UNIVERSITETET I OSLO

Institutt for biovitenskap

ADMINISTRASJONEN
I. 3/2020

INNKALLING STYREMØTE

Instituttstyrets møte nr 3/2020 – 02.04.2020, kl. 12:00-13:00 (merk tiden),
ZOOM-møte ID; https://uio.zoom.us/j/699518954

V-SAK 09/2020 GODKJENNING AV INNKALLING
Forslag til vedtak: Innkallingen godkjennes

Den eksepsjonelle situasjonen universitetet og instituttet er i på grunn av coronavirus-epidemien har gjort det svært vanskelig å forberede dette styremøtet. Jeg ber derfor om styrets forståelse for at vi ikke har greid å forberede saksfremleggene til dette møtet tidsnok. Siden det ikke vil være vedtakssaker i dette møtet, mener instituttleder at det likevel er forsvarlig å gjennomføre styremøtet til oppsatt tid med de to orienteringssakene som er på agendaen.

V-SAK 10/2020 GODKJENNING AV REFERAT IS2/2020
Forslag til vedtak: Referatet godkjennes

O-SAK 11/2020 Orientering om status ved IBV i forbindelse med stenging av UiO pga coronavirus-epidemien.

Til saken:
Instituttleder gir en muntlig orientering om status ved IBV

O-SAK 12/2020 Orientering om status for PRA-prosessen og IBVs ledergruppes møte med IBV SAC 27. mars 2020

Sakspapirer:
Instituttleder utarbeider et kort resymé fra møtet mellom IBVs Ledergruppe og IBV SAC. Dette sendes styret innen 1. april kl 11:00

Rein Aasland
Instituttleder

Til: Instituttstyret ved Institutt for biovitenskap

Sakstype: Orienteringssak
Saksnummer: O-sak 12/2020
Møtedato: 2.4.2029
Saksbehandler: Rein Aasland

Sakstittel: Orientering om status for PRA-prosessen og IBVs ledergruppes møte med IBV SAC 27. mars 2020

Title: Briefing on the status on the PRA process and the IBV's leader group meeting with the IBV SAC on March 27th 2020.

Previous documents:
IS3 V-sak 3/2019 New plan for recruitment to permanent scientific positions.

Meeting between IBV SAC and the IBV Leader group, 27.3.2020
Due to the coronavirus situation, it was not possible for SAC to visit IBV as planned. A meeting (videoconference) between the IBV SAC and IBV Leadergroup (LG) was therefore held on 27.3.2020.

All SAC members were present:
Leif Andersson (chair), Angela Fago, Anders Goksøyr, Malcolm Bennett, and Susanne Mandrup

From IBV's Leadergroup were present:
Rein Aasland, head of department, Section Leaders Paul Grini, Pål Falnes, Alexander Eiler, Göran Nilsson, Kjetill Sigurd Jakobsen, and Education Leader Kristian Prydz
Tore Wallem and Åshild Maria Eftevåg took notes from the meeting.

Before the meeting, LG had drafted a Follow-up of the IBV SAC's evaluation and recommendations on the Proposals for prioritized research areas (PRAs). [**attachment 1**: "Follow-up plan"]. This document, together with the SAC's evaluation and recommendations, had been forwarded to the PRA proposing teams and the IBV Board on March 4th and to the SAC on March 24th. In preparation for the meeting, LG had prepared a set of questions as a guide for the discussion. Key points from the meeting were:

1. SAC expressed that the LG's Follow-up plan is a reasonable approach for taking the PRA process further, including the four tracks for follow-up as outlined by the LG.
   - For track 4.3 ("emerging fields"), the SAC expressed that this is a good idea as long as it is scientifically sound.

2. SAC advised that, as the LG has more information on the PRA proposals and the Department, the LG must develop the process further [towards decision by the Department's Board].

3. Concerning the "Themes" proposed by the SAC, the SAC stated that this was meant as a suggestion and noted that not all SAC members agreed on the "Themes".

4. SAC expressed that, to meet with the PRA proposers now, would slow down the process. Hence, SAC advised to proceed without this step. The SAC is, however, prepared to return at a later stage, when the Department [Board] has made its decisions and started to develop the PRAs and make new recruitments.

Feedback from PRA proposers
On March 4th, when the *SAC's evaluations and recommendations* and *the Follow-up plan* were communicated to the PRA proposers and the IBV Board, a web form was opened for collection of feed-back from PRA proposers. Per March 31st, 13 of the 19 PRA proposing teams have provided feedback. Since PRA proposers will not have opportunity to meet with SAC, as planned, all PRA proposal leaders will be encouraged to use the feedback form. As soon as all teams have given feedback and the form is closed, the feedback will be collated and made available to the proposers and the Board. Provided that all the proposing teams give consent, the feedback as well as the SAC report can be made internally available to the Department.

Further process
Given the advice from the SAC, the IBV Leader group will now develop the process further, based on the follow-up plan and considering the feedback from the PRA proposers. Since SAC did not consider criterion C4 (capacity to support IBV's BA-education), this aspect will be taken into consideration when LG develops its proposal.

During the course of this process, an open meeting on the process will be held in the Department. Subsequently, the leader group will propose which PRA proposals should be selected and Head of Department will present this to the IBV Board for decision in accord with step vii) in the plan for developing the new model for recruitment to permanent scientific positions (V-sak3/2019).

LG will now proceed with its work as fast as possible. A timeline for this will be developed by LG and agreed with the IBV Board.

Attachments:
- Follow-up of the IBV SAC's evaluation and recommendations on the Proposals for prioritized research areas (PRAs)

Follow-up of the IBV SAC's evaluation and recommendations on the Proposals for prioritized research areas (PRAs).

Rein Aasland, March 4th 2020

1. Introduction and background.

The new plan for recruitment to permanent scientific positions (V-sak 3/2019; and see other relevant document in internal folder) is based on the development and selection of a set of Prioritized Research Areas as basis for future recruitments to permanent scientific positions.

The purpose of the PRAs is that they shall define and facilitate the *development of strong research clusters* at IBV – both within and across sections - and form the strategic basis for future recruitment to the Department as a whole.

A set of five criteria (C1-C5) for assessment of the PRA proposals were formulated. The two first criteria were set to ensure that the selected PRAs shall have high scientific quality (C1) and sufficient size to reach and maintain critical mass (C2). The third criterion specifically addresses the PRAs potential and capacity to address current and emerging big research questions (C3). The fourth criterion was devised to ensure that the new recruitment plan should cover sufficient breadth within the biosciences required to deliver all parts of IBV's BA-programme (C4). The fifth criterion is intended for those PRA proposals that aim to synergize with external parties outside IBV and create convergence to address important questions within the life sciences (C5).

A total of 19 PRA proposals were developed and submitted by the end of June 2019 and forwarded to the SAC, together with additional information describing the Department, its sections, infrastructures, and educational programmes as well as IBV's context within the Faculty and the UiO.

The IBV Leader Group (LG) met with 3 members of the SAC on November 16th to explain the purpose of the process and the task given to the SAC. The SAC subsequently evaluated the 19 PRA proposals and delivered its evaluation and recommendations in December 2019.

