Preliminary response to the IAB recommendations 2019:

The IAB requested the board and management provide a preliminary response to the IAB recommendations from their site visit in March 2019. We want to thank the IAB for truly insightful, constructive and on some occasions, provocative comments about the future of SciLifeLab. The IAB review has attracted a lot of attention and discussion. It is also freely available on the SciLifeLab web site for the SciLifeLab community and the general public.

This is document prepared as a response to the IAB. This document has been prepared based on many discussions with the key stakeholders, and has been formally approved by the board of SciLifeLab.

Re: Comments to IAB are indicated in italics.

General recommendations:

The IAB prepared the following six general strategic recommendations:

1) Renew the strong commitment to the synergistic dual mission of SciLifeLab as an international centre of research excellence and a national research infrastructure.

Re: MG has worked with the board, rectors, host universities, governmental agencies, ministries, and funders to discuss the next 10-year plan for SciLifeLab. A national hearing on SciLIfeLab was held on Sep 20, with about 100 key stakeholders attending. We have also prepared a proposal from SciLifeLab to influence the next 4-year research proposal by the government. To a large extent, the IAB report was used as a base for preparing SciLifeLab plans. Here are the main points of that proposal:

SciLifeLab's proposals for the research bill 2021-2024 can be summarized as follows:
- *Increase the government's commitment and long-term funding for national research infrastructures.*
- *Increase the investment in SciLifeLab's national infrastructure platforms, with a total of 320 MSEK over 2021-2024 in order to:*
  – Strengthen funding to advanced technologies within SciLifeLab, increase availability of SciLifeLab to academia, industry and healthcare, and increase connectivity with MAX-IV and ESS.
  – Develop a national framework for the large amounts of data generated at national life science infrastructures, in collaboration with VR and URFI.
  – Increase investments to the Drug Discovery and Development Platform at SciLifeLab.
- *Extend the Strategic Research Funding (SFO) for molecular biosciences and link it to SciLifeLab infrastructure.*
- *Strengthen future national strategic research programs by utilizing SciLifeLab's infrastructure within data-driven cell biology, data-driven precision medicine and data-driven environmental research (such as biodiversity, evolution, climate change and impact of environment on human health).*

2) Develop the national infrastructure to an inclusive Hub and Nodes model with all Swedish universities.

Re: As part of the preparations for the next SciLifeLab budget cycle and the next international evaluation of infrastructure in 2020, we have placed increasing emphasis towards expanding SciLifeLab infrastructure presence across the country. Depending on the maturity of the technology and the platform, we will continue to use either a single site or two-site model, a hub-and-node model (increasingly common) or a network model. We have also asked the infrastructure platforms to prepare a dissemination plan that ensures that expertise and capabilities flow from the national to the local level, in terms of training and exchange of expertise and information, particularly as technology mature and become commonplace and eventually moves out from the SciLifeLab.

3) Create a truly integrated international centre of research excellence focused on technology development and data science in Stockholm and Uppsala.

Re: We are continuing to develop the research center(s) of SciLifeLab in Stockholm and Uppsala, but will also make sure that we are open and linked with strategic research initiatives across the country.

4) Provide the mandate and delegated authority to the SciLifeLab research director to run an internationally competitive centre and support especially its excellent junior fellows adequately.

Re: A process is underway to prepare a plan that will delegate increased mandate and responsibility for the practical matters at Campus Solna (space, services, research environmwent) to a senior scientist/professor who will undertake the role of föreståndare (Campus Solna director). We will also discuss the leadership or coordinator role for the research environment and the integrated research profile of SciLifeLab as a whole, at Campus Solna, Uppsala and elsewhere.

5) Make a compelling bid for a significant increase in government funding to fulfil the infrastructure mission for all of Sweden.

Re: This was prepared as part of the SciLifeLab hearing, a research proposal to the goverment for the next 4-year cycle (see above) and we will continue to express these views with the ongoing work for the 10-year strategy.

6) Truly integrate the complementary research strengths of the four host universities in a joint centre and renew the commitment of the hosts to support SciLifeLab research with their SFO funds.

Re: This matter is also being handled as part of the three processes underway as explained above.

3.3. Evaluation of the period 2017 to 2019

The IAB was happy to see many changes and improvements in response to the comments from the IAB 2017 visit and listed several highlights (chapter 3.2) as achievements. IAB also pointed out several issues that have not yet been resolved. These are listed below, and many of these will be also further pointed out in other parts of the IAB document.

