Laboratory	UiS	Mahmoud Khalifeh	120 000 000
316467	Norwegian Infrastructure for Climate-smart Soil Management - CSM	NMBU (NIBIO, CICERO)	Peter Dörsch	79 000 000
316468	Infrastructure for Precision Diagnostics for Clinical Cancer Trials; InPreD - Norway	OUS (OUS, HUS, UNN, St. Olavs Hospital, SUS, Ahus)	Hege Elisabeth Giercksky Russnes	115 000 000
316481	National Bioprocessing & Fermentation Centre - NBioC phase 2	NORCE (SINTEF, NOFIMA, UiT, UiB, UiS)	Catherine Boccadoro	69 000 000
316487	ELIXIR3 - Strengthening the Norwegian Node of ELIXIR	UiB (UiT, NTNU, NMBU, UiO)	Inge Jonassen	190 000 000
316494	Oppgradering av bioprosseseringsanlegg for maksimal økonomisk og bærekraftig utnyttelse av marine råvarer	NOFIMA AS	Ragnhild Dragøy Whitaker	23 200 000
316502	Norwegian Biorefinery Laboratory III	RISE PFI AS (SINTEF Energy, SINTEF Industy, NTNU, NIBIO, NMBU)	Øyvind Eriksen	50 000 000
316544	National research infrastructure for biopharmaceutical process development and production	SINTEF AS	Hanne Haslene-Hox	91 000 000

316559	Museum collections for the future. The Norwegian digitization laboratory for museum specimens at the Arctic University Museum of Norway	UiT	Andreas Altenburger	28 448 000
316560	Endring og oppgradering av SINTEF Oceans mobile anlegg for prosessering av marine råstoffer.	SINTEF OCEAN AS	Bendik Toldnes	9 181 500
316583	Biobank Norway 4 - a National Biobank Research Infrastructure	NTNU (UiT, UiB, UiO, NTNU, Helse Nord, Helse Vest, Helse Sør-Øst, Helse Midt, Kreftregisteret, FHI, OUS)	Kristian Hveem	95 000 000
316600	Mandatory draft for infrastrucutre application Center for Land-based Aquaculture, CLA	NORD UNIVERSITET (LetSea, SINTEF Ocean and NCE Aquaculture)	Mette Sørensen	32 500 000
316603	Microalgae platform for Norway	NORD UNIVERSITET (NIBIO, UiT, NIVA, VUC)	Kiron Viswanath	63 350 000
316607	Infrastructure for a sustainable ocean economy and conservation of the ocean genome	NORCE (UiS, UiB, IMR, UiA, SINTEF Ocean, NIVA, DNV GL, RevOcean, MBARI, IFREMER, DTU Aqua, Bremnes Seashore, Skretting AS)	Thierry Baussant	17 188 660
316609	Establishment of a new advanced imaging platform in the Oslo region	OsloMet (SimulaMet, Fertilitetssenteret)	Trine Berit Haugen	12 351 454
316610	NIBIO-XCT - An integrated X-ray Computed Tomgraphy (XCT) facility for the Ås campus (NIBIO/NMBU/Veterinærhøgskolen)	NIBIO (NMBU, Veterinærhøgskolen, Kimen Såvarelaboratoriet AS)	Adam Vivian-Smith	40 973 000
316616	Norwegian Plant Phenotyping Platform	NMBU (UiO, NTNU, UiT, NIBIO)	Morten Lillemo	50 000 000

Prosjektnummer: 316175
Tittel: NorMet – Norwegian Infrastructure for Metabolomics
Søkerinstitusjon/partnere: **NTNU** (UiB, UiO, UiT)
Prosjektleder: Per Bruheim

Kort sammendrag:
NorMet – Norwegian Infrastructure for Metabolomics – is an initiative for joining resources and competence on detection, identification and quantification of small molecular components (<1500 Da, i.e. metabolites) of living organisms. NorMet will provide users with a broad selection of analysis of metabolites (Metabolomics), that includes metabolic fluxes (turnover of metabolites; Fluxomics) and lipids (Lipidomics). The infrastructure will focus on chromatography and mass spectrometry-based technologies, but will collaborate closely with other technology platforms and e-infrastructures to provide the most comprehensive and complete service for the users.

The study of metabolites (their concentrations and fluxes) provides a picture of the state of the cell/organism at a specific time point and are generally more precise phenotypic descriptors than RNA or proteins. Still, whereas genomics, transcriptomics, proteomics have developed into mature technologies with extensive service infrastructures established for Norwegian scientists, Metabolomics is less established on the technology side and completely underdeveloped at the service side in Norway. Metabolomics has emerged as a highly topical field that has led to major discoveries in biomedicine, agriculture and geobiochemistry; however, there are still non-resolved challenges throughout the whole Metabolomics workflow from study design, sampling and sample processing, analyzing and post-analytical processing incl. interpretation (data analysis tools, metabolite libraries and databases are also required). It is therefore correct timing for Norwegian universities to join forces, like other comparable countries have already done the last 4-6 years, to put Norwegian scientists at pace with the international community and further advance the field of Metabolomics. The NorMet partners have together with NMR-Metabolomics groups formed the Norwegian Metabolomics Network as a discussion and information forum for researchers/ groups interested in metabolomics. The NorMet infrastructure project will provide a broad specter of expert services within metabolomics, both on quantitative targeted and untargeted analysis within health, industrial and marine applications, that should cover most needs within the Norwegian life science community. This will be possible through investment in state-of-the-art LC-GC-MS instrumentation in strong research groups with experience in MS based Metabolomics that are committed to build and operate the research infrastructure on behalf of the four partner universities. Collaborations with several other infrastructure initiatives will provide a more complete service offer. Service will be open for the other universities, research institutions, industry and other public agencies.

Prosjektnummer: 316393
Tittel: NOR-Openscreen II – The Norwegian node of EU-OPENSCREEN ERIC
Søkerinstitusjon/partnere: **UiO** (UiB, UiT, SINTEF)
Prosjektleder: Johannes Landskron

Kort sammendrag:
NOR-Openscreen started as a national RI with funding from the NFR in 2016. It consists of four facilities located in Oslo (UiO, NCMM), Bergen (UiB, BiSS), Trondheim (SINTEF) and Tromsø (UiT, Marbio), and represents the Norwegian node of the EU-OPENSCREEN ERIC. The RI delivers services in the area of chemical biology, high throughput screening, cheminformatics and bioprospecting to both the public (academic research groups, hospitals) and the private sector, from SMEs to large life science and pharma companies. The different nodes are very specialized with regard to instrumentation, technologies and services that are made available to the users. UiO is hosting the project and the majority of the networks' chemical compound collection (~70 000 molecules) and

offers a broad variety of screening technologies. UiB is specialized on structure-based approaches like fragment screening and the cheminformatics. SINTEF has a strong background in mass spectrometry and metabolomics and UiT is the bioprospecting node, offering pipelines for purification, characterization and screening of natural products mainly from marine sources. In the present application the RI is applying for a phase II funding to implement novel emerging technologies to maintain its cutting edge position.