Since January 2020, the LG has discussed the SAC report and how it should be followed up towards the upcoming meeting with the SAC on March 26-27. 2020.

2. The SAC's evaluation and recommendations

The SAC report consists of a set of *general observations and recommendations* as well as specific comments on each proposal.

The SAC observes that "*many of the PRA proposals have high scientific quality and contained groups of highly competent scientists."*

The SAC observes a complication in that *"there is a substantial overlap between the proposals and many scientists are participants on several proposals."* They have therefore suggested that scientifically overlapping PRAs could be considered merged into *themes*.

The SAC has devised a scoring scheme used by each of the SAC members to assess the given criteria (C1, C2, C3, and C5). On this basis, they produced *a ranking of all the PRAs*. The SAC cautions, however, that their task has not been trivial since **i**) the PRA proposals varies much in their descriptions, and ii) since the SAC had not had a chance to meet with the proposers. *Hence the SAC states that the scores and the ranking should be interpreted with caution.*

Concerning the premise that *"The individual PRAs as well as the collection of PRAs and the overall recruitment plan must be based on high quality in both science and education with potential to achieve or maintain excellence in several areas"* the SAC points out that *"excellence in education must also be an aim of the development of IBV's new PRAs".* They observed, however, that while several proposals had described how it would support quantity of teaching, few had addressed quality and ambitions to develop teaching. Furthermore, the SAC felt that they "were not in a position to judge how the PRAs and possible new recruitments could contribute to the IBV's BA programme". *Hence, the SAC has left it with the Department to make these considerations (i.e. criterion C4; scientific breadth).*

The SAC notices that, if the Department chose to impose as an absolute requirement that new recruits should be a good fit with existing research activities, this could lead to stagnation. The SAC therefore recommends that the Department does not exclude the opportunity to recruit outstanding candidates *with a novel research program that is of relevance to the Department.*

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The LG also take note of the SAC's concern about the limited resources the Department has to support each new recruitment. This issue can not, however, be addressed during this process.

3. The IBV Leader group's consideration of the SAC evaluation and recommendations.

3.1 The Leader group (LG) notes the observations and recommendations from the SAC and agrees that the form and contents of the PRA proposals are quite varied, making it non-trivial for the SAC to compare them with respect to all criteria. This is also why it has taken time for the LG to analyse and thoroughly discuss the SAC's recommendations.

3.2 Since SAC caution the use of the detailed scoring they have done, the LG chooses not to emphasize small differences in the scores. *The LG will, however, use the scores together with the SAC's comments to the individual PRA proposals.* The LG will discuss this further with the SAC.

3.3 LG also observes that the form and nature of the SAC's comments to individual PRA proposals vary substantially. LG will discuss these variations with the SAC.

3.4 As the SAC, the LG also notes that, there is a substantial degree of overlap between some of the proposals, both with regard to the contents of the proposals and the teams of proposing staff. *These overlaps will be taken into consideration when selecting PRAs, as it will not be purposeful to select substantially overlapping PRAs as it would not be compatible with the overall aim to strengthen IBVs research and education as a whole.*

3.5 For some PRA proposals, LG has noted that they may have been written and evaluated more as project proposals than prioritised research areas for the Department. The LG will to discuss this issue with the SAC.

3.6 The LG notes the SAC's suggestion that some PRA-proposals could be merged into "Themes". Yet, the SAC (in particular one SAC member) is a little hesitant to this idea.

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The LG invites the PRA proposal leaders to comment on these points in the dedicated web form (see pt. 5 below).

4. LG's proposal for a plan for further work with the PRA proposals

Since the purpose of the PRA process is to improve and strengthen science and education at IBV as a whole, LG sees that some criteria and recommendations appear to "compete" with each other. Hence, LG proposes to adopt four different tracks for following up the recommendations. These tracks will be discussed with the SAC when they are here.

4.1 The LG proposes to select a set of the highest ranked PRA proposals WHILE at the same time taking into account the observed overlap in PRA content and participation.

4.2 The LG proposes to select a set of the highest ranked PRA proposals from each of the Department's five sections WHILE at the same time taking into account the observed overlap in PRA content and participation.

4.3 Since one of the aims for the PRA process is to ensure that IBV will be able to address current and big emerging questions, the LG proposes to select a small number of PRAs that have a substantial element of an emerging field not currently well developed at IBV.

By selecting PRAs that collectively ensure that each of these three tracks (4.1-4.3) are fulfilled, we will keep balance and breadth of scope across the department, while we at the same time consider both scientific quality and potential for addressing big and emerging questions. Although the LG has not concluded on this, it considers a total number of 8 - 10 PRAs as optimal.

4.4 Furthermore, as the LG sees the need for reserving some recruitments for the following purposes:

i) to be able to act on <u>exceptional</u> opportunities (e.g. outstanding candidates; c.f. SAC recommendation); - previously referred to as the "*ad hoc-mechanism".*
ii) to fill <u>critical gaps in the breadth</u> of the collection of the PRAs selected in order to cover needs for delivering our BA-programme.

Recruitments following 4.4 should only take place once the result of selection of PRAs according to 4.1, 4.2 and 4.3 have been done.

Based on the above points (4.1-4.3), the LG will propose which PRA proposals should be selected and Head of Department will present this to the IBV Board for decision.

5. Feedback from PRA proposers

As the SAC's evaluation and recommendations are now communicated to the PRA proposing teams, we realise that there will be many questions and comments. We therefore invite the PRA proposal leaders to give feedback via the dedicated web-form dedicated for this. Your feedback will valuable help to guide the LG's preparation for meeting with the SAC.

6. Meeting with the SAC on March 26.-27th.

When the SAC comes to visit IBV on March 26th - 27th, LG will meet with them and discuss the questions and considerations made above. We will also arrange so that PRA proposal leaders can meet with subgroups of the SAC. Obviously, there will be limited time (max 20 min) for such meetings. We therefore ask the PRA chair persons to indicate the most important questions in advance the in the Web form.

Further details on the SAC visit will be given at a later stage.

Proposals for prioritised research areas (PRA) – IBV, University of Oslo
SAC evaluations and recommendations, December 2019

1. Background – the request for input from the Scientific Advisory Committee

According to the instructions we received from the IBV Board the overall mandate for the Scientific Advisory Committee (SAC) is two-fold: i) to evaluate the individual proposed PRAs according to the premises and relevant criteria and ii) to evaluate the collection of PRAs according to premises and relevant criteria as well as in light of IBV's strategy. The SAC should give advice on which proposed PRAs to select or reject as well as how proposed PRAs can be improved or optimised before approval.

2. Composition of the committee

Prof. Leif Andersson, Uppsala University, Sweden (chair)
Prof. Malcolm Bennett, University of Nottingham, UK
Prof. Angela Fago, Aarhus University, Denmark
Prof. Anders Goksøyr, University of Bergen, Norway
Prof. Susanne Mandrup, University of Southern Denmark, Denmark

3. Recommendations

The major aim with the evaluation of submitted PRAs is to identify strong research programs within IBV that can host the new recruitments that are planned the coming year to increase the chances for the new recruitments to be successful. Three of the SAC members (Andersson, Fago and Goksøyr) had an initial meeting with the head of department and IBV's leader group at Gardermoen airport on October 15/16 to get an orientation concerning the task and expectations.

