

My SUPER Experience at the University of Stuttgart 2019
Institute of Inorganic Chemistry
Project: Synthesis and Electronic Investigation of a Rhenium Complex
Supervisor: Dr. Brigitte Schwederski

Sara Diem
Field of Study: Chemistry
Home University: Purdue University

The Journey to Stuttgart

If you had asked me a year ago what I thought I'd be doing the summer of 2019, I never would have imagined spending two months in Germany. I knew at the beginning of my sophomore year of college that I wanted to study abroad, but in the back of my mind, I was set on going to France, since I had studied French in high school. At the end of my fall semester, my plans started to change. I came across the SUPER program on Purdue's study abroad page. It seemed almost too perfect. I would be able to work in a lab that is specifically for chemistry (which is rare to find since most of the programs are for engineering students), and I would be able to spend the summer in Europe. When I got back to school from winter break, I decided to apply. I heard back early February, and I immediately booked my flight to Stuttgart, Germany.

Though I had locked in Germany for the summer, it didn't really hit me until right before I left. The week before leaving my home, I felt so anxious to travel by myself to a country where I don't speak the language and don't know much about. Finally, June 1 came and it was time for me to leave the US. Check-in went smoothly at O'Hare International Airport, and I patiently waited for my 9-hour flight to board. 9 hours go by quickly when you have a red-eye flight. I first landed in Copenhagen, Denmark, and then I flew from Copenhagen to Stuttgart. I landed there around 6 pm, and my buddy was there to welcome me and help me settle in. When I landed, I was exhausted, but I was so excited to start my epic summer journey.

Settling in and the First Few Days

If you don't know much about Germany, one stereotype is that they have a lot of paperwork. They definitely lived up to this expectation. The first day after I landed in Stuttgart, my buddy and I met up bright and early to get all the paperwork done. Little did we know it would take the full day. On this day, we had the intentions of taking care of everything (health insurance, bank account, VVS pass, enrollment, etc.), but we could only take care of two things off of that list. I could see the stress in my buddy's eyes, but I was so excited to even be in Germany that I wasn't too worried yet.

After the first couple of days, all of the paper work got sorted out. On my second day there, Tuesday June 3, I met my research professor, Brigitte Schwederski. She introduced me to the graduate students I would be working with for the next two months, and I joined the team for lunch and coffee break. I felt very welcomed that day, and it made me excited for what was to come. The first graduate student I worked with, Svenja, gave me a small introduction to the project I would be working on with her, and she showed me around her lab space. There was equipment I recognized from my lab back at home, but then there were things I didn't recognize at all. I felt a little intimidated, but also I was excited for this opportunity to learn something new.

The following day, all of the SUPER participants met for the first time with Babette. It was so comforting to finally meet people from the program, because the first couple of days felt very lonely due to the fact that I only knew my buddy and my research supervisor. After the meeting, we had our first German class. I definitely recommend taking this, even if you are fluent because it was a great way to socialize. Since everyone in this program has different projects in different institutes, German class would be the one guaranteed time we'd see each other every week. But since we all lived in the same student housing (172 Neckarstrasse), we were bound to see each other more than once a week. After our first German class, we all

grabbed dinner at an Italian place next to our student housing. From this moment on, I knew this summer I'd have fun with these amazing people.

Exploring Stuttgart and the Surrounding Areas

The first weekend, a group of us spent our time exploring Stuttgart and what it has to offer. Our first excursion was to Schossplatz/Konigstrasse. This area is the center of Stuttgart. This is where you can find the new palace, the old castle, and shopping. Then, we visited Wilhelma Zoo. I definitely recommend visiting this zoo. It is one of the biggest zoos in Germany, and it is beautiful. The next day, we went to Unterturkheim, which is a town just outside of Stuttgart. This is where we did a wine hike through the vineyards, and it was so amazing. The Wurttemberg Mausoleum is also in this area, so we decided to hike up to it. In Stuttgart, I also recommend visiting the TV tower, Staatsgalerie, and the Mercedes and Porsche museums.



A group of us at Schlossplatz



Schillerplatz



Wilhelma Zoo



The Research Project

Back in February when I was looking at all of the projects listed on the site, I noticed most of them were focused more towards engineering. Nevertheless, I still wanted to do this program because it just seemed like the perfect length and place for the summer. I talked to my advisor at Purdue, and she fortunately had a contact over at the University of Stuttgart who is a chemistry professor. She emailed who I now know as Professor Schwederski, and she asked if she had any space in her inorganic lab for the summer. Luckily, she did and I was soon after accepted into the program.

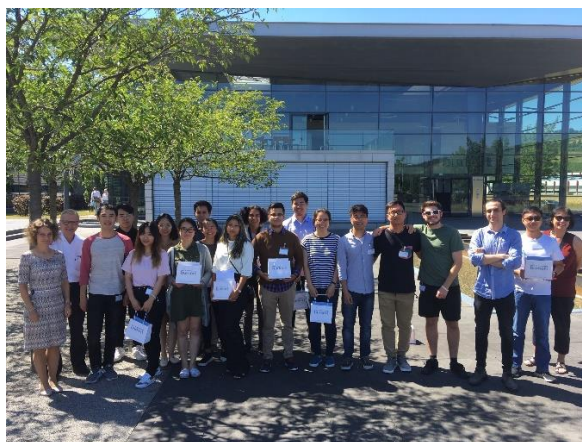
After settling in, my graduate student and I went straight to work. My project involved the synthesis and electronic investigation of a rhenium complex (with camphor quinone as the ligand) with a ring that had a methoxy substituent in the meta position. The first week or so involved doing the reaction, and purifying the product. Once the product was purified, we had to do all kinds of tests. I was introduced to cyclic voltammetry (CV), electron paramagnetic resonance (EPR), spectroelectrochemistry (SEC), and much more. For the rest of the first month, we worked on doing these tests and analyzing the data. Once the product was purified, we had to confirm that we got the product we wanted, so we had to test it by using infrared spectroscopy (IR), mass spectrometry, nuclear magnetic resonance (NMR), and elemental analysis. Once our product was confirmed, we performed cyclic voltammetry to see if oxidation or reduction is reversible. This is important, otherwise the other tests will be useless. Luckily, our product did have a reversible reduction, so we could move on with further testing. Next, the sample underwent UV-vis, EPR, and IR-SEC. All of these tests turned out well, and from the data that was collected, we made good observations of the electronic composition of the complex.



