A Radical Adventure: The Day-to-Day Journal of a Prague Nuclear Reactor Practicum Student
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This blog is a day-to-day summary on the Prague Nuclear Reactor Practicum. This year, it took place between January 15-27. Most of us arrived in Prague on Saturday the 13th to help mitigate jet-lag before we started at Czech Technical University the following Monday. For the next two weeks, our time was filled with lectures on nuclear and reactor physics, trips to nuclear facilities, cultural immersion, and best of all, conducting experiments with and even operating the VR-1 research reactor!

Day 0- Sunday evening
We had our welcome dinner tonight at 1900. Unfortunately, my plane from Finland arrived a little late into Prague so I was slightly late to the hotel restaurant for dinner.
You’ll be happy to hear that Uber works great in Prague! To make up some time for my delayed flight, I decided to Uber instead of taking the bus or train from the airport. My Uber driver, who’s English was impeccable, turned out to be a retired diplomat who had worked personally for one of the Czech Republic’s former prime ministers. We had a really nice chat about international issues on the 25-minute drive to the Castle Residence Hotel.
The welcome dinner was very relaxed and the first 15 minutes (and probably the previous 15 minutes that I missed) consisted of Dr. Moore and Dr. Lubomir Sklenka giving us an overview of the program and some logistics of living in Prague for the next couple of weeks. Dr. Jan Rataj was also in attendance, whose VR-1 Reactor textbook we were given at dinner.
The food was really good, and the wine was even better. After a couple hours of chatting with my practicum-mates and the professors, we went up to our rooms to prepare for our first day.

Day 1- Monday- Class and Reactor Orientation
When I found out I was accepted to participate in this practicum back in November, I had decided that I was going to spend an additional week in Europe visiting friends prior to the program. I thought this would give me enough time to get over the jet-lag, but I was unfortunately still pretty tired. Luckily, we got to sleep in a bit today, as our first “class” started at 9. We made the 5-minute walk down the hill to the tall, concrete building where the CTU nuclear engineering department is located. First on the schedule was a pre-test with multiple-choice questions about everything from safeguards to fundamental nuclear reactor physics. This test would be compared to a post-test that we would take on the last day of the practicum. Next, we had classes on reactor components and a review of general reactor operation.
This afternoon, we walked to the next building over, which houses the VR-1 research reactor. We spent the rest of the afternoon at the reactor, with a faculty member showing us where each major component is located. We ended the day with a demonstration of the Cherenkov phenomena, to which I would give glowing reviews.

Cool Factor: 3/5
New Things Learned: 4/5
Tiredness Rating: 3/5
Highlights: A few of us took the tram downtown for dinner and walked across Charles Bridge and some of Old Prague. I learned that gothic style architecture is absolutely stunning. Also, that “thank you” in Czech is dékuji, pronounced dje-qwoo-ee.

Day 2- Tuesday- Class and Tokamak Fusion Reactor
This morning also started with classes at 0900. The first lecture was on nuclear safety and operations, the second on the nuclear fuel cycle. After lunch, we took a bus and the tram over to the Czech Technical University headquarters downtown. There we visited the GOLEM fusion reactor. The director of the reactor introduced us to the basic components of the reactor and demonstrated (in non-physicist terms) how it works. Afterwards, we participated in a discussion by the professor who teaches introduction to fusion. And, saving the best for last, we returned to the GOLEM reactor for the last hour to run our own “shots”. Through the remote ‘control room’, each of us was able to input our own specifications and run the reactor.

Cool Factor: 5/5
New Things Learned: 4/5
Tiredness Rating: 4/5

Highlights: Today was the second day we ate at the CTU cafeteria for lunch. The food there is so tasty (and cheap)!

Day 3- Wednesday- Temelín Nuclear Reactor
We left early this morning on a bus to the nuclear power plant in Temelín. The drive took about two hours and it was a beautiful drive south through some smaller towns and countryside outside of Prague. When we got to the reactor, we watched a video orienting us to the huge ‘campus’. The perimeter around the reactor grounds is about 5KM (maybe they should start an annual fun run?). After the introduction, we walked across the way to visit the plant. The tour took us through high security areas, with hard hats in tow. We stood by the enormous cooling towers and walked through the turbine halls and were monitored for radiation before we left the facility.

That afternoon, an engineer from the CEZ Group presented on the future of Czech energy. The pursuit for energy security are leading the state to grow the role of nuclear power in the state.

Cool Factor: 3/5 (I personally thought we would be able to see more of the reactor vessel, but unfortunately not)
New Things Learned: 4/5
Tiredness Rating: 2/5 (was able to take a nice nap on the bus)

Highlights: From a non-proliferation standpoint, it was really neat to see how the security measures put in place around the nuclear facility. The entire campus was surrounded by a double layer of barbed-wire fences and had multiple stages of ID check and radiation detectors.