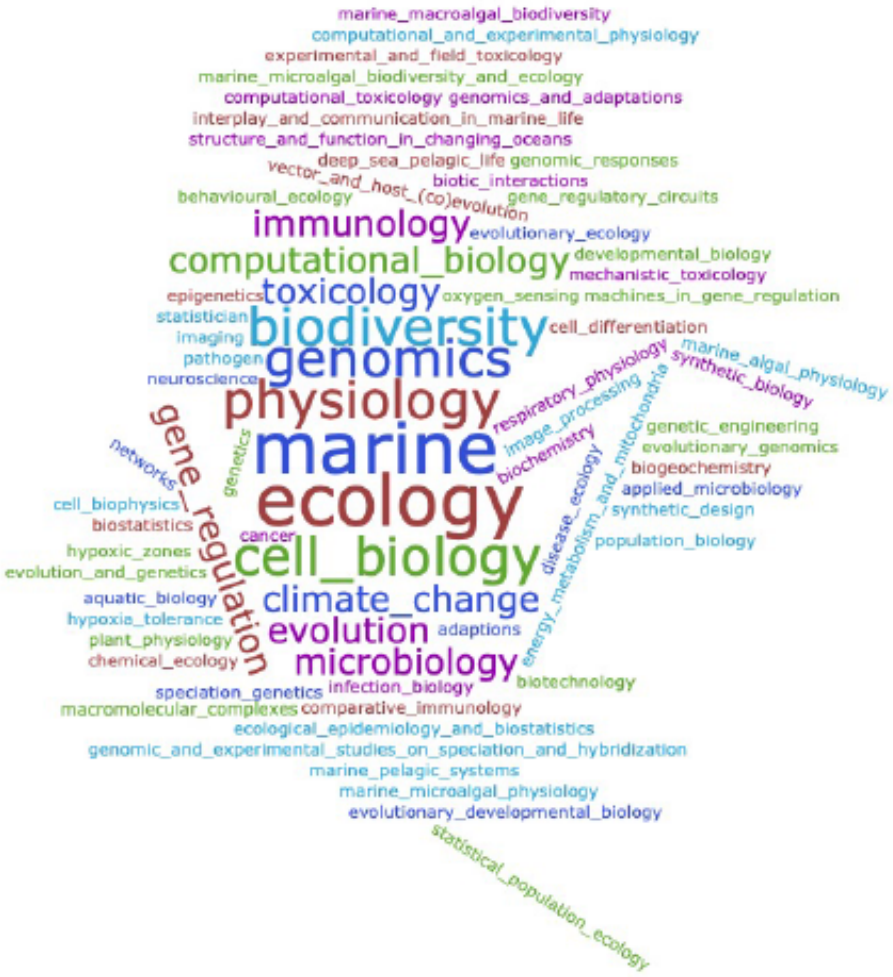
All SAC members have read all proposals and evaluated them as regards Scientific Quality, Critical mass, Potential and capacity, and Synergy. In the enclosed spreadsheet (Appendix 1) all scorings are provided including the ranking of the PRAs. We also provide a short summary of the evaluation of each PRA (see below). The SAC found that many of the PRAs were of high scientific quality and contained groups of highly competent scientists. However, it has not been a trivial task to evaluate the different PRAs partially because some proposals contained quite short descriptions of the research areas. Furthermore, the SAC has not had the opportunity to meet with the scientists behind the proposals and discuss the content. Therefore, we recommend that our ranking is interpreted with caution. Another complication is that there is a substantial overlap between the proposals and many scientists are participants on several proposals. We have therefore discussed the possibility that PRAs may be merged to larger themes (see next section).

In the premises of the PRA strategy it is stated that: "The individual PRAs as well as the collection of PRAs and the overall recruitment plan must be based on high quality in both science and education with potential to achieve or maintain excellence in several areas." Hence excellence in education must also be an aim of the development of IBV's new PRAs, and a special focus when recruiting new junior faculty. However, it is only very rarely that excellence and innovation in teaching is explicitly expressed in the PRA proposals. Whereas the quantity of teaching supported by the PRA proposals is generally well described, the quality or the ambitions to develop teaching and learning quality is not mentioned, although in some cases new or modified courses are suggested.

The SAC felt that we were not in a position to judge how the PRAs and possible new recruitments could contribute to IBV's BA programme because we don't have sufficient

insight into the organization of teaching within IBV. So, the department need to take this in consideration when using our evaluations.

Several PRAs comment on current capacity and the need for recruitment to replace retired or soon retiring staff, and in some areas this appear to be more critical than in others. There is also a general concern for capacity at the MSc and PhD level, specifically for supervising capacity of Master students in the most popular programs, and for providing PhD level training courses. The wordcloud below reflects the topics for proposed recruitments, given both as specialized areas (when given), and the more general term indicating some common priorities among the PRAs.



During the pre-meeting in Oslo the SAC asked the head of department how much resources will be provided for each new recruitment, and it was clear that the amount of funding provided is limited. It is the strong recommendation of the SAC that IBV should strive their very best to improve this so that new recruits can get more favourable start-ups. This is important in order to attract the most talented young researchers. Furthermore, a favourable start-up increases the chances that the new recruit can build up a strong research program and can compete for the most prestigious national and international research grants such as ERC starting and consolidator grants.

The whole idea with this exercise is to allocate new recruits so that they can be a part of strong research constellations to be successful even if start-up funding is limited. SAC got the impression that IBV may consider an absolute requirement that new recruits should be a

good fit with existing research activities. The SAC does not recommend having this as an absolute requirement, because that may lead to stagnation. An outstanding recruit with a novel research program that is of relevance for the department, but which does not fit the existing PRAs (or themes) should not be excluded.

4. Suggestions for how PRAs may be merged

The following is a suggestion to how PRAs on similar research topics could be merged into themes, but there may be reasons why these are not optimal. We have marked within each theme which we felt was the strongest proposal that can lead the organization of the theme. PRAs in parentheses are those that the SAC judges not strong enough to be a standalone PRA. The allocation of new positions to the different themes may reflect the impact and scientific strength of the theme as well as the need to maintain key competence for research and teaching.

One SAC member (Mandrup) expressed concerns with respect to merging of the PRAs and would like to recommend that the PRAs are considered as submitted. She feels that merging PRAs could force the best proposers to try to find a consensus within the suggested themes instead of following the best idea for a PRA. This could directly counteract the idea behind having a SAC identify the strongest proposals, could lead to less sharply formulated PRAs, and would not be fair to the proposers. Furthermore, there is the risk that merging could skew the balance and lead to more weight to the themes with many PRAs.

<u>Theme 1: Biodiversity, Ecology and Evolution</u>
15. Disease Ecology & Evolution (lead)
(11. Ecosystem genomics)
18. Experimental and evolutionary approaches to speciation and hybridization
20. Evolutionary Ecology

<u>Theme 2. Computational Biology (modelling, statistics, bioinformatics)</u>
6. Statistical Population Ecology (lead)
1. Ecological Forecasting
(8. Integrative Computational and Experimental Bioscience)

<u>Theme 3. Comparative physiology and biomedicine</u>
16. Oxygen – from molecules to ecosystems (lead)
14. Fundamental and comparative immunology
(17. Cell plasticity and bioimaging)
(13. Fundamental biomedicine)

<u>Theme 4. Transcriptional regulation and development</u>
3. Gene expression – principles, regulations and biomedical implications (lead)
9. EvoDevo

<u>Theme 5. Microbial Systems Biology and Biotechnology</u>
5. Microbial Systems Biology and Biotechnology
This PRA needs to be further developed (see specific comments) to be a standalone PRA.

