

Report on the evaluation of the Luxembourg Centre
for Systems Biomedicine (LCSB) at the University of
Luxembourg

Based on a peer review as commissioned by the Ministry of Higher Education
and Research of Luxembourg

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COMPANY INFORMATION

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I INTRODUCTION

The Ministry of Higher Education and Research (MESR) of Luxembourg mandated *Interface Policy Studies, Research, Consulting*, Switzerland, to organize and lead a research evaluation of the University of Luxembourg. Simultaneously, the Institutional Evaluation Programme (IEP) of the European University Association carried out an institutional evaluation of the University of Luxembourg. The results of the IEP evaluation are published in a separate report.

The research evaluation was conducted in 2016 and followed two earlier evaluations carried out in 2008 and 2012.

The University of Luxembourg has three Faculties with research units conducting research in different scientific disciplines. In addition, there are three interdisciplinary centres.¹ The evaluation focused on the research performance of the University research units and interdisciplinary centres. This report presents the evaluation of the Luxembourg Centre for Systems Biomedicine (LCSB).

The observations and recommendations presented in this report are based on a peer review by the following four experts working in the interdisciplinary centre's research fields:

- Rolf Apweiler, director of the European Bioinformatics Institute of the European Molecular Biology Laboratory (EMBL-EBI) and senior scientist, United Kingdom
- Rudi Beyaert, professor, associate department director and leader of the Unit of Molecular Signal Transduction in Inflammation at the VIB Inflammation Research Centre and the University of Ghent, Belgium
- Michael Hastings, head of the Neurobiology Division at the MRC Laboratory of Molecular Biology, United Kingdom
- Ulf Landegren, professor, head of the Advanced Molecular Techniques in Genomics, Proteomics and Medicine research group at the Department of Immunology, Genetics and Pathology, University of Uppsala, Sweden

The peer review consisted of a self-assessment report written by the LCSB and a hearing at the research unit that took place in September 2016. The evaluation assessed the period 2012 to 2015. The hearing, which was organized and moderated by Interface, consisted of a self-presentation by the research unit, a group discussion of the self-assessment report, and several individual and group interviews. These included interviews with representatives of the management team, professors, PhD candidates,² and further members of the research staff. Based on the experts' assessments, the report

¹ The Interdisciplinary Centre for Contemporary and Digital History was established in 2016. It is not part of the evaluation, as the assessed period is 2012 to 2015.

² The University of Luxembourg calls its PhD students 'PhD candidates'.

was finalized by Louis Schlapbach (sub-contractor of Interface) and Zilla Roose (Interface). The report has been approved by the experts.

The overall results of all unit evaluations are summarized in a synthesis report.³ The synthesis report includes the findings of the interviews conducted with representatives of the management team at the University of Luxembourg.

The report is divided into two parts: The first part discusses the expert team's observations gathered during the evaluation process. The focus is on the input, the output, and the outcome/impact of the research unit:

- *Input* includes the preconditions for the research conducted, such as strategies, financial and human resources, infrastructure, organization, and quality assurance systems.
- *Output* includes the performance of the research unit, exemplified through research results and their dissemination.
- *Outcome and impact* refer to the medium- and long-term effects as well as the relevance of the output for science, society, economy, and politics.

The second part presents the expert team's recommendations for further development of existing strengths and overcoming observed weaknesses.

The evaluation team would like to thank everyone involved for preparing and implementing the hearing at the LCSB, for making the documentation available, and for participating in interviews.

³ Rieder, Stefan et al. (2017): Evaluation of the University of Luxembourg, Interface Policy Studies, Research, Consulting, Lucerne.

2.1 OVERALL ASSESSMENT

In general, the expert team is impressed by the dynamic development and the performance of the LCSB, which was created only seven years ago. Much of the positive development should be attributed to the director, Rudi Balling, and his energetic leadership, strategic focus, and vision. The persons interviewed are proud to be part of the dynamic and speedily developing centre. The research output of the centre seems to the experts to be of very high quality and quantity.