Although conditions are somewhat more aligned among the SciLifeLab fellows, support and integration of the fellows (at Solna campus, but also at Uppsala university) including a lack of general scientific infrastructure and a working community network and mentoring and support by the SciLifeLab senior faculty remains a major concern
- No joint/coordinated recruitment of fellows

- No turnover of SciLifeLab faculty, no useful common definition of SciLifeLab faculty
- Insufficient priority to the international research centre of excellence mission, no aligned research strategy between the host universities, not enough empowerment to SciLifeLab management to implement this mission and the agreed strategy on behalf of the host universities.
- No aligned scientific and/or technology strategy for the research carried out at SciLifeLab
- An effective organisational authority and leadership of the Solna SciLifeLab campus is not established
- Joint postdoc/predoc program still missing, establishment appears likely among Stockholm universities (currently a joint Master program exists)

Re: All these issues indeed concern major questions arising during the IAB 2019 visit as well. Thus, these comments reissued from 2017 underlie the urgency, but also difficulty and complexity of some of these issues. We are now having a decisive effort to address all these issues. For those that concern Campus Solna, we have set up an action committee that includes the Integration Directors (Chair Ylva Engström) and the Dir/Co-Dir of SciLifeLab. We also have a process underway to launch a position of a Campus Solna Director, who will be responsible for the campus development, local infrastructure, research environment, shared fellows' issues, turnover of scientists and integration of Campus Solna research across host universities as well as with the infrastructure. A definition of SciLifeLab group leaders is being processed towards board approval in November, 2019. In addition, more work is needed to address also the research profile for SciLifeLab as a whole in the future. In the proposal to the government's four year plan, we suggested the following three broad research themes:
- *Data-driven cell biology*
- *Data-driven precision medicine and translational research*
- *Data-driven environmental research*

3.4. Drug Discovery and Development Platform

3.4.1 Response to general comment about DDD programs in the main IAB report (for other comments, please see appendix)

…….."The first, a program on Acute myeloid leukemia (AML) improving a known compound with significant medicinal chemistry effort, apparently already generated interest from Pharma and Venture Capital investors. It was not made clear however, what properties of the new molecule were required for this new indication, and we were not shown any toxicology. The second program discussed antibodies against a novel target for inflammatory diseases. This is showing promising activity in a couple of animal models, however we were not shown the rationale for which patient group this might be effective. The biology presented was of classical animal models that are not always predictive, and it was not clear to the IAB that the team had seriously considered ex vivo or topical tests in order to understand the mechanism in man. It would have been helpful to understand the rationale behind the proposed initial clinical studies as this would show how much is understood about the mechanism in real patients."…

Re: Unfortunately, the IAB may have misunderstood the specific project presentation from the DDD platform. We regret for not being able to convey the complex information in a sufficiently clear way. The AML program does not involve any known compounds - it concerns development of a completely new lead series. The AML program has now been licensed by an international VC company that has started a new company around the project. For the mAb project, the mechanism of action is only partly understood. However, our understanding stems from ex vivo human cell

models and data are further supported by mouse KO of the target protein and analysis of human tissue/biofluids from patients with disease.

4. Strategic advice for the future development of SciLifeLab

4.1.a. The commitment to the dual SciLifeLab mission of national infrastructure platform and international centre of research excellence needs to be renewed and strengthened and then jointly supported and implemented.

Re: See comments above for the actions underway at the research policy level, including the Sep 20 hearing, its follow-up, SciLifeLab suggestions to the government 4-year research plan, and the ongoing development of a 10-year SciLifeLab strategy. In addition, we will undertake continued discussions with both host university leadership, but are also meeting the leadership of all major non-host universities (Umeå, SLU, Lund, Gothenburg, Chalmers, Linköping) during the fall of 2019.

4.1. b. Communication and Coordination: SciLifeLab to hosts
Although communication between SciLifeLab and the host universities has improved, closer coordination among SDs and IDs is still needed and their key partners in SciLifeLab (e.g. fellows) and universities (department heads and rectors) still have to be more aware of this mechanism to achieve better coordination, joint planning and support for implementation by SciLifeLab management.

Re: We agree and will continue efforts already underway.

c. Coordination and Synergies: Among hosts of SciLifeLab
In our opinion, SciLifeLab provides a fantastic opportunity for improved communication and collaboration in the life science between the host universities. …. We thus recommend that the hosts fully embrace this opportunity and utilise the connections SciLifeLab has established between their rectors, life science department heads, integration directors and scientific directors to align their strategy and jointly take the responsibility for developing SciLifeLab into an internationally leading centre they jointly take pride in and do their utmost to support.

Re: We agree and will continue to promote this role. The three Stockholm universities have also started a "Stockholm trio" collaboration, across all fields of research. SciLifeLab collaboration and CS in Stockholm are natural parts of this effort.

4.1.d. Inclusive governance of the national infrastructure mission
We applaud the formation of the NSC and recommend to continue the representation of external universities on the SciLifeLab Board regarding its national mission. To simplify the governance as much as possible and limit the number of people involved, this may be best done by having the Chair and vice chair of NSC be part of the SciLifeLab board ex officio

Re: The future role of NSC is being discussed and the mandate of the members should be even stronger (particularly from their host universities) with the board. The chair of NSC was originally selected to be a SciLifeLab board member from non-host universities, so this representation is already addressed. Also, half of the board members come from outside of the host universities. We are undertaking discussions with the leadership of all non-host universities during the fall 2019 (Umeå, SLU, Lund, Gothenburg, Chalmers, Linköping) to find concrete solutions on how to take

care of the national integration better. The next infrastructure evaluation is meant also to better take into account the national dimension. We will take into account the plans for VR infrastructure and will also be engaged in discussions with the universities' own infrastructure collaboration URFI.