Theme 6: Ecotoxicology
2. Multi-stress

Theme 7: The Blue-green planet
4. Phytoplankton (lead)
7. Marine Benthic
19. Life in the Ocean
(10. Plant CO2)

5. Specific comments on each proposal

PRA 1: Ecological Forecasting – tools for sustainability

The "Ecological forecasting – tools for sustainability" proposal describes the development of a methodology very much related to ecosystems modeling, but with the aim to predict changes or outcomes due to driving forces and properties of the system. The skills needed are computational and informatics-based, and will possibly involve machine learning, although data must come from ecosystem observations and monitoring programs. As such, this involves highly interdisciplinary activities, bridging traditional biological disciplines beyond current activities in statistics and modeling.

The "big current and emerging research questions" are more a list of how this type of methodology can be applied ("how can we counteract biodiversity loss" etc.) than questions related to developing the methodology as such. It is at least not clear how ecological forecasting can prevent biodiversity loss, except as a warning when and where action needs to be taken.

Although the link to sustainable development goals is clear, the need for ecological forecasting as its own discipline based on this connection, is not obvious. There are however also many links to other PRA proposals (e.g. Muliti-stress, Statistical population ecology, COMPEX, Plant CO2, Disease Ecology and Evolution, Life in the Ocean, and Evolutionary Ecology) which may merit to merge some of the ideas presented here into a larger context, e.g. under a Computational Biology and Modelling heading.

The list of proposers makes a strong team of scientists across several of the fields where ecological forecasting may be helpful. At the same time these scientists are critical partners in other, possibly stronger, proposals. Hence, the critical mass related to this specific PRA may be less than what it seems from the proposal.

Although the team of proposers has a strong potential to address many of the big research questions listed, it is not clear that they may contribute to developing the field of ecological forecasting. New recruitments are described within specific areas of application. It is not clear whether the team wants to recruit someone with a background in the field described (biogeochemistry, biodiversity, population biology) to apply established forecasting approaches, or rather someone with a background in forecasting to develop forecasting methodology in these fields.

Strong links to other parties outside IBV exist. The suggestion to appoint faculty with adjunct positions at other departments is interesting, but it is not obvious how this would work. Should these be split positions shared with other departments at the faculty? Is the PRA intended to be more of a convergence centre? What then is the unique contribution of IBV? This is also not very clear.

PRA2: Multi-stress in a multi-exposure world

The focus of this proposal is toxicology and the effect of chemical stressors and pollution on humans and biological ecosystems. The aim is to combine toxicology areas within medicine and biology into a 'holistic approach' given the similar methods. However, the biological approach emerges in the proposal as the one having a stronger focus. The authors list eight specific important questions in this area, overall relating to consequences of exposure to several toxicants separately and in combination, molecular and cellular mechanisms of action, predictions of effects, time windows. It is not clear to what extent the proposed positions will include some or all of these questions.

The proposal encompasses three main positions, all with links to different areas at IBV:

1) Mechanistic toxicology (understanding of mechanisms for toxicity by using molecular, cellular and epigenetic techniques). Not entirely clear if focus will be on humans or ecosystems or both.
2) Computational toxicology (in silico modelling of possible combinations of chemicals and stressors, interactions of toxic molecular with their targets). The position will be strongly dependent on availability of large datasets of highly validated experimental data. Not clear if such datasets are already available. It is possible that this computational position can be shared with other research areas at IBV.
3) Experimental and field toxicology (to address complex interactions for multistress and multi-exposure experimentally, validate experiments and use field observations). The position will use facilities such as the biological station in Drøbak and the UiO research vessel.

Positions 1 and 3 appear as the ones with the strongest relation to the existing core environment. Good description of motivation and rationale for all positions. At the preliminary meeting at Gardermoen, this proposal was assigned as the only one belonging to an Environmental Biology and Global Change research area, without need to merge with other PRAs. In this case, perhaps the title should make it more clear that the recruitments are centered on toxicological aspects.

This proposal is particularly well suited to address the UN's Agenda 2030 sustainable development goals (SDG), 14 Life under Water and 15 Life on Land. Although toxicology has somewhat become a relatively low priority area in recent years, perhaps due to competition with climate change agendas and other approaches, the significance and potential impact are still high due to the steady increase of ambient chemical pollution.

The toxicology group at IBV is very active in the toxicology community with recent good publications. The group comprises two full professors (Borgå, Hylland) and three adjunct professors (Grung, Ruus, Øvrevik) with different areas of expertise. These include food-web modelling and life-history studies (Borgå), experimental studies and effects (Hylland, Ruus), Arctic ecotoxicology (Borgå, Ruus, Hylland), chemical toxicology (Grung) and human toxicology (Øvrevik). Teaching and supervision appear high for the present size of the group. New recruitments would increase capacity for incrementing research output and reducing teaching and supervision load. The proposed positions appear reasonable in this respect (see above).

Several grants, especially Borgå. Many PhD students and post docs are supported by external grants, providing solid basis for interactions.

The PRA is highly centered around the toxicology group, with contributions from AQUA, CBA and CEES. Good network of collaborations abroad and in Norway, and within the IBV, with several externally funded projects. Among these initiatives, the AnthroTox (Combining natural and social sciences to understand and manage global anthropogenic toxicants), is highly interdisciplinary and is co-lead by Borgå. With this PRA it can be expected that these activities will be strengthened even further.

PRA3: Gene expression - principles, regulation, and biomedical implications

The PRA "Gene expression – principles, regulation and implications" covers an important and central topic in molecular biology of relevance to many other fields in biology and biomedicine. The core group members in the proposal, Ciosk, Saatcioglu and Falnes, are strong and cover a wide spectrum of topics in the field of gene expression ranging from signal transduction in cancer (Saatcioglu) and posttranscriptional regulation in C. elegans (Ciosk) to enzymes regulating epigenomic modifications (Falnes). The supporting group members are mainly from the EvoDevo section and working with plant molecular biology. This means that the research interests are quite dispersed, and this section could benefit a lot from recruiting members that could bridge the existing groups.

The proposal mentions several broad topics within which they would like to recruit new PIs. This includes 1) epigenetics with possible focus on genome/transcriptome-wide approaches; 2) gene-regulatory circuits and synthetic design; and 3) macromolecular complexes/machines in gene regulation. These are all excellent topics that would synergize well with the core group as well as other groups in the department and at UiO.

It is further emphasized that perspective hires would conduct their research in areas of interest to others, either by studying biomedical areas of interest to others or by bringing in new technologies of interest to others. This is an excellent strategy.

The proposal could be further strengthened by including an international outlook mentioning existing and potential international synergies.