Prosjektnummer: 316403
Tittel: Life Science Electron Microscopy Center (LSEMC)
Søkerinstitusjon/partnere: **UiO** (NMBU, UiT)
Prosjektleder: Norbert Roos

Kort sammendrag:
The proposed infrastructure is of national importance and critically essential among the future technology platforms to be accommodated in the Life Science Building (LSB) that is being built in Oslo. In the new building an area of 650m^2 is being custom-built for, and dedicated to, this infrastructure. The major thrust of this application is to introduce new technologies such as cryo-electron microscopy of single particles (Nobel Prize 2017), which Norway (as the only Nordic country and one of the few European countries) does not offer its scientific community yet. The University of Oslo has declared it's intention to implement this technology in the LSB. This type of instrumentation is very expensive and requires a skilled workforce to operate it and we do not see it feasible to establish more then one of these centres in Norway. Combined with the fact that the new LSB has custom built housing for this facility we would argue that UiO is the best place to take care of this infrastructure.

It is clear that cryo-electron microscopy would thrive optimally in a life science electron microscopy environment. It will enable the study of biological specimens from organs, tissues, cells, subcellular structures down to the atomic composition and structure of biological molecules, by offering the complete arsenal of life science electron microscopy techniques and instrumentation.

The proposed infrastructure is therefore building on an existing one, namely the Life Science Electron Microscopy Consortium (LSEMC) core facility that currently is spread across different departments/faculties at UiO and OUS. It will be beneficial to co-localize these activities in the new Life Science Building, thus avoiding duplication of expensive scientific equipment at UiO locally and in Norway nationally. The existing scientific and technical expertise (human expertise) represented at UiO today will provide a robust

environment for the integration of cryo-electron microscopy of single particles into a comprehensive life science electron microscopy facility. We also envisage a participation in the ESFRI system of international research infrastructure as well as participation in scandinavian networks, such as cryo-NET.

Prosjektnummer: 316405
Tittel: National network of Advanced Proteomics Infrastructure phase 2
Søkerinstitusjon/partnere: **UiO** (OUS, UiO, UiB, NTNU, UiT, NMBU)
Prosjektleder: Tuula Nyman

Kort sammendrag:
The National Network in Advanced Proteomics phase 2 (NAPI2) is an extension to NAPI funded by RCN in the INFRA2018 call (Project no 295910). With NAPI2 application we will expand NAPI's current capabilities by including emerging new techniques and proteomics instruments currently not

available to the Norwegian research community. NAPI2 application will have 'Clinical proteomics' as the main theme. Clinical proteomics is the application of proteomics technologies and informatics tools to identify proteins involved in diseases in order to understand disease mechanisms, and to be able to detect and monitor specific disorders to improve patient care. As emerging new techniques, we will establish imaging mass spectrometry, array-based proteomics, single cell proteomics, and automated sample handling and microfluidics. NAPI2 is a critical and very timely application and it will have major impact on all life science research in Norway.

Prosjektnummer: 316409
Tittel: Norwegian Nuclear Magnetic Resonance Platform 2
Søkerinstitusjon/partnere: **NTNU** (UiO, UiB, UiT, SINTEF)
Prosjektleder: Olav Haraldseth

Kort sammendrag:
The NNP-2 project's aims are to upgrade and expand the present Norwegian NMR platform (NNP - a national infrastructure on the RCN Roadmap) in order to maintain existing high-field capacity and quality and introduce new functionality. This will add new methods and possibilities for state-of-the-art applications of high-field NMR technology for Norwegian researchers and industry in a broad range of research fields of national importance. More specifically NNP-2 aims to:

- Expand the geographical and thematic coverage through inclusion of new nodes
- Ensure continued and new state-of-the-art functionality of the existing NNP infrastructure through upgrades.
- Establish a national infrastructure for MR metabolomics as part of NNP-2
- Establish a national infrastructure for solid state NMR as part of NNP-2

To this end, NNP-2 will upgrade and expand the present NNP with the inclusion of the NMR labs at UiT, SINTEF in Oslo, and the MR Core Facility at the Faculty of Medicine and Health Sciences (MH) at NTNU. The NNP-2 will thus have 6 nodes localized in Bergen, Tromsø, Trondheim (2 locations – NV Faculty and MH faculty) and Oslo (2 locations – UiO and SINTEF).

All these nodes have their own specific scientific and technological expertise, competence and experience. The 6 nodes are highly complementary and will offer the Norwegian research community a broad range of methods and services on a high international level of quality.

- Investments in NNP-2 will focus on maintaining the state-of-the-art level of the very-high-field (≥800MHz) instruments of the existing NNP through upgrades and includes important added functionality that will push the sensitivity limit and increase the spectral quality of liquid samples. These investments will benefit a broad range of Norwegian research communities of high national importance within medicine, chemistry, biotechnology, food sciences, toxicology, material science, energy, environment, and biology.
- The establishment of a national infrastructure for high-throughput MR metabolomics analysis of liquid and tissue samples will significantly benefit research in clinical medicine and population-based studies by facilitating discovery of disease mechanisms, new therapeutic targets and new methods for diagnosis and treatment follow-up.
- The establishment of a national infrastructure in solid state NMR enables for the first time in Norway highfield solid state NMR and will have great impact on research within material sciences and structure elucidation of proteins and systems in life science research.

Project number: 316414
Title: Norwegian Infrastructure for Microbial Genomics
Applicant (partners): FHI (OUS, UiO, UiB, HUS, NTNU, St. Olav hospital, NMBU, UiT, UNN, NVI, Nofim)
Project Manager: Dominique A. Caugant

Short summary:
The development of new sequencing technology is permitting rapid elucidation of whole genomes of microbes involved in all kind of infections and is having a determinant impact on our understanding of disease transmission and evolution. This is illustrated in our present fight of the global threat elicited by SARS-CoV-2. Analysis of the first 160 complete virus genomes sequenced from human patients elucidated the original spread of this new coronavirus. Now thousands of coronavirus genomes have been sequenced and identification of different phylogenetic viral lineages might help predict future global hot spots of disease transmission and surge.

The Norwegian Infrastructure for Microbial Genomics (NIMG) is a national initiative bringing together the leading research environments within microbial genomics in Norway. Its aims are to promote the use of advanced sequencing technology, to provide means for handling large amount of sequence data and developing new bioinformatics tools in order to solve important research questions concerning infectious diseases, such as those related to antimicrobial resistance development, the development of virulence and the epidemiological spread of pathogens between humans, and to humans from animals and the environment.

This funding application is a request for: 1) establishment or adaptation of a general IT infrastructure that facilitates storage, sharing and analysis of microbial sequence information linked to sensitive data; 2) setting up analytical pipelines that can be easily accessible, facilitating sharing of both genomic sequence data as well as corresponding metadata and tools; 3) setting up a team of experts (help desk) that can assist users in performing their analyses; and 4) building microbial bioinformatics expertise in Norway by establishing a network of bioinformaticians serving the different partners. The NIMG infrastructure is working in close collaboration with ELIXIR through BioMedData (funded by RCN) in the development of a structure allowing portability of the microbial and human data between the partners and exchange of expertise, especially in the metagenomics area. As an IT infrastructure, NIMG will permit storage, immediate sharing and analysis of data linked to microbial sequence information in a secure way and as such will be an essential tool to fight infectious diseases.

