Fifth Report of the International Advisory Board (IAB)

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Content

Annexes

A. Members of the International Advisory Board 2024

1. Executive Summary

At the 2024 meeting the International Advisory Board (IAB) was pleased to see that the implementation of the new SciLifeLab strategy is very well under way – first and foremost now formally including four additional geographical sites, Gothenburg, Linköping, Lund, and Umeå, complementing the existing and founding sites in Stockholm and Uppsala. This is a major step forward that increases the competitiveness of Sweden within the life sciences and underlines the national mission of SciLifeLab. The IAB was pleased to observe that SciLifeLab clearly is maturing but at the same time acquiring entirely new, national roles. The implementation and advancement of the SciLifeLab Wallenberg National Program for Data-Driven Life Science (DDLS) was another highlight in this respect. With the new developments in artificial intelligence, the competition for talent in this domain has become fierce and the IAB found it impressive that SciLifeLab has so successfully recruited a large number of excellent group leaders internationally. The coordinated manner in which this recruitment is carried out would be an excellent model for all SciLifeLab-related recruitments.

The generous investments in SciLifeLab make high-level contributions to national research and translational initiatives feasible. These would otherwise not be possible in the Swedish setting. As the organization matures it is not surprising that several of the recommendations revolve around removing bottlenecks and perform benchmarking that can guide future strategies. These bottlenecks also include major and urgent (lack of) space problems which have become detrimental for both recruitment and daily function. However, we also suggest that SciLifeLab considers starting a major flagship project that could advance the science and showcase its capabilities nationally and internationally even more. A new flagship project would also be a good opportunity for the new incoming director to impact the organization in a major way and bring specific infrastructure areas to the next level.

We make six major recommendations:

i. Aim to solve the **infrastructure problems haunting the data-driven research** efforts. These problems make it hard for researchers to take full advantage of life science relevant AI developments. National fragmentation has an impact on the productivity and feasibility of SciLifeLab projects. The IAB recommends designing internal solutions to avoid further delay.

ii. Continue to **develop a more differentiated benchmarking model** that can rank the SciLifeLab efforts separately across subareas, such as infrastructures, innovation, and training.
iii. **Provide practical onboarding solutions** solving the startup problems in the fellow's projects. These are multifactorial: infrastructure access in the project design phase, lack of mentors for each fellow, uneven integration in departments, immigration issues, guidance in handling legal issues and research ethics etc.
iv. Use the flagship model to **select a single large-scale project for each focus area** that may continue to enhance the international reputation of SciLifeLab. Consider appointing a single leader for each flagship project.
v. Argue for a **new building at Campus Solna** such that critical mass is maintained at a single physical location.
vi. Continue to work with the three Stockholm Universities to develop a coordinated recruitment plan for the Solna campus, following the DDLS example.

2. Introduction

The 5th review of the Science for Life Laboratory (SciLifeLab) by the International Advisory Board (IAB) took place in Uppsala as an in-person meeting (February 7-9, 2024). The previous (2021) meeting was held virtually due to pandemic-imposed travel restrictions. The meeting took place at an important moment, where the SciLifeLab partners are in the process of identifying the successor to the current director, Olli Kallioniemi, who has served very successfully for the past close to nine years. The appointment was not yet finalized at the time of the meeting.

The IAB welcomed its new members: Iain Mattaj, Human Technopole Foundation, Italy; Kjetil Taskén, Oslo University Hospital and University of Oslo, Norway; and Ruedi Aebersold, ETH Zürich, Switzerland. At the beginning of the review the IAB took note again of its role in SciLifeLab's governance (SciLifeLab rules of procedure Chapter 10, paragraph 1). The IAB is an independent, consultative body consisting of internationally leading experts from a broad range of fields of life sciences relevant for SciLifeLab's activities (for the current composition of the IAB, see Annex A). The mandate of the IAB is to advise the SciLifeLab Board on strategic questions regarding the future of SciLifeLab, especially from an international perspective.

To prepare the review, SciLifeLab management had provided the IAB with a comprehensive dossier of the SciLifeLab activities. As the International Evaluation of the SciLifeLab Infrastructure was to be carried out soon after the IAB meeting, the report from the evaluation was not available to the IAB members, although several members agreed

to subsequently be present as observers of the expert review panel. The SciLifeLab material outlined five key challenges on which IAB input was requested, Communication strategy, Translational research and clinical diagnostics, the SciLifeLab Group Leader concept and the role of Campus Solna, Division and prioritization of infrastructure budgets, and the new Roadmap for SciLifeLab (discussed below). The IAB benefited significantly from interacting with the SciLifeLab research fellows at private meetings. Similarly, the IAB is very grateful that important stakeholders were available for discussions and shared their views on the status and the future role of SciLifeLab.