PRA4: Marine phytoplankton ecology and evolution under climate change

The PHYTOPLANKTON PRA has great potential - scientifically, educationally and economically – for UiO and Norway. In terms of strengths, this PRA builds on novel existing and/or planned UiO resources (e.g. NORCCA algae collection, new research vessel and Station at Drøbak) and its activities would be funded through an impressive portfolio of grants with an extensive network of national and international collaborators. The inclusion of evolutionary and genomics expertise with existing AQUA team is strongly encouraged. In terms of weaknesses, the demographic profile of key academic staff is VERY concerning (later 50-early 60's), requiring urgent action by UiO to appoint new faculty to ensure that this core research area is maintained and (ideally) strengthened. Educationally, given growing climate change awareness and the importance of the marine economy in Norway, this represents a key area to enhance student recruitment (UG and PG) to UiO. Economically, this represents a major (and increasingly important) area to Norway and highly trained (post)graduates are essential to underpin existing and new activities (e.g. farmed

salmon, bioprospecting). In summary, this represents a priority area for investment either as a standalone PRA or a combined PRA (with BENTHIC and LION).

PRA5: Microbial systems biology and biotechnology – Synthetic microbiology

This is a well-articulated and very long (>9 pages) proposal aimed to strengthen molecular biology synthesis and analytical methods in microbial (pro- and eukaryotic) models. Besides basic research questions (e.g. understanding coevolution, cell regulation and defining 'essentials' of metabolism), the proposal has strong biotechnology applications (e.g. GMO food, industrial and pharmaceutical chemistry). This PRA is heavily dependent on current facilities at IBV including Imaging, Electron Microscopy, Sequencing Center, Proteomics, Computational resources, stable isotope labs, etc. There is a need to develop metabolomics facilities concerning NMR, MS. A more defined focus on applied aspects within microbiology and biotechnology would have made this proposal stronger.

The PRA encompasses 3 positions, that should focus on microbial systems

1) An experiment-focused scientist in applied microbiology and biotechnology (at AQUA or EVOGENE). This position would strengthen biotechnology teaching (presently insufficient) and increase applied research funding of the group.
2) A computational biologist with a strong emphasis on developing new computational tools and theory for modelling complex biological systems (at AQUA, BMB, CEES, or EVOGENE)
3) A method specialist on Synthetic Biology and Genetic Engineering working on the development of new gene editing or genome synthesis technology (at BMB, CEES, CELLPHYS, EVOGENE). This position would strengthen biotechnology teaching (presently insufficient) and increase applied research funding, and have strong innovation profile.

There is a strong emphasis on the methodological expertise of these positions and some degree of overlap between positions 1 and 3. Position 2 can be shared among various sections, as also proposed. At the preliminary meeting at Gardermoen, this proposal was assigned as the only one belonging to a Microbial Systems Biology research area, without need to merge.

Six overarching research questions are listed, although it is not clear to what extent each of these will be specifically addressed in the recruitment proposed. The technological aspect appears overall central in this proposal. The motivation for this proposal is also to strengthen biotechnology teaching. High interest in the field (Nature recent publications), good publications by the proposers.

This PRA will bring together the expertise in microbiology that is currently dispersed at IBV across several sections. IBV staff proposers include Eiler (AQUA) and Linke, Koomey and Shalchian-Tabrizi (EVOGENE). All of them appear highly competent in their respective fields, with good publication records. There are ongoing collaborations within these groups and other groups at IBV. Linke has several active grants (only 2-3 externally funded positions), Eiler lists only one grant from the Swedish Res Council (expired in 2016). Funding of other core members is not evident. The recruitment positions are reasonable to enhance methodological capabilities and

especially funding (which can be improved). Expertise within biotechnology should be a priority for any modern university.

For synergy within IBV, see above. Within UiO, future collaborations are expected with Pharmacy, Chemistry (possibly Geology), Odontology Norwegian Center for Molecular Medicine etc. but these appear to be long term. There is a strong basis for immediate synergy with data science, computing and modelling expertise at UiO, in particular the newly established Bioinformatics Centre at the MN faculty and the (likely new) Centre for Data Science and Computational Science (DS-CS). The applicants suggest that each of the faculty members appointed in this proposed PRA should have a coaffiliation at one these centres or with departments such as medicine, physics, mathematics, or computer sciences. Although this may appear reasonable, it might cause unwanted fragmentation of the research area and work against assembling competences within the PRA.

PRA6: Statistical Population Ecology

Statistical Population Ecology is clearly an area of scientific strength at the Department of Biosciences. The group has a strong track record in leading both major national and international projects. The group is well funded and lists 13 ongoing projects that brings in substantial funding to the Department. It appears that the competence in this area is of strategic importance for Norway as regards monitoring natural populations including fish populations exploited by commercial fisheries. This PRA has overlap with several of the other proposals in particular #1 and 8, and a merged PRA should be considered.

PRA7: Marine benthic algae in relation to climate change

The BENTHIC PRA addresses a key area - scientifically, educationally and economically - for UiO and Norway. In terms of strengths, this PRA builds on core expertise in macro-algae and kelp forest ecology, a grouping that has published several important papers in recent years. The inclusion of phytoplankton expertise is strongly encouraged to provide greater critical mass. In terms of weaknesses, the demographic profile of key academic staff is VERY concerning (early 60's), requiring urgent action by UiO to appoint new faculty to ensure that this core research area is maintained. Merging BENTHIC, PHYTOPLANKTON and LION PRAs would make most sense. Educationally, given the importance of the marine economy in Norway, this represents a key area for student recruitment and training (UG and PG). However, I was surprised by the weak offering of courses. In summary, this represents a key area for investment as a combined PRA (with PHYTOPLANKTON and LION) as its lack of critical mass means it cannot form a standalone PRA.

PRA8: Integrative Computational and Experimental Bioscience

Integration of computational and experimental science is very important in modern biology. In this PRA, it is proposed to use physics-based computational models to allow systematic interpretation of data, to predict interactions and to understand their impact across scales, from molecular processes to detailed single cell models and larger network models. The PRA is rather vaguely defined and does not appear to be associated with any particular experimental area. Furthermore, it is unclear whether

the department is sufficiently strong in this field to recruit a strong junior PI. The proposal is missing an outlook to the international community.

PRA9: Evolutionary Developmental Biology

The "Evolutionary Developmental Biology" proposal suggests strengthening both the disciplines of evolution and developmental biology, as well as their synthesis in evo-devo research at IBV. The description of the area, and the "big current and emerging research questions", are very general and mostly at the overarching "textbook" level. However, this aspect is somewhat more developed under section 9 (recruitment). There is obviously a strong competence in developmental biology and epigenetics, especially in plants, but also in other experimental models, at IBV. Building on this, a growing interest and activity in evo-devo related research through the Centre for Epigenetics, Development and Evolution and various NRC and CAS grants is described. The proposal would also fit nicely within a broader PRA on e.g. Transcriptional Regulation & Development.

The list of proposers constitutes a strong team in developmental biology and evolution, now describing converging interests in evo-devo (and devo-evo) related research, which would represent a critical mass for this PRA.

