Skisser med relevans innenfor

Medisin og helse

Tabell: Oversikt over skisser med relevans for området **Medisin og helse**

Prosjekt-nummer	Prosjekttittel	Søkerinstitusjon	Prosjektleder	Estimert søkt beløp fra NFR
315742	Norwegian Centre for Nanoscale X-ray Tomography	**NTNU** (UiO, NTNU)	Ragnvald H. Mathiesen	33 250 000
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
316408	Next generation risk assessment of chemicals – building in silico and in vitro platforms combined with Artificial Intelligence	**FHI** (NIVA, UiB, NVI)	Hubert Dirven	70 000 000
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
316423	Competence Hub for Neutron Technology	**IFE**	Sindre P. Hassfjell	36 080 000
316427	Norwegian Advanced Light Microscopy Imaging Network Phase II (NALMIN-II)	**UiO** (UiB, NTNU, UiT, OUS)	Harald A. Stenmark	69 100 000
316432	National Human iPS Cell Biobank	**OUS (**UiO, HUH/UiB, St.Olavs/NTNU, Biobank Norway)	Joel C. Glover	26 600 000
316434	Infrastructructure for digital production	**OsloMet** (FFI, Sunnaas)	Jon Samseth	18 500 000
316443	Norwegian Bioscreening Platform for Laboratory Fish	**NMBU Veterinærhøgskolen** (UiO, NTNU, UiB, Nord Universitet)	Peter Aleström	92 245 000
316445	Norwegian Rheology Laboratory	**UiS** (NTNU, NMBU, SINTEF Industri, NORCE, IFE, UiO)	Mahmoud Khalifeh	120 000 000

316455	Norwegian Infrastructure for Mouse Models (NIMM)	UiO (NTNU, NMBU, UiB, UiT)	Knut Tomas Dalen	36 800 000
316458	Norwegian open infrastructure for high-throughput experimentation and scale-up	UiB (NTNU)	Bengt Erik Haug	104 000 000
316463	Norwegian Micro- and Nanofabrication Facility IIIb	NTNU (UiO, USN, SINTEF)	Peter Köllensperger	32 000 000
316465	Center for Characterisation of Ultrasonic Devices	USN (TBD)	Lars Hoff	17 000 000
316468	Infrastructure for Precision Diagnostics for Clinical Cancer Trials; InPreD - Norway	OUS (HUS, UNN, St. Olavs Hospital, SUS, Ahus)	Hege Elisabeth Giercksky Russnes	115 000 000
316476	NorHEMA - Norwegian facility for Helium ion & Electron Microscopy and microAnalyses	UiB (UiT, NORCE, DNV GL, Equinor, IMR)	Ingunn Hindenes Thorseth	70 936 000
316480	Joint national infrastructure for clinical and translational microbiota research	OUS (UNN, Haugeland uni.sykehus, Ålesund sykehus)	Michael Bretthauer	43 000 000
316482	Infrastructure for MoBa	FHI (NDE, NTNU, UiO, UiB)	Jennifer R. Harris	98 660 000
316487	ELIXIR3 - Strengthening the Norwegian Node of ELIXIR	UiB (UiT, NTNU, NMBU, UiO)	Inge Jonassen	190 000 000
316488	Research infrastructure for preventative care	USN (Norway Health Tech, Nova Discovery, Vestre Viken Hospital Trust)	Hilde Eide	110 000 000
316495	Norsk Senter for Minimal Invasiv Bildeveiledet Behandling og Medisinsk Teknologi, Fase 2	ST. OLAVS HOSPITAL HF (OUS, UiO, NTNU, SINTEF)	Jan Gunnar Skogås	80 000 000
316504	National Platform for NanoSafety	UiB (NILU, STAMI, SINTEF Ocean, NMBU)	Mihaela Roxana Cimpan	111 600 000
316505	e-INFrastructure fOr e-health research aNd InnovAtion	HELSE BERGEN HF (Helse Vest IKT)	Tine Nordgreen	56 100 000
316517	NorBRAIN – A Norwegian Brain Bank Initiative	HELSE BERGEN HF (UiB, OUS, UiO, St.Olavs, NTNU, UiT, UNN)	Charalampos Tzoulis	200 000 000

316530	EBRAINS Norway: Norwegian Node of the European Research Infrastructure for Brain Research and Brain-Inspired Sciences	UiO (NMBU)	Jan G. Bjaalie	77 500 000
316531	Norwegian Infrastructure for Advanced Cell Engineering	OUS (UiO, HUH, UiB, NTNU, UiT)	Karl-Johan Malmberg	90 000 000
316532	Norwegian Organ-on-a-Chip infrastructure for testing and qualification of preclinical interventions	OUS (UiO, UiB, NTNU, USN)	Stefan Krauss	61 000 000
316544	National research infrastructure for biopharmaceutical process development and production	SINTEF AS	Hanne Haslene-Hox	91 000 000
316550	Norwegian Research Infrastructure for studies of environmental contaminants	NILU (NIVA, UiT)	Aasmund Fahre Vik	85 000 000
316551	SUSTAINHEALTH-workflow, an Infrastructure for Food, Health, and Sustainability	FHI (NVI, SSB, UiO, NFSA)	Helle Margrete Meltzer	32 000 000
316562	FAIR Data Management Plan	NSD	Katrine Utaaker Segadal	7 566 000
316563	National bio-mechatronics infrastructure for ASSISTive and AugmeNting Technology in personalised healthcare	UiA (OsloMet, UiO, UiT, HVL, USN, UiS, I4Helse, NORA, NAIS, NOBIM, Sørlandet Hospital, Sunnaas Rehabilitation Hospital, SUH, NSCC, Norway Health Tech)	Filippo Sanfilippo	102 000 000
316566	SEFIRE: Research infrastructure for knowledge-building on societal health, security and sustainability	NIVA	Malcolm Reid	75 940 000
316570	Norwegian Urban Observatory	NILU (Augment City/Offshore Simulation Centre AS, Oslo Kommune)	Leonor Encuentra Tarrason	75 500 000
316574	Digital BioBank Norway	HELSE BERGEN HF (SUH, Helse Fonna HF, UiB, HVL)	Hauke Bartsch	50 000 000

316577	Linear accelerator for comparative and veterinary research	**NMBU Veterinærhøgskolen** (University of Edinburgh, UiO, OUS, Swedish University of Agricultural Sciences)	Lars Moe	13 000 000
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
316587	Norwegian Family Based Life Course Study - Competence Hub	**UiO** (FHI, NTNU)	Øyvind Erik Næss	18 645 000
316604	The Norwegian Eye Initiative (NOREYE) - a leading national and international research infrastructure on the eye and visual function	**USN**	Bente Monica Aakre	69 312 500
316609	Establishment of a new advanced imaging platform in the Oslo region	**OsloMet** (SimulaMet, Fertilitetssenteret)	Trine Berit Haugen	12 351 454

Project number: 315742
Title: Norwegian Centre for Nanoscale X-ray Tomography
Applicant (partners): NTNU (UiO, NTNU)
Project Manager: Ragnvald H. Mathiesen

Short summary:
X-ray imaging is a field in tremendous development, both at large-scale facilities and at university laboratories. In addition to the fundamental science aspects, X-ray imaging distinguishes itself by its applications in virtually all the natural and life sciences, and industry. X-ray imaging is consequently of utmost importance for Norwegian competitiveness, and there is a rapidly growing number of X-ray computed tomography (CT) instruments nationwide, both at the universities and in industry. In this landscape, there is a strong need for national coordination, also to ensure optimal use of the expensive infrastructure, alignment of investments and knowledge sharing. The NEXT consortium aims to fill this role, similarly to X-ray imaging centers abroad.

NEXT has hubs at UiO and NTNU, uniting the leading national research groups in X-ray imaging. NEXT will be coordinated by NTNU IFY, which is Norway's leading research unit in X-ray physics and imaging. The center has national and international affiliated collaborators, including several Centres of Excellence (CoE). In particular, the NTNU hubs are part of CoE PoreLab (www.porelab.no), and enjoy close collaboration also with CoI CASA (www.ntnu.edu/casa). NEXT will provide access to state-of-the-art X-ray imaging infrastructure for Norwegian users, both through upgrades of existing infrastructure and through established collaborations with imaging centers abroad. NEXT aims to maximize quality and cross-fertilization across disciplines, while maintaining a particular focus on porous media and mesoscopic structures.

