

IBV-2020: plan for faculty recruitment and infrastructure investments

Background

The Department of Biosciences (IBV) was established January 1, 2013, by the merger of the Departments of Molecular Biosciences and Biology. The department has nearly 50 tenured faculty members (professors and associate professors), approximately 47 technicians, and about 170 PhD students and postdocs/non-tenured researchers. The department administration, including student services, financial officers and Centre of Excellence administration (see below) count approximately 15 employees. There are at any given time about 650 students divided into undergraduate and graduate level.

Table 1	Faculty ^a	Technicians ^a	Researchers ^b	PhDs ^c
AQUA	11	3.5	6	7
BMB	11 ^d	3.2	21	15
CEES	11 ^e	2.6+(2 ^f)	41	19+7 ^g
EVOGEN	8	3.2	19	15
FYSCCELL	7	3.1	17	13
Total	47	15.6	102	76

Table 1. Distribution of staff in IBV sections (1.9.15). a) UiO funded; b) post-docs and researchers (90% externally funded); c) UiO or externally funded PhD students; d) includes one UiO-funded permanent researcher (head of proteomics); e) chair of CEES is RCN-funded during CoE period; f) includes two UiO-funded administrators; g) PhD-students in the quota program. Table 1 does not include externally funded technicians.

Table 2. UiO-funded technicians working in core facilities and other joint service areas at IBV.

Table 2	Technicians
Phytotron	2
Animal facility	3.6
Finse	1
Drøbak	0.5
Sentral workshop	4.6
Research vessels	3
Electron microscopy	2
Advanced imaging	1.5
NSC (sequencing)	3.8
Proteomics	3
NMR	1
IT	3
Purchasing office	2.8
Total	31.8

The research of IBV focuses on understanding fundamental biological processes from molecular and cellular level to population and ecosystem level. IBV is organized into five research sections, one section for infrastructure (INFRA) and one section for administration (ADM). One research section is a Centre of Excellence (CoE) supported by the Research Council of Norway (RCN), Centre for Ecological and Evolutionary Synthesis (CEES). The other four research sections are Aquatic Biology and Toxicology (AQUA), Biochemistry and Molecular Biology (BMB), Physiology and Cell Biology (FYSCCELL), and Genetics and Evolutionary Biology (EVOGENE). Core infrastructures organized in the INFRA section are animal facility, phytotron, central work-shop, research vessels and the research stations at Finse and in Drøbak. In addition, the department has state-of-the-art core facilities (CF) for DNA sequencing (Norwegian Sequencing Centre, NSC), advanced subcellular light microscopy (NorMIC), electron microscopy (EM) and proteomics. NSC and NorMIC are national infrastructures supported by RCN equipment investments. To maintain strong connections between front-line research groups and the CFs, the latter are organized as part of the research sections rather than part of INFRA: NSC is operated by CEES, NorMIC and EM lab by FYSCCELL and proteomics lab by BMB.

The world around IBV

IBV is part of the Faculty of Mathematics and Natural Sciences (MN), and is the only pure biology department at the University of Oslo (UiO). Consequently, IBV has a broad scope in teaching and research. Within the life sciences at MN there is a School of Pharmacy and a Department of Chemistry. Additionally at UiO, there is the Museum of Natural History, which has about 20 faculty members with 10% teaching obligations in biology at IBV, and the Faculty of Medicine (MF). Although there is no formal collaboration agreement between IBV and MF, many research groups at IBV collaborate with researchers at the Institute of Basic Medical Sciences and/or the Institute of Clinical Medicine (both MF), and researchers from these departments are frequently used as lecturers in IBV masters courses. Furthermore, IBV has several adjunct faculty members (professor II) with a primary affiliation to Oslo University Hospital (OUH), which is by far the largest research hospital in Norway.

In the region there are several biologically focused research institutes (e.g. NIVA, NINA, NILU, FHI, STAMI), and significantly, the Norwegian University of Life Sciences (NMBU), which also encompassed the former Norwegian School of Veterinary Science. IBV maintains an active relationship of partnership and competition with these institutes.

The known and unknown future

In the next five years about 12 faculty members of IBV are expected to retire and four have already retired since the foundation of the department. While it is a great challenge for IBV to fill the voids left by these faculty members, it is also an opportunity to stake out a new course and rejuvenate the department. Furthermore, the end of the 10-year RCN-supported CoE period of the CEES in October 2017 is an opportunity for the department to harvest from competencies built during the CoE era, although it will also be a challenge to find sufficient financial resources to maintain the high activity level of the CEES. Most of the employees currently affiliated with CEES are temporarily employed, funded by external research projects. Many of these will be competitive for tenured positions that will be advertised at IBV or elsewhere and the competencies built by CEES will thus be harvested. Some research directions developed by CEES on the other hand may lie outside the current scope of the department and in order to benefit from such international top level research IBV should consider taking up new research areas, which currently have no tenured faculty members.

