

LagLivLab annual report 2022

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2022 is the second year of student activities in LagLivLab. There has been a steady throughput of students that have participated during 1-4 semesters. Currently there are 13 active students and there are 17 alumni. 3 professors, 4 postdocs and 2 PhD students have contributed significantly to the supervision of the groups (3 of whom are financed by UiO:LS). At the end of 2021 a student board was formed. During 2022 the student board has taken over many tasks like planning events, recruiting students and communication/outreach. The main outreach activities in 2022 have been the event at Realfagsbiblioteket on August 30 "Studentmekking på bio-skaperverkstedet", a 45 minute presentation of LagLivLab at the "Felleskollokvium" of the Department of Physics on October 27 and the @laglivlab Instagram stories. The LagLivLab cell lab has been operational since 2021 with the aid of SciGroup, a private research company with facilities in the Physics Building. During 2022 LagLivLab has finished the investment in infrastructure and can continue to function if it can acquire funds for consumables. At the beginning of 2023 the main challenges are:

- Acquire funding for continued operation
- Organize the student activity as a UiO student association
- Recruiting a new cohort of students
- Publish results from electrorotation and bioactuator groups
- Initiate new project(s)

Student Board

From January 2022 the student board consisted of Nigar Abbasova (leader), Håkon Krogrud, Kristina Heyerdahl and Adam K. Jørstad and from August 2022: Nigar Abbasova (leader), Elisabeth Surgucheva and Domantas Sakalys.

The board arranged 2 gatherings of LagLivLab and the event at Realfagsbiblioteket. It held meetings to discuss possible participation in iGem. The lab maintenance was planned by the student board. The Instagram account @laglivlab is being fed with content by the board.

Report from the project groups

Throughout the year, LagLivLab went through a lot of changes. We started off the year as three groups (electrorotation, bioactuator and microfluidics) and ended the year as two (electrorotation and bioactuator). Nevertheless, both groups were able to make significant progress in getting one step closer to their final goals.

The electrorotation group

The electrorotation group lost a member, and gained two more. The two new members were biology bachelor students in their 2nd and 3rd years. Our team has made a great effort in incorporating the new members in the group as soon as possible, as well as making sure to give them the necessary training in the wet lab. This year, we were able to train one of the new students to grasp the basics of the wet lab within one month, which is something that we are quite proud of.

At the same time, our team improved our communication skills, which is crucial especially when our group is reliant on cell cultures that need to be taken care of. In order to make sure that everyone is contributing equally to cell culturing, and no misunderstandings arise, our team has developed a cell culturing schedule. This way, each team member had the responsibility of passaging the cells on weekly basis, and everyone was contributing to the experiments equally.

We have also learnt a lot through trial and error this semester. In order to get the cells to rotate, we had to perfect the medium that the cells were suspended in. We managed to get the cells to rotate for the first time when two of our members were fed up and decided to experiment by mixing different components together. Suddenly, the cells started rotating, and we were able to find the perfect ratio of different components for our medium. This type of work craves a lot of time and dedication, and our team is immensely proud of how far they were able to come by working together and having fun at the lab.

During autumn 2022, our team was joined by a PhD student from France, who contributed a lot with his knowledge within cell culturing, as well as microfluidics and microscopy. It was refreshing to have someone from a different background to ours (he holds a MSc degree in biomedical engineering), as we were able to learn a lot from him.

By presenting LagLivLab at Felleskollokvium at the department of physics, we were able to share our progress and motivation with the rest of the institute. Based on the feedback that we got, one MSc student and one more PhD student wants to join our team from next year. As per now, the electrorotation team consists of 8 members, and 2 new potential members starting from next year. Our plan for the upcoming year is to start experimenting using the new cell line BV-2 cell line that we have received from Belgium. The plan is to meet with Petter Angell Olsen from HTH and have him explain how to take care of these cells and if anything special is needed for the cell culturing, acquire those cells from HTH (they are currently frozen), and start rotating them using our rotating medium that we were able to perfect throughout the entire autumn semester.

The bioactuator group

As for the bioactuator group, over the past months we have also experienced changes in its membership. Two students have left the group due to graduation or other commitments, while a new member has joined the group. The new member is a second-year bachelor's student in biology, and he has been successfully integrated into the laboratory environment through training at HTH and hands-on experience.

We have also made an effort to increase organizational efficiency in our group. We have experimented with various platforms for roadmap creation and document storage. These efforts have been aimed at streamlining our processes and improving access to important materials.

Our group has been exploring new parameters for stimulating the muscle cells, in which the voltage is increased to 50V and the pulse peak length is decreased to 3 milliseconds. This approach has been proposed in the literature, and we sought to test its effectiveness in our own stimulation experiment. However, we encountered difficulties in procuring an amplifier suitable for our setup. Through networking efforts, we were able to secure the assistance of E-lab, which agreed to construct a custom made amplifier that would be shared with another project led by Ørjan Grøttem Martinsen. The construction process took approximately two months, which impacted the progress of our project. In the meantime, we took the opportunity to get more organized in our group and to train our new members in the wet-lab. Additionally, we were fortunate to receive an opportunity by Kayoko Shoji to play around with and study beating cardiac cell organoids that she has made in her projects.

We have also made a new design for stimulation set-up, which is improved to suit our needs, and made more basic. We have also printed it out. In this set-up we have made use of PDMS which simplified our set-up significantly. Unfortunately, we have not yet tested the set-up yet and therefore have no results from stimulation. This is something that we will be working on during the next academic year.

Economy

In 2022 LagLivLab received 285 kNOK from UiO:LS, it had 552 kNOK from 2021 and received 45 kNOK rent from SciGroup. The Department of Physics and Hybrid Technology Hub supported LagLivLab with lab space, access to equipment, consumables and supervision. While SciGroup used the cell lab alongside the LagLivLab students they also contributed with an incubator. They have now moved out and the last infrastructure, including an extra incubator, has been ordered, the investments total 676 kNOK. The consumables were well stocked up in 2021 and replenished in 2022 at a cost of 156 kNOK. The main costs in the 2023 budget for LagLivLab are the consumables, 223 kNOK, engineer support, 50 kNOK, and for students performing maintenance and training, 27 kNOK. The projected cost of consumables is higher because of inflation, a lower current stock of consumables than in January 2022 and expectation of a 3rd student group starting up. In total, this means that the continued functioning of LagLivLab will require a funding of 300 kNOK in 2022.

Organization of LagLivLab

The initiative to start LagLivLab was taken by Ørjan G. Martinsen, Dag Kristian Dysthe (both professors at Department of Physics) and Stefan Krauss (head of CoE Hybrid Technology Hub) and was supported by their respective Departments. Dag Kristian Dysthe has taken an

active role in the development of LagLivLab and reported to UiO:LifeScience. LagLivLab is not a formal entity at UiO, but in the period 2020-2022 it was a project under UiO:LifeScience. We think it is time to make a more formal organization that can continue to work for the years to come and plan the following:

- The students register LagLivLab as a student association at SiO and Brønnøysund.
- The supporting departments (Department of Physics and Hybrid Technology Hub) and the student association enter an agreement on the use of lab facilities and supervision support
- Funding organizations can fund LagLivLab either through the student association or through a representative of the supporting departments