

Veronika Fernberg's Travel Blog

MIIS Nuclear Research Reactor Practicum Prague & Vienna 1/13/18-1/26/18

Saturday

January 13, 2018

Today was travel day. As our Nuclear Research Reactor Program at the Czech Technical University in Prague starts Monday morning on January 15th, 2018, our group was asked to arrive by Saturday 13th at our lodging to ensure that when we begin our official program we have overcome most of our jetlag.

Conveniently enough, Prague is located a mere 4-hour train ride from Vienna, Austria, which happens to be my hometown. I was lucky enough to spend some time with my family before starting my journey to the Czech Republic.

My train left from Vienna Central Station (Hauptbahnhof) in the late morning. My train ride was comfortable and uneventful. However, I do suggest paying the few dollars more to reserve a seat, especially when traveling with bigger luggage. A standard one-way ticket with [OEBB](#) to Prague is about \$45 and can easily be purchased online.



The view of rural Czech Republic on my way to Prague. 1/13/18

Once I had arrived at Prague Central Station (Praha hlavní nádraží), I opted to make use of Prague's extensive public transportation system to get to the Castle Residence Praha hotel. Since I knew that a month pass was already waiting for me at the hotel, I opted to purchase a 90-minute ticket at the information stand for 32 CZK (\$1.55). At the information stand, one can also find a free guide/map for Prague's public transportation system.

A little side note: Although the Czech Republic is part of the European Union, it has not yet adopted the Euro. It is advisable to exchange some cash or withdraw money at a local ATM. To get the best exchange rate, one should use official bank ATMs.

Having grown up in Vienna, I have been spoiled by an excellent public transport system, which today I often use as the golden standard to compare other cities with. In my experience so far, Prague has been able to hold up very well. It is quite easy to navigate, it is clean and feels safe to use. It took about 20-25 minutes by public transportation from Prague's Central Station to our lodging.

Another side note: For those that like it a little faster and more comfortable when traveling with luggage, there are also taxi stands and UBER. It is important that when using a taxi, that the price is negotiated before the beginning of the trip, otherwise tourists end up being drastically overcharged. Also, it appears as if UBER in PRAHA charges less for the same route in comparison to an average taxi.

The Castle Residence Lodge is a very convenient hotel for the purpose of this trip. It is located 5-10 minutes walking distance to the VR-1 reactor and lecture hall. The rooms are spacious and clean and provide all the necessities one may need during this program. Although it is located in a residential area about 20 minutes from downtown Prague, the hotel provides a free shuttle service to and from the Metro and tram station. There is also a little restaurant in the hotel that provides the closest dinner opportunity.

Sunday

January 14, 2018

Until the evening, we did not have any official or mandatory program, which allowed us to take the opportunity to explore Prague on our own. Before that, I enjoyed some true European breakfast, which was included with our stay at the hotel. Vegetables, eggs, cheese, bread rolls, and most importantly Nutella was all I needed to fuel me in the morning. Despite the chilly temperatures and the ice-cold wind, I got to walk around downtown Prague, marvel at the great variety of architectural styles, enjoy traditional food and drink and visit some of Prague's most unique sites.