The NEXT consortium has extensive X-ray imaging infrastructure, with complementary instruments covering life science, via environmental and geophysics, to material science. The labs are operated as open-access facilities with large and increasing external user demand. The proposed investments within X-ray CT and imaging are extensions to this existing infrastructure, planned to provide an optimal portfolio of methodologies in a united national perspective. Coordinating and strengthening the national X-ray imaging capability at mesoscopic scales is of huge importance to the climate, environment, energy, health and Norwegian industry.

NEXT will introduce and refine X-ray imaging techniques, such as phase-contrast based methods and time resolved studies, and actively support and educate users from a wide range of science disciplines through introductory courses, workshops, seminars and advanced training. NEXT will operate as a national competence center, ensuring that Norway stays abreast with the latest developments in X-ray imaging. The national competence center has as an aim to give Norwegian industry a competitive edge and aims to secure that the national X-ray imaging resources are exploited in the best possible way to maximize the advantage to society.

Project number: 316175
Title: NorMet – Norwegian Infrastructure for Metabolomics
Applicant (partners): NTNU (UiB, UiO, UiT)
Project Manager: Per Bruheim

Short summary:
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 spectrometrybased 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.

Project number: 316382/ 316393
Title: NOR-Openscreen II – The Norwegian node of EU-OPENSCREEN ERIC
Applicant (partners): UiO (UiB, UiT, SINTEF)
Project Manager: Johannes Landskron

Short summary:
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.

Project number: 316403
Title: Life Science Electron Microscopy Center (LSEMC)
Applicant (partners): UiO (NMBU, UiT)
Project Manager: Norbert Roos

Short summary:
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 650m2 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.

Project number: 316405
Title: National network of Advanced Proteomics Infrastructure phase 2
Applicant (partners): UiO (OUS, UiO, UiB, NTNU, UiT, NMBU)
Project Manager: Tuula Nyman

Short summary:
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.

Project number: 316408
Title: Next generation risk assessment of chemicals – building in silico and in vitro platforms combined with Artificial Intelligence
Applicant (partners): FHI (NIVA, UiB, NVI)
Project Manager: Hubert Dirven

Short summary:
Due to the large and growing number of chemicals in use, toxicological risk assessments and management are increasingly challenging. Only a small fraction of the chemicals on the market have been extensively characterized in terms of their toxicological properties or exposure scenarios, or are regularly monitored, while limited or no data are available for the overwhelming majority of chemicals[1].

To deal with these challenges there will be more focus on grouping of chemicals based on chemical structures and similarities in biological effects based on understanding of the mechanisms resulting in adverse effects. There is an interest in application of New Approach Methodologies (NAMs) to study the hazard of chemicals and mixtures of chemicals based on in vitro and in silico testing. Knowledge based on the use of new and existing data can be expanded by machine learning and artificial intelligence. The One Health approach combining ecotoxicology, veterinary toxicology and human toxicology offers the opportunity to have a more holistic view on chemicals, their behavior in the environment, sources of exposure, hazards and risks.

Objective: to build a national infrastructure with in vitro and in silico platforms that will be applied in the next generation of risk assessment of chemicals. The platforms will allow closing mechanistic knowledge gaps in toxicological data, improve modeling and using machine learning and artificial

intelligence technology to study the effects of chemicals on biological systems. Data and methods generated will be used to facilitate the transition to the next generation risk assessment to better protect human health and the environment, thereby supporting the EU commission ambitions for a non-toxic environment.

Project number: 316409
Title: Norwegian Nuclear Magnetic Resonance Platform 2
Applicant (partners): NTNU (UiO, UiB, UiT, SINTEF)
Project Manager: Olav Haraldseth

Short summary:
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.

Project number: 316423
Title: Competence Hub for Neutron Technology
Applicant (partners): IFE
Project Manager: Sindre P. Hassfjell

Short summary:
Institute for Energy Technology (IFE) has been running Norway's two nuclear research reactors for decades which are now shut down and scheduled for decommissioning. IFE and Norway have no longer a neutron source available, and it is of national importance to have a replacement. Otherwise, Norway will lose industrial possibilities and vital competence in nuclear technology, which is of importance for Norway's safety and security. As a first stage remedy, IFE intends to set-up a neutron facility at Kjeller, equipped with two types of neutron generators. One stationary D-T type generator for 14 MeV neutrons with high neutron flux output, and two mobile D-D or D-T type generator for 2.5 MeV neutrons with medium neutron flux output, along with detectors for neutrons and gamma-rays, both for analytical and safety measurements. This neutron facility can then produce radionuclides for medical applications, typically diagnostics and therapy of cancer, and industrial applications, typically mass flow studies and leak detection. Neutrons from neutron generators can be used for qualitative and quantitative analysis of light elements, which are otherwise difficult to measure, and for non-destructive radiography and tomography of various materials, e.g. in archaeology and art. The neutron irradiation facility will also be available for university studies in nuclear technology.

Project number: 316427
Title: Norwegian Advanced Light Microscopy Imaging Network Phase II (NALMIN-II)
Applicant (partners): UiO (UiB, NTNU, UiT, OUS)
Project Manager: Harald A. Stenmark

Short summary:
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.

Project number: 316432
Title: National Human iPS Cell Biobank
Applicant (partners): OUS (UiO, HUH/UiB, St.Olavs/NTNU, Biobank Norway)
Project Manager: Joel C. Glover

Short summary:
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.

Project number: 316434
Title: Infrastructructure for digital production
Applicant (partners): OsloMet (FFI, Sunnaas)
Project Manager: Jon Samseth

Short summary:
Today ADDLAB at NTNU Gjovik has established a center for digital manufacturing of metallic parts. Oslo Metropolitan University together with FFI are seeking to establish a center for digital manufacturing for non-metallic and metallic materials. It includes reinforced plastics, wood based plastics, concrete and ceramics. The center will invest in state-of-the-art digital design and manufacturing equipment such as 3D-printers, CNC equipment, scanners, VR design tools, etc. This equipment will be available for researchers and engineers as well as industry nationally. The center will be co-located at OsloMet and FFI at Kjeller, but the other research institutes in the Oslo area will also be invited to join. The rapidly development of personal targeted care and solutions within the health sector will be of importance for the center.

The center will be part of a new innovation laboratory, OpenLab, at OsloMet, which will work closely with a corresponding center at the University Health Centre in Toronto, Canada.
In addition to the focus on materials, emphasis will be on developing individual adapted objects and using virtual technologies in the design of such objects. An example is the research with human adaptation of orthopaedic objects.

Project number: 316443
Title: Norwegian Bioscreening Platform for Laboratory Fish
Applicant (partners): NMBU Veterinærhøgskolen (UiO, NTNU, UiB, Nord Universitet)
Project Manager: Peter Aleström

Short summary:
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.

Project number: 316445
Title: Norwegian Rheology Laboratory
Applicant (partners): UiS (NTNU, NMBU, SINTEF Industru, NORCE, IFE, UiO)
Project Manager: Mahmoud Khalifeh

Short summary:
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.

Project number: 316455
Title: Norwegian Infrastructure for Mouse Models (NIMM)
Applicant (partners): UiO (NTNU, NMBU, UiB, UiT)
Project Manager: Knut Tomas Dalen

Short summary:
Rodent animal models are powerful research tools of invaluable importance to understand human biology and to clarify human disease mechanisms. Nearly all break-through discoveries in medical science have relied on research using normal or genetically altered animals. Further, preclinical development of novel therapeutic programs, including mandatory preclinical testing of new drugs prior to phase 0-II human trials depends on experiments in animals. Therefore, infrastructure for generation, housing and phenotyping of rodents are of national vital importance for research on human health and medical drug development.

Research infrastructure for rodent preclinical studies consists of three fundamental pillars. I) Basic infrastructure to house animal models at host institutions. II) Standard phenotyping instrumentation that are widely distributed on host institutions. III) Highly specialized genome modifying or preclinical phenotyping platforms dependent on costly instrumentation operated by specially trained and dedicated personnel. Compared to Scandinavian and many European countries, Norwegian Universities are relatively well equipped regarding pillar I and pillar II infrastructure, but is lagging behind on pillar III. Key factors for the current situation is the absence of national coordination and collaboration between Norwegian research institutions with respect to investments in pillar III infrastructure and sharing of such platforms outside own institution. Moreover, since both institutional infrastructure planners and the research community in general lack an overview of existing national infrastructure, decision-making is mainly based on research initiatives within research groups or consortiums with limited budgets. A serious consequence is that pillar III platforms rarely are funded or operate under suboptimal conditions.