**Electron Paramagnetic Resonance
machine**

My typical work week wasn't like everyone else's. I didn't have too much structure to my schedule, since the work was dependent on the reaction and the experiments. Typically, I would arrive at the lab around 9:30 am. Then, we would take a lunch/coffee break from 11:30am-1:00pm. Sometimes I would get the afternoons off, or sometimes I could come after lunch. Sometimes there wasn't work for me to do, so my grad student would tell me that I didn't have to come in. It just depended on the experiment we were going to do that day. I didn't mind these flexible hours, because it gave me time to work on my research paper and explore.

Once this project was completed, it was time to present at Burkert Fluid Control Systems. We took a trip to Ingelfingen, which is about an hour and a half outside of Stuttgart. Burkert's facilities were absolutely amazing, and the company was very welcoming to us. We had a short welcome breakfast, and then it was time for our presentations. We had to give two, four-minute presentations in front of the SUPER participants and some of Burkert's representatives. One was about our home university and the other was about our research project. Once the presentations were over, the Burkert representatives gave us a tour of the facilities, and they gave us in-depth presentations about the company itself.



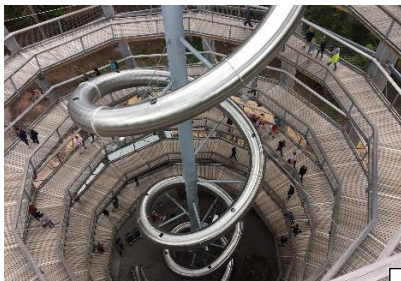
After the first month, my supervisor had me switch over to a different graduate student. The project structure was very similar to my first project. First, we had to do a reaction between a ligand and a metal. Then we used column chromatography to purify the substance.

Unfortunately, my two months were up before I had time to properly run tests on the product and analyze the data.

Exploring

Before this trip began, I knew I wanted to travel as much as I could while I was in Europe. I didn't realize how much I would be able to do though. I knew that research was my main purpose for coming to Germany, but once I arrived, I realized that my graduate students and professor understood that a big priority of this trip was to travel and learn about more cultures. Traveling was one of the most fun aspects of this study abroad. I had the opportunity to travel with large groups of people. Other times, I traveled by myself, and it was a great learning experience.

A plus about being in Europe is that traveling is very cheap, and there are many different options for cheap travel. You could fly, take a bus, or take a train, and all have extremely cheap options. Another plus about being in Germany is that Germany borders nine countries, so it makes it very easy to travel to a different country. But don't forget, Germany has a lot of cool places to visit as well. For me, I was able to travel on the weekends. Sometimes, I was able to travel during the week as well if I knew I didn't have much work. My professor and grad students were very accommodating. After two months of being in Europe, I was able to visit 5 countries and 1 principality, and I visited over 15 cities. I was also able to cross so many things off of my bucket list. Traveling was by far the best part of my trip, because I was able to experience things that I never would be able to experience in the US.



Bad Wilbad, Germany (Black Forest)



Munich, Germany



Athens, Greece



Bad Urach, Germany



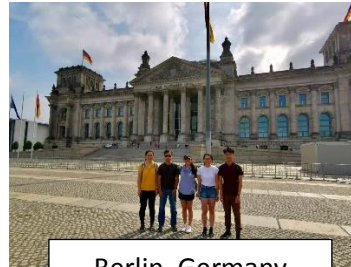
Luzern, Switzerland



Monaco



Nice, France



Berlin, Germany



Lake Como, Italy

Advice for Future SUPER Participants

- Book your flight so that you arrive and leave Germany on a week day (housing only allows you to move in/move out on a weekday).
- You can fly into Stuttgart, but it also might be cheaper to fly into Frankfurt and then take a train down (trains are really easy in Germany)
- Bring a fan! A/C is really rare in Europe
- Here are some helpful apps to download: Flixbus, Ryanair, DB Navigator, Google Maps, Google Trips
- Buy a German/European SIM card. You can find them on Amazon, or you can wait and buy one in Germany.
- Don't worry about setting up a bank account or health insurance before going to Germany. Your buddy will help you with that once you arrive, but these are important in order to be enrolled at the university.
- Bring medicine/products you think you might need to Germany (i.e. cold medicine like Dayquil, shampoo, contact solution, etc.). Though Germany might have these products, it has different brands and the instructions/explanations are all in German.
- Try travelling by yourself. It's such a great learning experience and a great way to feel more independent.
- Bring reusable bags for shopping. They will charge you for bags if you don't bring one.
- Try beer even if you don't like it. Radlers are a great alternative if you don't like beer.
- Try and learn some basic German before you go. Though most people speak English, you'll be respected more if you try to speak their language first.

- Take advantage of the German class once a week. It's a great way to socialize with the people in the program. Some times after class on Wednesday, we would go out for dinner or go to a karaoke bar.
- Have fun! And don't be afraid to try new things. When will you ever be in this position again?