Centre for Ecological and Evolutionary Synthesis (CEES)

The Centre for Ecological and Evolutionary Synthesis (CEES) combines a broad spectrum of disciplines (such as population biology, statistical and mathematical modelling and genomics) to foster the concept of ecology as a driving force of evolution via selective processes, with a corresponding influence of evolutionary changes on ecology. On this basis, the CEES vision is to contribute to a better integration of ecological and evolutionary thinking. CEES was established in 2007 as a 5+5 year CoE by the RCN (thus ending in 2017), and consists of approximately 170 members, including core staff, postdocs and researchers, PhDs, research assistants, technical and administrative staff, and Master's students. The CEES has a base funding of 10 MNOK/year from RCN and in addition substantial internal (UiO) funding for infrastructure, researcher/PhD positions and administrative staff, which has been instrumental in the CoE's success of attracting small and large externally funded projects. Internal and external financing has worked together to build excellence in several research areas within ecology and evolution (and the integration of ecology and evolution) and it is

imperative that IBV integrates these activities in a good way to enhance the scientific quality of the entire department. Specifically, topics related to the three new CoE developments emerging from the CEES-CoE should be considered.

1. The ecology and evolution of vector-borne bacterial diseases with environmental reservoirs.
2. An integrated approach bridging genomics, evolutionary biology and computational sciences that provides new and fundamental insights into diversification, functioning and adaptation of species.
3. Species, populations and adaptation in changing coastal ecosystems.

The challenge in the years to come will be to secure the success of CEES for the future in a way that will ripple outwards to the whole IBV. It will be necessary to consider strategies for making and reinforce bridges between a continued strong CEES unit and other groups at IBV (and at the Faculty of Mathematics and Natural Sciences) to strengthen the status and visibility of the department.

The UiO life science initiative and life science building (Vev) in Gaustadbekkdalen

Of great significance for IBV is the development of the life sciences domain as a major strategic research area for UiO, and in particular the planned new life science building in Gaustadbekkdalen, Vev. The School of Pharmacy and the Department of Chemistry (perhaps not all the physics-oriented groups) will move to Vev in 2022-2023. In addition to these two departments, Vev will house other life science research groups and innovation activities. Which scientific activities at the UiO that will move to Vev will largely be determined by the newly appointed Board of Life Science¹. The MN leadership has authored a document entitled "Where is MN in 2030?", which sketches out possible scenarios for Vev and Kristine Bonnevieres (KB) hus². MN leadership argues in favor of a division of labor between Vev and KB hus.

Specifically, five scientific/strategic pillars are proposed for Vev:

1. A pillar of chemistry, biochemistry, other basic life science disciplines as well as pharmacy, keeping an overall scientific focus on the human subject.
2. A pillar with central core facilities (CFs), whose generic character will underpin the life science field at the UiO and Oslo University Hospital.
3. A pillar of computational life science (bioinformatics, biostatistics, biomodeling, etc.).
4. A pillar for "Talent and Growth". Possible examples include the Biotechnology Centre (BiO), Norwegian Center for Molecular Medicine (NCMM), and start-ups by staff and students.
5. A pillar for "Excellence and Change" to ensure a dynamic research environment.

Thus, Vev constitutes a significant opportunity for IBV, particularly for research groups with a biomedical or human physiology focus. Such groups may benefit from a larger and more interdisciplinary scientific environment as well as a more modern infrastructure than KB hus can offer (space constraints will limit how much of IBV that could possibly move to Vev). It may also be in the best interest of MN/UiO that faculty members from IBV within research areas that are also covered by School of Pharmacy or the Department of Chemistry co-localize. Currently, many research groups

¹ UiO board v-sak 5, 5. mai 2015,

² Hvor er MN i 2030? Visjoner for utnyttelsen av bygningsmassen ved UiO og oppspill til prosess for utvikling av MNs organisasjon frem mot 2030.

in BMB and FYSCCELL, as well as microbiologists in EVOGENE fall into this category. However, the majority of faculty members in the BMB section and two of four cell biologists in FYSCCELL will retire before Vev is realized. Recruitment of new faculty members to IBV should therefore consider the future direction of biological research in both KB hus and Vev, and for each position advertised IBV needs to make a conscious decision as to the future of the person hired. Although much is yet to be decided regarding the scientific activities in Vev, the UiO Life Science Board proposed in September 2015 that in addition to Pharmacy and Chemistry, BiO/NCMM should be moved to Vev. Furthermore the Board has proposed that structural biology, chemical biology platform and computational biology (up to 75 persons) should be included in Vev. Currently, life science departments that are not moving to Vev have been invited to suggest other activities which could be localized to this building (see below).