Town Square 1/14/18



Me in front on the famous John Lennon Wall 1/14/18



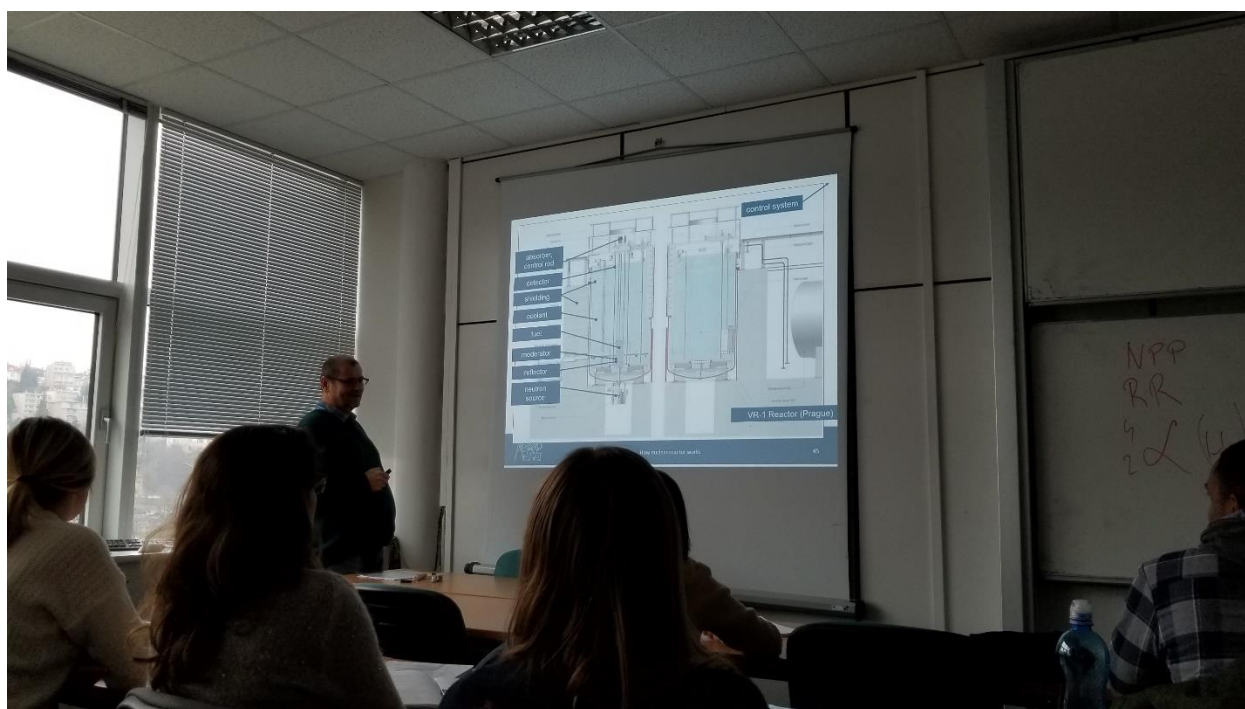
Charles Bridge from below, 1/14/18

In the evening, at 7pm, we officially kicked off our program with a welcome dinner at the hotel's restaurant, hosted by Lubomir Sklenka, Department Chair of Nuclear Reactors at Czech Technical University in Praha. It was a nice evening that allowed us to get to know each other a little better and receive a briefing on the days to come.

Monday

January 15, 2018

Today was the first official class day. We started off at 9 am in the morning at Czech Technical University. We were given an introduction to the course and the schedule for our practicum. Afterwards we took a little pre-test for the CTU department to see where we all were at. It will later also serve as a comparison for our post-test in how far we hopefully will have improved. After a short break, and a room switch, to what would become our permanent classroom for our lectures, we were given two lectures on the operation and construction of nuclear power plant as well as how a nuclear power reactor works. Although most of our group had taken Dr. Moore's 2 credit class, NPTG 8553 Nuclear Power & Nonproliferation, it was a well structured and fresh reminder for us all. Moreover, some concepts that seemed a little abstract for me to grasp were explained using different analogies and graphs, which made it easier for me to understand. An example of this was what happens in a fission reaction. Although I understood the basic principle, having a graph that shows all the different products from this reaction, really deepened my understanding.



During Lecture at CTU 1/15/18

During lunch break, we got to eat at the University's small cafeteria. Since Czech Technical University is located in a more residential area, there weren't really any other options for lunch, the hotel maybe. However, I found the cafeteria food to be quite tasty. Luckily for us, the department we were working with translated the menu for the entire week for us, which made the communication with the cafeteria staff easier. The menu consisted of 3-4 different hot meals too choose from, including one vegetarian option. Each plate was about \$4. Adding a side dish, like a salad or compote and a drink made lunch about \$6. I know that some of my colleagues, who aren't quite used to such hearty meals, were not necessarily fond of the meals. I on the other hand was in heaven. Of course, it was not restaurant quality but traditional Czech food is very similar to Viennese food, so I felt very much at home.

After lunch we finally got to see what we all came for, the reactor. Before entering the reactor hall, we had to get into our lab coats and shoe protectors. Each of us was also issued a little dose meter, to measure our

exposure. Unfortunately, we were not allowed to take photos inside the reactor hall. The reactor itself was smaller than I had expected, despite having seen pictures of it before. We were given a tour through the reactor hall and got to see the core. Once it got dark enough outside, the CTU staff prepared the reactor for the first experiment. What we got to witness was the Cherenkov radiation. Contrary to movies and TV shows, the glow of underwater radiation is blue and not green. It was very unique experience to see the visualization of actual nuclear radiation.

