

DAAD RISE Professional Final Report

Heidi Liu

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As a recent graduate from the University of Washington, having earned a Bachelor of Science in Astronomy and Physics and currently taking a gap year, a summer research internship offers an excellent bridge before graduate school. Additionally, Germany has always been the country I wished to visit and spend an extended period in. However, I also did not want to halt my physics education for the sake of travel. Therefore, the DAAD RISE internship program provides a perfect opportunity for me to explore Germany while gaining experience in physics research at a top-tier research institute.

Working at GSI

The GSI Helmholtz Center for Heavy Ion Research stands as Europe's preeminent nuclear physics research facility and its partner facility, FAIR, is one of the best places for exploring particle physics. I plan to specialize in Cosmology combined with particle physics for my upcoming graduate studies next year. However, my undergraduate studies did not provide me with extensive experience in particle physics. Therefore, the opportunity to immerse myself in cutting-edge particle research at this facility perfectly aligned with my future goals.

I was mentored by Dr. Thomas Neff, and our project aimed to study the beta decay within the rapid neutron-capturing process (r-process). The r-process occurs in cataclysmic astrophysical events and is responsible for the formation of heavier elements in the Universe beyond iron. Our primary focus was the comparison of mean-field calculations with nuclear shell model calculations for beta decay in the r-process. I investigated the energy transitions within the nuclear shell models, employing numerical simulations and data analysis. During the process, I needed to effectively grasp the quantum mechanics concepts behind the code and actively come up with solutions to compute the generated shell model calculation database using Python. My output gains insights into the strength of the corresponding transitions, crucial for understanding nucleosynthesis in the r-process.

My day-to-day work life has mostly been spent in front of a computer in the student office of the theory building, which I shared with two other summer students. I dedicated most of my time to learning and reviewing physics concepts, with the remaining time coding and strategizing on code construction. During lunchtime, the theory group will gather up at the GSI cafeteria and have lunch together where we chat about physics and other news. Our group will also occasionally take breaks after lunch to grab coffee at the GSI café for leisure before resuming work in the afternoon.

The experiences at GSI greatly enhanced my understanding of quantum mechanics and particle physics while also sharpening my computational skills. Moreover, I was able to experience the German research culture and observe the work habits of researchers from various nations around Europe within my group. I noticed that work-life balance is highly prioritized at GSI (Europe in general), and it's common for colleagues to enjoy leisure activities after work hours. Additionally, the flexible working hours allowed individuals to choose their office hours based on their needs and meeting schedules.



Figure 1. My workstation at GSI.

Outside of Work

The GET_INVolved program at GSI organized many gatherings and events for international and summer interns. We had several gatherings at the local beer garden and enjoyed authentic German beers. Additionally, we explored various facilities on the GSI campus, with one of the most memorable experiences being the tour of the FAIR particle accelerator site.

The DAAD Scholars' Meeting in Heidelberg was a remarkable experience. It provided an excellent opportunity to network with Ph.D. students from the U.S. and Canada. This was particularly valuable for me, as a recent undergraduate graduate, to meet individuals who were already in graduate school. Coincidentally, another U.S. DAAD intern was also on my team, and we had the chance to attend the DAAD meeting together, building a friendship over the summer.



Figure 2. FAIR particle accelerator construction site.

Living in Germany

I signed my internship to be exactly 90 days. A three-month stay in Germany certainly sounds very exciting. However, being a Chinese citizen, I had to navigate the process of obtaining a German Internship Visa. This process was quite time-consuming, primarily due to the duration required to obtain the ZAV (work permit) document from GSI. To add a twist to the tale, I received my visa on the very day of my scheduled flight. As a helpful tip for future interns, I highly recommend initiating the visa application as soon as receiving acceptance into the DAAD program.

Regarding accommodations, GSI provides housing for their interns, the guest house and the Steinhaus. Consequently, I was spared the hassle of searching for housing before my internship. Additionally, opening an online German bank account (N26) was straightforward. It only required a few documents and a video call for verification, and this process can only be completed within Germany.

There are some small cultural differences. For instance, there is no customary practice of leaving a tip after dining in a restaurant, and there are fees associated with getting water in a restaurant and using public restrooms. Furthermore, GSI is situated around a cornfield somewhat removed from urban centers. However, Germany's highly efficient Deutsche Bahn system made it easy to travel throughout Germany. It is worth mentioning as a tip to purchase the 'Deutschland Ticket' for 49 Euros a month to access all regional trains and buses.



Figure 3. Photographs of the landscapes I captured during my travels. (From left to right: Heidelberg, Berlin, Nördlingen, Salzburg, Hallstatt, Vienna, Hamburg, Copenhagen,)

Travel

One of my dreams and goals is to travel around the world. Before the internship started, I backpacked Europe for 35 days traveling to 9 countries and 19 cities as a graduation gift for myself. Throughout the duration of my summer internship, I planned several solo trips over the weekends taking full advantage of the efficient European train system. These excursions led me to various cities in Germany and neighboring countries. The experiences I gained and the views I saw were truly unforgettable.

I agree that my report and accompanying pictures may be used by the DAAD in printed materials, presentations, and on websites in order to inform funding organizations, sponsors, and students about the RISE program.