In addition, the IAB would like to thank SciLifeLab Management for compiling a clear, comprehensive, and well-structured dossier. A special thanks goes to the Operations Office team, Jenny, Erika, Maria, Anna and David for organizing the IAB's visit with great professionalism, care and dedication.

The IAB was pleased to see that the implementation of the new SciLifeLab strategy is very well under way – first and foremost now formally including four additional geographical sites, with Gothenburg, Linköping, Lund, and Umeå complementing the existing and founding sites in Stockholm and Uppsala. The IAB finds that the inclusive national organization is a major step forward that increases the competitiveness of Sweden within the life sciences. The implementation and advancement of the SciLifeLab Wallenberg National Program for Data-Driven Life Science (DDLS) was another highlight. The SciLifeLab organization has here shown and proven again that it can attract highly qualified and talented group leaders – individuals that can position themselves with support from the existing infrastructures, but also via the networks they create together – to the benefit of Sweden and its capacity to be a leader in multidisciplinary data-driven life science. The international competition for staff is extremely fierce. Therefore, it is impressive that SciLifeLab has successfully recruited excellent international group leaders. The upcoming national PhD and postdoc programs in DDLS will most likely add further to the impact of this program.

The IAB would also like to acknowledge the responses to the recommendations included in the 2021 report. The national scope, the increased focus on infrastructure quality assessment, and the additional agility arising from the pandemic involvement and preparedness, are all areas that were handled extremely well and in line with our previous recommendations. At this year's meeting the IAB also discussed one of the remaining challenges, the problem of obtaining full benefit of the Campus Solna location, due to space shortage. Here we hope that a contribution to solving the immediate problem of space shortage could be to expand the footprint by making the additional, existing Beta building available to SciLifeLab. Given the expected growth in the life science area this could add value to the investments already made and pave the way forward. Overall, the

IAB felt that the implementation of the new 10-year strategy, including the integration of the new DDLS activities, is off to a very good start. Given this context, our report focuses on major recommendations for the implementation of SciLifeLab's strategy for the next two years and provides advice on its future development.

3. Response to IAB recommendations from 2021

The IAB appreciates the way the recommendations have been used to act following the last meeting in 2021. In relation to four of the recommended actions, 1) the transition into a truly national research infrastructure, 2) leveraging the integrated capabilities that have proven their value in the pandemic response, 3) streamlining the fellows programs, and 4) to leverage Campus Solna to improve the training across SciLifeLab overall we found that these had been advanced considerably.

We will therefore not discuss further the responses to the 2021 SciLifeLab report here, but rather limit this section to one specific area where we think the recommendations could have been followed to a higher degree and where the IAB maintains that it would be beneficial to consider it further.

This concerns the benchmarking effort where we think reconsideration would be appropriate. The responses in the report indicate that SciLifeLab, due to the difficulty in finding matching organizations as comparators, finds that it would be of limited value to devote additional effort into developing this area further. While a comparable organization may not exist, we suggest that a more differentiated benchmarking model, that can rank the SciLifeLab efforts separately across subareas, should be considered. Subareas could be individual infrastructures, the outcome of intensified innovation efforts or training. We hope, as it is also further detailed below, that a more differentiated model could add to the management and strategic development and prioritization, in addition to improving subareas or confirming their excellence.

4. Strategic advice for the future development of SciLifeLab

The SciLifeLab report outlined five key challenges on which IAB input was requested:

4.1 Communication strategy and the development of the unique advantages

Given the vast scope of the SciLifeLab activities it is a challenge to find the optimal way of communicating the unique advantages and the diverse roles of SciLifeLab – especially

if the Swedish government decides to undertake major changes in the research funding area.