It is of utmost importance that IBV is fully devoted to maintaining strong research and teaching activities localized to KB hus. ***Although there is no natural breakage point within IBV, indeed within the continuum of biology, development of Vev as a life science building (including pharmacy and chemistry) with a focus on the human subject necessitates a distinct vision for the scientific direction of activities undertaken in KB hus.*** Ecology, evolution and environmental research are areas where IBV is particularly strong with many top-level research groups, and constitute natural foci for IBV. Furthermore, comparative physiology and plant sciences are important fields for UiO that will have no other natural home than KB hus. These latter fields also have research groups at the top international level at IBV, but are vulnerable because they are rather small.

The ambition

The main goal for IBV is to develop the department as a major European player within research and education in biosciences. This is exemplified by the IBV Board's ambition that the department should have several world-leading basic research environments and all research groups should be at the very top national level. Although IBV covers a broad scope within biology, focusing on some target areas is needed to achieve this goal. The organization of IBV into research section is a natural framework to achieve convergence around focus areas. Accordingly, each research section has developed their own strategic plan, which was presented to the IBV Board June 2015.

Furthermore, the program committee for the revised bachelor and master's programs in biosciences has decided that our education programs should be founded on physical, chemical and biological first principles. Important biological first principles are the flow of information as described in the central dogma and the role of evolution by natural selection as an explanation for living diversity.

Infrastructure development in KB hus and Vev

While the most important asset of IBV is the competencies of its employees, we must acknowledge that modern biology research requires access to state-of-the-art infrastructure and environmental sampling. Maintaining advanced research infrastructure is costly and there is internationally an increasing trend toward development of CFs, which cover the needs of departments, universities or regions. As mentioned above, IBV co-hosts two national CF platforms in DNA sequencing and advanced light microscopy as well as hosts other CFs for the department or the entire UiO. It will be inefficient for UiO to maintain functionally identical CFs in Vev and KB hus although some overlapping equipment will be needed and is unavoidable. There is consensus that CFs need to be

operated by front-line research groups that rely on the upkeep of the CF for their own research questions, and at the same time are given sufficient incentives to operate CF for the benefit of other users. Thus, it may be beneficial for UiO to move some CFs currently localized in KB hus, while at the same time further develop others. In October 2015, IBV received an invitation from the UiO Life Science Board to suggest strong technology-oriented research groups, which if moved to Vev, would enhance life science research at the university as a whole. While it is convenient for IBV to maintain as many CFs as possible in KB hus, the financial reality of the department and the interest of life science at UiO may promote other solutions. Thus, the department management will (by the deadline October 31st) propose to the Life Science Board that the proteomics facility and the EM lab are to be relocated to Vev. Furthermore, we will propose that a UiO state-of-the-art imaging lab is established in Vev, and that nodes will be required to be integrated into the different life science research environments at UiO and OUH including KB hus.

CF-like research infrastructure that should be maintained and/or further developed in KB hus include the phytotron, ancient DNA (aDNA) lab and DNA sequencing center/genomics-/bioinformatics platform. KB hus will remain the location for plant sciences at UiO and a major upgrade of the phytotron is required. IBV has already, together with MN and the Buildings Department at UiO (Eiendomsavdelingen; EA), started the planning of this project, and maintaining the priority of phytotron upgrade on MN agenda is highly prioritized by IBV management. It is fair to assume that a major upgrade will cost approximately 50 -100 MNOK. However, a somber plan, that additionally is aligned with plant facilities at Ås (NMBU) will need to be made to ensure the continued support of MN faculty and ultimately the UiO Board for financing.

The UiO has recently invested heavily (approximately 20 MNOK) in a state-of-the-art aDNA lab located in south corner column of KB hus with access from the parking lot. In addition to IBV, many other units at UiO have an interest in the aDNA lab: research projects that use this lab are in general very interdisciplinary.

