

Internship Report

In my search for an internship I was searching for an institute where I could gain first-hand practical experience in a lab or a professional research environment in my field of study: Biochemistry and Cellular Biology. I was most interested in the field of research involving the molecular mechanisms of ageing, this involves telomere structures, mitochondrial dysfunction, epigenetic alterations and so on. I had gained further interest in this topic due to the very interesting courses I took in my second year, such as Immunology and Advanced Cell Biology.

Therefore, I searched for labs that work in this specific field around the world but mostly interested in institutes located in Europe. Before I learned about the DAAD program, I sent individual emails to different PIs (Principal Investigator) at research institutes hoping to see if they had an available spot. I had applied to around 20 different institutes and only got a few responses, and one successful interview. Then, during a seminar organized by the Society of Life Sciences club (a club organized in my university), one of the members provided a talk about the DAAD RISE worldwide program which piqued my interest.

The organization contains a program called RISE Worldwide which stands for Research Internships in Science and Engineering. There they offer funded summer research internships globally to German undergraduate students that have good grades and recommendations with academic training on a variety of topics such as Biology, Chemistry, Computer Science, Physics, Engineering, and other closely related fields. These students are then matched to researchers around the world so they're able to gain first-hand experience in a professional working environment, allowing them to not only strengthen their knowledge in their academic field, but also potentially form professional ties and connections which can further aid the student in later career choices.

I have chosen this organization because of its very financially friendly approach to give students an opportunity to delve into the professional world in their field, outside of their comfort zone in Germany. I already had gained the ability to experience multiculturalism from the university, and thus I learned about experiencing and assimilating some of these different cultural aspects into my own life. Even so, I had wished to further explore outside of the university and country, and experience a different but interesting culture in a much larger scale. DAAD RISE Worldwide provided that with the appropriate funding if you got selected. There are lots of options and therefore the student gets a lot of freedom to choose where in the world would they prefer to do the internship in. It's also the fact that the institutions that the organization had options for are regarded as really high level academically, and thus being accepted and performing your internship with the help of the organization is good feedback for later career options. With all this in mind, and since nothing is lost for applying, I gave it a go.

One of the institutes that I had chosen and ultimately went to do my internship at a scientific research center in Spain. I had chosen this institution because I was interested in their projects. It mentioned that they were investigating various different proteins and the interactions between them. More specifically its main project was investigating Mitochondrial proteins such as Cytochrome C from Complex III, and its interaction with Nucleophosmin protein after a DNA damage response. However, from the information provided, I was most interested in the laboratory methods. What enticed me the most was the fact that I would be able to broaden and improve my laboratory techniques and knowledge which inevitably would further support me in my later

academic career. They mentioned methods that I was not familiar with, but also methods that I had previously done but was not the most confident performing them, and therefore this would allow me to refine my skills further. This is why I had chosen this institution. There were other projects not mentioned that I also took part in, however I was very glad to do so since it broadened my skills and knowledge.

During my internship, I worked as a lab researcher assistant. I did not have individual projects on my own, however I worked with other lab members on different projects and also took on their role in the lab when they were absent. There was no set time of when I would go to work and when I would leave, this would all depend on the workload of that day and the tasks that have to be completed. As a lab researcher assistant, they would sometimes provide me with protocols to perform the tasks however I also had to do my own individual research on theory and methodology to be able to continue the projects.

The internship experience is very highly related to my major. The field of topic that my internship worked on is Molecular Biology, Cell Biology, Biochemistry, Microbiology, and genetics. This was all touched upon during my courses in Biochemistry and Cell Biology. With the different projects that I had worked on, there was always lots of familiarity with the methodology, lab techniques, and theory that I had learned throughout my courses. For example, in our Advanced Cell Biology course we learned about programmed cell death, and the different pathways that can be triggered depending on the signal. We learned about various different key proteins involved, such as p53 or Arf, their interactions with each other, its effects on the cell, and its purpose. This was highly useful because during my internship there was mentioning of these different proteins in the project. This undoubtedly saved me lots of time from doing my own research to try and understand their interactions from scratch and thus allowed me to proceed with the project much more efficiently.