The IAB sees two major arms forming a strategy in this area: 1) internal communication to the SciLifeLab users, and 2) external communication to private and public funders as well as other stakeholders; for example, decision-makers within health care and industry. These two areas are clearly interdependent, the general perception among users impacts the funders and vice versa. The IAB has the following recommendations:

- Intensify the communication of how SciLifeLab does things that are not done elsewhere in Sweden or (when this is the case) anywhere else. The broad role of SciLifeLab makes it hard for the stakeholders to notice unique, recent offerings as they become available. This also entails communication being clearer with respect to the past, present and future.
- Use benchmarking more actively in the communication strategy. Benchmarking is equally useful in the development of new initiatives and when providing improvements to those in existence.
- Highlight examples of research that could not have been done without the infrastructures, nationally and internationally.
- Include future focuses on addressing current health and planetary challenges**.**

4.2 Translational research and clinical diagnostics

The IAB finds that with the vast technological opportunities SciLifeLab provides, there is great potential for intensifying translational research generally and in particular for underpinning research that will drive future clinical diagnostics.

For the Genomics and Clinical Genomics Infrastructures and Genome Medicine Sweden there appear to be a good division of labour in that the Genomics facility does cutting-edge sequencing across all life sciences and sample types, Clinical Genomics does a lot of training and handles clinical research samples whereas Genome Medicine Sweden (GMS) organises sequencing on clinical indications in the health care system. GMS also organises joint storage of clinical sequence data for all the 21 Swedish regions that provide health care and handles complicated data flows.

For new technologies, this should also entail making clearer what the anticipated division of labour would look like. Given that health care in Sweden is provided by 21 self-governed regions with relatively weak instruments for coordination and to ensure equal access, there are significant obstacles to translation into the health care. However, the fact that SciLifeLab is a national infrastructure may provide some opportunities. Lastly,

the IAB acknowledges that translational research and innovation will always include unforeseen possibilities that the strategy should allow for.

The IAB has the following recommendations:

- Along the lines of technology development, we recommend that SciLifeLab should continue to fuel genomic medicine enterprises based on SciLifeLab's achievements and history. It would benefit SciLifeLab to make it well known that they are the source of those achievements and still stay state-of-the-art. Synergies with GMS should be exploited. Furthermore, spatial biology and Sweden's research strengths in single cell and spatial genomics will at some point need to be transferred to routine care.
- Presently, Genomic Medicine Sweden (GMS) is largely genomics based. There are clear indications that reaching the ambitious goals of precision medicine will additionally require multi-modal research expansions which will have to be developed, integrated and tested before being transferred to health care. As was done for genomic technologies, SciLifeLab should act as the central platform for advancing the state of the art of multi-modal approaches and for transferring them to the clinic and to thus act as a perpetual technology driver for the goals of GMS and precision medicine in general.
- In translating new technologies to the clinic, for example in precision medicine, SciLifeLab as a national infrastructure could reach out to all 21 regions and take lead on a national arena in implementation of new technologies into the health care space. If SciLifeLab recruited relevant board-certified diagnosticians (e.g. one or two molecular pathologists) that could sign off on delivery of actionable diagnostic information for use in stratification of patients into clinical trial arms, this could forge closer collaboration of researchers, diagnosticians and clinicians. It would also facilitate acting on some of the fantastic data SciLifeLab generates and help overcome hurdles with implementation of precision medicine in the regionalised Swedish health care system.
- While training is integral to the SciLifeLab undertaking, it seems probable that training of clinicians working at the bedside is better handled elsewhere, or with limited contributions from SciLifeLab. We recommend viewing other organizations "taking over" such efforts as a success instead of being considered a threat.
- Engage in translational efforts such that specific resources driving SciLifeLab activities become available. DDLS actually needs data from health care and the risk is that they are sequestered within the health care settings. Sweden may, with its limited population, be at a disadvantage because of lack of integration across health care regions in Sweden. SciLifeLab has the competence to integrate data

to provide critical mass in analyses and incorporate AI that will help Sweden in the routine care area.

- It was unclear to the IAB what the strategy for bringing clinical data together with biobank data for cohort research is. The interface to the Swedish biobanks could possibly be further developed, for example in relation to the fellows that may not always have time to establish connections on their own.
- A more active and directed innovation strategy may need to be developed in the translational area. Entrepreneur in Residence staff could be hired to assist fellows and PIs with innovation. The IAB noted that the teacher's exemption often results in missed opportunities in innovation because the institutions are not incentivised to assist in promoting innovation projects, the inventor and institution get conflicting interests and do not act in concert to develop synergies.
- It was not clear to the IAB to what extent the distribution of four legal entities in the SciLifeLab organization imposes a barrier for innovation. In relation to innovation, it is recommended to focus on 'legal ability', instead of "legal entity'. The legal team should focus on common SciLifeLab issues, rather than prioritizing their own host universities. This would also help SciLifeLab to get 'credit' that is well deserved for SciLifeLab initiatives and research innovations.
- The IAB recommends that SciLifeLab makes a strategy for exploiting the emerging European Health Data Space in its projects. This could also contribute to improving how to work towards making secondary use of health data easier in Sweden.