Whereas the team behind the PRA proposal is strong, the research questions described are very general and would need to be further refined if they should define a research strategy for a PRA, along the lines described in section 9. The recruitment strategy is hesitant to move directly into the field of evo-devo. Since there exists quite strong evo-devo research environments around, also in Norway (the Sars Centre in Bergen, for example), this strategy could be reconsidered.

Except for some connection to NHM, the links outside IBV do not appear very strong for this PRA. A potential to develop this towards OUS and the Medical Faculty is suggested.

PRA10: Plant responses to elevated CO2 and temperature

The Plant CO2 PRA addresses an important area - scientifically and societally. In terms of strengths, this PRA integrates a wide set of expertise in terrestrial plant sciences. The inclusion of scales and organisms ranging from molecular to ecosystem and plant and microbial expertise is encouraging. In terms of weaknesses, there is insufficient critical mass in this grouping to be competitive internationally. Moreover, creating this PRA would separate terrestrial and aquatic research – which are both effected by elevated CO2 and temperature. Merging Plant CO2 with BENTHIC, PHYTOPLANKTON and LION PRAs would represent an opportunity to create a novel UiO BLUE-GREEN PLANET grouping (which better maps onto the new Centre for Biogeochemistry in the Anthropocene). In summary, uncompetitive internationally but partners could underpin more ambitious terrestrial-aquatic grouping that would be an unique offering research and teaching wise.

PRA11: Ecosystem Genomics

This is an extremely ambitious program from a highly competent and well-funded group of scientists. The ambition is to study the genomic space of an entire ecosystem including whole genome sequencing of all species in the ecosystem, transcriptomics, epigenomics and other –omics field and also including ancient DNA research. In fact, this program essentially is a program that overlap essentially all other proposed PRAs. This PRA plans to be closely associated with the recently initiated Earth Biogenome Project where the ambition is to establish genome assemblies of all eukaryotic species on earth.

The problem with this PRA is a lack of focus and a clear vision what the specific contribution will be by the members of this PRA in order to make important steps towards Ecosystem Genomics. The applications mention that a similar project in the UK has got 2 billion NOK in funding suggesting that very substantial funding will also be needed to make this PRA internationally competitive.

Since there is a considerable overlap with other PRAs this could be a part of a merged PRA.

PRA13: Fundamental biomedicine

This proposal is a challenging read. It states the importance of basic molecular and mechanistic research to identify reasons of disease, and at the same time refuses to describe what the team sees at the big current and emerging research questions. Three research “tracks” are suggested initially (- cancer, - immunology, infection biology and antimicrobials, - cell biology, physiology and neuroscience), but these are not explored or described any further. There is also no clear recruitment strategy, except a statement that positions should be “advertised broadly”. Although one can easily agree that a large department of biosciences such as IBV should maintain research activities in this direction, this PRA proposal is not very helpful. In general, the topic could fit within a broader PRA on Comparative physiology and biomedicine.

The proposers behind the team represent strong scientists with a varied and relevant background. Again, the proposal is not well developed, and does not contain any description of how the team will work to create a critical mass together.

As mentioned, the proposal does not contain a description of important research questions that the team wants to prioritize, and no clear recruitment plan. Hence, the potential and capacity of the intentions behind this proposal are difficult to assess.

The proposal describes extensive collaborations with researchers at the Medical Faculty and OUS, and ambitions to contribute towards convergence activities in the new Life Science building.

PRA14: Fundamental and comparative immunology

The proposed PRA on Fundamental and Comparative Immunology is superficially described, and it is unclear what visions/expectations the group behind this proposal has for a new PI in this field. The particular strengths of UiO in the immunology field are also not well described, and it is not clear that the environment in the department is strong enough to recruit a stellar junior PI. The proposal is missing an outlook to the international community.

PRA15: Disease Ecology & Evolution

The proposed PRA in Disease Ecology and Evolution is based on research fields, in particular disease ecology, where the department is particularly strong. The overarching aim is well defined and justified. It is proposed to integrate host-vector-pathogen ecology with dynamics at evolutionary and climatic time scales and use that as a basis for understanding precursory signals leading to disease emergence in response to changes in climate and environment. The proposal is supported by a group of strong researchers from CEES and EvoDevo and constitutes an ambitious proposal to strengthen the collaboration between the two sections by recruiting new PIs in specific fields where expertise could help facilitate new synergies. The suggested areas, 1) Ecological epidemiology and biostatistics; 2) Disease ecology; and 3) Pathogen, vector and host (co)evolution, are all well justified relative to the long-term aims and to the expertise in the department. The societal relevance of this proposal is high.
The proposal could be further strengthened by including an international outlook mentioning existing and potential international synergies.

PRA16: Oxygen – from molecules to ecosystems

This is a precise and 'to the point' proposal addressing the role of oxygen as a central molecule in multiple levels of biological organization. Lack of oxygen (hypoxia) compromises cellular energy metabolism and is associated to numerous human diseases, but is also linked to increased temperatures and climate change. The overarching idea is to understand how nature has evolved mechanisms to cope with or even benefit from low oxygen in microbes, fish and immune system. Several approaches have been chosen: biochemical/cellular, physiological, microbiological/immunological and ecological/climate change approaches, all addressing central questions on how oxygen is sensed, transported and utilized most efficiently.

The PRA suggests 4 positions to be broadly defined within

1) Cell Biology / Biochemistry – energy metabolism and mitochondria
2) Oxygen sensing and gene regulation
3) Respiratory physiology/hypoxia tolerance
4) Aquatic biology – hypoxic zones and climate change

All these topics are sound and fall within the scope of the PRA. As mentioned above, this proposal is suggested to be merged in a broader Comparative Physiology and Biomedicine research theme, potentially merging with Fundamental Biomedicine (13, Johansen), Fundamental and Comparative Immunology (14, Johansen) and Cell

Plasticity (17, Progida). Among these, the present proposal appears as the strongest one.

The impact of the research area is expected to be very high, also due to this year's Nobel Prize in Medicine on exactly the same topic (discovery of O2 sensing mechanisms). The PRA is highly timely. Good publication records of the applicants (e.g. a joint Science paper in 2011) and of the topic in general, demonstrating capacity of high impact papers of the group and high interest in the scientific community.

Good funding sources by Levefre, Nilsson, Gundersen and Linke (not listed for others). Proposers include Nilsson, Gundersen and Lefevre (FYSCELL), Hersleth (BMB), Hessen and Kaartvedt (AKVA) and Linke (EVOGENE). Given the broad area of this PRA, the four recruitment positions suggested appear reasonable. The main proposer Nilsson is a very strong international profile within comparative physiology. Overall, the group has strong competence and expertise within the proposed topics: Hernsleth (biochemistry of oxygen binding proteins and enzymes), Nilsson (physiology of anoxia tolerance in vertebrates), Lefevre (defense against reactive oxygen species), Gundersen (Hypoxia inducible transcription of genes - HIF), Linke (anaerobic pathogens and hypoxia signaling) Kaartvedt (ecology of hypoxic aquatic environments). The group will need access to existing facilities (e.g. Drøbak station, Imaging, Proteomics and Sequencing).

Proposers come from all sections at IBV, so synergy is high. The proposers have carefully considered gaps that need to be filled with new recruitment (positions 1 and 4) within mitochondrial function, oxygen radicals and energy metabolism, and ecology of aquatic hypoxia, also good synergy between these topics. Expertise in omics methodology is also a plus for other areas at IBV. Several ongoing collaborations within UiO (medical faculty), within Norway and abroad.