Prosjektnummer: 316427
Tittel: Norwegian Advanced Light Microscopy Imaging Network Phase II (NALMIN-II)
Søkerinstitusjon/partnere: **UiO** (UiB, NTNU, UiT, OUS)
Prosjektleder: Harald A. Stenmark

Kort sammendrag:
Norwegian Advanced Light Microscopy Imaging Network (NALMIN), which has nodes in Oslo (UiO and OUS), Bergen (UiB), Trondheim (NTNU) and Tromsø (UiT), provides Norwegian life scientists access to cutting-edge light microscopes. Since the establishment of NALMIN, there has been a rapid technological development in live microscopy, and NALMIN Phase II (NALMIN-II) is dedicated to the implementation of the most advanced light microscopy of live specimens. NALMIN-II will have the same nodal distribution as NALMIN, and there will be a nodal specialization of services offered so that a broad spectrum of advanced light microscopy technologies can be offered to the Norwegian research community. NALMIN will cooperate with BioMedData and ELIXIR for data handling and

storage. Services will include access to microscopes and advanced image analysis software, microscopy and image analyses on demand, courses, workshops and hands-on training. As member of the European Research Infrastructure Consortium (ERIC) Euro-BioImaging, NALMIN also welcomes international visitors, and NALMIN members are offered access to European infrastructures in advanced light microscopy.

Prosjektnummer: 316428
Tittel: The Norwegian X-ray Diffraction and Scattering Resource Centre (RECXII)
Søkerinstitusjon/partnere: **UiO** (NTNU)
Prosjektleder: Helmer Fjellvåg

Kort sammendrag:
X-ray diffraction and scattering are essential tools for structural science, used in everything from batteries to biology. Recent developments in X-ray sources, detectors and optics are bringing experiments previously only possible at large-scale facilities like synchrotrons to the home laboratory. We will harness the latest instrumentation to bring new experimental capabilities to the highly successful Norwegian National Resource Centre for X-ray Diffraction and Scattering (RECX). The investments proposed will also extend user base of the centre, making what is already a valuable resource for inorganic materials science, analytical chemistry, and soft matter in Norway more relevant for the life science and operando communities. The investments in Oslo will focus on two new instruments, a dedicated "BioSAXS" small angle scattering system and an operando specific powder X-ray diffractometer. Both machines will be equipped with the latest 2 D detector technology, high intensity X-ray sources and optics. To deliver maximum utility to the user community from the instrument platform we will invest heavily in sample preparation, process automation and sample environment equipment. This will create a lab where users from a range of disciplines can carry out very advanced experiments: examining the structure of working materials and devices, following biological processes in real time and studying samples available only in tiny volumes. The investments in Trondheim will also focus on two new instruments, where the first instrument will be dedicated to characterization of thin films and texture and strain in bulk materials, while the second instrument will focus on non-ambient X-ray diffraction under controlled atmosphere. Both instruments will be equipped with state-of-the-art detector technology, X-ray source and optics optimised for the purpose. The instruments will be configured to cover and promote expanding demand in the user community. RECX-II will, like RECX, act as a focus for X-ray based science in Norway. It will bring cutting-edge experiments from the large-scale facilities to a wider user base in the home laboratory, allow users to arrive well prepared for experiments at advanced large-scale facilities (in which Norway has already made significant investments), and act as a gathering point for the X-ray scattering and diffraction communities.

Prosjektnummer: 316432
Tittel: National Human iPS Cell Biobank
Søkerinstitusjon/partnere: **OUS** (UiO, HUH/UiB, St.Olavs/NTNU, Biobank Norway)
Prosjektleder: Joel C. Glover

Kort sammendrag:
Since their introduction to the scientific community in 2008, human iPS cells have revolutionized the field of human cell biology by providing an ethically viable source of all human cell types. This is particularly relevant for studying human disease, since iPS cells can form the basis for in vitro disease models at personalized resolution. The generation of human iPS cell-based in vitro disease models is steadily increasing internationally and in Norway. The Norwegian Center for Stem Cell Research spearheaded this approach in Norway through its Core Facility for Human Pluripotent Stem Cells, which has been making patient- and healthy control donor-derived iPS cells since 2012, has developed standardized differentiation protocols for several cell types, and combined this expertise

with other technologies to generate microfluidic-based personalized neurological disease models. Research groups in Bergen and Trondheim have followed suit - it is expected that use of iPS cell-based human in vitro disease models will accelerate throughout Norway in the coming years.

iPS cells have also substantial potential as therapeutic agents. International analyses point to the pressing need for utilizing stem cells in future medical therapeutics. Japan has been the prime mover, under the direction of Nobel Prize-winner Shinya Yamanaka. His Center for iPS Cell Research and Application (CiRA) at Kyoto University has established a national biobank of allogeneic iPS cells from so-called “super-donors” (homozygous for multiple HLA haplotypes) to meet the needs of nearly the entire ethnic Japanese population for clinical grade cells for tissue and organ replacement and repair. Norway has an exceptionally strong starting point for such a biobank, given its genetically relatively homogeneous population and well-organized patient and health registries. In particular, the Norwegian Bone Marrow Donor Registry contains HLA data for a large number of individuals, among which several “super-donors” have already been identified.

The purpose of the National Human iPS Cell Biobank is twofold: 1) to extend and expand Norway’s expertise and capabilities in the area of in vitro human disease modeling, and 2) to capitalize on Norway’s highly favorable position to generate its own allogeneic iPS cell resource, thus providing the Norwegian population with locally produced, characterized, certified and available cells for currently planned and future stem cell-based clinical trials and treatments. To this end, a biobank of iPS cells with a research grade component and a clinical grade component will be established, through respectively 1) coordination of efforts at multiple, transregional institutions currently generating research grade human iPS cells and developing in vitro human disease models from these (Oslo and Bergen to begin with, and Trondheim as next on the list), and 2) an integration of expertise and efforts at the Norwegian Core Facility for Human Pluripotent Stem Cells, the Norwegian Bone Marrow Donor Registry, and the Ex Vivo Laboratory at Oslo University Hospital to create clinical grade iPS cells from already identified super-donors. The National Human iPS Cell Biobank will partner with the existing national infrastructure Biobank Norway, creating a mutually beneficial development, built on prior investment from the NRC, to increase and secure the national availability of personalized cellular material for medical research and therapeutics.