2.2 INPUT

Specific remarks

The LCSB was founded in 2009 as a part of the Health Technology Initiative of the Government of Luxembourg. It is one of two interdisciplinary centres that existed at the University of Luxembourg in the evaluation period. Rudi Balling was chosen as founding director of the LCSB. The centre strives to secure a link between systems biology and medical research; in its scientific activities, it focuses on neurodegenerative diseases. The LCSB was given an exceptional initial capital investment and therewith the opportunity for fast development. In 2015, the centre comprised 16 subunits and 190.5 full-time equivalent (FTE). The government has declared systems biomedicine one of the most important research focus areas for the next period, and it is therefore a national priority of Luxembourg.

Unlike the University's research units, which are affiliated with Faculties, the interdisciplinary centres are directly subordinate to the rector's office. The centres do not have research unit heads but rather directors, who are granted more decisional power than research unit heads. Top-down leadership by the director thus characterizes the LCSB. The retirement of the current director is foreseen in the upcoming years, but the transition process has not yet been worked out.

The LCSB is located in the buildings Biotech I and II on Campus Belval, which it shares with the Life Science Research Unit (LSRU), which is affiliated with the Faculty of Science, Technology and Communication.

Research strategy

The experts agree that the centre has a clear strategic focus on neurodegeneration and more specifically on Parkinson's disease and on bioinformatics. It follows an interdisciplinary approach in its scientific projects. An explicitly formulated element of the centre's strategy is recruitment of high profile researchers.

Human and financial resources, infrastructure, and equipment

To ensure the top-level quality of research conducted at the LCSB, at the start the director approached top researchers with attractive offers from the University and succeeded in hiring them. By the time of the evaluation, the international visibility of the

LCSB had increased and led to many spontaneous applications from researchers interested in becoming members of the centre. The experts rate the quality of the team leaders that they interviewed as excellent.

Many of the younger LCSB members interviewed mentioned insecurities concerning career development and showed a considerable degree of dissatisfaction with the lack of clear plans for promotion at the University of Luxembourg. Several researchers also mentioned the negative consequences of the strict handling of the five-year limit on non-permanent contracts at the University. Some of the persons interviewed also named specific difficulties, such as having to leave the country immediately after the end of the contract, or parental leaves – in particular maternity leaves due to restricted lab access for pregnant women – counting as part of the limited employment period. The experts thus consider guidance in terms of professional development for younger researchers to be an area for improvement.

A further and connected issue that was raised was the administration process and support for PhD candidates, which does not yet seem ideal to the experts. In line with this, the experts gained the impression that there are not yet sufficient alumni structures that allow current students to gain an understanding of their professional perspectives.

The experts agree with the leading members of the LCSB in viewing the amount of university-internal funding allocated to the LCSB appropriate, as it is equivalent to the amount requested by the centre. Together with the successful competitive funding by the National Research Fund (FNR) coming from the ATTRACT⁴ and PEARL⁵ positions, the LCSB's budget is adequate and allows for the acquisition of larger equipment. Nevertheless, the centre lacks a funding instrument of the University or of the FNR for the acquisition and renewal of large equipment.

The expert team congratulates the Ministry and the University of Luxembourg on the planning and construction of the impressive and appealing Campus Belval. Nevertheless, based on impressions from the group discussion, the interviews, and especially the guided tours, the experts agreed with the LCSB members' statement that the spatial division in the buildings Biotech I and Biotech II is not ideal. The LCSB staff members feel that the distance between the two buildings hinders daily internal collaboration and communication efforts. The limited space within the two Biotech buildings also restricts the centre's capacities for further growth. The experts fully support the director's demand for a speedy decision regarding the Biotech III building. In line with this, no staff member of the LCSB complained about programmes, salaries, access to stu-

⁴ The ATTRACT programme of the FNR is designed for researchers not yet established in Luxembourg who demonstrate the potential to become leaders in their field of research. The funding scheme offers promising junior researchers the opportunity to set up their own research team within one of the country's research institutions (see <www.fnr.lu>).