To solve I) capacity constraints in animal units, II) upgrade existing and promote establishment of new advanced phenotyping platforms, and III) open for collaborative sharing of advanced infrastructure for biomedical preclinical research in Norway, the five main Universities in Norway propose to establish Norwegian Infrastructure for Mouse Models (NIMM).

For a modest investment at the national level, NIMM will:

1) Upgrade infrastructure essential for generation of permanently or transiently genetically modified mouse.
2) Upgrade existing and establish new pillar III platforms with top-of-the-art instrumentation for advanced rodent preclinical and biomedical phenotyping.
3) Establish a shared national cryopreservation service with nodes at all partner institutions to solve housing-capacity issues and simplify import/export of models between research institutions.

4) Establish a NIMM steering committee consisting of representatives from all institutions to coordinate further investments in preclinical infrastructure. Additionally, establish a Web-portal to increase awareness of national phenotyping platforms and simplify access to these for the Norwegian scientific community.

Project number: 316458
Title: Norwegian open infrastructure for high-throughput experimentation and scale-up
Applicant (partners): UiB (NTNU)
Project Manager: Bengt Erik Haug

Short summary:
Norwegian open infrastructure for high-throughput experimentation and scale-up (NorHTE)
This application seeks to establish a new national infrastructure platform (NorHTE) that will furnish Norway's research communities in chemistry, materials science, biotechnology, pharmaceuticals, and chemical and energy process engineering with state-of-the-art instrumentation for high-throughput experimentation (HTE) and advanced materials manufacturing. By offering a fast, automated and quality-assured alternative to error-prone manual methods, NorHTE will accelerate the discovery of new molecules and materials for multiple application areas, including electronics, catalysis, renewable feedstocks, therapeutics, diagnostics and energy generation and conversion.

The proposed infrastructure - the first of its kind in Norway - will comprise five integrated platforms for (i) high-throughput experimentation, (ii) flow-chemistry, (iii) real-time analysis, (iv) machine learning, and (v) scale-up. By combining automation, state-of-the-art robotics, chemometrics and machine learning, NorHTE will allow Norwegian scientists to carry out large-scale chemical experiments of far wider scope than is currently feasible, leading to superior products and/or more efficient synthesis routes. The main HTE platform will be located at UiB, with a complementary flow-chemistry platform located at NTNU. The Bergen node will consist of two robotic systems for aerobic and anaerobic synthesis, a system for automated purification, and analytical instrumentation for reaction monitoring and quality control. The Trondheim platform will comprise a suite of flow modules for in-line reaction, analysis, purification and scale-up. Both nodes will be furnished with extensive instrumentation for reaction monitoring, allowing for automated feedback-driven searches in which the most promising conditions for testing are decided on the basis of previously acquired data. The resulting "self-optimising" reactors will massively enhance the efficacy of HTE chemistry, bringing Norway to the international forefront of automated chemical discovery.

NorHTE will be open to both academic and industry users across Norway, with users being charged on an hourly rate model. The distinguishing feature of NorHTE which sets it apart from other HTE facilities worldwide is the inclusion of infrastructure for intermediate-scale chemical synthesis up to the 1-kg/day-level, providing users with a complete solution that encompasses both chemical discovery and chemical manufacturing.

Project number: 316463
Title: Norwegian Micro- and Nanofabrication Facility IIIb
Applicant (partners): NTNU (UiO, USN, SINTEF)
Project Manager: Peter Köllensperger

Short summary:
The NorFab III proposal submitted in 2018 sought 186 MNOK for a five-year period of funding from 2020-2024, continuing the ambitious development track we have been on so far. As per the NFRs request, a minimal version was also submitted, consisting of four years of operational support and just two years of investment funding, and this is the version NFR has funded. The minimal version represents the maintenance of current capabilities, with a few reinvestments to upgrade to state-of-the art. In order to maintain the infrastructure as a state-of the art national facility and replace critical aging equipment, we are now applying for funding for the two remaining years of NorFab III, 2022-2023, as indicated during the NorFab III contract negotiations. The investment plan requires 32 MNOK in order to keep our current capabilities updated. NTNUs main investment will be the replacement of an aging Focused Ion Beam system that is at the end of its life cycle. This represents one of the most heavily used pieces of equipment at NTNU NanoLab. Several groups, including national infrastructures such as NorTEM and the MiMaC 3D Atom Probe Tomography system recently installed at NTNU are fully dependent on our FIB systems in order to operate. UiO MiNaLabs investments will be focused on replacing two aging instruments, namely a Scanning Probe Microscope and a Hall-effect instrument. These instruments are key to characterize thin films produced in the cleanroom and essential part of the thin-film production line. Furthermore, they ensure continued ability of localized (nm-scale) topographical and electrical characterization. Both current instruments have a large and increasing user base, and with the larger sample out-put obtained by the installed beyond-state-of-the-art cluster system, the more frequent need for maintenance creates critical bottlenecks in the infrastructure. USN MST lab in Horten planned with the original ambitious budget to invest in a SOA AlN deposition tool along with several upgrades of older tools. With the current minimum budget option, USN will upgrade the Wafer level bonder for 150mm wafers, Ultrasonic welder, Interferometer and Profilometer. SINTEF MiNaLab will focus its investment on a tool opening for new opportunities and offering new capabilities to our "tool box". We plan to invest in a submicron fine line lithography tool to bridge the gap between standard lithography with micron-resolution and nanolithography with <100 nm resolution. It is anticipated that such a tool will have an impact on all our research areas (radiation sensors, piezoMEMS, BioMEMS and Optical MEMS).

Project number: 316465
Title: Center for Characterisation of Ultrasonic Devices
Applicant (partners): USN (TBD)
Project Manager: Lars Hoff

Short summary:
The aim of this infrastructure is to strengthen Norway’s position within research and development of advanced piezoelectric and ultrasonic devices. Norway has world-leading research groups within physical acoustics and ultrasound technology, supporting a high-tech industry making products based on this technology. The infrastructure we apply for is associated with the NFR appointed SFI Centre

for Innovative Ultrasound Solutions (CIUS) and it is complementary to and will benefit from the infrastructure project Norwegian Infrastructure for Micro- and Nanofabrication (NorFab). The need for this infrastructure is acknowledged in the latest version of Norsk veikart for forskningsinfrastruktur (published 28 April 2020), where ultrasound technology and piezoelectric materials are identified as areas for new investments. The new infrastructure will give access to reliable and accurate electro-acoustic data for materials used in ultrasonic devices by establishing documented and well-maintained measurement systems and procedures. Such data are essential when developing and optimizing novel devices. The infrastructure also provides characterisation methods for research into novel materials and material structures, such as composite structures, acoustic meta-materials, and lead-free piezoceramics. Such materials will be central in developing next-generation ultrasound devices. The use of this infrastructure is not limited to ultrasound transducer development, as it will be of use in research into other types of piezoelectric sensor and actuators devices and in research on RF filters based on ultrasonic waves, e.g. SAW and FBAR.

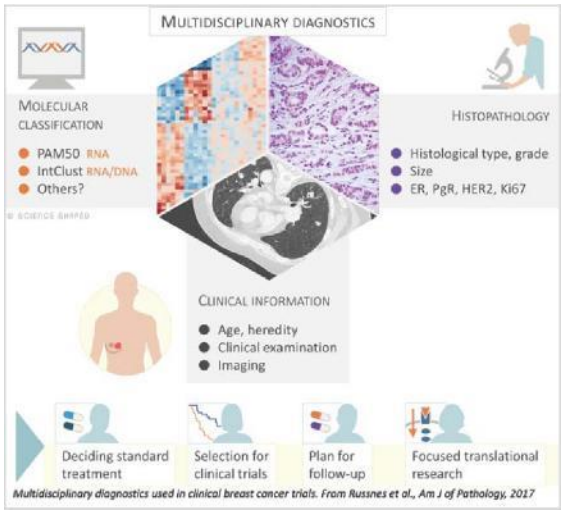
The infrastructure will improve research quality by providing accurate and reliable data for design and optimisation of novel ultrasonic devices. It will free up time for researchers allowing them to concentrate on the core of their research, and it will allow companies to design and fabricate more optimal devices in shorter time, reducing costly trial-and-error iterations. Access to such methods will make us an even more attractive partner in international research programs.