4.2 National infrastructure mission

4.2.a. Overall direction

The IAB is very impressed by the many positive developments since 2017. This area makes it clear that when SciLifeLab management has a clear mandate, it is very effective in formulating and implementing a strategy. The IAB is also very supportive of the proposed future plans for the development of the national infrastructure, to become even more clearly organised, evolve by regular and synchronised evaluation and even better alignment with the structuring and evaluation processes.

b. Platforms
The platforms are well-organised and we support the simplification into six major areas. However, we would advise to avoid re-organising the high-level platform designations too frequently, but rather let the system settle and stabilise. It may be worth thinking about calling the "translation" platform "of life" or "from life", rather than "for life". It is important that the platforms are presented consistently in all SciLifeLab media, once a change is agreed. Currently on the homepage or in flyers we find nine or even ten platforms listed, while the IAB report referred to seven and the new proposal is to reduce to six.

Re: This is at least partly due to the different definitions: SciLIfeLab service areas (areas visible to users) vs. platforms (organizational units at SciLifeLab). The service area concept was launched in 2018 to help users to find the services, regardless of the internal SciLifeLab organizational changes within facilities and platforms, but we agree that we need to be careful about introducing new concepts to an already complex SciLifeLab environment. The no. of platforms changed in 2019, when the single cell platform was dissolved and the facilities moved to genomics and proteomics platforms. However, single cells field continues as a service area visible and available to the users.

c. Capabilities.
The IAB supports to move from individual technologies to capabilities, to support the research questions their users have better and to integrate technologies across facilities and platforms even more seamlessly into the most commonly requested workflows in a modular fashion. This is a forward looking and sustainable concept. We advise however, to take more advantage of Sweden's unique strengths in several areas, such as advanced protein technologies or Genomic Medicine, to avoid that the capabilities' denominations become too generic.

Re: We value the advice as we are planning to launch capabilities during the next 4-year period.

d. Life-cycle management of facilities
The IAB welcomes the 4-year review cycle of national platforms with a mid-term check-up after two years. The 2016, 2020, 2024 cycle will also synchronise well with the 2-yearly IAB visits 2017, 2019, 2021, as the results of review or checkup are then available for the IAB. We strongly advise to keep the international and independent nature of the platform review from 2016 and continue to involve selected IAB members as observers, to ensure good coordination and continuity of strategic planning.

Re: We will act accordingly and will be happy to invite IAB members to join as observers. We are in other ways working to increase the transparency of the reviews.

These reviews will benefit from the criteria for what defines a national infrastructure, that were developed in 2016. However, they need additional guidance on the life cycle management of SciLifeLab facilities. We suggest to set-up something akin to a four-step system used by other infrastructures….. Initially, new facilities are likely to be small with only few users and receive most of their funding from SciLifeLab. If successful, the facilities will grow and start to attract significant funding from user fees as well as support by external funders, as is true for example for the genomics platforms. Finally, at some point, facilities may need to be phased out, if their services are no longer demanded, or if they provide readily available commodities that are as effectively available commercially to the community.

For each of the four steps of this life cycle, strong SciLifeLab coordination is essential to integrate the activities within each technology/platform across the country, promote the use of consistent and high-quality standards, promote cross-platform workflows and integrate and maximise the value of the produced data. SciLifeLab management should develop clear criteria for changing the status of a facility from one step to another and allow independent evaluators to help guide these decisions. We propose that SciLifeLab management should have the strategic decision on the facility life cycle, upon proposals made by the platform directors based on external evaluations.

Re: We agree fully with the principles of the life cycle guidance and are developing better description of the process for the next 4-year infrastructure review. Next international evaluation will be more platform-centric, and individual facilities are evaluated as part of their participation in the platforms and service areas. Therefore, facility or technology life cycle management is also in the future more in the hands of the platform directors. SciLifeLab management oversees the process and makes sure that international reviews are executed also at the platform level.

e. National facility networks

The IAB in principle supports this idea, as it is a good mechanism for being more inclusive and bring non-host universities into the national research infrastructure not just as users, but also as service providers and therefore become co-owners and supporters of SciLifeLab. That being said, care needs to be taken that each part of these networks has national significance and is well linked and integrated with the major hubs in each domain. It goes without saying that this will require transparent criteria for how to join into a network and being subject to the same review process that all SciLifeLab platforms adhere to. The IAB notes that some individual facilities in the networks presented appeared to have either very few or exclusively local users and also did not seem to add much value to the network in terms of data integration and that this needs to be looked at carefully to preserve the integrity and national significance of SciLifeLab platforms. In the long run, we recommend to develop the national infrastructure along a Hub and Nodes concept (see next point).