⁵ The PEARL programme is directed at public research institutions in Luxembourg and leading research professionals abroad. The goals of the programme are to recruit internationally leading researchers with outstanding track records and thereby to strengthen the research areas that are of strategic importance to Luxembourg. PEARL projects have a lifespan of five years with a financial contribution of between three to four million euros by the FNR (see <www.fnr.lu>).

dents, or funding, but many members expressed their dissatisfaction regarding the available space.

Organization

As a result of a strong top-down leadership, the centre developed rapidly over the last four years and became in the experts' view one of the flagships of the Luxembourg research landscape. This is reflected in the growth of the number of researchers to a critical mass as well as in the output and the international visibility of the centre.

The interdisciplinary centre is operated in parallel to the Faculties, as part of the University of Luxembourg and an integral part of the life science structure of Luxembourg. The experts agree that the LCSB benefitted from the top-down director-led organization, which contrasts with the greater individual academic autonomy of research units of the Faculty.

Regarding the engagement in teaching, the staff members of the LCSB did not present a consistent opinion to the experts. On the one hand, some interviewed individuals stressed that the LCSB is deeply involved in the activities of the doctoral school in terms of legal issues and structures as well as in teaching in general. On the other hand, some members expressed the view that only part of the LCSB members engage in the teaching obligation, whereas others leave most of the work to the LSRU. Not all members regard teaching as an unpleasant burden; however, people who would be willing to engage in teaching expect to be promoted to an adequate position and title before investing time in the less career-promoting teaching.

External research collaborations

The LCSB is collaborating with several other research units and other institutes in Luxembourg (especially with the Luxembourg Institute of Health (LIH) and the *Centre Hospitalier du Luxembourg*) and beyond (e.g. serving as a node for ELIXIR⁶). The experts support the aim of looking into the potential of strengthening national collaborations without losing sight of important international interactions.

The physical and organizational proximity of the LCSB and the LSRU could motivate closer interactions between the two, although there are several collaborative efforts between the LCSB and the LSRU already ongoing. Accordingly, the experts perceive an openness of the LCSB towards collaborating with the LSRU but also towards sharing ideas and infrastructure. The two units chose deliberately to share two common buildings instead of separating the units in order to guarantee access to costly equipment for both institutes. Irrespective of the spatial proximity, the experts note that the cultures in terms of thinking and working diverge greatly. Whereas the LSRU takes decisions on a consensual basis among the principal investigators and strives for high academic freedom, the management style of the LCSB is mostly top-down. The experts do not consider the merger of the two institutes to be a valid option, as they rather expect that

⁶ The European life-sciences Infrastructure for biological Information is an initiative that will allow life science laboratories across Europe to share and store their research data as part of an organised network.

a merger would affect the dynamics and the flexibility of the LCSB in a negative way. Moreover, the LSRU's research focus on cancer would not fit into the LCSB.

Quality assurance system

Quality assurance measures have been introduced at the LCSB on all levels for strategic development, research, and operations. Accordingly, all papers that are to be submitted to a journal are first submitted to the director for review. The peer review of the manuscripts by the journals as well as the peer review process of funding agencies for grant applications give an additional level of quality assurance. The experts further acknowledge the installation of an international scientific advisory board for the LCSB, the composition of which they consider an excellent match for the LCSB. Quality control of data management is part of the LCSB's own research enterprise. The experts find the reproducible science initiative of the LCSB and the quality handbook especially interesting approaches.

2.3 OUTPUT

The interdisciplinary centre has shown dynamic growth and rapid development, very effectively managed by the director and his team. The experts agree on the high standard of the research output, which is reflected in the number and quality of publications, patents, competitive FNR grants, number of awarded PhDs, and currently employed PhD candidates. They are also impressed by the international visibility achieved by the centre.

Quality of research output

In general, the experts consider the leading members of the LCSB to be highly qualified and successful researchers who contribute to the steadily growing international visibility of research in Luxembourg. Research outcomes are increasingly published in some of the best journals in the field, with impact factors above 10. Nevertheless, the experts do not feel that all persons interviewed were of the same high calibre. It is therefore important in their opinion to pay proper attention to the persons to whom positions of high responsibility are given. Furthermore, researchers who are not seen as developing the required profile for permanent positions should be informed about this perception by their supervisors as early as possible.