A variety of ultrasound measurement equipment has been built in Norwegian research institutions over the years. These were often developed ad-hoc for a specific task and are poorly documented and maintained. In the time leading up to submitting the final application, we seek to identify existing equipment at other institutions. We invite other research groups with similar needs and interests to take contact so we can coordinate our efforts.

Project number: 316468
Title: Infrastructure for Precision Diagnostics for Clinical Cancer Trials; InPreD - Norway
Applicant (partners): OUS (HUS, UNN, St. Olavs Hospital, SUS, Ahus)
Project Manager: Hege Elisabeth Giercksky Russnes

Short summary:
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 aconsequence, 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-the-art

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.



Project number: 316476
Title: NorHEMA - Norwegian facility for Helium ion & Electron Microscopy and microAnalyses
Applicant (partners): UiB (UiT, NORCE, DNV GL, Equinor, IMR)
Project Manager: Ingunn Hindenes Thorseth

Short summary:
NorHEMA will provide the latest and most advanced infrastructure technology for cutting-edge research in material- and life-science on ultrastructure, function and composition of a wide range of natural and synthetic materials, cells and tissues. The facility is highly relevant for many disciplinary and interdisciplinary fields including basic and applied biological science, geoscience, geobiology, nanophysics and nanotechnology, and also medicine and food research.

Helium Ion Microscopy (HIM), which will be unique in Norway, will provide sub-nanoscale imaging of non-conducting materials and life-science samples without coating, highly improved topological contrast of surface structures with high depth of field, and specialised nanoscale fabrication (particularly suitable for free standing and very small features structures). Furthermore, the addition of Secondary Ion Mass Spectrometry (SIMS) system to the HIM will allow detection of all elements/isotopes at unmatched sensitivity and spatial resolution in the investigated material. A Focused Ion Beam Scanning Electron Microscope (FIB-SEM) equipped with electron backscatter diffraction (EBSD) and energy dispersive spectroscopy (EDS) systems will allow high-resolution 3D imaging of material- and life-science samples and in-situ micro-analyses of crystallography and chemical composition. One Field Emission Scanning Electron Microscope (FE-SEM) will be equipped with a broad set of microanalytical tools, some of which are not yet available in Norway. In addition

to EDS this will include wavelength dispersive spectroscopy (WDS) and micro-X-ray fluorescence (µ-XRF) spectroscopy for major and trace element analyses, cathodoluminescence (CL) for crystal growth fabric imaging, and RAMAN spectroscopy for crystallographic/phase analyses. Another FE-SEM will be equipped for serial block face SEM (SBEM), transmission SEM (tSEM) and array tomography (AT) for 3D imaging of large life- and material-science samples and correlative light and electron microscopy (CLEM). State of the art equipment will be provided for sample fixation and processing. An automated epi-fluorescence microscope, data storage and image processing resources will accomplish the toolkit for correlative microscopy.

Project number: 316480
Title: Joint national infrastructure for clinical and translational microbiota research
Applicant (partners): OUS (UNN, Haugeland uni.sykehus, Ålesund sykehus)
Project Manager: Michael Bretthauer

Short summary:
The gut microbiota, the collective of microbes in the intestine, is critical to human health and may be manipulated in patients' by microbiota therapy (e.g. fecal microbiota transplantation) to treat disease. This proposal is a joint national effort aiming to establish infrastructure to facilitate research targeting the gut in all medical disciplines.

Recent Norwegian landmark studies published in the New England Journal of Medicine and The Lancet Gastroenterology about the efficacy of fecal microbiota transplantation in Clostridioides difficile infection and irritable bowel syndrome indicated a positive treatment effect that may change clinical practice. Currently, large, phase III clinical trials are underway in Norway to confirm the promising early results. These trials involve a national network of researchers in all regional health authority that investigate the microbiota in health and disease. Oslo University Hospital recently provided seed support by designating microbiota therapy as a "strategic research area".

Despite this development of strong clinical and translational microbiota environments in Norway, a major challenge is the lack of a joint, nationwide infrastructure. We propose such an infrastructure that will include clinical and basic science services (e.g. laboratories with freezers and analytic tools), database management and stool donation clinics and -banks for use in clinical and translational microbiota research. The infrastructure will also facilitate collaboration with private and public partners to develop new microbiota therapies and -delivery methods. Importantly, this infrastructure will make it possible to design clinical (phase II and III) and translational studies that identify efficacy-promoting features in the microbiota, new pathophysiological mechanisms for development of other therapies and personalized microbiota treatment based on molecular features.

Project number: 316482
Title: Infrastructure for MoBa
Applicant (partners): FHI (NDE, NTNU, UiO, UiB)
Project Manager: Jennifer R. Harris

Short summary:
This project will upgrade and expand the existing data infrastructure for the Norwegian Mother, Father and Child Cohort Study (MoBa). MoBa is a nationwide-pregnancy cohort that is well-recognized as one of the most unique and valuable health research resources ever created. Its ongoing genotyping effort of ~284,000 individuals will make MoBa one of the world's largest cross-generation genotyped studies specifically designed to address research questions beyond the scope of single-generation cohort studies. MoBa is a living entity; its scientific value will increase tremendously as the participants transition through their life course. The MoBa children will become parents, the MoBa parents will become grandparents. Capturing changes in health and well-being as participants age and expanding the study to include the next generation will enable new opportunities for powerful studies that are globally unrivalled.

Since its inception in 1999, MoBa has been developed as a national research resource. During the last 20 years its scientific scope has grown dramatically. MoBa has provided data and biological samples to more than 550 projects, at all the major Norwegian universities, smaller universities and numerous academic centers. MoBa data also feature prominently in international collaborations and consortia, spanning more than 20 countries and more than 60 thematic research areas. MoBa is also proving to be invaluable for the study of communicable diseases as witnessed by its centrality in monitoring the current corona pandemic. Most recently, MoBa data (genetic and non-genetic) are the basis for multiple new studies and research applications investigating risk factors for Covid-19 infection and severity.

During the lifetime of MoBa, dramatic advances have occurred both in the technologies associated with databasing and in the Norwegian health data landscape, as reflected by national strategy under the Norwegian Directorate for e-health (NDE). Dedicated funding is critical for MoBa to modernize and scale its infrastructure to meet the demands of these changes and manage all the MoBa data, including the newly generated genetic and health surveillance data. This expansion and upgrade will achieve a unified, strategically coherent, and cost-effective data management infrastructure (iMoBa) founded on best practice, and the FAIR Data Principles. A critical component of the infrastructure will be the development of solutions enabling the full complement of the MoBa trio data to be hosted on the Health Analysis Platform (HAP). This will greatly increase the ability to make large amounts of high-quality digitized data available to researchers.

Project number: 316487
Title: ELIXIR3 - Strengthening the Norwegian Node of ELIXIR
Applicant (partners): UiB (UiT, NTNU, NMBU, UiO)
Project Manager: Inge Jonassen

Short summary:
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.

Project number: 316488
Title: Research infrastructure for preventative care
Applicant (partners): USN (Norway Health Tech, Nova Discovery, Vestre Viken Hospital Trust)
Project Manager: Hilde Eide

Short summary:
Preventable non-infectious chronic diseases cost the EU countries more than €700 billion each year in terms of management. This burden can be reduced if the value chain is re-designed to give more attention to prevention and prediction with corresponding economic benefit and improvement of citizens health. The development of Health Tech and drugs has a new paradigm: human in silico trials. We are proposing to build a new research infrastructure for preventative care (IT-Prevent) by applying in silico modelling and simulation (M&S) to prevention, prediction and self-management. USN will build on its current assets to provide the foundations for the ITPrevent Platform, enabling early collaboration between existing research infrastructures, municipalities, health care providers and industry. Specifically, IT-Prevent will start by requesting proof of need for their idea from candidate teams combining industry with health & social care providers. Proposals will be assessed against criteria for prevention and predictive products (apps and devices) and related services. If proof of need is demonstrated then IT-Prevent will support testing proof of concept, technology validation and technology validated in virtual environments using in silico testing.