The DNA sequencing center, NSC, is a hub for some of the highest impact research groups at IBV and has been a critical factor in securing funding for several large externally funded projects. However, DNA sequencing services are subject to fierce international competition and the general high operating costs in Norway are particularly felt by this CF. Considering the importance NSC has for IBV research groups it is nevertheless of strategic importance for the department to continue to support NSC. In the future NSC may develop more into a bioinformatics platform and IBV plans for NSC (including bioinformatics and biostatistics) need to be aligned with the MN/UiO plans for a computational life science unit in Vev (see above).

In addition to CFs in KB hus, IBV is responsible for the operation of field stations at Drøbak and Finse as well as research vessels. National and regional obligations and partnerships, as well as the likely future research strategies of IBV necessitates that these infrastructures are maintained and up to date. A new facility at the marine biological research station at Drøbak would significantly enhance the research capacity and quality of teaching. Some foundation work for such a facility has already been done and a planning project is nearly completed. It is estimated that a new facility will have a relatively low cost of 2-3 MNOK. Thus, a new facility at Drøbak should be prioritized by IBV.

Of particular relevance is the state of the research vessels. Trygve Braarud, the largest boat of the department was built in 1983 and Bjørn Foyn in 1977. The relative low operating cost of these vessels

compared with larger national vessels argues in favor of IBV/UiO maintaining its own vessel(s) for use in Eastern Norway, contingent on continued collaboration with regional partners as today. Furthermore, marine biology is an important component of IBV research and education. A national committee appointed to evaluate the need for investments in research vessels noted in its report in 2006 that the expected life time of such vessels is approximately 30 years³. Thus, both IBV vessels are by this definition ready to be decommissioned. A project group, led by the Sindre Holm, the captain of Trygve Braarud, should be commissioned to determine future needs and possibilities at different cost alternatives. A financial plan for investment in a new vessel to replace Trygve Braarud is urgently needed and IBV should initiate a dialogue with the MN faculty on this issue.

Other CFs, currently operated by IBV include laboratories for EM, advanced light microscopy, proteomics and an animal facility with both terrestrial (mostly mice and rats) and aquatic units.

Currently, the plans for a vivarium in Vev are not definitive, but it seems fair to assume that a solution for rodent experiments will be found in Vev and/or in the nearby Domus Medica building (which already has the largest vivarium at UiO). If the IBV research groups that are the main users of mice and rats as model organisms move to Vev, the need for such facilities at KB hus will dwindle, but such a move has not been determined by MN faculty or others. Furthermore, a need for aquatic animal facility and hosting of non-model organisms in KB hus will still be needed. The aquarium facility is in urgent need of refurbishment and this should be a priority of the IBV.

EM lab, advanced light microscopy and proteomics are operated by research groups that in the future may be localized to Vev and it would be natural that these CFs also move. However, it should be noted that even if certain activities are to move to Vev, this will not be for another 7-10 years from today (i.e. 2022-2025). It will therefore be necessary to continue to invest in these CFs while they are still at KB hus, as was done recently with the purchase of a new EM.

Recruitment considerations

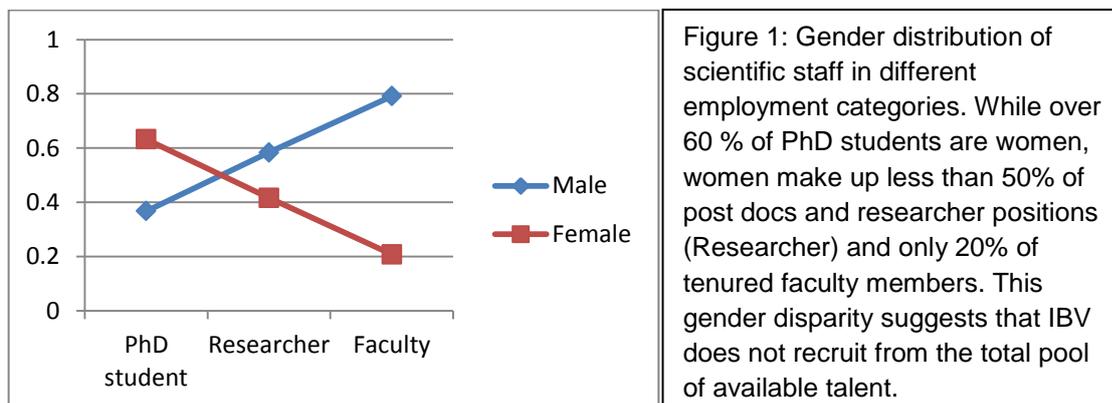
IBV needs to recruit faculty members that will fulfill the research and teaching ambitions of the department. Regarding teaching, the partnership with Museum of Natural History, and the use of associated professors (professor/førsteamanuensis II) increase the flexibility of the department's needs for specific competencies. Furthermore, the life science initiative at UiO is pulling the Department of Chemistry in a more biological direction, and is expected to do so even more once Vev is in full operation. This department already has two protein x-ray crystallographers including one recent joint appointee with BiO. Thus, increased research and teaching capacity in the field of biochemistry in Vev will increase the flexibility of IBV in filling new positions.