Re: We agree with these views and they are being discussed. The national network of nodes discussion is particularly active at the moment in the translational platform of DD, where national implementation to health care across the nation is critically important and politically valued. The GMS project has created a clinical genomics distributed network on top of the DD platform. This enables translation of technologies to health care across the nation. However, if we emphasize national coverage, we cannot expect at the same time that all the seven network nodes become equal SciLifeLab nodes as they are not likely to provide (nor do they have a mandate to do so) a

unique national service according to the SciLifeLab guidelines. The translational area and SciLifeLab's role in health care diagnostics needs to be defined in further discussions.

f. Towards a Hub and Nodes organisation of the national infrastructure

It is clear that there is a trend and community demand towards a more inclusive national infrastructure, that will increasingly contain facilities located elsewhere than Uppsala or Stockholm. This is positive, as it brings the non-host universities into a service provider role, but it also bears the risk of fragmentation of SciLifeLab into smaller independent sub-networks, while it is very clear that strong overall coordination by SciLifeLab is hugely beneficial and needs to be strengthened further. To address this challenge, we recommend to organise SciLifeLab in a Hub and Nodes model, that together form the national infrastructure. In such a model, the Uppsala and Stockholm universities would host the coordinating and supporting Hub while the national universities would host service providing Nodes.

Re: we fully agree with the hub and node model being appropriate in many cases and many facilities and platforms are already organized in this manner. This discussion will become more active and concrete as we prepare for the next evaluation of the entire SciLifeLab infrastructure in the spring of 2020.

Regarding the two Hub sites, we recommend to organise their coordinating activities along their complementary strengths. Examples of a complementary coordination profile could be new experimental technology development and testing for service in Stockholm, while bioinformatics, data management and training coordination would be a focus in Uppsala. This complementary profile should of course be developed jointly by the two sites. The overall administrative coordination would be performed jointly, for which the successful integration of the SciLifeLab operations office across the two sites forms an excellent basis. We realise this cannot be achieved overnight, but view it as a unifying organisational model to strive for in the medium term. Once achieved, most if not all Swedish Universities would be an integral part of the national infrastructure and the NSC could become a Heads of Nodes committee, that advises the SciLifeLab Board and has permanent representation in it.

Re: We continue to strive to unite Uppsala and Stockholm sites together in a number of ways. However, a clear division of responsibilities or the generation of unique service profiles that would be totally non-overlapping between Stockholm and Uppsala appears difficult and almost disruptive in some cases. For example, three of the biggest platforms at SciLifeLab, genomics, bioinformatics and DDD (covering more than half of SciLifeLab budget), have their activities shared across the two hubs. Furthermore, Uppsala is the formal coordinator in bioinformatics and DDD, while in genomics activities are roughly equally divided. It is very challenging to consider that this overlap would not continue in the next 4-year period. We also see this as a strength and an opportunity to make use of the talent in both cities.

g. Career development of technical and service staff

The national platforms' and facilities' most valuable asset are the expert staff that operate them and support the users. It is very important to recognise the key contribution of these staff members and to evaluate them with suitable key performance indicators (KPIs) in order to provide adequate career paths and career development support to them. Much too often such staff are forced into academic research career development procedures, that are inadequate, as they evaluate quality by

the wrong indicators such as publication track record, number of students supervised etc. SciLifeLab should establish appropriate KPIs for facility staff, that could include for example user satisfaction, number of user publications, grants and patents supported, engagement in user training, engagement in technology development and renewal etc. Based on this, the career of these staff can be evaluated, developed (for example with managerial or new technology training) and where appropriate also provided with a long-term perspective. SciLifeLab is an opportunity for the host universities and eventually all Swedish universities to test such a system jointly, limited to SciLifeLab platforms, before considering whether it could be applied more broadly.

Re: We agree and career planning efforts are being actively discussed and explored. For example, an exploration of these issues was recently started by URFI, which focussed on major national infrastructures. This effort already identified a major challenge at SciLifeLab, which is the very diverse range of position titles that infrastructure staff are employed at the different host universities. This underlies the challenges to introduce clear career paths. SciLifeLab can serve as an example to sort out these types of challenges and to facilitate coordination across universities. Eventually all decisions related to research careers and employment have to be done at all the universities that act as employers of the SciLifeLab infrastructure staff.

h. Data centre
As stated already in part 2, the data centre is one of the highlights of the last two years and it is amazing what it has achieved given the very small team behind it. This area has huge potential and we encourage SciLifeLab to embrace the data management challenge fully and become the national leader in developing solutions for the whole life science research data life cycle, in close coordination with the Bioinformatics Platform. Given the key role a good view of the infrastructure data and usage has for SciLifeLab's strategy, we suggest to consider to have a data centre representative ex officio present in the management group, similar to the head of the operations office. We note that the DC could have done more to allow a better stratification of the publication statistics (see 4.3.d below), and expect this long-standing issue to be addressed at our next visit.

Re: We agree and we are already engaged in the planning and implementation of these suggestions.

i. Become the service provider for the whole life science data life cycle

Beyond the DC, we see a strategic opportunity for SciLifeLab to become the leading service provider for the whole life science data life cycle, from planning data production, to data management during production, quality control, primary data analysis, mining and knowledge extraction and submission to public repositories. With the platform-facing DC and the user-facing Bioinformatics Platform, SciLifeLab has all the ingredients to do this and fulfil a major need of the Swedish universities and life science community at large. However, it will take significant additional resources and strategic planning and recruitment to grasp this opportunity, which we strongly recommend to do to establish SciLifeLab as an irreplaceable data infrastructure provider for all Swedish universities. It goes without saying, that this should be done in close coordination with existing national efforts and infrastructures in the research data domain.