PRA17: Cell Plasticity and Bioimaging

This PRA proposal involves groups from FYSCELL and BMB and addresses 'cellular plasticity' in a broad context. The proposal lacks a well-defined focus and major question(s) it wishes to answer. There is an interest in exploring mechanical and physical cues to cell development and differentiation in muscle cells, but it is not clear exactly what cues are relevant and why and how these studies are going to be made. A reference list would have helped in understanding the scientific context of the PRA. In its present form, the proposal is rather vague.

Three new recruitments are proposed:

1. Cell Biology / Cell Biophysics: how cells respond to biophysical cues
2. Gene regulation and cell differentiation
3. Bioimaging (as part of a core facility).

The need and tasks for position 3 are well accounted for, while these are not entirely clear for the other two positions. Position 3 appears as an extension of an existing capacity. As mentioned above, this proposal is suggested to be merged in a broader Comparative Physiology and Biomedicine research theme, together with Fundamental Biomedicine (13, Johansen), Fundamental and Comparative Immunology (14, Johansen) and Oxygen (16, Nilsson). Among these PRAs, the present proposal appears as the weakest one and can in principle be incorporated in other PRAs.

The 5 most important papers in the field are all in high impact journals (Nature etc.), indicating interest in the topic. The group also lists publications in very good journals (e.g. PNAS), but these are not among the most recent ones. It appears though that the group has solid competences and that necessary methodologies (including bioimaging) are available, although these can be further improved (e.g. by new recruitment).

Good external funding to Progida and Gundersen as PIs, none listed for Bakke, but assuming there must be. Progida leads a good group size, based on 5 externally funded positions. The new recruitments if approved should really aim to tight the groups together within the PRA and outside and have very well defined cross disciplinary tasks and aims. It seems from the proposal that at present the 3 groups work rather independently.

All three proposers (Progida, Gundersen and Bakke) come from the FYSCELL section. BMB is included as a contributor, but not clear how. The proposal states that other groups at IBV (working within neuroplasticity and oxygen) would be interested in collaborating with this PRA. Collaborations outside IBV include the Medical Faculty and the Dept. of Mathematics and Physics at Oslo. No collaborations with groups abroad have been mentioned in the proposal.

PRA18: Experimental and Evolutionary Approaches to Speciation and Hybridization

The applicants behind this PRA contribute to the strong competence in the broad field of Evolutionary Ecology/Evolutionary Genomics at Department of Biosciences. Hybridization and Speciation is absolutely a hot topic in this field of research and the group at Department of Biosciences has made important contributions to the field and is expected to continue to so. Therefore, new recruitments to this constellation of researchers are well justified. However, this PRA has considerable overlap with several other PRAs including #11, 15 and 20. Therefore, a merged PRA should be considered.

PRA19: Life in the ocean: dynamics in the face of change

The “Life in the ocean” proposal describes the vast range of research needs facing the field of marine science, from ecosystem oriented research to mechanistic studies of life (and death) in the ocean. The proposal is well founded, both strategically and scientifically. It clearly demonstrates the strong position of marine science at IBV, both in the past and the present, arguing well for sustaining a robust and prioritized research activity in this area. It could well be merged with aspects in other marine-related proposals, such as 4 (PHYTOPLANKTON) and 7 (BENTHICCLIM).

The list of proposers behind this PRA represents both young and more experienced scientists with varied specializations within marine research. Together they constitute the critical mass needed to bring this PRA forward. At the same time, the demography of the group indicates the need for recruitments in the coming years to maintain a strong position of IBV in marine science.

The research questions listed are a selection from a NAS report from 2011, but still representing important questions to address. In combination with a good recruitment strategy, this adds to the potential for keeping the Life in the ocean PRA at the research front.

The proposal describes extensive collaborations outside IBV across departments, faculties and institutions, representing cross-disciplinary initiatives such as “Data science and computing” and the Skagerak-Kattegat-Oslofjorden project.

PRA20, Evolutionary Ecology

Evolutionary Ecology is clearly a stronghold for Department of Biosciences and the group behind this PRA has together a strong track record. However, the description of the Research Area is very brief, 9 lines of text. This PRA has considerable overlap with several of the other PRAs including #6, 11, 15 and 18. Therefore, a merged PRA should be considered.

PROPOSALS FOR PRIORITISED RESEARCH AREAS - IBV 2019

Score 1-3 (3 = Best) (for C5:Synergy score only 1-2 (2=Best)

Department of Biosciences, UiO

				C1: Scientific quality					Av.	C2: Critical mass					Av.	C3: Potential and capacity					Av.	C5: Synergy					Av.
	Proposer (ed)	**Short title**	**Acronym**	**s1**	**s2**	**s3**	**s4**	**s5**		**s1**	**s2**	**s3**	**s4**	**s5**		**s1**	**s2**	**s3**	**s4**	**s5**		**s1**	**s2**	**s3**	**s4**	**s5**	
1	Andersen	Ecological Forecasting – tools for sustainability	EcoForecasting	2	3	2	2	2	2,2	3	3	3	2	2	2,6	2	3	3	2	2	2,4	2	2	2	2	2	2
2	Borgå	Multi-stress in a multi-exposure world	MIME (multistress)	2	2	3	3	2	2,4	3	2	3	3	2	2,6	2	3	3	3	1	2,4	2	1	2	2	1	1,6
3	Ciosk	Gene expression - principles, regulation, and biomedical implications	GeneExpress	3	2	3	3	3	2,8	3	2	2	3	2	2,4	2	2	3	3	3	2,6	1	2	2	2	2	1,8
4	Edvardsen	Marine phytoplankton ecology and evolution under climate change	PHYTOPLANKTON	2	2	3	3	2	2,4	2	3	2	3	2	2,4	2	3	3	3	2	2,6	2	2	2	2	2	2
5	Eiler	Microbial systems biology and biotechnology	Synthetic Microbiology	2	2	3	2	2	2,2	2	1	2	2	1	1,6	2	2	3	2	1	2	2	2	1	2	1	1,6
6	Ergon	Statistical Population Ecology	Statistical Population Ecology	3	3	2	3	2	2,6	3	3	1	3	3	2,6	3	3	2	3	2	2,6	2	2	1	2	2	1,8
7	Fredriksen	Marine benthic algae in relation to climate change	Benthic	1	2	1	2	1	1,4	1	2	1	1	1	1,2	2	3	1	1	1	1,6	1	2	1	1	1	1,2
8	Fyhn	Integrative Computational and Experimental Bioscience	COMPEX	2	3	2	1	1	1,8	2	1	1	2	1	1,4	2	2	2	2	1	1,8	1	2	1	2	1	1,4
9	Grini	Evolutionary Developmental Biology	EvoDevo	3	3	2	2	2	2,4	3	2	1	3	2	2,2	3	3	3	2	1	2,4	2	2	1	1	1	1,4
10	Hessen	Plant responses to elevated CO2 and temperature	Plant CO2	1	1	2	2	2	1,6	2	1	1	3	2	1,8	2	2	3	2	1	2	1	1	1	2	1	1,2
11	Jakobsen	Ecosystem Genomics	EG	2	3	2	2	2	2,2	3	3	3	3	3	3	2	3	3	2	2	2,4	2	2	1	2	2	1,8
13	Johansen	Fundamendal Biomedicine	FUNBIOMED	1	2	1	1	1	1,2	2	2	1	2	1	1,6	2	2	2	2	1	1,8	2	2	1	2	1	1,6
14	Johansen	Fundamental and comparative immunology	Immunology	2	3	2	2	1	2	3	3	1	2	2	2,2	3	3	2	2	2	2,4	2	2	1	2	1	1,6
15	Mysterud	Disease Ecology & Evolution	Disease Ecology & Evolution	3	3	3	3	2	2,8	2	2	3	3	3	2,6	3	3	3	3	3	3	2	2	2	2	1	1,8
16	Nilsson	Oxygen - from molecules to ecosystems	Oxygen	3	3	3	3	2	2,8	2	2	3	3	2	2,4	3	2	3	3	1	2,4	2	2	2	2	1	1,8
17	Progida	Cell Plasticity and Bioimaging	Cell plasticity	2	2	1	2	2	1,8	1	1	2	2	1	1,4	2	3	2	2	1	2	2	2	1	2	2	1,8
18	Skrede	Experimental and Evolutionary Approaches to Speciation and Hybridization	Speciation and Hybridisation	2	2	2	3	2	2,2	2	2	1	2	1	1,6	2	2	2	2	1	1,8	2	2	2	2	1	1,8
19	Titelman	Life in the ocean: dynamics in the face of change	Life in the Ocean (LION)	3	3	3	3	2	2,8	3	2	2	3	1	2,2	3	3	3	3	1	2,6	2	2	2	2	1	1,8
20	Vøllestad	Evolutionary Ecology	Evolutionary Ecology	2	3	2	2	2	2,2	2	2	1	3	3	2,2	3	3	3	2	2	2,6	2	2	2	2	2	2