4.3 The SciLifeLab Group Leader concept and the role of Campus Solna

The problem of designing a good group leader model that applies to all age intervals is ubiquitous. This was also evidenced by the European Research Council grants that initially had a combined category for what is now separated into starting and consolidator strata. However, the problem of discriminating between late starters and early consolidators remains. SciLifeLab supports the recruitment of a large number of junior group leaders in and to Sweden and provides generous support to start their careers for the first five years. This period is very short for a life science researcher to build a strong portfolio and the funding opportunities for the next career phase are sparse compared to the starting phase. The IAB recommends the following:

- To minimize the number of young group leaders leaving Sweden after their career start, we recommend that SciLifeLab and the host universities develop policies to alleviate the bottlenecks for their immigration and introduction into the SciLifeLab fellows program and institutional young faculty programs.

- The IAB also discussed the gap between junior and senior leaders, particularly focusing on the potential need for developing initiatives for junior group leaders that later must position themselves for tenure and other continuation models, for example, via teaching. It was highlighted that a significant portion of life science recruits in Sweden are funded by SciLifeLab/DDLS/Wallenberg, with some young group leaders acquiring substantial starting grants and leading large teams. A model that makes the career opportunities clearer is needed.
- The IAB also recommends tracking the percentage of international recruits among fellows and their retention rates in Sweden. International recruits that have carried out a postdoc in Sweden should also be identified as a separate category. Other similar organizations devote more effort into monitoring career transition statistics. This could make it easier to obtain insights into how detrimental immigration problems in Sweden influence the time needed to get the laboratory up and running. This could also improve the current long waiting time for ethical approval of experiments and data access across the cohort of group leaders. This type of effort should be combined with bibliometric analyses that can help provide information on both quantity and quality of research.
- The IAB also recommends that the career paths for group leaders who are heads of platforms are clarified.
- The DDLS fellows project will lead to the recruitment of a cadre of 39 junior group leaders at the interface of data and life science over the next few years and their continued support for more than a decade. The program represents a major and perhaps worldwide unique opportunity to bridge data science and life science in a systematic and sustainable manner because each fellow will be faced with operational and infrastructure challenges inherent in their research approach. The first group of recruits impressed the IAB with their enthusiasm and cohesion as a group. The IAB recommends that SciLifeLab will position and empower this group to act as a major driver in the move towards the systematic implementation of data driven, multi-modal and cooperation driven research approaches in Sweden as envisaged in the three SciLifeLab “capabilities”. Specifically, the IAB recommends, i) SciLifeLab to mandate expert groups of DDLS fellows to address specific infrastructure challenges at the data-life science interface, ii) to contribute to training SciLifeLab users, iii) to establish university courses and perhaps curricula at the interface of data and life sciences, iv) to act as advisors to the SciLifeLab data center and IT groups and vi) participate in community building. Importantly, all these specific demands on DDLS group leaders should be compensated by alleviating other group leader community tasks because the primary focus of DDLS fellows will remain their individual research careers. In the meeting with the IAB the DDLS fellows welcomed the opportunity to shape the research landscape at the data and life science interface.

Campus Solna provides fantastic opportunities for collaboration. The IAB understood at the same time that the building is now at capacity and that phone rooms and pantry spaces have already been remodelled into office spaces. This is not viable.

- The IAB supports the suggestion to expand SciLifeLab into the Beta Building. The Solna campus is already overcrowded and the plan to recruit a significant number of new DDLS and SciLifeLab fellows there will further exacerbate the situation. Allowing SciLifeLab to expand into the Beta building as soon as it becomes available will help relieve the space problem. This expansion should also consider building a meeting room for 200 people in the Beta building, because the current one is limited to only 50-60 people. The IAB understands that some of the host universities are consolidating, and that other campuses have been shut down. The IAB felt that it would be problematic to introduce further separation and support working for a solution that secures the critical mass on the Solna campus that was an obvious argument for establishing a synergistic organization in the first place.

An additional point brought to IAB's attention by the recruitment of DDLS fellows, to the Solna campus in particular, was the effectiveness with which the participating universities, and in particular the three located in Stockholm, worked together to attract outstanding young PIs that are complementary to each other and form a strong cohort. IAB therefore renews its appeal that, on the Solna campus, the three universities work with SciLifeLab in a coordinated fashion to recruit complementary PIs into the other SciLifeLab PI positions. The advantages of this approach are glaringly obvious.