Tuesday

January 16, 2018

The morning again was dedicated to lectures. The first lecture primarily focused on the 3S concept: safety, security, and safeguards. The most important lesson to draw from that particular lecture was the to learn about the actual life cycle of a nuclear reactor. Most of our class work at MIIS had been focused on design and the nuclear fuel cycle. However, we have never really looked into the steps before and after such as siting, decommissioning and release from the regulatory body. There are a lot of steps involved, which makes the project, nuclear energy, decades, if not century long commitment.

The second lecture's focus was on the nuclear fuel cycle, a topic that MIIS really emphasizes in its nuclear related classes, due to the dual use issue. There wasn't too much new information, however, I thought it was interesting to learn that within the EU, there is a specific differentiation of spent and used fuel. Spent fuel in this case really just refers to fuel that will not be reprocessed, while used fuel has a potential for re-use. Although it may seem small, as future policy makers it is essential to be aware of different terms used in different countries and regions.

After lunch, we went to the city center to visit the Golem Tokamak Fusion reactor. The reactor, which is donut shaped, is a comparatively small Tokamak, with the primary function of education and training. We were shown a few experiments and later were able to operate it via our mobile phones. It was a fun experience to see the contrast between a fission and fusion reactor. However, the reality of commercial fusion power is still far in the future.



Golem Tokamak Fusion Reactor Experiment 1/15/18

Wednesday

January 17, 2018

Today was the day I have probably been most excited about: our visit to Temelin Nuclear Power Plant (NPP). We left early in the morning in a small little bus that picked us up from the hotel. Although distance wise the NPP is not that far away, it took a couple hours to get there. The Czech Republic has not quite the same sophisticated highway system as other European countries, which is probably due to its communist past. Anyway, the drive was beautiful. It was interesting to see the change of landscape and apparently also weather. In some parts everything was snow covered.

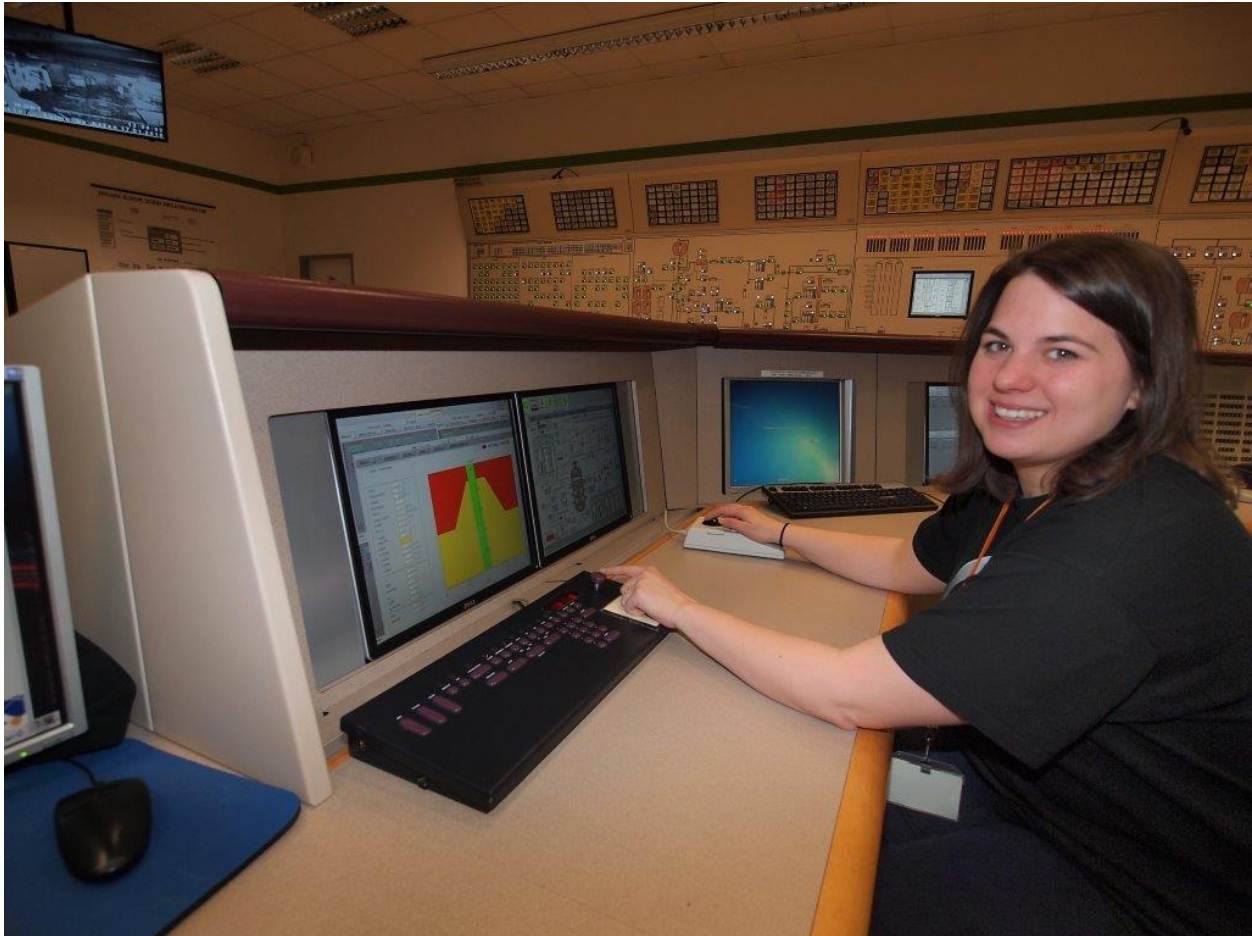
As Austrian, I have grown up with a general dislike for NPPs. My country is probably the European spokesperson against nuclear power. However, as I arrived at Temelin, I thought that the sight of the water cooling towers was quite fascinating. Our tour started with a small video about the basics of the facility and Czech nuclear power use. We then were split up into two groups and toured through the facilities. Unfortunately, again we were not allowed to take pictures due to security reasons but the staff there was so kind to take some for us. Temelin has two reactors, however, while we were there, one of them underwent inspection. Unfortunately, we were not able to see all parts of NPP, such as the reactor hall or a closer look at the cooling towers. Nonetheless, it greatly improved my personal understanding of the magnitude of the NPP. What was most important to me personally was to see how staff was dressed working in this environment. Visiting the power plant made me respect nuclear material but definitely reduced my fear of it, in terms of the peaceful uses.