Proposal #12 was not submitted.

PROPOSALS FOR PRIORITISED RESEARCH AREAS - IBV 2019

Score 1-3 (3 = Best) (for C5:Synergy score only 1-2 (2=Best)

Department of Biosciences, UiO

				C1: Scientific quality					Av.	C2: Critical mass					Av.	C3: Potential and capacity					Av.	C5: Synergy					Av.	**Total score**	Ranking
	Proposer (ed)	**Short title**	**Acronym**	**s1**	**s2**	**s3**	**s4**	**s5**		**s1**	**s2**	**s3**	**s4**	**s5**		**s1**	**s2**	**s3**	**s4**	**s5**		**s1**	**s2**	**s3**	**s4**	**s5**			
15	Mysterud	Disease Ecology & Evolution	Disease Ecology & Evolution	3	3	3	3	2	2,8	2	2	3	3	3	2,6	3	3	3	3	3	3	2	2	2	2	1	1,8	**10,2**	1
6	Ergon	Statistical Population Ecology	Statistical Population Ecology	3	3	2	3	2	2,6	3	3	1	3	3	2,6	3	3	2	3	2	2,6	2	2	1	2	2	1,8	**9,6**	2
3	Ciosk	Gene expression - principles, regulation, and biomedical implications	GeneExpress	3	2	3	3	3	2,8	3	2	2	3	2	2,4	2	2	3	3	3	2,6	1	2	2	2	2	1,8	**9,6**	2
4	Edvardsen	Marine phytoplankton ecology and evolution under climate change	PHYTOPLANKTON	2	2	3	3	2	2,4	2	3	2	3	2	2,4	2	3	3	3	2	2,6	2	2	2	2	2	2	**9,4**	4
11	Jakobsen	Ecosystem Genomics	EG	2	3	2	2	2	2,2	3	3	3	3	3	3	2	3	3	2	2	2,4	2	2	1	2	2	1,8	**9,4**	4
16	Nilsson	Oxygen - from molecules to ecosystems	Oxygen	3	3	3	3	2	2,8	2	2	3	3	2	2,4	3	2	3	3	1	2,4	2	2	2	2	1	1,8	**9,4**	4
19	Titelman	Life in the ocean: dynamics in the face of change	Life in the Ocean (LION)	3	3	3	3	2	2,8	3	2	2	3	1	2,2	3	3	3	3	1	2,6	2	2	2	2	1	1,8	**9,4**	4
1	Andersen	Ecological Forecasting – tools for sustainability	EcoForecasting	2	3	2	2	2	2,2	3	3	3	2	2	2,6	2	3	3	2	2	2,4	2	2	2	2	2	2	**9,2**	8
2	Borgå	Multi-stress in a multi-exposure world	MIME (multistress)	2	2	3	3	2	2,4	3	2	3	3	2	2,6	2	3	3	3	1	2,4	2	1	2	2	1	1,6	**9**	9
20	Vøllestad	Evolutionary Ecology	Evolutionary Ecology	2	3	2	2	2	2,2	2	2	1	3	3	2,2	3	3	3	2	2	2,6	2	2	2	2	2	2	**9**	9
9	Grini	Evolutionary Developmental Biology	EvoDevo	3	3	2	2	2	2,4	3	2	1	3	2	2,2	3	3	3	2	1	2,4	2	2	1	1	1	1,4	**8,4**	11
14	Johansen	Fundamental and comparative immunology	Immunology	2	3	2	2	1	2	3	3	1	2	2	2,2	3	3	2	2	2	2,4	2	2	1	2	1	1,6	**8,2**	12
5	Eiler	Microbial systems biology and biotechnology	Synthetic Microbiology	2	2	3	2	2	2,2	2	1	2	2	1	1,6	2	2	3	2	1	2	2	2	1	2	1	1,6	**7,4**	13
18	Skrede	Experimental and Evolutionary Approaches to Speciation and Hybridization	Speciation and Hybridisation	2	2	2	3	2	2,2	2	2	1	2	1	1,6	2	2	2	2	1	1,8	2	2	2	2	1	1,8	**7,4**	13
17	Progida	Cell Plasticity and Bioimaging	Cell plasticity	2	2	1	2	2	1,8	1	1	2	2	1	1,4	2	3	2	2	1	2	2	2	1	2	2	1,8	**7**	15
10	Hessen	Plant responses to elevated CO2 and temperature	Plant CO2	1	1	2	2	2	1,6	2	1	1	3	2	1,8	2	2	3	2	1	2	1	1	1	2	1	1,2	**6,6**	16
8	Fyhn	Integrative Computational and Experimental Bioscience	COMPEX	2	3	2	1	1	1,8	2	1	1	2	1	1,4	2	2	2	2	1	1,8	1	2	1	2	1	1,4	**6,4**	17
13	Johansen	Fundamendal Biomedicine	FUNBIOMED	1	2	1	1	1	1,2	2	2	1	2	1	1,6	2	2	2	2	1	1,8	2	2	1	2	1	1,6	**6,2**	18
7	Fredriksen	Marine benthic algae in relation to climate change	Benthic	1	2	1	2	1	1,4	1	2	1	1	1	1,2	2	3	1	1	1	1,6	1	2	1	1	1	1,2	**5,4**	19