Project number: 316495
Title: Norsk Senter for Minimal Invasiv Bildeveiledet Behandling og Medisinsk Teknologi, Fase 2
Applicant (partners): ST. OLAVS HOSPITAL HF (OUS, UiO, NTNU, SINTEF)
Project Manager: Jan Gunnar Skogås

Short summary:
NorMIT2 national infrastructure addresses the needs for national collaboration on medical big data analytics, artificial intelligence (AI), and automation in patient monitoring/management. In the operation theatres of the future, AI will be used clinically in cognitive robotics, medical imaging interpretation, automated fusion of images and navigation tools, and decision support on the fly. New medical technologies will be utilized for improvement of resource allocation in programs and to manage the operation theatre by predicting operation time based on the intraoperative data and event detection. This will lead to better patient flow in the ORs and multi-modal suites.
The main clinical goal of NorMIT2, is to further improve patient care through the development of minimally and non-invasive medical technology with less trauma to patients, better safety and quality of treatment, improved tools for clinical decision support, and shorter hospital and rehabilitation time for patients, thus, cost-effective solutions for the health care sector and society. NorMIT2 will be based on clinical and technological needs for new investments, upgrading, expanding and improving the well-functioning national research infrastructure NorMIT (established 2014, www.normit.no). NorMIT has been a success because equipment and infrastructure has been implemented in technical and clinical research and innovation projects, including EU projects and industry driven projects. An infrastructure payment system has been established, and the nodes in Oslo and Trondheim have developed a common software platform for planning and navigation in image-guided therapy.

Phase 2 of the infrastructure will also focus on and operate in the field of minimally and non-invasive treatment and medical technology to develop new treatment techniques, and enable decentralization of diagnosis, treatment and follow-up of patients. The upgrade and new investments will also cover the growing need for data sharing and computational tools as pointed out in the Norwegian Roadmap for Research Infrastructure (2018). The NorMIT partners have in the phase 1 period managed several large-scale projects where NorMIT has played an instrumental role: i) Lighthouse project BigMed, aiming at removing the bottlenecks for introducing precision medicine in clinical everyday practice, 2) CIUS, SFI project, developing next generation solutions for ultrasound by bridging academia and industry to address the needs and challenges in ultrasound across the three sectors of health care, maritime, and oil & gas, iii) Several EU projects, including HiPerNav (soft tissue image-guided surgery) where 6 out of 15 ESRs are working in Norway, several of them using the NorMIT infrastructure.

Project number: 316504
Title: National Platform for NanoSafety
Applicant (partners): UiB (NILU, STAMI, SINTEF Ocean, NMBU)
Project Manager: Mihaela Roxana Cimpan

Short summary:
Nanotechnology is one of the six Key Enabling Technologies, which are expected to address many societal challenges by providing new and innovative solutions. The aim of the National Platform for NanoSafety (NPNS) is to provide relevant stakeholders, e.g., industry, academia, research centres and institutions, and consumers with easy access to the expertise, state of the art instrumentation, infrastructure and methods to assess the exposure, hazards and risks associated with nanomaterials (NMs). It will provide a national hub for expanding insight into the impacts of NMs on humans and the environment, support the development of safe(r) NMs, facilitate application of nanosafety principles to products and industrial processes and inform regulatory decision-making bodies to ensure responsible research and innovation in nanotechnology . The platform will cover evaluation of the physico-chemical characteristics and biological effects of various types of NMs, from metal oxides to organics, including polymer-based 'nanoplastic' and complex composite nanostructures. We will especially address the real and urgent need for biological three-dimensional models and interference-free methods that mimic real-life exposure to NMs. There will be an emphasis on high-throughput testing. The NPNS addresses the international goal of ensuring
that NMs are in compliance with the proposed principle of small, smart and safe (the 3 S´s).
The NPNS builds upon the SafeNano Norway Network and successful collaborations between Norwegian research centres in previous and current national and European projects focused on the safety assessment of NMs. The NPNS is strategically anchored in the prioritized research areas of the Research Council of Norway and of the host institutions, it will strengthen and expand the existing national and local networks and promote collaboration in the field.

The National Platform for NanoSafety aims to provide industry, academia, research institutes and other relevant stakeholders a user-friendly, open test bed consisting of state of the art instruments and expertise for exposure, hazard and risk assessment of nanomaterials (NMs). The ultimate goal is to contribute to the development of ***small, smart and safe(r) NMs.***

Project number: 316505
Title: e-INFrastructure fOr e-health research aNd InnovAtion
Applicant (partners): HELSE BERGEN HF (Helse Vest IKT)
Project Manager: Tine Nordgreen

Short summary:
The vision for the e-INFrastructure fOr e-health research aNd InnovAtion (INFONIA) is to improve public health through research on e-health interventions. INFONIA will facilitate e-health research with the aim to improve mental, behavioral and physical health within the context of collaborative and distributed primary and secondary healthcare services. The research on digital prevention and treatment requires an accessible einfrastructure where digital interventions can be developed and evaluated. This infrastructure should be available to clinical expertise and research projects in order

to reduce the need for technology-development in every single clinical e-health project, and consequently increase the cost-effectiveness in e-health. Our goal is to offer cross-disciplinary e-health-research teams (users, health personnel, health researchers, Information Communication Technology (ICT) researchers, and ICT industry, a secure, accessible and reliable infrastructure where sensitive digital health data can be collected, stored, shared, analyzed, and fed back to the users and health care providers. This includes the possibility to quickly and thoroughly gather evidence on the effects of e-health interventions by supporting clinical trials.

The INFONIA infrastructure will move the e-health research in Norway, including international partners, well beyond state-of-the-art. The infrastructure will also have a positive impact on the society at large: Two thirds of the Norwegian population asks for more digital communication with the health services. However, the existing research infrastructure do not facilitate our abilities to reach these ambitions. For the public sector INFONIA will increase the access to evidence-based e-health interventions. Increased digital collaboration will provide the patients with long-term needs a seamless chain of health care across services: primary, secondary, somatic and psychiatry. As a long-term impact for the industry, INFONIA will provide easier access for SMEs in general by defining a technological infrastructure with application programming interfaces (API's) which allows the integration of solutions from third parties. This will stimulate innovation in private sector resulting in high-quality e-health related products.

Project number: 316517
Title: NorBRAIN – A Norwegian Brain Bank Initiative
Applicant (partners): HELSE BERGEN HF (UiB, OUS, UiO, St.Olavs, NTNU, UiT, UNN)
Project Manager: Charalampos Tzoulis

Short summary:
Brain diseases such as Alzheimer's disease, Parkinson's disease, amyotrophic lateral sclerosis, multiple sclerosis, schizophrenia and mood disorders, are among the greatest health and socioeconomic challenges of our time. Collectively, these disorders are the leading cause of disability and the second leading cause of death. For most of these disorders there are no effective disease-modulating therapies and patients face a future of progressive disability and prermature death. Since cell and animal models accurately reflecting human disease are lacking, direct access to brain tissue is pivotal for gaining insight into underlying disease mechanisms and developing targeted treatments. In spite of this clear need, there is currently no national storage resource for human brain tissue in Norway and very few in the world. Moreover, the few existing brain banks (e.g. in the UK, the Netherlands and Barcelona) do not cover this urgent need because they: 1) have a relatively low number of samples compared to what current research needs to provide clear and definite answers, 2) contain little or no tissue from extra-neural organs, which play an increasingly recognized role in brain diseases, and 3) lack tissue from a sufficient number of healthy control subjects.

We propose NorBRAIN: The Norwegian Brain Bank. NorBRAIN will collect, store and study antemortem clinical information and postmortem brain, as well as tissue from other relevant organs, from individuals with brain diseases and healthy controls. NorBRAIN will comprise: 1) A tissue repository with fresh-frozen and formalin-fixed tissue from all relevant brain regions and other organs. 2) Standardized pathological characterization and staging of all samples. 3) A digital

pathology database containing scans of all sections. 4) Systematic clinical information. 5) Antemortem neuroimaging and blood samples.6) Whole-genome sequencing on all subjects. NorBRAIN will provide access to data and material for users from all fields of academic research and the industry.