Re: We agree and will implement these suggestions together with all platforms, bioinformatics, data center and the universities. We are seeking increased funding from the government for this task, which already involves many players and is quite complex and demanding. We will start from organizing data cycles better at SciLifeLab national facilities, establishing IT infrastructure and best practices across facilities towards FAIR and GDPR compatible data pipelines. When it comes to the health care field, there are challenges of ownership and access to sensitive clinical

information, which will need to be addressed. Partly this will be done together with the Genopmne Medicine Sweden effort as well as together with major international consortia, such as the 1 Million Genomes project where SciLifeLab is connected to. Both universities and health care players have legal responsibility for their data, so SciLifeLab's coordinating and facilitating role needs to be positioned appropriately and carefully communicated to avoid misunderstandings.

j. Collaboration with other large-scale infrastructures (Max IV, ESS)

It is an important achievement for life science in Sweden that SciLifeLab is recognised as a large-scale infrastructure at the same level of status (even if not of funding) to the large-scale physics infrastructures. We encourage SciLifeLab to identify opportunities for collaboration with these infrastructure partners. In structural biology with MaxIV this is self-evident, especially given the convergence and complementarity of electron-microscopy and synchrotronradiation- based structure determination technologies. We would recommend that the Structure and Imaging platforms of SciLifeLab develop a strategy for future collaborations with both MaxIV and in the longer term also ESS.

Re: We agree and are considering such an opportunity for structural biology in the next platform evaluation. Other collaborations between SciLifeLab and MAX-IV are also already underway and we have mentioned this collaboration specifically as one major step for the next 4-years in the SciLifeLab suggestion to the government 4-year research program.

k. Training

User training is a key aspect of the national research infrastructure and highly valued by both host and non-host universities. This is a particular strength of the Uppsala site, especially, but also going beyond, bioinformatics. We suggest to strengthen and better integrate the SciLifeLab training portfolio and develop it into a national hub for training activities. Some of these should of course be carried out locally and the national facility networks provide new opportunities for potential additional training sites. Taking advantage of the European opportunities, including for example EMBO workshops, and the training efforts of the ESFRI infrastructures such as in ELXIR regarding bioinformatics, but also in Euro-BioImaging and INSTRUCT for imaging and structural biology, is also important.

Re: We agree and will discuss how to implement these efforts.

l. Non-academic users

An important aspect of demonstrating societal impact is to keep track of how industry and health care users are benefiting from SciLifeLab platform services of SciLifeLab technologies. We recommend that management evaluates if there are any obstacles in these users accessing SciLifeLab services and remove them and that the data centre takes special care to track these important data.

Re: We agree and will discuss how to implement these efforts.

4.3 Centre of research excellence mission

We see with great concern that the difficulties to delegate sufficient authority from the host universities to SciLifeLab Mangement to coordinate and integrate their joint research activities

among the core SciLifeLab research faculty and fellows especially at Campus Solna, continues to prevent SciLifeLab from fully delivering on its research excellence mission.

While small positive steps have been taken, we have unfortunately seen relatively little overall progress since 2017, when we already expressed sincere concerns regarding the ability of SciLifeLab management to implement the vision of a joint centre of research excellence and the difficult situation faced by the internationally recruited faculty, especially the junior fellows.

Re: We have framed these problems and trying to solve urgently the Campus Solna (CS) and fellow issues first and then working on a pan-SciLifeLab research agenda, as part of the 10-year strategy writeup. CS action group, consisting of integration directors, director and co-director (Chair Ylva Ensgrtöm, SU) has been nominated by the board to discuss these issues and to find and implement solutions, which include e.g. the launch of a CS director position, which would address many challenges simultaneously. We are also now creating strategies for the research missions and profile of SciLifeLab for the next 10 years, a lengthy process where strong stakeholder discussions and engagement are needed.

……

This is a unique opportunity for the host universities to realise jointly. They must no longer allow it to be set on hold by administrative concerns, historic grievances, or the cultural ambivalence to the concept of "excellence". We have seen a large level of appreciation, enthusiasm and trust among the host universities up to and especially among their rectors. We strongly recommend them to unite behind the research mission and remove the barriers to realise the dream of a Swedish jointly owned centre equivalent to the Crick or Broad institutes internationally. Such a vision, promoted together by the four hosts, will form a compelling basis to ensure sustained and ideally even increased funding of SciLifeLab's research from the government SFO allocation to the universities for the next decade.

Re: We fully agree about the opportunity, and this has been the goal since the original SFO-funded Stockholm and Uppsala nodes of SciLifeLab. While the original period of SFO-funding is now ending, the expectation is that such support will continue in one form or another. We can therefore create strategies better after we see the detailed outcome of the government funding strategy in late 2020. A vision to create a Crick/Broad-type of a research institute has not been widely considered as a key goal and needs to be balanced with the national infrastructure mandate. As SciLifeLab is now primarily known as a national infrastructure, dependent on national funding and support, implementation (and funding) of an exclusively Stockholm (and/or Uppsala) centered research excellence mission will be challenging. Government research policy at the moment emphasizes the importance of all regions of the country as well as equal access to the infrastructure. Discussions on this topic will continue.