Prosjektnummer: 316440
Tittel: Centre for Biodiversity genomics
Søkerinstitusjon/partnere: **UiO** (NTNU, UiB, UiT, OUS)
Prosjektleder: Kjetill Sigurd Jakobsen

Kort sammendrag:
The proposed Centre for Biodiversity Genomics (CEBIGEN) will deliver high quality reference genomes, population genomics data, transcriptome, metagenome and other relevant "genomics" services for all types of research associated with non-human samples. CEBIGEN will provide consultation, run projects from biological samples to analysed genomic data using state-of-the-art pipelines. CEBIGEN will focus its services to all types of biodiversity research implying that it provides complete pipelines for analyses of all kinds of non-human biological samples - ranging from bacteria, microbial eukaryotes, algae, plants, invertebrates and vertebrates. The ambition is to build a national genome centre specialized for the various and diverse needs of research on non-model organisms and non-human models. The need for such a genome centre is driven by threats to biodiversity, ecosystems, climate change as well as the great potential of exploiting genomic information for the benefit of mankind and for developing a sustainable blue-green economy in Norway. An additional driver is the fast emergence and progress of international projects such as the Earth BioGenome (E BP) and related projects aiming at sequencing all existing eukaryotic organisms on earth. Norway needs to relate to

these transformative projects, and currently we do not have sufficient capacity regarding sequencing instruments, bioinformatics and computing to efficiently carry out a full-scale EBP-Norway effort.

Prosjektnummer: 316443
Tittel: Norwegian Bioscreening Platform for Laboratory Fish
Søkerinstitusjon/partnere: **NMBU** (UiO, NTNU, UiB, Nord Universitet)
Prosjektleder: Peter Aleström

Kort sammendrag:
The Norwegian Bioscreening Platform for Laboratory Fish (LABFISH) will be a national platform for *in vivo* bioscreening in the life sciences using laboratory fish, i.e. zebrafish (*Danio rerio*) and medaka (*Oryzias latipes*). The platform will deliver advanced high-throughput whole-organism bioassay systems for the Norwegian research community. LABFISH will be a multi-nodal platform, centered at NMBU and UiO in the Oslo region, with additional nodes at UiB in Bergen, NTNU in Trondheim and Nord U in Bodo, and collaborating closely with UiT in Tromso.

The platform will be used by the Norwegian research community to accelerate the discovery of bioactive small molecules and natural bioresources with commercial potential as pharmaceuticals or as feed ingredients. LABFISH will be also used to systemically study environmental, toxicological and genetic perturbations to assess the impact of pollutants, radiation, drugs and disease-associated genetic, epigenetic, transcriptomic or microbiomic variations. Transgenic reporter lines and xenograft models with cell type- and/or cell state-specific expression of fluorescent or luminescent proteins will enable the rapid quantification of physiological responses relevant for a wide range of diseases in human, veterinary and aquatic medicine. The platform will be established within the new and/or existing model fish facilities at NMBU, UiO, UiB, NTNU and Nord U thereby leveraging and strengthening these major strategic investments in the life sciences by the partner institutions. The equipment and competence installed by LABFISH will bring substantial added value to these facilities and will deliver to national research institutions technology that is competitive at the highest international level. Automated and robotic equipment will be installed in the platform including pipetting robots, embryo and cell sorters, and medium- to high-throughput bioimaging systems. A cryopreservation facility will reduce the numbers of live fish (RRR) needed to maintain multiple laboratory fish lines. LABFISH will operate as an open-access platform on a user-pays principle to partially recoup investment costs and to help ensure operability. LABFISH will be professionally managed by a board, a director, and experienced node managers. This management team will work in close consultation with (1) a user committee including members of the academic, governmental and industrial partners in Norway and Europe, and (2) an international scientific advisory board.

Prosjektnummer: 316445
Tittel: Norwegian Rheology Laboratory
Søkerinstitusjon/partnere: **UiS**
Prosjektleder: Mahmoud Khalifeh

Kort sammendrag:
Rheology is the science of deformation and flow of materials, ranging from liquid to solid materials such as food, drilling fluids, paints, polymers, blood, medicine, concrete, rocks, ceramic-based materials, gas hydrates, etc. Rheology is a fundamental subject for understanding fluid systems and the dynamic behaviour of solids. The main objectives of the proposed infrastructure are: a) to develop cutting-edge techniques for rheological analysis and characterization combined with advanced data processing and image processing methods; b) modelling rheological behaviour for

processing and design; c) facilitate the discovery and development of new functional materials and fluids for use in industries and in society; d) improve process control in advanced production by generating in-depth understanding of the rheological properties of materials (from feedstock to intermediate and final products). This infrastructure project will bring together leading Norwegian academic and research environments within the field of rheology. The partners in Norwegian Rheology Laboratory (NRL) have a wide range of active research activities related to rheology, such as Pumps & Pipes (UiS, NORCE), research on movement of cancer cells (UiS), sustainable technologies such as carbon capture and storage, hydrogen-based technologies, multiphase flow systems, oil-water dispersions (IFE, SINTEF Industry, NTNU) and processrelated technologies (SINTEF Industry, NTNU, IFE) including oil & gas and energy, background on food and biotechnology (NMBU) and development of new advanced carrier systems for pharmaceuticals based on nanoparticles and complex gels (UiO). The infrastructure project will strengthen multi-disciplinary collaboration related to rheology in Norway and with leading international environments, and result in common project applications, exchange of fellows, students, and experience, and sharing equipment. The collaboration will also help strengthen smaller research environments within rheology in Norway. The NRL will also support industrial research and collaboration, helping SMEs and industries in developing/ optimizing their services. We plan the infrastructure to be fully operational within 3 years. NRL will provide services and leading research infrastructure to academia, research organizations and industries, and will make Norway a leading country within rheological innovation, science and technology.

Prosjektnummer: 316467
Tittel: Norwegian Infrastructure for Climate-smart Soil Management - CSM
Søkerinstitusjon/partnere: **NMBU** (NIBIO, CICERO)
Prosjektleder: Peter Dörsch

Kort sammendrag:
Norway's agricultural sector is under great pressure to reduce its greenhouse gas (GHG) emissions and has pledged itself to reduce 5 million tons of CO2 equivalents by 2030, roughly the equivalent of one year's climate forcing by the Norwegian agricultural sector.1 Despite much focus on how to estimate GHG emissions from agriculture and to make the sector's GHG savings visible2 , evidence-based approaches to curb nitrous oxide (N2O) emissions and to increase soil carbon sequestration remain understudied and techniques to reliably document such mitigations are missing. This despite the fact that soils are anticipated to play an important role in combating climate change3 . A national infrastructure on soil management seems timely, given soils' role for food security, renewable raw materials and as recipient of waste streams in a circular bioeconomy. A major barrier for using soils more actively for GHG mitigation in Norway is the lack of data documenting management-specific effects on N2O emissions and soil C sequestration under Norwegian conditions. While N2O emissions are highly episodic, C sequestration and turnover in soils are slow processes, making it difficult to observe both processes at the same time. The CSM infrastructure is designed to overcome these limitations by providing a network of state-of-the-art research facilities across different scales, ranging from highly instrumented field-laboratories at campus Ås and NIBIO Apelsvoll to mobile GHG measurements units that will be deployed in a nation-wide network of agronomic and real-farm field sites to a data infrastructure integrating data for industrial and public stakeholders. Once established, this infrastructure can be used for developing and rigorously testing climate-smart soil management strategies and for deriving region- and management specific emission factors urgently needed to improve national emission inventories. CSM directly addresses the bio-industry by aligning national agronomic GHG research with the needs of industries engaged in fertilizer production, mining, waste treatment and bioproduction. It serves the farming sector as a whole by providing data for disintegrating emission factors to be used to meet the sector's GHG targets. CSM is proposed jointly by NMBU, NIBIO and CICERO.