Project number: 316530
Title: EBRAINS Norway: Norwegian Node of the European Research Infrastructure for Brain Research and Brain-Inspired Sciences
Applicant (partners): UiO (NMBU)
Project Manager: Jan G. Bjaalie

Short summary:
The scope of this proposal is to establish a National node in EBRAINS: the European distributed Research Infrastructure (RI) for brain research and brain-inspired sciences. EBRAINS is currently a platform (https://ebrains.eu) developed by the EU Flagship Human Brain Project (HBP), with funding until 2023 and continued support for basic infrastructure through other ICT funding mechanisms. Seven institutions from across Europe, including the University of Oslo, have established EBRAINS AISBL (an International Non-Profit Organization based in Brussels, Belgium) to facilitate the effort of transforming the EBRAINS platform into a distributed RI on the ESFRI roadmap. The EBRAINS RI will lay the technical foundations for a new model of ICTbased brain research, driving integration between data and knowledge from different disciplines, and catalysing a community effort to achieve a new understanding of the brain, new treatments for brain disease and new brain-like computing technologies. Through a range of services, allowing researchers to collect, share, access, analyse, and integrate brain data, and to perform modeling and simulation of brain function, EBRAINS will allow creation of the necessary synergy between the (often fragmented) different national efforts to tackle one of the most challenging targets of research: understanding the brain in health and disease. Users of EBRAINS will be basic, computational, and clinical neuroscientists, as well as developers of brain-inspired technologies for AI. Norway holds a leading role in the ongoing EBRAINS infrastructure developments. Within the distributed RI, the Norwegian Node at UiO will contribute to services in the domain of Data and Knowledge (FAIR data services), Brain Atlases and related analytical workflows, with partner NMBU contributing to Modeling and simulation services and the organization of the pan-European EBRAINS High-Level Support Team. With Norway being an active participant in EBRAINS, all researchers in Norway will have access to all services provided by EBRAINS.

Project number: 316531
Title: Norwegian Infrastructure for Advanced Cell Engineering
Applicant (partners): OUS (UiO, HUH, UiB, NTNU, UiT)
Project Manager: Karl-Johan Malmberg

Short summary:
The current proposal concerns the establishment of a Norwegian Infrastructure for Advanced Cell Engineering (NICE) to support the development and clinical implementation of regenerative medicine, cell and gene therapy in Norway. Regenerative medicine and cell therapy form two of the

most dynamic research areas world-wide and provide fundamentally new therapies for diseases without available treatment. However, large-scale, clinical-grade cell engineering represents a key bottleneck for the development of new cell and gene therapies. The development of advanced gene and cell therapy is spearheaded by the unprecedented clinical success of cancer immunotherapy and CAR-T cell therapy for B cell malignancies. In parallel, new advances in stem cell biology, including the possibility for directed differentiation of mesenchymal stem cells (MSCs), and the successful reprogramming of somatic cells to induced pluripotent stem cells (iPSC) open up new possibilities to regenerate cells and tissues for the treatment of chronic diseases such as diabetes and endocrinopathies, as well as various organ failures, including liver diseases. iPSCs can also be the source for genetically engineered immune cells for off-the-shelf immunotherapy against cancer (First patient treated at UCSD June 2019). A key technological advance for the successful clinical implementation of regenerative medicine is the advent of new tools for gene editing using the CRISPR/Cas9 system. These tools can now be used to correct monogenetic disorders in a cell type or tissue specific way to treat a broad spectrum of inherited diseases. To meet the challenge of lacking infrastructures for large-scale, clinical-grade cell engineering, the applicants have attracted unique investments from two private funds. These investments are dedicated to actions that strengthen the competence in cell differentiation, manipulation and genomic editing under full-scale good manufacturing practices (GMP). With this application we outline a path to expand and restructure the pre-GMP and GMP infrastructure in Norway to support novel clinical trials based on in-house developed cell and gene therapy concepts. NICE aims to make novel and advanced therapies available to Norwegian patients, and to create a fundament for innovation and facilitate industrial collaborations, to position Norway at the international forefront in this highly competitive area of precision medicine.

Project number: 316532
Title: Norwegian Organ-on-a-Chip infrastructure for testing and qualification of preclinical interventions
Applicant (partners): OUS (UiO, UiB, NTNU, USN)
Project Manager: Stefan Krauss

Short summary:
Complex in vitro models aim to recapitulate higher-level anatomical and physiological or pathological aspects of human biology in practical experimental setups. In order to deliver better, faster, more precise and patient-tailored (personalized) drug regimes in medical practice; human Organs-on-a-Chip (OoC) technology is quickly advancing as a platform for complex in vitro models. OoCs represent aspects of human organs and tissues, and reproduce human physiology in a way that resembles the animal and human situation good enough for predictive testing of interventions. This is key for preclinical testing of novel drugs, for personalization of drug testing and – importantly – for being able in future to respond far quicker to novel challenges such as the current COVID-19 outbreak. Clear evidence shows that OoC technology is on the verge of widespread acceptance by academia, the pharmaceutical industry, as much needed alternatives to animal testing.

We propose to establish and implement a Norwegian Organ-on-a-Chip infrastructure to fill the missing link between cell culture, animal models and human subjects.

Project number: 316544
Title: National research infrastructure for biopharmaceutical process development and production
Applicant (partners): SINTEF AS
Project Manager: Hanne Haslene-Hox

Short summary:
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.

	Nodes	Research aim	Equipment	Personnel	Placement
10 MNOK	Preproduction	Predictive modeling and underlying data to determine and plan process inputs and production parameters	• Data models and digital tools for data storage and handling • Instrumentation for RNA and DNA sequencing	Arne Berre, SINTEF Digital	1 Node in Trondheim 1 Node in Oslo
35 MNOK	Upstream processing	Efficient and flexible cultivation systems to enable broad testing and accommodate mammalian and microbial process development	• Miniatyrized and automized bioreactor systems (15-250 mL) • Automatic sampling systems for bioreactors • Atline/online process analyses	Håvard Sletta, SINTEF Geir Klinkenberg, SINTEF Hanne Haslene-Hox, SINTEF	1 Node in Trondheim
10 MNOK	Downstream processing	Purification technology to improve capacity, product quality and yield from various upstream processing, purification of formulated products	• Preparative and multicolumn liquid chromatography and filtration, robotic integration • At-line product and process monitoring during purification	Inga Marie Aasen, SINTEF Anders Brunsvik, SINTEF	1 Node in Trondheim, Additional Node TBD
10 MNOK	Process monitoring (all phases of production)	Implementation of inline, online and offline sensors and analyses to better understand, monitor, model and control production processes	• Instrumentation for online biomass and cellular metabolism (e.g. IR, UV-Vis and Raman) • Mass spectrometer for off-gas analysis	Anna Nordborg, SINTEF	1 Node in Trondheim Additional Node TBD
10 MNOK	Formulation and post-production	Methods for product formulation, characterization, including potency, sterility, purity, stability and reproducibility	• High-resolution MS with nanoLC fractionation for protein characterization • Equipment for product formulation and sterilization	Sven Even Borgos, SINTEF Yrr Mørch, SINTEF	1 Node in Trondheim

Project number: 316550
Title: Norwegian Research Infrastructure for studies of environmental contaminants
Applicant (partners): NILU (NIVA, UiT)
Project Manager: Aasmund Fahre Vik

Short summary:
Positioned at high latitudes, Norway is especially vulnerable to long-range transport of persistent contaminants and Norwegian authorities have thus decided to take a leading role internationally related to studies of chemical contaminants and regulation of emerging pollution. In addition to that, changes due to global warming are opening new areas for various industries (e.g. petroleum, shipping, mining), which requires research around potential environmental impacts of these activities in order to achieve sustainable management of the ecosystems.
Main goal:

- Establish a nationally coordinated and internationally leading research infrastructure network for environmental chemistry with a special focus on emerging pollution

Objectives:

- Provide cutting-edge research infrastructure for investigating the consequences of emissions and exposure of emerging environmental contaminants including microplastic and nanomaterials
- Develop advanced data management structure featuring front-line data treatment and storage tools
- Support national high-quality training of Master and PhD candidates with cutting-edge research infrastructure for environmental chemistry, epidemiology and ecotoxicology
- Bridge the gap between harmful exposures and chemical management strategies
- Evolve and consolidate the existing national collaboration on research related to environmental emissions, ecotoxicological impacts and human exposure to contaminants
- Contribute to the aim of a pollution-free environment and to lessen the impact and exposure on environment and human exposure

It is planned to develop a Norwegian component of the European NORMAN e-infrastructure through the currently proposed infrastructure.