Our recommendations below may seem radical, compared to the rather conservative proposals on the research excellence mission in the future plans section of the SciLifeLab report. We make them on purpose to stimulate discussion and help create an ambitious long-term vision which we hope the stakeholders can develop and support together. We realise that some aspects may take more and some less time and some will need to be modified and implemented according to the Swedish system. Nevertheless, we believe that if such a vision is formulated and promoted jointly by the host universities, the necessary funding and the mechanisms to realise it will follow naturally from it.

Re: We appreciate the "radical" IAB opinions. These suggestions have caused wide-spread discussions about the future plans, which we hope will converge towards a positive and proactive further development for SciLifeLab..

a. A research strategy: new technologies and their application

To the IAB, the natural focus of the in-house research activities at SciLifeLab is new technology development and new breakthrough applications of such technologies to the life sciences. Such a focus is pursued successfully by comparable international institutions (Sanger, Broad, EMBL) and perfectly nurtures the national research infrastructure mission. Being an institution with strong openly accessible infrastructure services, SciLifeLab would not be subject to the criticism of concentrating resources without giving back to the community that pure research institutions such as Crick or Janelia have experienced.

Re: We strongly agree about the research focus at technology development. Technology development is being considered as yet another major topic for SciLifeLab research.

b. Focus on the complementarity and strengths of the host universities

The four host universities make an excellent combination, as they have very complementary strengths regarding life science. In Stockholm, KTH has strong expertise in engineering and technology development, while KI needs them to drive biomedical applications ahead and SU applies them to basic research. While UU is a comprehensive university, in addition to genome science it provides particular strength in computation and bioinformatics. We suggest to focus on combining these strengths for maximum synergy, collaboration and integration among the host universities.

Re: We agree and are working to define the research profiles for SciLifeLab, given the strong areas in each university and synergistic opportunities by leveraging the infrastructure.

c. Two sites – one integrated centre

We recommend to truly integrate the experimental in-house research activities of SciLifeLab senior faculty and fellows from all host universities at the Solna Campus, in order to create a physically shared and stimulating interdisciplinary environment and achieve critical mass for technology development and pioneering application development. In the medium term, this would allow most of the experimental SciLifeLab fellows to take advantage of this environment for their first six years of junior training, before taking up long-term positions (if successfully obtaining tenure) at a university department. Achieving this, would likely necessitate reorganisation of the Solna Campus to prioritise resources and space to faculty and fellows that are primarily focused on SciLifeLab research in line with the strategy outlined in 4.3.a. It would also mean that a mechanism for turnover of senior faculty must be possible, if they no longer make key contributions to SciLifeLab's research strategy. The Uppsala site, could focus its in-house research mainly on aspects that are especially strong there, such as for example data science, as the compute facilities and bioinformatics expertise are located largely there already. More theoretical fellows and faculty from Uppsala university could then work initially either physically "embedded" in Solna, or virtually linked in Uppsala, depending on the nature of their research, but in either case be closely interlinked scientifically with the more experimentally focused groups in Stockholm. Data may in the long-term well become the most important aspect of SciLifeLab's impact. Thus, while it may be

difficult for UU to give up the notion that all of its life science faculty somehow belongs to SciLifeLab (see below), they would gain responsibility over one of the most important areas of its research strategy. We recommend that UU considers to spatially cluster its SciLifeLab fellows around Navet, which for dry groups would be less challenging to achieve than for wet groups due to less demanding space and infrastructure requirements.

Re: We agree with the concept to creating unified dual center between Stockholm and Uppsala as well as many suggestions concerning CS as well as turnover of faculty etc. These are being acted upon. The difficult suggestion to the host universities is to create a research profile for Uppsala that is more focussed on bioinformatics and one that is more focussing on experimental research in Stockholm. In reality, Stockholm is also very strong in bioinformatics and Uppsala has some of the most profilic experimental ("wet lab") research in the SciLifeLab community. The overlap of these capabilities is a strength for SciLifeLab research that we would not like to un-do.

d. Define SciLifeLab faculty unambiguously

From the start, the different nature of the Solna (integrated research centre) and Uppsala sites (collaborative and training space for more distributed faculty) has made the definition of SciLifeLab faculty very confusing. Even for the 2019 report it was still impossible to stratify the publication statistics (except for the highlights) by what was done by SciLifeLab in-house research, what was done by heads of facilities as their own technology development or user collaboration and what was published by loosely affiliated PIs, that were essentially regular users of SciLifeLab's platforms but happened to be located at a host university, especially in Uppsala.

We strongly recommend to come clear on this long-standing issue and aim for a definition along the following principles:

o SciLifeLab research faculty
o SciLifeLab service faculty
o SciLifeLab user

In addition, it will of course be very important for SciLifeLab to keep good track of its alumni in all three categories, as they will be an important metric for its long-term impact.