In terms of competitive funding, the experts acknowledge the sum originating from third party funding, including some funding from industry and private donations. Members of the LCSB successfully applied for highly prestigious PEARL and ATTRACT grants.

However, more than half of the centre's competitive budget funding comes from the FNR. The experts encourage efforts to increase the amount from European funding and consider this possible in view of the increasing international visibility of the LCSB. Grants from the European Research Council (ERC) would provide evidence of the high research quality of the LCSB and further enhance its international visibility.

The experts assess the integration of bioinformatics research infrastructure at the LCSB into a Translational Medicine node of the European ELIXIR bioinformatics research infrastructure as a particularly good development.

The experts are impressed by the development of novel methodology, more specifically the novel microfluidics-based cell co-culture systems and biomedical data management systems.

Quantity of research output

The experts acknowledge the success of the LCSB also in terms of the quantity of its output. During the period from 2012 to 2015, the centre produced an increasing number of good quality publications. Many of these demonstrated the interdisciplinary nature of the centre.

In 2015, the LCSB had already awarded around 19 PhD degrees and employed 48.5 PhD candidates. This has contributed to the development of a lively research community. Furthermore, 16 patents were filed, and four spin-offs with so far six employees have been founded.

Several supportive services were installed at the level of the centre (i.e. offices for innovation, infrastructure, grants, fundraising, communication, and management). The experts were informed that this was done because the equivalent systems at the level of the University do not exist or are working too slowly. The experts praise the LCSB for installing these services and are of the opinion that in the long run, the economic benefit will outweigh the costs. At the same time, the experts agree that this could serve as a good example for the University to maintain comparable services for all research units and centres on a superordinate level. Another example of the LCSB creating opportunities that should in fact be provided at the University level is that the centre made it possible for several of its members to take a leadership course.

The experts are impressed by the well-organized and frequently used graduate school. However, it seems rather unfavourable that it is not mandatory for all of the PhD candidates to sign up for this training. Some of the PhD candidates reported excellent conditions concerning their supervision, but unfortunately, this does not seem to apply to all candidates. As was expressed in the interviews, the advisory committee is not equally well organized in all cases. Apparently, guidelines and standards regarding the structure, form, and content of the progress reports are not available.⁷

⁷ Concerning this, the LCSB management stressed that a clear template for these progress reports exists and that some PhD students were concerned about not fulfilling the quality expectations of their supervisors.

2.4 OUTCOME AND IMPACT

The experts acknowledge the wide national and regional network of the LCSB, which includes persons and institutions of great influence in the public and private sectors. Outstanding examples are the centre's collaboration with the LIH and the *Centre Hospitalier du Luxembourg* as well as the centre's service provision to a considerable number of institutions and companies in Europe.

The decision to make biomedicine a high priority topic within turned the centre into an internationally visible, attractive, and well-performing research institute within a short period.

It surprised the experts that according to a group leader's statement, an LCSB member has to travel regularly to California to use a scanning electron microscope, even though the nearby Luxembourg Institute for Science and Technology (LIST) has such microscopes (although they are not optimal for bio-samples). The experts therefore see opportunities for expanding collaboration not only overseas but also with institutions in Luxembourg and its neighbouring countries.

Several initiatives were put in place to increase awareness among younger students of the opportunities presented by biomedical research. Moreover, the centre organized energetic and imaginative programmes for outreach events. In the opinion of the experts, this put research at the University of Luxembourg in a positive light for the broader population.

The experts consider the centre to be well on its way to fulfilling its long-term goal of stimulating economic development by innovation.

2.5 STRATEGY FOR THE FUTURE

The experts applaud the strong focus on translational medicine and the effort in bioinformatics for molecular medicine.