This was also similar in regards to laboratory methods. Throughout our lab courses we learned about laboratory techniques, their purpose, the methodology, and when to use them. Throughout my internship I performed methods such as immunofluorescence, ponceau staining, western blotting, cell harvest and culture, protein expression, PCR, qPCR, cell transformation, plasmid purification and so on. Most of these methods I already had performed during my lab courses in BCCB however by going over them once more in the lab, I gained further confidence in my skills in understanding and performing them. I also learned about different methods to approach some of these lab techniques which each have their own pros and cons. Even the basics that are taught in the first year of BCCB were very useful, such as being comfortable in a lab, safety precautions, handling must-have lab devices, handling different chemicals, calculations that have to be done for different solutions, etc. With these fundamental skills acquired it allowed me to quickly assimilate into the professional lab environment quickly, and be comfortable enough to start working directly.

I spent all my time in the internship working for one department, however as mentioned previously, I worked in different projects throughout my duration there. There were certain weeks where I had to repeat protocols multiple times to either verify the values I had obtained, or due to human or technical errors during the experiment. Although most of the times the tasks I had to do were different and varied. Since a project could take weeks to finish, my daily tasks were mostly the continuation and progression of that project.

My own personal goal was to learn as much as I could from the laboratory techniques and methods, to broaden my horizon and hopefully fill in the gaps of knowledge that maybe could not be taught in our lab courses. In terms of more specific goals in the lab, another one of the main projects I partook in was investigating the effects of mutated nucleophosmin in its phosphorylated regions, to see which residue is responsible for its transport outside of the nucleus after a DNA Damage response. To perform this, a common task that I was assigned to do was to order and test different primers. These primers were used to then perform site-directed mutagenesis using PCR and thus induce desired mutations on a double-stranded plasmid. The mutated plasmids were then used to transform bacterial cells. The transformed cells were selectively chosen and isolated, they were cultured and grown, and then the plasmids of interest were extracted, purified and sent for sequencing. This process helped me fill in certain gaps of knowledge that I had not always known how to best go about. For example, the making and ordering of primers, or the sending of the purified plasmids for sequencing. In these protocols there are also small details which you usually are not made aware of in the lab courses, but can have significant changes in your results.

It was also the case that every Friday we would have a lab meeting to discuss the progress of the ongoing projects. Each member would have their turn explaining what they did during the week, and then discussions with the other members would partake to see what plans or steps can be taken to reach further desired goals.

Throughout my internship I was constantly receiving useful feedback from my supervisors. The first 2 weeks they were by my side to make sure I understood the tasks that I was doing, this further gave me confidence to perform the experiments later on without direct supervision and allowing me to further have the freedom to investigate and research on my own. Whenever I was not sure about a step in the experiment, there was always someone in the lab with more experience that was there to be able to inform or aid me.

During my internship I had no problems in regards to communication with my peers. I am able to speak fluent Spanish and therefore even during the scientific meetings when they would discuss in Spanish I could fully understand. There was a lot of language switching between English and Spanish when communicating, this is because for the scientific terms I would be most comfortable in English while for a more relaxed discourse we communicated in Spanish. There was also no real issue in regards to intercultural change, people in Seville were very welcoming and easy to communicate well. They were always willing to help and aid you wherever you had trouble in, and this was very much reflected in the lab as well. There weren't any misunderstandings, just slight differences in lifestyles which made my stay in Seville much more interesting. For example, something I was not used to was the fact that in Seville civilians eat out very late, especially during summer, at around 10 pm. This is because of the very high temperatures and heat, something I was not used to, but I fully understood once I experienced constant above 40°C for weeks. The climate change was something that took me a while to get used to, and to deal with it I had to adapt and learn from the locals and peers in the lab.

I particularly enjoyed the work environment at my internship. When it came to professional work, my colleagues and supervisor were all highly conscientious. They were very organized and always had set up plans and backup plans for many different scenarios. When it wasn't related to work, the ambience was very warm, light-hearted, helpful, and good-spirited. There were periods of time during the internship where it was quite stressful for lots of my colleagues, this was usually due to an upcoming deadline that had to be completed, however this was not always the case. Something

else that I had noticed during my stay there was how when a lab colleague was stressed, anxious or unsure on how to proceed due to a problem in their experiment, the others were very much willing to provide some of their time and service to help them. They performed lots of selfless actions even if they themselves had their hands quite full.