Re: We fully agree with the importance of defining the SciLifeLab community better. Implementation is underway and a document on group leader definitions is being developed for a board decision with implementation in early 2020.

e. A functional centre needs a director with authority

SciLifeLab management in charge of Solna campus urgently needs to obtain more delegated authority from the host universities to run a functional research centre…..

Re: This is being addressed by the CS action group (Ylva Engström report), which suggests the launch of a CS Director position.

It was suggested by some stakeholders to change the name of SciLifeLab into "SciLifeSweden". We do not support this change for the centre of research excellence mission as the SciLifeLab brand is extremely successful and well established internationally and we recommend to keep it and strengthen it further.

Re: We agree.

f. Consider strengthening the leadership for the research mission of SciLifeLab….

Re: This will be addressed by the CS action group (see Ylva Engström report)

g. Extending the Solna campus

Installing a turnover system and providing better support to integration and core facilities for the junior faculty will be very difficult with the currently available space, which is already at its limit. While we do see turnover as an essential component of the Solna campus, we therefore at the same time recommend to proactively use any opportunity that may come up in the coming years to plan a space extension of SciLifeLab in Solna. This would allow the necessary reorganisation to be planned and carried out without major disruption of business continuity.

Re: This has been discussed with the Campus Solna Committee (CSC), which has over the past year or so already decided to acquire somewhat more space (worth 1-2 floors) by acquiring space that has become vacant. In addition, since there may well be much more space available soon in the Beta building, the CSC and the CS Action group have discussed these opportunities. However, the host universities have somewhat different opinions of this, and the challenge to most is that they already have quite a lot of space at other locations. However, these issues will continue to be actively discussed.

h. Fellows
After our 2017 discussion with the fellows, we took great care to try to obtain a representative picture of the fellows situation in 2019 and discussed with two extended groups of them, also addressing each host university and the two sites Solna and Uppsala separately. Unfortunately, the IAB was still shocked to see that the situations of the fellows had essentially not very much improved compared to 2017 and that the fellows research coordinator had not had too much impact because of turnover and recent re-appointment in this position.

- SciLifeLab directors and senior faculty needs to take responsibility for proactive fellow mentoring, with clearly assigned responsibilities for each fellow (currently mentoring works only partially but far from well within the host university departments) and a formalised mentoring system in place.
- Provide core facility support, access to shared scientific equipment (also in senior labs); a specific university affiliation should not be required for groups to obtain access and support within the Solna research centre.
- Provide open access also to advanced technologies in senior faculty labs or platforms, so fellows can engage effectively in technology development.
- Coordinate the recruitment of fellows among host universities (the four rectors expressed a willingness to do this, for example with joint candidate symposia) and select the best fellows mindful of the overall SciLifeLab research strategy with involvement of the SciLifeLab directors; avoid overlapping recruitments, aim for synergistic recruitments that maximise collaborative potential among fellows and with SciLifeLab faculty.
- Create transparent and harmonised procedures for tenure track independent of university affiliation, aiming for the first six years physically integrated and mixed between the universities in the centre and the possibility of tenure after evaluation in host university departments afterwards.

Re: Many of these issues are being addressed by the CS action group (Ylva Engström report)and the launch of the CS director position. There has been more coordination in the recruitment of the last round of fellows.

IF the above issues for the fellows can be addressed successfully, we additionally recommend to:
- grow the fellows program as it is strongly supported by all hosts and adds
huge value to them, and
- in the long-term, potentially open the fellows program to non-host universities, with the long-term vision that the best international faculty would receive their first six-years of training at the SciLifeLab research centre.

Re: The future of the fellows program is a critical strategic question to the future of SciLifeLab and will also depend on how the SFO-funding from the government will continue. This program is unique among the many SFO-funded research activities in that sense. This has been discussed at length between the host universities and will be further discussed by the CS action group. Expansion to a national fellows program was done already with national infrastructure funds (3 national fellows currently funded), but this program was discontinued due to the start of a big Wallenberg Molecular Medicine network in the non-host universities of SciLifeLab, with links to the SciLifeLab fellows' program.

- Linking to the research community. We very much welcome the first open call initiatives of RCPs and TDPs to allow researchers in the whole national system outside to become linked more closely to SciLifeLab infrastructure (RCPs) and technology development activities (TDPs). This will grow a national community that participates in SciLifeLab and becomes prominent users of its services or developers of its next generation technologies.We would suggest that SciLifeLab could help these initiatives even more by coordinating their interactions with each other and providing them with outreach and communication expertise to make their cases effectively and avoid having to reinvent the wheel multiple time. As a concrete example, the excellent aquatic microbiome initiative could probably easily increase its funding with help from SciLifeLab PR experts.

Re: We agree and we will continue to promote RCP and TDP programs and hopefully expand the number of funded projects. Each host university has also funded their own tech development work from SFO funds, while SciLifeLab has supported TDPs at non-host universities.

j. Flagship projects

The 2017 IAB comment that triggered the RCP calls was to foster flagship projects on the scale of the HPA that have the potential to address grand societal challenges and/or would be internationally unique and leading efforts, as these can be powerful drivers of unique technology development and new infrastructures.