Currently, IBV struggles with management and teaching in some of the large undergraduate courses, but this appears to be a structural problem rather than lack of faculty able to teach in specific areas of biosciences covered in our study programs. It could be argued that a large department such as IBV would benefit from having 2-3 faculty members more dedicated to teaching and organization of the study programs. However, an alternative to introducing such "teaching professorships" could be for the department to take better advantage of faculty members' individual wishes for life-time variations in their career. Some professors may wish to dedicate more of their time to teaching activities and this should be encouraged and rewarded by the management. The bachelor and

³ Forskningsfaglig begrunnelse for fornying av forskningsfartøyer, rapport 2006

masters programs in Biology and Molecular Biology are currently being revised and new bachelor programs will be launched across MN from the fall of 2017. While Computing in Science Education (CSE) will become integral to education also at IBV, a strong need for different expertise than currently available in the department is not foreseen. One notable exception is that IBV will need to increase education in bioinformatics. In that regard, the MN faculty is spearheading an increased focus on bioinformatics at UiO and OUS and is currently working together with department management to secure new funding for a bioinformatics position at IBV.

An issue that cannot be ignored in future recruitment is the gender balance at the department. More than 2/3 of the students are females and women are still in majority at the PhD level (Fig. 1). However, at the researcher level (post-doc and senior researcher), men are in majority and at the tenured faculty level women make up only 20%. While this present gender imbalance partly is due to the fact that more men than women completed PhDs when current faculty members were at that career stage, there is evidence to suggest that IBV is not recruiting effectively from the available pool. In accordance with MN policy, future positions should be advertised in areas where it can be documented that qualified female applicants will be competitive for such positions. This will often mean that positions should be advertised within a broad research area.



The long awaited introduction of tenure track positions became formalized in March of 2015⁴, and IBV is free to request from MN that we advertise new faculty positions as tenure track. However, there is no dedicated funding for such positions and they would need to be advertised instead of tenured positions that are planned. Furthermore, tenure track positions are only available to persons within 5 years of defending their PhD (plus time added for leave of absences). Thus, many of the senior researchers at IBV would not be eligible to be hired in tenure track positions and introductions of such positions would create a “lost generation” at the department. In addition, there might be more risk associated with hiring people for tenure track within five years of PhD than current hiring practice, particularly if the tenure assessment is not subject to the same rigorous evaluation as current selection committee for faculty positions. It is therefore not recommended that IBV advertise tenure track positions under the scheme introduced by the Norwegian government in 2015.

A recruitment plan should indicate a clear direction for scientific activities at IBV. However, the department also needs to maintain a certain level of flexibility to act when good opportunities arise, such as advertisement of suitable positions for outstanding young scientists who have won ERC

⁴ Forskrift fastsatt av Kunnskapsdepartementet 24. mars 2015 med hjemmel i lov om universiteter og høyskoler §6-4 første avsnitt punkt k.

starting grants in research areas that IBV want to develop. Furthermore, collaboration across departments at the MN faculty and planned activities in the Life Science building – Vev – may affect the needs of IBV.

Retirements and recruitment plan

The table below lists faculty members retiring by 2020 assuming all retirements occur at age 70 (those above the line in italics have already retired). Somewhat arbitrarily the table starts with retirements since 2013. In total 16 faculty members are expected to retire in this 7-year period. Should current faculty members choose to retire at different times than when turning 70 the recruitment plan will need to be adjusted accordingly.