Project number: 316551
Title: SUSTAINHEALTH-workflow, an Infrastructure for Food, Health, and Sustainability
Applicant (partners): FHI (NVI, SSB, UiO, NFSA)
Project Manager: Helle Margrete Meltzer

Short summary:
Worldwide, transforming food systems in the direction of sustainability with a high priority on health and food safety is getting increased attention, and in Norway, several projects are or will soon be addressing various issues in this respect. The work processes towards those goals are, however, not as efficient as they could and should be, and lack of infrastructures supporting the workflows needed is a major obstacle.

Currently, we lack many of the tools for the comprehensive research and development work needed for concerted attacks on these problems in an efficient, persistent and quality-assured way. We need

efficient access to co-ordinated and updated databases and metadata, and tools to utilize the data. This project will provide the research community, actors in the food systems context, health authorities and general public with a data- and knowledge infrastructure that links diet, food, human and animal health, agricultural and environmental information and constitutes a basic element in a sustainability research and development toolset.

Overall aim: To build a data and knowledge infrastructure that supports transdisciplinary research and development, bridging food production, food security, food safety, health and sustainability.

Some of the specific aims:

1. Develop a distributed infrastructure in the form of an integrated network of services on both the provider and user side. A workbench approach will furnish users and developers/maintainers with tools for developing, maintaining and using the services provided.

2. Develop tools and methods to facilitate monitoring of the sustainability of food production and food consumption, in part based on a OneHealth approach, integrating and making optimal use of existing data sources and dataflows, e.g. Landbrukets dataflyt.

3. Provide necessary access to food production and composition data, facilitating the development and use of validated dietary and health assessment tools for diet and health connections, and consistent with national health and biomonitoring surveys.

4. Provide simple and standardized access to data on food production, composition and consumption for research, evidence-based advice, policy development and evaluation, in part supported by linkage with data on health outcomes.

The handling of sustainability will be based on the UN SDG indicator set and similar international initiatives. Being unique, scalable and internationally usable, this research infrastructure will facilitate high-calibre research and attract international partners, top researchers and students. The infrastructure will be useful for researchers within public health and health analysis and sustainability projects, and will be valuable to the public, health personnel, health authorities and a number of international bodies.

Project number: 316562
Title: FAIR Data Management Plan
Applicant (partners): NSD
Project Manager: Katrine Utaaker Segadal

Short summary:
The FAIR Data Management Plan (FAIR-DMP) project aims to upgrade and improve NSDs' set of integrated tools and services for Data Management Planning, helping researchers and institutions in making their data FAIR and shareable. The portfolio of services consists of three tools with machine-actionable functionality: a Data Management Plan tool1, a Data Policy Manager2, and a Data Management Plan Overview3 for institutions. The upgrade of these DMP services will include several new integrated support tools that will help researchers in planning for sharing their research data. The upgrades will include services such as: a license selector that will guide the researchers in selecting licenses for both open- and restricted data; a guide for identifying relevant metadata standards; a built-in guide for estimating storage and computing costs connected to data

management; and a mechanism for assigning tasks, and setting roles and responsibilities regarding data management and data processing.

Additionally, the upgrade will build a system for turning all (final version) DMPs into FAIR Digital Objects4 by assigning them with a DOI5 and allowing researchers to publish them in a national public registry of DMPs.

An upgrade of this portfolio of services will contribute to cultural change with respect to data FAIRness and is an initiation towards a broader national FAIR ecosystem for keeping research data as open as possible and as closed as necessary.

Project number: 316563
Title: National bio-mechatronics infrastructure for ASSISTive and AugmeNting Technology in personalised healthcare
Applicant (partners): UiA (OsloMet, UiO, UiT, HVL, USN, UiS,I4Helse, NORA, NAIS, NOBIM, Sørlandet Hospital, Sunnaas Rehabilitation Hospital, SUH, NSCC, Norway Health Tech)
Project Manager: Filippo Sanfilippo

Short summary:
Vision and objective. The national biomechatronics infrastructure for ASSISTive and AugmeNting Technology in personalised healthcare (ASSISTANT) will be an interdisciplinary research infrastructure that focuses on the concept of human empowerment with support by technology, which will fundamentally improve human life. ASSISTANT will enable the exploitation of assistive and augmenting technology to provide personalised healthcare with shorter and efficient response times such that the costs are minimised, and patients can manage independent living. To achieve this, it is required to envision cross-disciplinary knowledge that cannot be found in a single research group and needs a transnational effort to reach a wide community of researchers, users, patients and practitioners. The necessary core discipline is biomechatronics. Moreover, different additional expertise are needed, such as eHealth, Robotics, Human-Machine Interaction (HMI), Internet of Things (IoT), Signal Processing, and cognitive Artificial Intelligence (AI). It is essential to synergistically integrate these disciplines working jointly to create new conceptual, theoretical, methodological, enabling and translational innovations that move beyond discipline-specific approaches. ASSISTANT will boost innovation, efficiency and sustainability in the field of personalised healthcare.

The overall objective of ASSISTANT is to establish a novel national research infrastructure that will encourage cooperation and networking across patients, practitioners, technology providers and service levels, to lay the foundations for better personalised assistive healthcare with shorter and efficient response times such that costs are minimised and patients can lead a more independent life with equalisation of social health inequalities. The objective of this infrastructure is twofold, first to developed the necessary national infrastructure comprising the leading institutions in biomechatronics, eBealth, robotics, BMI, information and communications technology (ICT), IoT, signal processing, and machine learning (ML); second, to establish a digital cooperative networking framework to reach the desired wide community of researchers, patients and practitioners. This will contribute towards implementing the future of personalised assistive healthcare.

Project number: 316566
Title: SEFIRE: Research infrastructure for knowledge-building on societal health, security and sustainability
Applicant (partners): NIVA
Project Manager: Malcolm Reid

Short summary:
Municipal wastewater (or sewage) is generally regarded as just waste with no real value. However, sewage represents an inexhaustible repository of information and is said to mirror society: disease [1], antimicrobial resistance [2], diet [3], human exposure to chemicals and environmental stimuli , micro-plastics [4], use of narcotics [5], and the impact of allergies can all be measured in sewage. In addition, the impact of most domestic and industrial activities, and modern living in general, are also part of the information included in sewage. Collectively, this allows for unprecedented holistic research into societal activity and wellbeing, and in turn allows informed management decisions regarding public health, pollution and security [6].

SEFIRE proposes to establish unprecedented national infrastructure to take advantage of this novel field of investigation and turn waste into research, societal improvement and value. The development of a near-real time national sewage surveillance system for the analysis and acquisition of these indicators would dramatically increase our ability to govern or manage timely and effectively and even predict future events [7]. While the scope may differ greatly between the fields of public health, environment and security, these fields share a common need for accurate data to aid research and ultimately make successful decisions and to measure the impacts of those decisions.

SEFIRE will also establish a tool to allow retrospective mining of information that could have been neglected before. By establishing a national centre for sewage-based services for use at research and governmental level, SEFIRE will increase the interaction between research infrastructures and improve the coordination of existing and future research and monitoring programs.

Project number: 316570
Title: Norwegian Urban Observatory
Applicant (partners): NILU (Augment City/Offshore Simulation Centre AS, Oslo Kommune)
Project Manager: Leonor Encuentra Tarrason

Short summary:
Urbanization is one of the main societal trends today, also in Norway, where urban growth is one of the highest in Europe. Urban pollution originates from many sources inside and outside cities, including exhaust and nonexhaust road traffic, residential and commercial sectors as well as energy, construction, waste and industrial activities. There are large uncertainties about which sources release pollution components in the urban environment, and how the different components affect human health, climate, and the environment. Strengthening the scientific evidence is needed to design sustainable urban areas. This requires above all, knowledge based on advanced measurements. The Norwegian Urban Observatory (By Observatoriet) will offer an infrastructure for urban experimentation and monitoring with measurements of urban pollution for researchers,

policy-makers and the public. It will also provide scientific evidence and knowledge to support, simulate and monitor the transition to sustainable cities and urban communities.