We still believe that SciLifeLab should be a driver to allow such projects to come to fruition in Sweden more frequently, by creating the environment where they can make their first pioneering steps. Such projects could come from SciLifeLab's own in house faculty, from successful RCPs and TDPs or from a combination of the two. In our opinion, one such flagship has essentially already happened, with catalysing the Genomic Medicine Sweden project nationwide and we expect more to come in the future.

Re: We agree and continue to be positive towards identification and incubation of grand challenge initiatives in the SciLifeLab community with research funds, ideally based on the SciLifeLab infrastructure.

5. Closing remarks

We recommend to think big and make an ambitious and forward looking strategic plan, similar to when SciLifeLab was founded almost 10 years ago. We hope that our recommendations help to formulate the roadmap for the next decade and we are very optimistic that all of SciLifeLab's enthusiastic and supportive stakeholders will embrace, jointly own and promote it. United together behind the common SciLifeLab goal, they can create the powerful lobby with the government and make their own commitments to make it happen. Probably no other area of research will have such an impact on society in the next decade as life science. With SciLifeLab, Sweden has the opportunity to be at the forefront of this development internationally if the right choices are made now.

Re: We fully agree and thank for the positive words of encouragement that tremendously helped to profile the program for the national hearing of SciLifeLab and the ongoing 10-year strategy work.

Given the imminent strategic negotiations for SciLifeLab and the potential need to consult the IAB on aspects of the process as well as in the next national infrastructure evaluation, we would request a summary response to our recommendations by the SciLifeLab Board within three months after its receipt. This would provide the IAB with an orientation on the Boards general vision for the future development of SciLifeLab prior to our next formal engagement in the platform reviews and ahead of the next IAB site visit. Finally, we very much value the strategic importance of our dialogue with the University rectors. We would therefore also highly appreciate a joint statement from the rectors regarding the alignment of our recommendations with their vision for SciLifeLab's future.

Re: We have prepared this initial statement from the board and the management team in response to these comments and we have received joint comments from the host university rectors.

Appendix: Detailed recommendations to the Drug Discovery and Development Platform

1. The IAB recommends that DDD should be able to receive funding via clearer partnerships with its users. To enable this, one of the universities could create an office that represents all universities and is able to sign contracts with investigators and/or funders. The investigators clearly would continue to own the IP but could then share future funds of their drug discovery research with the DDD platform. Such a solution would significantly enhance the ability of DDD to support more and better programs and should ideally be done in a way that helps SciLifeLab to coordinate and represent its different platforms in general.

Re: We are very happy to inform the IAB that, since April 1st, the SciLifeLab Drug Discovery and Development platform has an office function to represent and sign contracts with investigators and funders – in line with the recommendations from IAB.

2. The IAB recommends that the DDD platform engages more with European projects and other international projects, including for example IMI toxicology-oriented projects, or drug discovery projects like "Illuminating the Druggable Genome" in the US.

Re: We embrace the IAB recommendations to engage more with European projects and we are actively pursuing this. As an example, since the meeting in March is DDD involved in a new IMI project, "ConcePTION", to evaluate how drug treatment affects pregnant and breastfeeding women. Also, thanks to the office function described above, DDD is now applying for membership in the European Advanced Translational Research InfraStructure, EATRIS.

3. The risks of toxicity, lack of specificity or therapeutic efficacy of small molecules are high and often only detected in late phase clinical studies. Pharma companies have thus reduced efforts on small molecules, and are refocusing on biological and cell agents. The DDD program should review its resource distribution across different drug classes, and consider focusing more on biological agents such as novel antibodies, proteins, peptides, modified nucleic acids and cells, as this area is now full of new opportunities for highly specific and effective agents and also represents a strength in Swedens and SciLifeLab's academic research and would offer close links with other SciLifeLab platforms.

Re: We agree to the obstacles using traditional small molecule drugs as pointed out by IAB. In the review process, the DDD steering group favours projects with new modality approaches and technology development projects that aim to increase the competence and capacity to work with these new modality approaches. The majority of projects supported by DDD are either novel antibodies, proteins, peptides, modified nucleic acids and cells or technology development for new approaches for drug development. We agree to that there still are untapped resources and competence within other platforms to address these opportunities. To engage a wider spectrum of SciLifeLab platforms in our supported projects is one of our priorities.

4. Some of the small molecule screening activity to discover new drugs could be redirected towards testing existing registered medicines on novel biological targets as in the AML example that was presented. Many existing medicines have several activities that may prove useful in novel indications. There is an important synergy here with rare disease genomics work, since by screening all registered drugs against targets or cells derived from rare disease patients, it is sometimes possible to find existing medicines that can quickly be repurposed to alleviate certain rare diseases.

Re: Repurposing is a valid approach to find new therapies. The current viewpoint at DDD is that these projects are better suited at the CBGE platform with their expertise in phenotypic assays and screening combined with target deconvolution. There is a close collaboration between the DDD and CBGE platforms and projects can shuttle between them depending on how they progress.