4.4 Division and prioritization of infrastructure budgets

SciLifeLab aspires to "allow for research not otherwise possible". At the inception of SciLifeLab this was primarily achieved by establishing platforms of complex or expensive technologies that would otherwise not be accessible to the wider Swedish research community. The IAB acknowledges the enormous impact of this approach over the last decade. The support of "research not otherwise possible" now additionally requires the integration of data and demanding computational approaches in multi-disciplinary research settings. SciLifeLab is ideally and uniquely positioned to serve as the catalyst for this transformation in Sweden. The IAB found that the infrastructures supporting data management had come a long way, but also that the general model was fragmented and lacked logic that would secure productivity and competitiveness.

- The IAB recommends that the incoming user fees generally should be used to guide the prioritization of infrastructures. At the same time, it is important to provide extra support for emerging techniques that could result in early adoption, increasing the impact of ground-breaking research. The platform's long-term structure and mechanisms for project review and resource allocation was highlighted as a means of prioritization.
- The IAB recommends establishing clear guidelines concerning the inclusion of new infrastructure areas and, similarly for the potential dissolution of existing platforms. These guidelines should minimally include, i) documentation of a significant user demand for the new infrastructure, ii) documentation of maturity of the new infrastructure for routine use, iii) documentation of relevant high-level know-how by the new platform team and iv) documentation as to how the new platform will advance the technology to remain state-of-the art in the future. The same criteria, plus consideration of what suitable commercial alternatives are available, could be used to assess whether existing infrastructure should be discontinued.
- The data storage (long & short-term) and compute (CPU, GPU, memory requirements) is a critical infrastructure for SciLifeLab and in particular the DDLS programme. While the IAB acknowledged that the SciLifeLab does not have the funding nor the mandate to build its own compute and storage center it felt that the current situation was far from being optimal. The efforts to build an internal data framework allowing for flexible, general storage and secondary use of data using external resources was found to be somewhat fragmented and not ideal in the life science domain where both person-sensitive and non-sensitive data must be accommodated. At this point, the architecture of storage solutions does not appear coordinated with the compute solutions, in the sense that the appropriate infrastructure is not co-located, leading to long and costly transmission times. In addition, the availability of short- and long-term storage for large secondary datasets and the allowance on a per-PI basis is not clear. It seemed that one problem was that national (or university) policies did not allow SciLifeLab to have the mandate, for example around long-term storage or sensitive data. It is also possible that the user awareness of how to solve issues is lacking. This is clearly not competitive and not aligned with the substantial DDLS investments in staff. These problems will potentially reduce the return on the DDLS investments. A suggestion for moving the infrastructure forwards in harmony with the user community would be to have a committee which inputs into the design of on-premise hardware/cloud/commercial solutions for SciLifeLab and DDLS.

The IAB viewed presentations from the platforms that generally were highly impressive. These included Genomics, Clinical Genomics, Metabolomics, Spatial Biology, Bioimaging and Molecular Structure, Integrated Structural Biology, Chemical Biology and Genomics

Engineering, Drug Discovery and Development, and Bioinformatics. The IAB was generally impressed by the scientific level, and the collaborative and organizational aspects of the work in the platforms, including the plans for venturing into new areas such as planetary biology, exposomics, or whole organ modeling (to mention a few examples).

- It seemed to the IAB that while the platforms worked very well with their user communities, the potential for collaboration between the platforms was not fully exploited.
- The career development for platform staff was also discussed and it was suggested that a more uniform strategy could be developed, although there may be large differences between established and emerging areas.
- The fragmented situation around data management mentioned above calls for solutions that are fully controlled by the SciLifeLab rather than having to use national models that are better suited for other areas than for life sciences.
- New infrastructure areas that may be on the horizon: SciLifeLab currently provides access to 'cool technologies' that are not yet even available at large pharma companies. There should be continued searches for what is next on the horizon. For example, 3D printing and large language learning models (training is expensive). Infrastructure needs may increase in the digital area due to DDLS. The SciLifeLab Technology Development (TDPs) have been very important for developing and applying new technologies. The Red Grants at Campus Solna are also a good start. One could also highlight the tech development projects through PULSE. AI, automation, and robotics that are clear and actual opportunities, for example, through collaboration with WASP. For SciLifeLab infrastructure development this is the right approach.
- The rapidly increasing volume and complexity of data generated by many of the platforms and the increased needs of many projects to integrate multi-modal data challenges the capabilities of user groups. The IAB recommends strengthening the support capacity in the area of translating data to knowledge and to explore new modes of interaction between platform scientists and user groups to facilitate the process. The IAB further recommends that the data platform will develop mechanisms supporting secondary use of research data, particularly for genomic and multi-modal data sets.