After our tour and the lunch and the cafeteria, which was kindly paid for by CTU, we were given a brief lecture on the CEZ group and nuclear power produced by the group. It was interesting to learn more about



In front of Temelin NPP Cooling Towers 1/17/18

the Czech Republic's nuclear power consumption and plans for the future, as well as neighboring countries working with the CEZ group.



Me "operating" the NPP 1/17/18

After the presentation we also got to spend some time in the replica of the operation room. To be more precise, the training room for future NPP operators. It was fascinating to learn about the role of the operator and the difficulty of even making it to the training process. It was again another layer that made me feel safer about nuclear power. After some of us were allowed to play around and initiate fake incidents of concern, we headed back to Prague. It was definitely an exciting day.

Thursday

January 18, 2018

Our day started off with a lecture on radiation protection and waste management. It was an interesting topic because radioactive waste management is a serious issue that will become even more troublesome in the future, especially with no permanent storage yet. This lecture was also valuable to me because it allowed me to better grasp the concept of beta decay. For me the explanation provided at CTU has been the most clear and understandable one thus far.

After lunch, we took another little fieldtrip to SURO, the national radiation protection institute. We were first introduced to SURO with a little briefing on what SURO is and does. Afterwards we toured the facilities, where we got to see the analysts and their computer technology that could simulate where radioactive fallout or radioactive material that was released into the air would travel according to meteorological data and data from the sensors the institute owns. We were also able to see the drone that is being used to locate sources safely. Lastly, we got to see the medical side of SURO. They had two chambers which are being used to accurately measure radiation inside of organs. Depending on the type and accuracy of the measurement one must sit in this chamber between 20 mins and several hours.



SURO - Analysis Chamber 1/18/18

Friday

January 19, 2018



NPT Simulation 2017 Working Group 1 representing at Pilsner Uquell Brewery Tour 1/19/18



Skoda Factory 1/19/18

Another fascinating day has come to an end. Today was our last big field trip. We went to Plzeň and surroundings to visit several SKODA factory sites. Skoda has always been familiar to me as car company, but apparently SKODA produces a great variety of things including all of Czech Republic's public transportation as well as NPPs. Unfortunately, once again we were not allowed to take pictures at the facilities. First, we learned a little bit about SKODA's company history. Afterwards, we were able to see the production of smaller to medium size parts, including parts of the fuel assembly. At the second location, we were able to see all the different steps of the production of nuclear waste storage and transportation casks. The magnitude of these items and the machinery was unimaginable to me before visiting the factory. Visiting Temelin NPP and SKODA factory so far were absolute highlights of our little practicum.