Family name	Given name	Section	last semester
<i>Eriksen</i>	<i>Aud</i>	<i>EVOGENE</i>	<i>Spring '13</i>
<i>Nordal</i>	<i>Inger</i>	<i>EVOGENE</i>	<i>Spring '14</i>
<i>Sand</i>	<i>Olav</i>	<i>FYSCELL</i>	<i>Fall '14</i>
<i>Klaveness</i>	<i>Dag</i>	<i>AQUA</i>	<i>Spring '15</i>
Kristensen	Tom Arne	BMB	Fall '15
Slagsvold	Tore	CEES	Fall '17
Høiland	Klaus	EVOGENE	Spring '18
Nissen-Meyer	Jon	BMB	Spring '18
Leinaas	Hans Petter	AQUA	Spring '18
Aarnes	Halvor	BMB	Fall '18
Griffiths	Gareth Wyn	FYSCELL	Fall '18
Ugland	Karl Inne	AQUA	Spring '19
Schumacher	Trond	EVOGENE	Spring '19
Eskild	Winnie	BMB	Spring '19
Stenseth	Nils Christian	CEES	Spring '19
Klein	Uwe	BMB	Fall '19

The table below lists faculty members hired since the foundation of IBV and a suggested time frame for recruitment of new faculty members before 2020, 15 positions in total. This includes phasing in of CEES and a possible new bioinformatics position championed by MN and IBV. It is a reduction of one position since IBV was founded, but the current long-term budget prognosis does not allow more positions to be filled without severely restricting the department's ability to support its faculty. To maintain a certain level of flexibility, the plan is divided into two stages.

Recruitment plans for stage one: 2016-2017

The first stage of the recruitment plan should be initiated as soon as the specifics of such a plan have been approved by the IBV Board. The exact order of hiring for each position should be decided by the Board as it sees most appropriate. Position 1 is suggested as the most important step in making research activity in an area where CEES has established a world class program a permanent fixture of IBV. Positions 2-4 are required for IBV to continue to fulfill our teaching obligations and will constitute vital rejuvenations of the department. Furthermore, there are considerable possibilities for synergy between these positions. Position 5 is dedicated to maintain and foster integration of

research activities in marine (or aquatic) fields at IBV. To achieve this it may be required to have a targeted call as indicated below.

	Family name	Given name	Section	Year hired
	Johansen	Finn-Eirik (Head of dept. until '17)	To be decided	2013 (2017)
	Linke	Dirk	EVOGENE	2013
	Borgå	Katrine	AQUA	2013
	Grimi	Paul	EVOGENE	2015
	Thiede	Bernd (permanent researcher)	BMB	2015
Recruitment plan stage 1: 2016-2017				
1	Ecological and evolutionary dynamics (e.g. plague)		CEES	
2	Cell biology (plasticity and cell trafficking)		FYSCCELL	
3	Plant science (developmental biology/genetics)		EVOGENE	
4	Genome function (e.g. epigenetics and gene regulation)		BMB	
5	Effect of climate-related environmental changes		AQUA	
Recruitment plan stage 2: 2018-2020				
A	Ecological and evolutionary genomics		Affiliation and order of positions to be determined	
B	Ecology and evolution			
C	Molecular biology			
D	Physiology			
E	Evolutionary genetics (possibly in fungal biology)			
F	Bioinformatics (new position contingent on funding from MN)			

Justification for proposed new position in stage one:

1. Ecological and evolutionary dynamics (of infectious diseases with an environmental reservoir)

New positions to secure the competencies developed during the CoE period of CEES should combine ecology and evolution. The evolutionary and ecological perspective on infectious diseases has turned out to be one of the most successful research foci during the CoE. It is unique in its focus and approach, cross-disciplinary and utilizes the newest technology (incl. aDNA methodology). Several promising and outstanding candidates have been fostered within this field during the CoE period. Such a position should attract several strong applicants (both from within CEES and externally). While it might be argued that the scope of such a position is narrower than what IBV would normally want, it would still be justified to announce such a call as part of the phasing in strategy for CEES. IBV will receive financial support from UiO directly targeted for phasing in CEES, which could be dedicated to this position.

2. Cell biology (plasticity and cell trafficking)

FYSCCELL has identified three strategic research areas; Plasticity and cell trafficking, Neurobiology and Comparative physiology. Whereas comparative physiology certainly will remain in KB hus, research groups under the other suggested topics may move to Vev. Although comparative physiology is a niche which is and may even more so be filled in the future at IBV, a new position is not the most urgent. In the field of cell biology, there are two retirements in the near future (2018, 2019) that will bring the teaching capacity way below what is needed. Furthermore,

research expertise in cell biology holds a great potential for bridging interests with other research groups in the section and beyond. The first announcement should therefore be in the field of Cellular plasticity and trafficking (tentative description). These are research areas within cell biology that has the potential to bridge existing research groups (e.g. neurobiology/physiology, posttranslational modifications, intracellular trafficking) and easy access to the advanced imaging platform at IBV should make the position very attractive and is likely to ensure strong applicants.