4.5 The new Roadmap for SciLifeLab

The IAB read with interest the new roadmap with its five sections and found it to be comprehensive and ambitious. A long-standing suggestion from the IAB has been that the SciLifeLab would take on a few "grand challenges" or "flagship projects" to exploit the capacity and make major impact in a highly focused manner as well. This was already

demonstrated through the efforts during the pandemic and the IAB welcomes the scale of the additional suggestions in the capability area of the roadmap. These efforts will have positive internal ramifications and at the same time increase visibility both among politicians and in the general public. We are pleased to see that three timely activities are prioritized as flagship projects. We are similarly pleased to see that additional emphasis has been devoted to the innovation area, where the potential also is considerable. While the IAB is enthusiastic about the roadmap, we caution that it will be essential that the new Director has the opportunity to bring his/her perspective on these developments before they are implemented.

We have commented on three of the areas elsewhere in the report and will add specific comments to the flagship projects and the innovation area here.

Flagship projects

Pandemic Laboratory Preparedness (PLP). The PLP project has grown out of activities during the covid pandemic. It is an excellent initiative that among other activities include laboratory methods to detect DNA and RNA viruses in patients and in wastewater. It can be envisioned that other streams of funding, for example from Myndigheten för Samhällsskydd och Beredskap, will be available in the future to run this program.

Similarly, **Precision Medicine** is on a good path and seems to have found a natural delimitation towards GMS and clinical diagnostics in the Swedish healthcare regions. As also stated above, the IAB agrees that in this area SciLifeLab should focus on the development of the next generation of techniques and the development of these to a state where they can be applied to patients at a large scale in routine care. The nationally overarching role of SciLifeLab could be exploited here for equitable and parallel introduction of such new techniques in precision medicine into hospitals in the 21 Swedish regions that administer health care. For example, multi-omics precision medicine, single cell approaches, and advanced imaging of tumours may be such areas. SciLifeLab should take care that these efforts are visible to stakeholders so that SciLifeLab does not become “invisible” once their efforts to bring these techniques closer to the clinic have been successfully accomplished.

Planetary Biology. This is a timely field to engage in given that Sweden has several world-class groups in the area, for example in Stockholm, Lund and in Uppsala. However, the IAB had some concerns and feared that the approach would be too broad. The plan may be too inclusive as a large variety and diversity of groups seemed to be invited to suggest projects. There also seemed to be a tendency to see and describe the efforts as parts of large international projects. We suggest that SciLifeLab identifies one major

challenge that several groups can focus on. This challenge should be something with clear relevance to the unique environment in Sweden or Scandinavia. Suggestions for such areas could be the arctic environment in the age of climate change, Swedish agriculture, or the Baltic Sea as a unique environment with a geographical saline gradient and complex influences from pollutants, fishing, and climate.

Precision medicine, pandemic preparedness and planetary biology have been defined by SciLifeLab as priority areas, termed capabilities. Each represents a large and critical societal need that will require the coordinated efforts of multidisciplinary research programs. The IAB recommends supporting the development of specific objectives and research plans within these priority areas and to explore with government agencies and private foundations funding opportunities for these grand challenge projects. The development and implementation of these projects will also allow SciLifeLab to continue to act as a catalyst for adapting the research capabilities and communities in Sweden to new challenges. To initiate this process the DDLS program has some funding to incubate grand challenge programs. Some will be together with WASP and some with infrastructure efforts. WASP has a breeding ground called “NEST” for funding grand challenges.

Innovation

The IAB applauds the SciLifeLab management for making innovation a priority in the roadmap for the future. The major contributions of SciLifeLab to innovation so far were to the DDD Platform. This endeavour has been very successful, leading to eleven start-ups, of which three already went through an IPO, with four drug candidates reaching clinical trials. A new opportunity is the program launched by the KAW with Proof-of-Concept grants for projects with clear innovation potential. Out of 61 applications, ten proposals received this type of grant. The IAB looks forward to following these projects and hearing about their outcomes.