My colleagues each had their own individual goals, I was the youngest and there were multiple Master's students, PhD candidates and also a postdoc. They all had visions and goals of producing work and results to further put forth progress to science. My relationship with my colleagues improved every passing day I spent there, and we were able to understand each other quite well. It was quite common to have to wait long periods of time in the lab due to incubation times, or waiting for the gel to load for example. This was one of those times where I got to know and understand my colleagues the best. This was also achieved when I would grab lunch with certain colleagues, since it was a common occurrence as well. We even had planned events that we would go to. During these conversations they also ended up providing me with lots of invaluable career and academic advice, and I ended up personally finding this information invaluable, since it stems from their own professional experience.

There was a strong team culture, where even if we each worked on individual different projects, there was still this idea that you can rely on others to help you. Even as a newcomer to the team they still treated and viewed me in this manner. I really enjoyed attending the lab meetings specifically for this case, since it's where the team spirit really shined. Even people that were not in the department I was working in, were also extremely amicable and willing to help. If we forgot to resupply on solutions, samples or ingredients, there were quite a lot of cases where other researchers from different groups were willing to provide some, and then of course later we would pay back the debt. Even if it was quite a large research institute, lots of people there knew each other, their field of work and their position.

What this internship has taught me cannot be overstated. It not only taught me and strengthened my skills and knowledge in regards to working in a lab, but also provided me with insights regarding general life advice and future career options. The learning process started from the moment I searched for the internship, to the moment I left the host country.

Searching for the internship position gave me lots of insight into the job world. It is unfortunate that general education does not really teach you on how to properly search and obtain a desired job position. And therefore, with this opportunity at hand, Society of Life Sciences club and as well self-learning I was able to better understand how this system works. I better understood the importance of CVs, and how to properly design them so that they can demonstrate your strongest points, but also preferably speaking be targeted towards a specific audience. I also better learned of the importance of networking, and therefore made a LinkedIn account. Most importantly though, I got better confidence in individually searching for positions online and demonstrating what I had to offer. It can sometimes be surprising to see how far simply asking can get you.

Once I got my internship position I also had to start looking for accommodation, deal with further contracts, and manage myself individually. All this taught me more about being independent, and taught me how to prepare for different potential problems that can arise from having to live in a culturally different country.

During my internship I learned even more about the importance of cooperation, teamwork, and independent learning. Since I had to do a lot of that, I further understood how effective these

concepts are in a lab environment, especially a professional one. Like mentioned previously, everyone had their own tasks and roles in the lab, however they still were always willing to provide help and aid to their colleagues if it was very much needed. This sped things up in the lab and made work in the lab much more productive.

I also managed to fill in certain small gaps of knowledge that I hadn't fully understood in theory, but was able to during my time there. For example, the purpose and effect of certain buffers or solutions, why we use them and what we expect of them when using them on different samples. I learned new theory on lab methods I had not yet delved into, such as LLPS (Liquid-Liquid Phase Separation) for example. I got a better grasp of knowledge on certain concepts, such as NMR (Nuclear Magnetic Resonance). All of these topics mentioned were done with hands on experience, which as I mentioned before is invaluable practical skill development. This practical experience will indefinitely stick with me, and further support me for the rest of my academic career. It provided me with better confidence when handling lab devices, a way it has done this was by gaining more knowledge on these devices, as well as training my dexterity in general.

Positive experiences I gathered from the lab, apart from all the self-development academically and professionally that I had obtained, was also the very friendly and welcoming connections I made with my colleagues and supervisor. It was also being in a new city, new environment, where I got to learn about a different culture, and a different way of life. A negative experience would probably be the climate change and heat wave that Europe had suffered through in the Summer. Seville was exceptionally hot, with temperatures reaching 45°C, this made exploring the city much more difficult to do so. In the workplace there were really no serious negatives that I think should be mentioned. Like as expected in a workplace, there were good days and maybe mediocre days, where nothing much unfortunately was achieved or gained.

This further solidified what I had in mind on doing for my future career. For now, I still desire to go further into academia and the internship helped me understand that. It taught me firsthand about the difficulties of working in this field, and this will allow me to not be unpleasantly surprised if I decided to go for it without any prior experience. I now feel a bit more prepared to go into this field, and am very excited for what the future holds.

Overall, I would say that if you can, apply for the DAAD RISE Worldwide internship program, it's very generous with the funding it provides, and as well allows you to experience an opportunity that is very much not always common for students to get. To be able to do an internship in your field of topic, in an environment that would be completely exotic or culturally different to you.