Prosjektnummer: 316468
Tittel: Infrastructure for Precision Diagnostics for Clinical Cancer Trials;
InPreD - Norway
Søkerinstitusjon/partnere: **OUS** (OUS, HUS, UNN, St. Olavs Hospital, SUS, Ahus)
Prosjektleder: Hege Elisabeth Giercksky Russnes

Kort sammendrag:
A key element guiding modern cancer treatment is the ability to perform detailed molecular characterization of biological properties of each patient's disease – precision cancer medicine. During the last decade, clinical cancer trials have increasingly demanded extended molecular testing (incl. multidisciplinary diagnostics), but no dedicated national research infrastructure supporting such activities have been established. As a consequence, there is a gap between the opportunities for precision cancer medicine provided by advances in technology versus molecular diagnostics implemented in cancer diagnostics. A reform of practice towards precision cancer diagnostics and treatment requires controlled testing through clinical trials. The university hospitals in Norway have built competence in individual technology areas, but in order to make these investments benefit the patients through clinical trials, interactions across disciplines must be improved and the competences and technology available nationally must be coordinated. A national Infrastructure for Precision Diagnostics (InPreD – Norway) will secure a robust, interactive structure facilitating clinical cancer trials on a national level by providing equal access to advanced diagnostics, state-of-theart competence and technology. It will be complementary to other infrastructures supporting clinical trials (i.e. NorCrin) and synergize with established technology-defined infrastructures. InPreD – Norway will facilitate Norwegian researchers to conduct molecular defined clinical trials at an international level, but will also enable interaction between Norwegian and international clinical trial groups in larger precision medicine multicenter trials. The infrastructure will secure faster transitions from research tools to diagnostic tests and will secure Norwegian cancer patients access to front-line medical treatment and at the same time provide multi-disciplinary research opportunities and allow new stake-holders, such as biotechnological industry and start-ups to connect to national infrastructures for clinical trials and pre-clinical research.

Prosjektnummer: 316481
Tittel: National Bioprocessing & Fermentation Centre - NBioC phase 2
Søkerinstitusjon/partnere: **NORCE** (SINTEF, NOFIMA, UiT, UiB, UiS)
Prosjektleder: Catherine Boccadoro

Kort sammendrag:
This application is to establish the second phase of the scaling up and pilot Norwegian Bioprocessing & Fermentation Centre (NBioC), responding to the need for a unique national Research infrastructure (RI) for fermentation research, as described in the Norwegian research infrastructure road map. The implementation of phase 1 of NBioC is currently underway. This first phase is funded by the NFR through INFRA2016 grant (project 270048), with in-kind contributions and industry support, and establishes an infrastructure at NORCE for scaling up of fermentation using sugar-based and gaseous feedstocks. Phase1 covers part of the funding necessary to fulfil the ambition of NBioC and includes funds for establishing laboratories and enabling gas and other fermentation up to 150L scale, as well as securing access to infrastructure and data from an industry enzyme production line. The support sought in the current proposal is to extend this infrastructure to include a 1000L state-of-the-art reactor for fermentation on gas sources including necessary sensors and downstream equipment to enable process optimization, scaling up and product analysis and testing, as well as access and data collection for R&D projects in existing 1 500L reactor for sugar-based fermentation. In addition, a strong infrastructure network will be built between members of the consortium, in this process linking up and upgrading key existing facilities across Norway to boost R&D to higher TRL levels and develop a strong drive towards gas fermentation in Norway. The total budget amounts preliminarily

to 89 MNOK of which 69 MNOK is sought funded by NFR. This will finance equipment investment, projects, operation and maintenance as well as development activities for new projects and the NBioC as a whole. The current consortium includes the NBioC partnership from phase 1 and the full application will most likely extend to other universities or infrastructures in Norway or internationally.

Prosjektnummer: 316487
Tittel: ELIXIR3 - Strengthening the Norwegian Node of ELIXIR
Søkerinstitusjon/partnere: **UiB** (UiT, NTNU, NMBU, UiO)
Prosjektleder: Inge Jonassen

Kort sammendrag:
With the ELIXIR3 proposal, we apply for funding to continue and to upgrade the operation of ELIXIR Norway, the Norwegian node of ELIXIR, the European research infrastructure for life science data, an ESFRI Landmark. Within the ELIXIR3 project, we seek to intensify our support towards users working with human data and precision medicine, biodiversity, and also users integrating data from several 'omics data sources. Alongside with this, we will continue and upgrade our operation as the Norwegian bioinformatics infrastructure, by offering an e-infrastructure platform for storing, sharing and analysing data, to provide bioinformatics user support, including data management support, at different levels, with tailored workflows to ease analysis, and training in using our tools and resources. Furthermore, we will contribute to the operation of ELIXIR on a European level and to provide tools and data resources that form part of the ELIXIR portfolio of services. Open processes, involving external scientific review, will be set up to allow bioinformatics research groups at the institutions owning the infrastructure to apply for their resources to be included and supported in the set of services provided by the Node. Our data management activities as part of the BioMedData infrastructure will be integrated into ELIXIR3 when BioMedData ends in 2023. Throughout our activities, work will be done in coordination and collaboration with relevant research infrastructures, including data generating platforms, domain oriented networks and infrastructures, the generic e-infrastructure provider Sigma2, as well as Digital Life Norway. Outreach and training activities will be coordinated with national research schools and institutional educational programs.

Prosjektnummer: 316494
Tittel: Oppgradering av bioprosseseringsanlegg for maksimal økonomisk og bærekraftig utnyttelse av marine råvarer
Søkerinstitusjon/partnere: **NOFIMA AS**
Prosjektleder: Ragnhild Dragøy Whitaker

Kort sammendrag:
Small companies and research institutes that intend to process new marine biomasses often do not have access to large-scale infrastructure that allows cost-effective test-production. In order to test their own process and technology on a larger scale without the risk of large investments, accessible demonstration plants are the key. Biotep is a demonstration plant equipped with a large number of instruments and tools suitable to handle many different marine biomasses (www.biotep.no) where companies can perform test production. Additionally, a cost estimate can be made, and a product prototype can be tested in the market. There is an increased demand in the market for new targeted bioprocessing in addition to environment-friendly and sustainable solutions. Biotep is equipped to meet many of the demands in the market, however there is an increased demand for more effective filter systems and environment-friendly lipid extraction, and in order to provide the industry better services we seek to add this to the Biotep Portfolio. A new ceramic filter system is robust, flexible,

handles thick liquids, and is well-suited for high temperature. Such a system is compatible with existing infrastructure. In addition, Biotep want to include a supercritical carbon dioxide system. This system is an environment-friendly and green technology and particularly useful for the extraction of non-polar compounds from hard rigid structures such as in microalgae, kelp and seaweed. The system is non-toxic, non-flammable and inexpensive in use, however it requires a high investment cost that is very risky for most companies, particularly right now. With a ceramic filter system and supercritical carbon dioxide system, Biotep will be able to help new and established companies to meet the new demands in the market and broaden application areas for processing marine biomasses.