This situation is a good basis for further innovation, but the IAB is convinced that SciLifeLab has the potential to do much more. Even if this is influenced by the teachers’ exemption model in Sweden and the fact that SciLifeLab does not control the innovation cycle fully, there are ways for SciLifeLab to stimulate the translation of knowledge and technology development to innovation.

In the first instance, SciLifeLab could track the patent applications of SciLifeLab Faculty, using free access databases such as the WIPO website (WIPO - Search International and National Patent Collections) or Espacenet (Espacenet – patent search). In addition, the companies started up by SciLifeLab faculty could be traced and tracked via public

registries and internal information. Both could be followed up by the SciLifeLab team to create an overview of the existing innovation effort and develop narratives on the value created. This information could also be used in the context of benchmarking. In the second instance, SciLifeLab could set up a training course (e.g. a one-week summer school) about the innovation path from knowledge to intellectual property, licensing of IP, business development and new venture creation. Further down the road, SciLifeLab might create a team of experts in every facet of innovation (including the innovation offices of the partner universities), to promote, facilitate and stimulate the faculties to bring their innovation efforts to fruition. This could include development of more pro-active approaches, such as invention harvesting by entrepreneurs-in-residence, as mentioned in section 4.2.

4.6 Discussions with Fellows

The IAB had, as usual, interesting discussions with the fellows. The SciLifeLab fellows seem to be mainly content. Despite serious startup challenges the general response was that if given the opportunity they would choose SciLifeLab again. Space limitations remain a challenge for some fellows (7 of 11 SciLifeLab fellows and 3 of 14 of the DDLS fellows present in the joint sessions with the IAB had experienced this). A clear plan needs to be in place for lab space and teaching before each new fellow arrives at his/her host department. All department heads should honour the letters of commitment signed on behalf of the institution before allocation of fellows, considering turnover between department heads that can occur during the fellow appointment. The letters of commitment are already registered at the SciLifeLab Operations Office as a means to support the fellows in case of arising conflicts. All fellows should have a “daily” mentor for help with onboarding (3 of 11 SclLifeLab fellows and 5 of 14 of the DDLS fellows present in the interview have had or have a mentor to help with onboarding now).

Access to the infrastructures is another recurrent challenge that the fellows brought up. Although the platforms are easy for the fellows to contact, it is not easy to just do test samples. A general clearance for processing of samples would be advantageous so that they do not have to get clearance for each set of test samples. The IAB observed that the fellows in the DDLS category had more interaction as a group. The Solna Campus in particular is good for fostering interactions. It is important to secure that there are similar opportunities for interactions in Uppsala, and at the other non-Stockholm sites, compared to Solna, even if the geography obviously is more challenging. The IAB also noted that the new PALS grants will help to facilitate additional interactions but recommended the development of additional transversal activities to help link all the SciLifeLab PIs. There is also a need to include DDLS responsibilities into tenure requirements. The IAB noted that unifying requirements for tenure are difficult because they are university specific. One recommendation would be to divide the fellow to work on different tasks, like the Research

School rather than have all DDSL fellows working on all tasks. A suggestion could also be to negotiate with the universities to reduce the teaching obligation for the DDLS fellows in exchange for the responsibilities that they would be asked to take on within the DDLS program. This could be regulated in the letters of commitment before the fellows arrive, which would reduce any later discussions or “disappointments” in the departments.

Although there are amazing resources and bioinformatics expertise, it currently takes too much time for the new fellows to understand who is doing what and how to navigate the now quite large NBIS organisation. A coordinator and/or contact person would help to facilitate this. In addition, some sensitive data take too much time to anonymize in time for publication. This process should also be facilitated.

The fellows also mentioned immigration issues as a major challenge when coming to Sweden. SciLifeLab is expected to continue to play in the “champions league” of world leaders in the field of life sciences, and to continue to attract the best talent from all over the world to Sweden to lead or populate their research and infrastructure teams. However, due to recent changes in the immigration laws of Sweden this has become very cumbersome, with a dramatic effect on waiting times to immigrate for these scientists, their partners, their children, and equally critically the scientists they need to recruit to their groups. In many cases this leads to the best talent deciding to go elsewhere. This deficiency will increasingly handicap the high-quality standards of SciLifeLab and their partner universities in Sweden. The IAB therefore recommends SciLifeLab (together with the partner universities, the industry, the KAW, …) to advocate for a fast-track treatment for scientists as an exception in the immigration laws.