Since we were already in Plzeň, we were also able to fit in a little cultural program after our visit to the SKODA factory. Fortunately for us, we were able to do a brewery tour of Czech Republic's probably most famous export, the Pilsner Urquell beer. Before we went on the actual tour, we got some yummy lunch at the brewery's restaurant. It was a nice little change of our daily routine.

Saturday

January 20, 2018

This morning we spent in the reactor hall. We were able to do some hands-on experiments with different radioactive sources and a variety of radiation detectors. We were also able to make use of a hand-held neutron detector. While we learned about detectors, we also were able to use different shielding sources such as lead and copper plates, as well as I believe it was polyethylene (which has a similar density to water).

In the afternoon, two members of the CTU staff took us to see the Prague Castle. It was a beautiful day. The castle is situated on a hill, which provided a beautiful view over the city.



At Prague Castle 1/20/18



A View From The Bridge 1/20/18

Sunday

January 21, 2018

Today was our day off. I used the opportunity to do some more sightseeing around town and enjoyed delicious Czech food.



Prague From Above 1/21/18

Monday & Tuesday

January 22-23, 2018

Both of these days we spent in the reactor hall. The mornings, we started off with lectures again on neutron detection practice and delayed neutrons. We were then separated into groups and worked on calculations with the data we received from the reactor. Luckily, we were provided with the math necessary for it and it wasn't too difficult to keep up with.

Wednesday

January 24, 2018

Today was our last day in the reactor hall. We got split into two groups. The first group that I was in went to a different part of CTU facilities to do some Neutron Activation Analysis. (NAA) It was super interesting to see how it worked. NAA is used to detect the element concentration of a given sample. You irradiate the sample and then measure the activity of the sample in the laboratory. NAA is used for a variety of things because it is non-destructive. As a history buff, its use for artifacts and archeology is the most appealing to me.

I had to sit out on the most exciting part, the operating of the reactor. Unfortunately, I had been feeling sick all morning and it got worse before lunch time. I went back to the hotel to rest. The other students were able to operate the reactor themselves (under strict supervision of course).

Thursday **January 25, 2018**

Since I was still feeling sick this morning, I did not attend the debrief of our experience at CTU. I wanted to make sure that I was feeling well enough to travel to Vienna. We took the train back to Vienna in the afternoon. It was the same that I had taken to come out and the ride was smooth without any problem. We arrived in Vienna around 8pm at Hauptbahnhof. Our hotel was located only a 15-minute short subway ride from the Bahnhof. However, I was lucky enough to be picked up by car by my family. After spending some time at home, my dad drove me back to the hotel, which was conveniently located walking distance from the UN building. The hotel was very nice and clean and definitely more luxurious than our Prague accommodation.



Friday

January 26, 2018

On our final day of the program, we went to the United Nations Offices in Vienna. I had lived in Vienna the first 21 years of my life, driven by the complex thousands of times and not even once had I been inside the UN. It was as if I was crossing off a bucket list goal. After we received our visitor badges, we headed to the IAEA. In one of the conference rooms, which overlooked the Danube, we received several lectures from multiple staff members. We covered all three aspects of the 3S's, as well as a very interesting presentation on possible future fusion reactors. It was interesting to learn about the initiative to build a common fusion reactor in the South of France. It is currently under construction, and I believe has reached the half point construction mark.



After the lunch break in the UN cafeteria, we moved to the CTBTO and got a brief overview of the organization. Afterwards we were shown the different detector stations and the control room of all the various stations worldwide. It was interesting to see some aspects of the inner workings of the CTBTO. I think at that point though we all suffered from information overflow. It would also have been nice to visit with more of the MIIS students doing practicum or alumni working there. At the end of the day, we all went to “the library”, the UN bar, and mingled among the hordes of interns and other staff. While we were told that this mingling would serve as a great networking opportunity, it quickly became very clear that this was mainly the intern hang out. Most of us left after an hour at the bar to get well-deserved dinner. The visit to the UN marked the end of our program. Overall, it was a unique and interesting educational experience.



UN Vienna