Prosjektnummer: 316502
Tittel: Norwegian Biorefinery Laboratory III
Søkerinstitusjon/partnere: **RISE PFI AS** (SINTEF Energy, SINTEF Industy, NTNU, NIBIO, NMBU)
Prosjektleder: Øyvind Eriksen

Kort sammendrag:
Norwegian Biorefinery Laboratory - NorBioLab is a national biorefinery research infrastructure, which has gathered the key research groups within the biorefinery area in Norway; RISE PFI, SINTEF Energy Research, SINTEF Industry, Norwegian University of Science and Technology (NTNU), Norwegian Institute of Bioeconomy Research (NIBIO) and Norwegian University of Life Sciences (NMBU). The existing and future infrastructure is well aligned with the strategies of the involved partners and will enable an even stronger cooperation of the partners in joint national and international projects. These projects are aligned with the coming EU New Green Deal and the UN sustainability goals for affordable and clean energy (Goal 7) and climate actions (Goal 13). Since the establishment in 2014, NorBioLab has evolved into the most advanced and versatile infrastructure in Norway for valorization of biomass and other renewable feedstocks. The key elements for the success of NorBioLab are the high competence, the well-established cooperation and well-developed relations between the NorBioLab partners. The competence of the partners within biomass- and biotechnology-related topics has enabled the development of a highly advanced infrastructure sought after both by research groups and industrial stakeholders. The importance of the NorBioLab infrastructure with equipment for analysis and conversion of biomass to green chemicals and biofuels is further emphasized by its use; more than 80 different research projects benefitted from the infrastructure in 2019. Some of the projects are integrated or support large prestigious Center-type national projects such as Bio4Fuels (an “FME”), Foods of Norway (an “SFI”), iCSI (Industrial Catalysis Science and Innovation, an SFI) and the Norwegian Seaweed Biorefinery Platform (SBP-N). Norwegian land-based and sea-based industries, including the bio-based industries, are facing an important transformation. We must create more value out of our bio-produced feedstocks, and we need to reduce the environmental impact and carbon footprint from the use of fossil raw materials by developing more sustainable processes. Thus, the need for NorBioLab the coming years is undeniable, including the development of existing infrastructure and installation of new, advanced research tools. There is a continuing requirement to strengthen all areas of NorBioLab to maintain its relevance for both researchers and industry.

Prosjektnummer: 316544
Tittel: National research infrastructure for biopharmaceutical process development and production
Søkerinstitusjon/partnere: **SINTEF AS**
Prosjektleder: Hanne Haslene-Hox

Kort sammendrag:
Biopharmaceutical production includes the expression of both small compounds (e.g. antibiotics) and large proteins (e.g. antibodies) in microorganisms or mammalian cell culture systems. Large research efforts are today put into the discovery and development of new biopharmaceutical drugs to answer clinical needs and for better treatment of disease. However, for these drugs to reach the clinic, they must be produced at large scale in demanding regulatory landscape, where individual tailoring of processes are required for different expression systems and products. This is not trivial for academia or SMEs, and specialized equipment and competence is required to do the research needed to gain better understanding of the bioprocess underlying such products and enable efficient process development towards commercial manufacturing. The national research infrastructure for biopharmaceutical process development and production (BioPoD) will provide facilities and expertise to enable researcher-driven bioprocess research and development across the whole range of biopharmaceutical products. The infrastructure will cover 1) preproduction, 2) upstream and 3) downstream processing, 4) process monitoring and 5) postproduction, filling the gap between drug discovery and development and commercial manufacturing. BioPoD will build 30 years of expertise on and advance existing national leading infrastructure for cultivation, fermentation and high-throughput screening for biopharmaceutical research and development. The complementation of the existing infrastructure will enable continued collaboration with research environments, public sector, start-ups and established industry in Norway, and supplement the possibilities for early process development for novel drug products. BioPoD will also answer needs in developing production for personalised medicine, and provide a basis for commercial and contingency production of national biopharmaceutical products in Norway.

Prosjektnummer: 316559
Tittel: Museum collections for the future. The Norwegian digitization laboratory for museum specimens at the Arctic University Museum of Norway
Søkerinstitusjon/partnere: **UiT**
Prosjektleder: Andreas Altenburger

Kort sammendrag:
Many museum specimens and historic material is stored in archives and museum collections around Norway. Some of the material might degenerate due to insufficient research capacity or sensitivity of the material or the specimens. To keep the material for the future, a comprehensive digitisation effort is necessary. The Arctic University of Norway wishes to establish a national digitisation infrastructure that allows high throughput digitisation of specimens in natural history collections, the archaeological collections, and the ethnological collections in order to systematise and annotate the collections and make the data accessible according to the FAIR principle (findable, accessible, interoperable and reusable). This infrastructure will allow museums and other research environments in Northern Norway to improve research quality to highest international levels and open up for new international collaborations. Digitizing museum collections gives a huge potential for new methods and crossdisciplinary research using state of the art digitisation equipment. Modern equipment can enhance visible detail in specimens. Digital specimens reduce the risk of loss or damage and allow for safe long-term storage and accessibility. Online access to digitized specimens allows for research from anywhere in the world, minimizing the need to ship and handle physical objects. Digitized specimens will enable researchers to select specimens relevant to their research, omitting the need to request large numbers of specimens. In addition to the benefits for research, digitized specimens offer new and more interactive possibilities to present specimens and museum

objects to the public. Online access to museum collections increases the number of people who can view the specimens and the number of specimens that can be investigated. Last but not least, digitized specimens offer new possibilities for citizen science.

Prosjektnummer: 316560
Tittel: Endring og oppgradering av SINTEF Oceans mobile anlegg for prosessering av marine råstoffer.
Søkerinstitusjon/partnere: **SINTEF OCEAN AS**
Prosjektleder: Bendik Toldnes

Kort sammendrag:
Mobile Selab is a small but complete and flexible processing facility, where any kind of (rest) raw material can be processed into oil and protein concentrate in cooperation with SINTEF. Customers are mainly businesses from the fishing industry, who wish to better utilise and profit from their rest raw material. Other research projects can also be run to test parameters or interesting finds from ground research in smaller scale labs and optimize processes. After more than a decade of being sent out in the field to perform large scale processing tests, the infrastructure needs upgrading

Prosjektnummer: 316583
Tittel: Biobank Norway 4 - a National Biobank Research Infrastructure
Søkerinstitusjon/partnere: **NTNU** (UiT, UiB, UiO, NTNU, Helse Nord, Helse Vest, Helse Sør-Øst, Helse Midt, Kreftregisteret, FHI, OUS)
Prosjektleder: Kristian Hveem