3. Plant science (developmental biology/genetics)

Plant developmental biology/plant genetics is a strong research area at IBV and EVOGENE. While traditional plant physiology research is diminishing in the department, the need for excellence in plant research remains in order to fulfill our obligations in education and research. A position that would address fundamental questions in cell signaling, cellular communication or gene regulatory networks related to plant growth and development and physiology will have synergistic effects with current research at IBV and consolidate the department as the national leading research environment in this field.

4. Genome function (e.g. epigenetics and gene regulation)

Current research at BMB focuses on structural biology, protein structure/function and (gene) regulatory networks and signaling. While structural biology is a research field of increasing importance, more research in this area is likely to move to the Department of Chemistry. The next position at BMB should therefore be used to consolidate the section for future research challenges rather than merely continue ongoing research. A position in the field of epigenetics, gene regulation or other genome functions with focus on basic mechanisms of chromatin-related biology is therefore suggested. Epigenetics is a rapidly expanding area (six-fold increase in the number of papers since 2004) with large international efforts (e.g. ENCODE, NIH Roadmap Epigenomics Consortium, FANTOM5). Most important, it represents a fertile soil for ground-breaking discoveries, not at least in the area of mechanistic insights. Finally, it is also an area of increasing societal relevance, in medicine exemplified by epigenetic drugs in current trials, its increasing importance for personalized medicine, as well as its future potential in the agriculture and marine sector. The candidate should have a strong background in biochemistry and molecular biology, and have interest in developing necessary cutting-edge technologies and skills including epigenomics, imaging and bioinformatics. Such a position is likely to attract strong candidates that will bridge ongoing research in the section, the department and beyond.

5. Effect of climate-related environmental changes

AQUA aims at better integrating activities in freshwater- and marine biology. A position focusing on the effects of climate-related environmental changes such as increased precipitation and subsequent runoff to aquatic recipients will play a strategic role and fill an important knowledge gap. Study focus could be factors like effects on primary production, food webs, life history strategies or community structures. Such a position could possibly bridge research activities in AQUA and CEES and foster stronger collaboration between sections.

Recruitment plans for stage two: 2018-2020

There are a number of uncertainties in the future for IBV, which necessitates that the recruitment strategy for stage two of this action plan remains flexible. These uncertainties include, but are not restricted to, the department's financial situation, altered teaching needs as a consequence of new education programs and better coordination of teaching across the MN faculty, the impact of Vev and the life science initiative at UiO.

Furthermore, the exact field of research and nature of expertise of faculty hired in stage one will affect needs of the department in stage two. IBV needs to maintain a broad organismal knowledge, both in terms of biodiversity and in terms of model systems. Faculty hired in stage one will for sure bring such knowledge to the department although we cannot predict exactly the nature of this knowledge. Furthermore it will be necessary to maintain a significant level of experimental expertise in the pool of faculty members. Such factors need to be considered when calls for positions in stage two of this plan are finalized. Even though a detailed plan is not presented here some themes are presented below that should be the starting point for further consideration.

New positions to secure the competencies built during the CoE period of CEES should combine ecology and evolution. The integration of ecology and evolution with genomics has been one of the most successful research foci during the CoE – combining classical ecology and evolution with state-of-the-art genomic tools. It has the potential for answering fundamental biological questions and causal relationships involving speciation, adaptation and organism functioning. Several promising and outstanding candidates have been fostered within this field and a position in **ecological and evolutionary genomics (A)** would attract several good applicants (from within and externally). Additionally, a position in **ecology and evolution (B)** will be needed to maintain teaching and research in this field with the forthcoming retirements of current CEES members.

Positions within the broad fields of **molecular biology (C)** and **physiology (D)** will also need to be filled in order to maintain critical mass in teaching and research in these areas. However, the specific nature of these calls should be determined once some of the uncertainties pertaining to Vev have been settled within the next couple of years.

Whereas modern biological concepts in general are broadly applicable to many organisms and biological systems, organism-specific knowledge is still a cornerstone of biology. In this regard, mycology is an area at risk of falling below critical mass due to two faculty members retiring in the near future (2018, 2019) thus creating a fragile situation for both research and education. Yet there is a strong research environment in this area with a younger faculty member and several temporarily employed researchers. Recruitment in the field of **fungus evolutionary genetics (E)** would therefore maintain teaching capacity and a robust international research environment. Recruitment in this field holds promise to consolidate research focus and put more emphasis on experimental evolutionary biology and genetics at IBV, and has the potential to connect research themes in the current EVOGENE section (i.e. plant biology, developmental biology, microbial biology).