4.7 Future development of the organisation and management of SciLifeLab

The IAB considers the inclusion of additional universities as SciLifeLab partners as a significant step towards becoming a truly national organisation. However, the status of the second-generation universities and their full integration into SciLifeLab remains to be defined. For example, not all sites are represented in the SciLifeLab board. One sensible and urgent idea would be to have each site represented in the board. Alternatively, the different sites could take turns to have a presence on the board. But all members, including additional sites, could be present at management meetings as voting is not taking place.

As SciLifeLab expands, how does the Operations Office adapt? SciLifeLab has established well deserved trust from KAW and the government and as a result is being asked to take on additional roles for Sweden. The question is how large should it grow? There are some organisational hurdles. Although SciLifeLab is not a legal entity, it can either act through one university or have all come together to get contracts and other legal

issues dealt with. The IAB encourages the different host universities to align as much as possible to avoid missed opportunities.

Format of IAB meeting. The IAB applauds the Operations Office and the presenting scientists for the excellent preparation and presentation of the state of SciLifeLab and its challenges. In particular the written report was concise and informative and the meetings with group leaders were exceptionally enlightening. The IAB acknowledges the thoughtful response of SciLifeLab to prior reports. Future meetings would benefit from some minor changes in the meeting schedule. The IAB recommends to i) schedule meetings with some platform users, including from SciLifeLab affiliated and non-affiliated research groups to understand their concerns, ii) insert into the schedule periodic (short) executive sessions for the IAB to discuss presented information, iii) consider scheduling the platform review before the IAB meeting so that the IAB could benefit from the findings of the platform review.

4.8 Continuing to shape the second decade of SciLifeLab

SciLifeLab has now established itself as a truly national infrastructure with a strong international reputation. Going forward the IAB focused its discussions on the issue of healthy and sustainable growth of SciLifeLab. In addition, the IAB has observed that some challenges seem to have reached a chronic stage, where new ways of attacking them must be introduced.

The ambition should be to allow researchers to do science supported by AI/digitalization and capabilities that can lead to a transformation from single-scientist approaches to large multi-disciplinary efforts. The IAB identified national barriers that need to be addressed.

Growth in terms of recruitment of fellows was also addressed, and discussion reflected the issues connected to recruiting a large number of fellows at (about) the same time. How to concretely address the strategic objective of innovation and bridge-building is very important. New upcoming research areas that can be implemented as infrastructure areas (e.g. 3D printing, synthetic biology, large language models/text mining), and the possibility to involve fellows in that development, were discussed.

In the view of the IAB, the main strategic recommendations to achieve this are six-fold and we repeat them here:

i. Aim to solve the **infrastructure problems haunting the data-driven research** efforts. These problems make it hard for researchers to take full advantage of life science relevant AI developments. National fragmentation has an impact on the

productivity and feasibility of SciLifeLab projects. The IAB recommends designing internal solutions to avoid further delay.

ii. Continue to **develop a more differentiated benchmarking model** that can rank the SciLifeLab efforts separately across subareas, such as infrastructures, innovation and training.
iii. **Provide practical onboarding solutions** solving the start-up problems in the fellow's projects. These are multifactorial: infrastructure access in the project design phase, lack of mentors for each fellow, uneven integration in departments, immigration issues, guidance in handling legal issues and research ethics etc.
iv. Use the flagship model to **select a single large-scale project for each focus area** that may continue to enhance the international reputation of SciLifeLab. Consider appointing a single leader for each flagship project.
v. Argue for a **new building at Campus Solna** such that critical mass is maintained at a single physical location.
vi. Continue to work with the three Stockholm Universities to develop a coordinated recruitment plan for the Solna campus, following the DDLS example.

5. Closing remarks

We very much look forward to SciLifeLab's continued success. We would appreciate to receive a formal response of the SciLifeLab Board to our recommendations within three months after the Board meeting in which they are presented.

Signatures

Ruedi Abersold	Prof. Søren Brunak	Dr. Jo Bury
Prof. Sirpa Jalkanen	Prof. Janet Jansson	Prof. Iain Mattaj
Prof. Svante Pääbo	Prof. Kjetil Tasken	Dr. Sarah Teichmann

Annexes to SciLifeLab's International Advisory Board report 2024

Annex A – Members of the International Advisory Board

Ruedi Aebersold
Søren Brunak (Chair)
Jo Bury
Sirpa Jalkanen
Janet Jansson
Iain Mattaj
Svante Pääbo
Kjetil Taskén
Sarah Teichmann