Kort sammendrag:
Biobank Norway 4 will build upon a ten-year experience as a well-established, mature, national biobank research infrastructure, comprising 11 partners (NTNU, UiO, UiB, UiT Norges arktiske universitet, FHI, Helse Sør-Øst, Helse Vest, Helse Midt, Helse Nord, OUS and the Cancer Registry). With a rapidly increasing number of users both nationally and internationally, there is a subsequent need to further develop the infrastructure to meet the growing requests and requirements from the research community with a stateof the-art infrastructure handling a vast number of biospecimen and large-scale data sets. We will develop i) An integrated infrastructure for precision medicine, by utilizing the huge potential in existing clinical biobanks and quality registries in the health care sector as well as genetic data from almost 400 000 participants in population-based biobanks, linked to registry-based phenotype data. A precision medicine environment will be implemented and managed on a national level as well as a national forum for precision medicine for all relevant stakeholders, including industrial collaborators, study participants and patients. We will seek funding for further digitalization of biobank samples in a multiple omics approach The corona pandemic has fully demonstrated the necessity of an efficient and operational national biobank network and a ii) Biobank network for clinical urgency, can be a significant prerequisite for supporting various clinical studies both to monitor the development of the pandemic, testing repurposing of existing drugs and the introduction of new treatments. We will refine our biobank platform to meet these needs as effectively as possible in the future. Other major priorities will be iii) Integration with the Health Analyses Platform and data handling, iv) National network of disease-specific biobanks, v) Prospective biobank recruitment from hospital sector and primary health care, vi) Digital biobanking, vii) Investments in automated storage facilities, viii) Participation in international biobank infrastructure networks (BBMRIERIC), ix) ELSI, including Biobank Participant engagement and x) Quality biobanking.

Prosjektnummer: 316600
Tittel: Mandatory draft for infrastrucutre application Center for Land-based Aquaculture, CLA
Søkerinstitusjon/partnere: **NORD UNIVERSITET** (LetSea, SINTEF Ocean and NCE Aquaculture)
Prosjektleder: Mette Sørensen

Kort sammendrag:
The planned infrastructure to be established by the Partners focus on three important pillars:

1. Research carried out on land-based research under controlled conditions in small units give results for a limited life cycle of the fish. The new infrastructure will offer research addressing post smolt production in seawater RAS covering the entire life cycle from tanks on land to ong growth and harvest in sea. This will give opportunities to study the biology, welfare and economy in new production systems of salmonids.

2. The infrastructure is planned with multiple smaller RAS units to enable replicates. Possibilities to study effect of treatments in replicates is currently not existing. The new facilities will allow research on optimal temperatures and salinities as well as effects of feed types and production on biofilter and water quality

3. The new facilities can also easily be reconstructed to cater for research on IMTA or to cater for research on circular bio economy, exploiting biological production in side streams from the system.

Prosjektnummer: 316603
Tittel: Microalgae platform for Norway
Søkerinstitusjon/partnere: **NORD UNIVERSITET** (NIBIO, UiT, NIVA, VUC)
Prosjektleder: Kiron Viswanath

Kort sammendrag:
The potential of microalgae as a driver of a biotechnology-based industry is well recognized now. Many varieties of microalgae are among the fast-growing photosynthetic organisms on the planet. Although these microorganisms represent the largest biomass in the ocean, they are minimally tapped for industrial purposes including for food or as sources of high-value products. Phototrophically grown microalgae can outcompete traditional food crops due to their high productivity per surface area, potential for cultivation in the sea or onshore and high nutrient value suitable for use in food and feed, without compromising the use of agricultural land and freshwater. On the other hand, the use of microalgae for carbon capture and bioremediation is another interesting industrial application – not only can they help reduce industrial emissions, but also produce valuable biomass. Norway has not made significant strides in establishing microalgae-based ventures, even though there is an understanding of the vast industrial potential for these microorganisms. Significant progress can be achieved in microalgae biotechnology only if there is an established applied research in this field. Though there are groups in different Norwegian institutions that perform research on microalgae, remarkable breakthroughs can be achieved only through trans-disciplinary collaborative efforts. This infrastructure project proposal aims to bring together research environments that study microalgae so that their pooled scientific expertise can be utilized by exploiting the newly acquired research infrastructure and generating knowledge that can be easily adopted directly or indirectly by the industry. The proposed infrastructure investment will act as a springboard for the success of microalgae-based industrial initiatives.

Prosjektnummer: 316607
Tittel: Infrastructure for a sustainable ocean economy and conservation of the ocean genome
Søkerinstitusjon/partnere: **NORCE** (UiS, UiB, IMR, UiA, SINTEF Ocean, NIVA, DNV GL, RevOcean, MBARI, IFREMER, DTU Aqua, Bremnes Seashore, Skretting AS)
Prosjektleder: Thierry Baussant

Kort sammendrag:
This research infrastructure will aim at 1) addressing the urgent need for increased ocean monitoring capacity using advanced genomic-based digital technologies and gene-sequencing monitoring tools to responding to the demand for sustainable ocean resources for the world and 2) mitigate the increasing cumulative impact of human activities indicated by ocean genome erosion on a variety of marine life i.e. biological diversity (or biodiversity). The ocean genome, or the ensemble of genetic material present in all marine biodiversity, including both the genes and the information they encode (Blasiak et al., 2020), is the key to marine ecological population resilience and plasticity that drives adaptability to anomalous conditions such as climate change. It also sustains major commercial industries such as marine fisheries and aquaculture, but as well other growing needs of pharmaceuticals as currently exemplified with the worldwide COVID-19 situation. Yet, ocean genome is threatened by overexploitation, habitat loss and degradation, pollution, impacts from a changing climate, invasive species and other pressures, as well as their cumulative and interacting effects in the Anthropocene time. While Norway is gradually transitioning into a blue/green energy, the expansion of existing uses of the ocean and emerging new ones – including offshore energy, ocean farming, and ocean mining –also requires a quick understanding of the consequences on the ocean genome to mitigate gradual erosion and loss of diversity, and a drastic loss of biodiversity in marine life with unknown consequences for marine life and ecosystems. The scarcity of quantitative data on biological baselines in many parts of the ocean—including the current status of organisms and ecosystems and their trends over time—undermines our ability to respond effectively to these threats to allow proactive responses, rather than the current reactive responses. According to a recent review (Duarte et al., 2020), the investment needed to rebuilding damaged marine life worldwide is estimated to billions of US dollar per year to extend protection actions but the economic return from this commitment will be considerable for the society and nations, not the least the genetic diversity of marine life. Rapid advances in sequencing technologies and bioinformatics have enabled exploration of the ocean genome. This is the future means to informing innovative approaches to conservation and a growing number of commercial biotechnology and industrial applications. Currently this requires manual labor combined with advanced instruments and lab processing tools. To address the near future challenges, less intervention and manual labor is required as new technologies and sensors will enable more granular data collection across a wider coverage area, so that we can move the laboratory from the ship into the environment itself and send data, not samples, back to centralized facilities. For this research infrastructure, a significant increase of the capacity to monitor the ocean genome using a fleet of state-of-the-art technologies complementing to existing oceanographic monitoring efforts, is requested. While several instruments and automated sampling technologies to capture the ocean genome exist (see for example Ottensen et al., 2016), they remain in the prototype stage and mainly the MBARI Environmental Sample Processor (ESP) is currently available commercially, with a wider use and prospect in research and industry application (Scolin et al., 2018). Further development of MBARI's ESP offers one way to fully automate new DNA analytical procedures in situ, which could be used to create the equivalent of DNA "weather maps" that showing areas of high/low target abundance as well as changes in species assemblages over time and exploratory genome research.