The Norwegian Urban Observatory is a cutting-edge infrastructure to improve the understanding of urban pollution, its physical and chemical characterisation as well as to provide solid knowledge on its origins and impacts. It consists of three elements: 1) an advanced urban observational infrastructure, 2) a shared database system and 3) an urban planning virtual reality (VR) platform. The advanced observational infrastructure will include i) a supersite with high-end instrumentation for the physical and chemical characterization of the urban atmosphere, ii) a mobile unit for characterizations in specific locations and iii) a platform for testing and calibrating of micro-sensor networks. The shared database system will allow access to the advanced data from the advanced observational infrastructure, as well as to information on urban pollution and its sources and additional relevant datasets to create specific services. The urban planning VR platform will be a Digital Twin City to engage transdisciplinary research and co-creation activities in support of sustainable urban planning and the testing of different urban environmental solutions. The Norwegian Urban Observatory is intended to guide the implementation towards urban sustainable futures addressing the challenges recognised under the UN Agenda 2030 Sustainable Development Goals (SDG11: Sustainable cities and communities), the Urban Agenda for the EU (UAEU) and support the required urban actions within the European Green Deal.

Project number: 316574
Title: Digital BioBank Norway
Applicant (partners): HELSE BERGEN HF (SUH, Helse Fonna HF, UiB, HVL)
Project Manager: Hauke Bartsch

Short summary:
Establishing eInfrastructure for the national priority area of health has been a focus of Norwegian efforts for more than two decades. As part of these attempts to address computing- and data-intensive challenges at a national level we propose the creation of a central coordinating facility for a Digital Biobank in Norway (DBB-NO). The main purpose is to combine the efforts of individual hospital-based technological research environments in Norway, capitalizing on the latest international research developments. Combining the best local and international efforts and providing them on a national level allows every health research institution in Norway to access environments for the safe evaluation of the latest technology and provides nation-wide access to shared resources and expertise supporting individual and local efforts. Research projects can focus on core expertise while benefitting from the best technology available. This integration of active research developments into hospitals is a requirement for the accelerated evaluation of novel solutions in clinically relevant settings, a fast-fail system that provides essential feedback to researchers and a platform for clinicians to learn about and demonstrate short-comings of proposed solutions, ethical- and privacy issues and edge-cases. The major benefit of DBB-NO is that it will lead to an accelerated cycle of technological development that does not have to focus solely on peer-reviewed publications and the involvement of incubator industry efforts before health-solution can be evaluated in a relevant environment. It will allow findings to be replicated across Norway and the distribution and integration of solutions to individual hospitals in the routine clinic and when facing urgent health crisis.

Project number: 316577
Title: Linear accelerator for comparative and veterinary research
Applicant (partners): NMBU Veterinærhøgskolen (University of Edinburgh, UiO, OUS, Swedish University of Agricultural Sciences)
Project Manager: Lars Moe

Short summary:
Comparative research using companion animals with spontaneous cancerholds great value due for medical research. This is due to the many similarities in between species in regard to cancer biology, ethiology, physiology, treatment response and physical size similarities. Companion animals have been used as such models through many studies and trials. In order to utilize the value of this important model,it is necessary to have access to state-of-the-art radiation therapy facilities for these animals. A LINAC capable of delivering high energy (Megavoltage radiotherapy) with possibilities of intensity modulated radiation therapy (IMRT) and integrated cone-beam computed tomography (CBCT) portal imaging would be ideal for this purpose. The new facilities of the Veterinary Faculty at the Norwegian University of Life Sciences (NMBU), which will be completed during the autumn of 2020, will have a fully functional, purpose-built radiation-shielded bunker, which can accommodate a LINAC. Due to budgetary restrictions, the planned funding for the LINAC was withdrawn, however, the bunker itself has been fully constructed. A LINAC would provide the researchers at NMBU, as well as its partner institutions, with the necessary infrastructure to perform high-quality comparative clinical research, as well as basic medical research. Such infrastructure are currently not available for companion animals in any of the Nordic countries. No access to LINACs seriously limits the possibilities of utilising the value of this biologically and size matched comparative model in all areas of radiation therapy treatment research.

Linear accelerators (LINAC) are used in cancer treatment and research, both in humans and companion animals. They provide ionizing radiation, which results in cellular damage and death of cancer cells. To study the mechanisms involved in radiation sensitivity and resistance, as well as to establish new treatment protocols, researchers need to have access to a LINAC.

Project number: 316583
Title: Biobank Norway 4 - a National Biobank Research Infrastructure
Applicant (partners): NTNU (UiT, UiB, UiO, NTNU, Helse Nord, Helse Vest, Helse Sør-Øst, Helse Midt, Kreftregisteret, FHI, OUS)
Project Manager: Kristian Hveem

Short summary:
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*

Project number: 316587
Title: Norwegian Family Based Life Course Study - Competence Hub
Applicant (partners): UiO (FHI, NTNU)
Project Manager: Øyvind Erik Næss

Short summary:
The Norwegian Family Based Life Course study (NFLC) has been operating since 2003 and continuously expanding with several sub-studies. Each of the studies in the NFLC are using data platforms that are among the most comprehensive for population based medical and health research in Norway. The NFLC study has shown viability and long-term commitment. As of May 2020, 6 studies have been established. Until now all stages of legal applications, data-management and research design have been handled by a limited number of individuals in the project group. These have been mostly researchers with no formal training in operating such large-scale data sources. There appears to be a gap between expectations in the national and international research community of what large-scale Norwegian register data and or biobanks can deliver, and the number of researchers with in-depth competence in how to bring research ideas into reality. This problem is even more pronounced in areas involving complex family and longitudinal data, which include more than two data-sources.

The Norwegian research community has put health registers and biobanks among the pillars of future strategic research areas in life science. There is a need to professionalize the capacity among researchers and research support staff for the transition stage between scientific objectives on the one hand and data owners, data storage or legal framework on the one other. This is a key element for planning new innovative research projects and become involved in international collaborations and networks. The integration of comprehensive Norwegian register linkages with biobanks have the potential to provide high quality data and unique innovative research designs by world standards. If sufficiently funded, the NFLC infrastructure will provide a competence hub for Norwegian research environments with important deliverables: 1) speed up the process of moving from research ideas to

complex data sets, 2) provide an environment of expertise on optimal and feasible data sources for specific research questions.

Project number: 316604
Title: The Norwegian Eye Initiative (NOREYE) - a leading national and international research infrastructure on the eye and visual function
Applicant (partners): USN
Project Manager: Bente Monica Aakre

Short summary:
The Norwegian Eye Initiative (NOREYE) aims to be a leading national and international research infrastructure providing access to broad scale expertise utilising advanced technology for imaging the eye and for non-invasive measurements of eye and visual function. This initiative will provide a Norwegian facility for a broad range of R&D&I targeting the areas emphasized in the Long-term Plan for Research and Higher Education 2015–2024 for developing world-leading academic groups to advance research on the eye and disorders of the visual nervous system in Norway.

Unlike other bodily organs, the eye and visual nervous system is severely under-researched. This is societal challenge for today and for the future. Visual impairment and blindness are growing health problems also in Norway. Today about 10% of the population of those aged 45 years and older have a visual impairment. That is about 500 000 people. Eye and vision problems limit the potential of individuals, hindering education and employment opportunities, reducing productivity and impairing quality of life. Eye and vision problems is creating a time bomb of: (i) age-related health problems — an issue that will place an added load on the already large societal burden associated with an ageing population; (ii) school and work-related health problems — new technologies and digitalisation will place an added load on requirements for having normal and healthy eyes and visual function.

NOREYE intends to become the first high-capacity eye and vision research infrastructure in Norway that with its complementary access to expertise can address a wide range of activities including research on common and rare eye disease as well cooperation with the eye care industry for clinical trials on contact lenses, spectacle lenses and therapeutic medicine. Another area releasing much needed activities is related to research on medical fitness of personnel in transport industries and in industries implementing new and advanced technologies for automation and remote services. The infrastructure will contain all needed facilities for quantitative, objective, and non-invasive imaging and functional measurement methods for studying the functional and structural integrity of normal and diseased ocular structures and visual function.

The interdisciplinary research centre, USN National Centre for Optics, Vision and Eye Care, will be the core team responsible for the NOREYE, with expertise in eye and vision research to develop a national scientific community of outstanding quality within the field.

Project number: 316609
Title: Establishment of a new advanced imaging platform in the Oslo region
Applicant (partners): OsloMet (SimulaMet, Fertilitetssenteret)
Project Manager: Trine Berit Haugen

Short summary:
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.