New developments in biological research and in IBV teaching portfolio require that the department also hires faculty in new areas. The UiO, in close collaboration with OUH, is currently working on a strategy for increased emphasis on **bioinformatics (F)** which is likely to support the funding of a new position in this area at IBV. If fresh funding for such a position does not materialize, alternative

solutions need to be sought to ensure education in the field in the revised bachelor and masters programs.

Organizational development of IBV

The most important known organizational issue facing IBV in the next few years is the end of the CEES CoE era. The base funding from RCN and additional support from IBV/MN/UiO has allowed the CEES an extraordinary level of administrative support and strategic flexibility. It should be noted that the strong research administration at CEES has been integral to the CoE's success. Therefore, this kind of support should not be torn down, but should rather be made available to the IBV researchers as a whole. Furthermore, the centralization of financial services at the MN faculty necessitates a reorganization of administrative research support at IBV.

The current organizational map of IBV should not be considered a permanent and static structure. Should IBV be successful in obtaining a new CoE in 2017, adjustments of sections might be a natural consequence. Similarly, when CEES is no longer an RCN-supported CoE it is not given that the best organization of IBV will be for current members of CEES to remain as a section. Faculty members at IBV are involved in several strategic research initiatives (SRI; Endringsmiljø) at the MN faculty. The SRIs and other research conglomerates (e.g. IBV initiatives) are organized as a matrix in relation to the sectioning of the department. Members of an SRI can belong to different sections within IBV and certainly within the MN faculty. Such an organization for CEES should also be considered an option to foster the continuation of the center beyond 2017 and to allow the strong research program of CEES to strengthen IBV as a whole. The interfaces between CEES, EVOGEN and AQUA will need to be examined, to determine the best alignment of revised sections. The outcome of the three CoE applications emanating from CEES described above will certainly also be a factor.

The competition for obtaining CoE funding is fierce and successful groups are clearly at a very high international level. Should research groups at IBV be successful in the current call it is natural that certain privileges, as currently enjoyed by CEES, should be extended to such groups. These privileges include a local (i.e. in the section) administrative support and perhaps other support functions needed for a specific CoE to operate effectively. However, establishment of extra administrative support at lower organizational level than the department will in all likelihood increase the total number of administrative staff, which will make it financially harder to replace scientific staff upon retirement. It is therefore not desirable that local administrations mushroom throughout KB hus.

Possible integration of infrastructures into sections

When the current organizational map was decided upon by the Board in 2012 two main issues were at stake: Firstly, creating possibilities for synergy between research groups; and secondly, integrating and aligning prioritization and operation of core infrastructure with the scientific activities of the research sections. The model for achieving this second goal was to have state-of-the-art technology platforms integrated into sections and operated by these for the use of all researchers of the department; whereas, common research facilities such as the phytotron, animal facility, field stations and vessels were organized in a separate section, INFRA. It would be appropriate to evaluate the effectiveness of this structure and consider whether it should be continued or whether all research infrastructures should be integrated into the research sections of IBV.

Need for technical support in sections and CFs

While the focus of this document is on investments in infrastructure and recruitment of permanent scientific staff, IBV is heavily dependent on an effective administration and competent technical staff. However, the financial realities of IBV, UiO and in Norway dictates that a larger portion of department infrastructure dedicated to support external research projects (such as those funded by RCN, EU and others) is financed through these external projects. IBV has recently introduced the so-called "leiested" system. Without new revenue from this system in the future, holding on to personnel with vital skills and man power will not be possible for IBV.

Beyond 2020

It is expected that decisions regarding Vev will be made in the relative near future and be known in ample time before calls for 2020 and beyond are made. A further four faculty members from IBV, in addition to the 16 listed in the table above, are scheduled to retire between 2020 and 2023, before Vev is operational (provided retirement age remains 70 years). These positions should be reserved for fields that will need to be strengthened at KB hus should some current IBV programs within physiology, cell biology, molecular biology or microbiology move to Vev.

In the longer term, a move of scientific areas from KB hus to Vev may warrant a reorganization of departments at the MN faculty. The void left in KB hus will need to be filled. If the number of people working in KB hus is at a low in the mid-2020s, that would be a good time for a major rehabilitation of the building. Subsequent to such rehabilitation new groups could be recruited, either from within the MN faculty (e.g. environmental research in geosciences) or from outside UiO should the financial situation allow for that. However, such issues are not dealt with in the current action plan.

Blindern, October 21st,

Finn-Eirik Johansen