Prosjektnummer: 316609
Tittel: Establishment of a new advanced imaging platform in the Oslo region
Søkerinstitusjon/partnere: **OsloMet** (SimulaMet, Fertilitetssenteret)
Prosjektleder: Trine Berit Haugen

Kort sammendrag:
Oslo Metropolitan University (OsloMet) reached university statues in January 2018 and is aiming to level its research activities up to the front line within the next 10 years. Across its four faculties, several research groups have ongoing projects within a broad range of biology areas including neuroscience, cell biology, embryology, gene regulation, physiology of muscular and skeletal tissues, microbiology and male fertility. All these research fields have growing needs for imaging methods and undergone rapid development due to the emergence of super-resolution microscopy. Indeed, several biological questions can only be assessed by microscopy, such as: localization of molecules within cells, tissues or embryos; motility of cells or cell cycle progression; in situ visualization of protein-protein interactions; protein trafficking within or between cells. It is therefore essential to have easy access to imaging platforms that meet the specific needs for (i) seeking for top research quality nationally and internationally and (ii) pretending to be competitive. In this context, research groups at OsloMet are in disadvantage since the university has no infrastructure at present for carrying out experiments based on fluorescence microscopy. Such experiments have to be done in collaboration with other institutes having the right equipment. Despite the possibility to use imaging platforms at the University of Oslo (UiO) or the Oslo University Hospital (OUS), local research groups are logically prioritized for allocation of time slots, which makes planning of experiments requiring several days of continuous observation a challenge. Moreover, it is often impossible to move living material from one place to another without biological consequences, which excludes certain types of research relying on live-cell imaging at OsloMet. It represents a serious impediment to scientific progress, and also for the independency, as well as attractiveness of our university. We therefore aim to gradually establish our own imaging platform that will cover all the needs from the different research groups from OsloMet, and also open new avenues for collaborations with our partners, including interdisciplinary areas, and establish new partnerships. Such an imaging facility will also benefit to students of the university, improving the association between research and teaching by use of advanced and updated technology. With the present application we are seeking funding for a state-ofthe art imaging station (a fully loaded Dragonfly 500 system, from Andor) and a supporting 3D, wildfield fluorescent microscope (IXplore Live system from Olympus). Briefly, the Dragonfly is a high-speed confocal platform allowing super-resolution imaging (SRRF) of live material (cells, tissues, embryos) and detection of single molecules (dSTORM). The fully loaded Dragonfly includes a TIRF module, a FRAP unit and offers the new capability to do infra-red imaging and the newest sCMOS camera from Andor. It will be the biggest super-resolution microscope in Oslo. The IXplore Live system is a wide-field, upgradable microscope allowing “basic” 3D fluorescence imaging with possibility to do deconvolution. It will serve as a support for the Dragonfly for preliminary observations and for experiments in fixed material which do not require super-resolution.

Prosjektnummer: 316610
Tittel: NIBIO-XCT - An integrated X-ray Computed Tomgraphy (XCT) facility for the Ås campus (NIBIO/NMBU/Veterinærhøgskolen)
Søkerinstitusjon/partnere: **NIBIO** (NMBU, Veterinærhøgskolen, Kimen Såvarelaboratoriet AS)
Prosjektleder: Adam Vivian-Smith

Kort sammendrag:
Nano- and micro-scale X-ray Computed Tomography (XCT) has become an exceptionally important tool for the non-invasive visualization of complex specimens in both materials science and in biology. This offers a non-destructive method to probe both living and fixed material from a variety of sources and resolve their internal structures, often in stunning detail, resolution and depth (ie. to micrometer

and sub-micrometer scale). Examples include (1) visualizing soil porosity and measuring the fine root structure, (2) imaging modifications to woody tissues, (3) imaging plant development like enclosed buds and (4) in the anatomical visualization of living insect specimens. Several international institutes are also now using nano- and micro-XCT for whole plant phenotyping, in time-series, using instruments that have a scanning deck large enough to accommodate whole plants and with specific environmental conditions. Plant biomass can now be evaluated above and below ground. We require and propose a facility for 3D X-ray Computed Microtomography (XCT) facility at the Ås NIBIO/NMBU campus to service the imaging of life science subjects, soils and materials science. The equipment and location at Ås campus is ideal for servicing the Life Science cluster and augmenting augmenting advances in the Bioeconomy. This facility will have a small set of four controlled environmental rooms alongside two XCT instruments to provide broad control over the parameters such as light, temperature and humidity. A bank of smaller cabinets will be provided for holding samples, or culturing growth. The facility will have a computing equipment to reconstruct, segment and analyse the data offline. That equipment will be a GPU accelerated and be capable of visualization with Virtual Reality (VR). The facility will be run together with a dedicated technical staff member. Two other pieces of equipment a standard 2D x-ray (eg Facitron Multifocus, for seeds, leaves) and a handheld X-ray fluorescence spectrometer (XRF) for the elemental analysis of different materials (eg. in soil)

Prosjektnummer: 316616
Tittel: Norwegian Plant Phenotyping Platform
Søkerinstitusjon/partnere: **NMBU** (UiO, NTNU, UiT, NIBIO)
Prosjektleder: Morten Lillemo

Kort sammendrag:
A stable Norwegian food production based on national resources is important for **food security** and supported by governmental policies. The Norwegian food production is currently challenged by **changing climatic conditions** and **technological developments** that call for faster and more effective development of new cultivars and production systems in order to meet current and future challenges.

The aim of this proposal is to build a **national platform for plant phenotyping** (***PheNo***) to serve the research needs in the "green" sector. State-of-the-art research facilities will be established at the Norwegian University of Life Sciences (NMBU), the University of Oslo (UiO), the Norwegian University of Science and Technology (NTNU), The Arctic University of Norway (UiT) and the Norwegian Institute of Bioeconomy Research (NIBIO) in close collaboration with the agricultural, horticultural and plant breeding industry. *PheNo* will serve as a Norwegian node in the ESFRI roadmap project EMPHASIS.

High-throughput and high precision platforms for phenotyping of plants in controlled conditions and relevant production environments (fields, polytunnels and greenhouses) will be established as a **distributed national infrastructure** building on the complementary strengths and unique competences brought in by the collaborating research partners: **Field-based plant phenotyping** and **robotics** at **NMBU** (robotic and UAV-based plant phenotyping, digital field trial operations, polytunnels for creating semi-controlled field conditions, multispectral laser scanner for field and greenhouse), **basic plant research** at **UiO** (advanced growth chambers and small plant phenotyping system, multispectral laser scanner for greenhouse phenotyping), Internet of things (IoT), **data science** and **machine learning** at **NTNU** (field and plants conditions sensing/monitoring using IoT, vision sensors and computational resources), **data storage** and **data management** at **UiT** and **applied plant production across the whole country** by **NIBIO** (Robotic and UAV-based plant phenotyping, multispectral laser scanner for field and greenhouse).