The experts were informed that additional expansion of the LCSB is in planning. They advise careful consideration of all consequences of further short-term growth in order to avoid rigid fixing of a future strategy for a subsequent director. They are of the opinion that not too much should be determined before the next director takes over. The experts encourage the centre to consider various managerial structures, such as a leading board with an empowered executive director. One option of putting this into practice would be to have a triple-headed organizational structure, led by current staff members of the LCSB. Before this can be realized, a transitional phase would be necessary. Moreover, it is crucial for the organization and the internal processes to have been well rehearsed for new leaders coming in.

The experts acknowledge the challenge of further developing the character of the centre while simultaneously changing leadership and organizational structures.

3.1 SUMMARY

The experts are highly impressed by the fast growing and very well developing interdisciplinary centre. In their assessment, the LCSB has become one of the principal scientific flagships of the University of Luxembourg, representing both innovation and research excellence.

The experts agree that the research conducted by the LCSB follows a clear strategic focus that all staff members share. The centre is characterized by clearly identified and shared objectives. The experts view the current director as a charismatic personality who is able to motivate people and create common values. He has been highly successful in establishing an internationally visible and recognized research centre with a clear and distinguishable profile.

The members of the LCSB struggle with the time restriction of temporary contracts and with the physical location of the centre in different facilities. Nevertheless, the centre's output is very good in both quantity and quality, and the outcome and impact are impressive. The experts see potential for improvement in terms of collaboration with other national institutes.

The centre faces the retirement of the director in the near future. The subsequent form of leadership and the future development of the centre are not yet worked out. The experts strongly recommend for the time being letting the current structures consolidate and pursuing the goal of successfully installing a new director.

3.2 RECOMMENDATIONS

Based on the observations stated above, the expert team formulates the following recommendations for the interdisciplinary centre, the University, and the MESR.

Recommendation 1: Retain the LCSB's position within the University

The development of the LCSB has been a considerable success. The experts are therefore of the opinion that the LCSB should continue to be a fully supported freestanding research centre within the University of Luxembourg.

Recommendation 2: Clarify division of teaching

The experts find it natural and highly desirable that the most accomplished scientists take part to some extent in both graduate and undergraduate education. Nonetheless, the teaching load does not need to be shared equally, and it must not present a hindrance to research excellence. In this context, the Max Planck Society's involvement in teaching could serve as a good example.

Recommendation 3: Make a speedy decision regarding the centre's physical location

The experts put strong emphasis on a speedy decision regarding the LCSB's future in terms of physical location (Biotech III building). This is a prerequisite for effective implementation of the first recommendation. Further, the expansion of the mouse house seems to be a logical component of the LCSB.

Recommendation 4: Consider establishing a medical school

The experts advise the University of Luxembourg to explore carefully the opportunity of establishing a medical school to complement the strong translational focus on the level of the University and the LCSB.

Recommendation 5: Provide potential for biomedicine-oriented industry

The experts recommend that the LCSB actively promote the creation of opportunities for the Luxembourgish industry to engage in the creation of branch of industry oriented towards biomedicine or biomedical techniques. To create such a branch, tools such as industry contacts, incubators, funding opportunities, and focused communications should be used.

Recommendation 6: Enhance career development programmes

The experts state that the University and the LCSB should work together to enhance career development programmes for PhD candidates through improved mentorship, advice (including profile, experiences and achievements of alumni), and efficient administrative support in the framework of the graduate school.

Recommendation 7: Grant the director greater financial autonomy

The experts state that the director of the LCSB should be allowed greater financial autonomy within the operation of the LCSB to further develop its flexibility and responsiveness. This would ensure the further dynamic development of the centre in a competitive environment.

Recommendation 8: Provide University services to the research units and centres

The experts are of the opinion that the University should provide at least some of the services that have been installed at the centre level (offices for innovation, infrastructure, grants, fundraising, communication, and management). They are of the opinion that in view of the University's strong commitment to dissemination and valorization of research, it is appropriate that suitable support structures for innovation are put in place at the University level and that these operate efficiently and expertly.

Recommendation 9: Modify participation policy and focus of the graduate school

Finally, the experts recommend that the participation of the PhD candidates in the graduate school be handled in a stricter, mandatory way, with a clear focus on mentoring and career opportunities.