Day 4- Thursday- Class and National Radiation Protection Institute (SURO)
Today we focused on radiation protection. We began with a lecture on the basic principles behind radiation protection in the morning. After lunch (try the cafeteria’s gnocchi!),
we took a bus, metro, and another bus to SURO, the Czech Republic’s National Radiation Protection Institute. The Institute is housed in a courtyard-style building, whimsically decorated with lots of colorful paint and playful shapes. I felt more like I was in a kindergarten class than a radiation protection institute. At SURO, the director first gave us an overview of the institute’s mission and general tasks. Then we walked around the colorful courtyard to the different departments where we saw everything from graphs and maps to the mobile radiation detection team’s van and drone! The last department we visited housed two full-body radiation detectors, which looked like a cross between a steampunk dentist’s office and a medieval torture chamber. Within thick walls with a heavy door were two rooms lined with copper-colored sheets on every surface. There was a chair in the middle of each room, one was reclining the other was not. Both chairs were surrounded by large metal arms with various fixed to the ends, pointing at the “phantom” person sitting in the chair. Although a little terrifying at first glance, the man who operates these rooms explained the physics behind the design of the rooms and demonstrated the purpose of each of the detectors, making the rooms more fascinating than scary.

**Cool Factor:** 4/5  
**New Things Learned:** 4/5  
**Tiredness Rating:** 1/5 (I’m probably really over jet-lag at this point, but the presenters at SURO really knew how to keep things short, informative, and fun.)  
**Highlights:** After the schedules events for the day, a few of us took another bus to a military antique shop nearby. There were so many awesome (but expensive) things. I ended up buying a Nazi era coin. Also, the operator of the full-body radiation detectors told us that he became a grandpa today! So cute.

**Day 5- Friday- Škoda and Pilsner Urquell tour**

Today’s agenda gave us a little break from the classroom. It was another early morning with a bus ride west to Pilsen. Our first stop was the Škoda j.s., the company’s nuclear engineering and manufacturing departments. We were given a short presentation on an overview of its nuclear department and current projects, then we toured the adjacent small-scale manufacturing plant. After that, we drove over to the large-scale manufacturing plant and saw the heavy machinery. Due to the current political climate surrounding nuclear power and the current challenge to construct a solution for long-term nuclear waste storage, Škoda’s main research and manufacturing is in storage casks. We were shown designs some potential cask designs and were able to see how current casks designs were made at the manufacturing plant.

After the tours, we drove over to the Pilsner Urquell brewery and museum, where the first pilsner was brewed more than a century ago! We had lunch at the restaurant on site (I recommend the goulash!) and then went on the tour through the brewery.

**Cool Factor:** 5/5 (contingent on my personal fascination with heavy machinery and beer)  
**New Things Learned:** 4/5  
**Tiredness Rating:** 1/5 (Got more ZZZzs on the bus!)
Highlights: As an engineering nerd and beer connoisseur, today was probably my favorite day so far. The machinery at the manufacturing plants were really awesome to see in action, and of course the pilsner was delicious.

Day 6- Saturday- Experiments at the VR-1 Reactor

Today was our first day to actually run experiments in the reactor. This morning’s experiments focused on radiation detection—for alpha, beta, and gamma radiation. We learned about the different types of detectors and how they work. Then we were able to use different radioactive sources, the detectors, and shielding methods to create our own experiments. The experiment I designed and carried out was to determine how well different materials and different thicknesses of each material shielded against beta and gamma radiation.

This afternoon, we went on a tour of Prague Castle, one of the most beautiful sites in Prague. The department bought our tickets to go through the main cathedral and the plaza. Then another student and I decided to pay for the extra ticket to climb 33 flights of stairs to the top of the highest tower. The climb was exhausting but the view was unbelievable.

Cool Factor: 4/5
New Things Learned: 4/5
Tiredness Rating: 1/5

Highlights: Late in the evening, I met up with some friends from Germany and we booked a reservation at the Hemingway Bar. Named after the famous author, the bar is known for their intricate drink presentations. I got a gin-based drink called the Magic Moment. Super beautiful and really good! Highly recommend!

Day 7- Sunday- Free Day

Today was our first full day off, so naturally I had to spend the day in the city! I walked around the Lesser Quarters in the morning and met up with my friends again for lunch at an amazing Czech restaurant called Lokál U Bílé kuželky. After lunch, I walked back across Charles Bridge to Old Prague, where I met up with some friends and fellow students at the Astronomical Clock. In Old Prague I also finally saw the Church of Our Lady Before Tyn, a site that I’ve been wanting to see for a long time. Both architectural structures are stunning, and a must-see during any time off.

We spent the rest of the afternoon at a couple of antique shops, which yielded really cool historical finds. If you’re not a fan of run-of-the-mill souvenir shops, I would highly recommend finding some local antique shops and digging through the treasures! I learned about a famous Czech ceramic artist and bought one of his pieces as a souvenir for my significant other.

Cool Factor: 4/5
New Things Learned: 2/5
Tiredness Rating: 1/5
Highlights: I highly recommend eating at “Lokál U Bílé kuželky”, if you want really good Czech food! It’s on the Prague Castle side of the Charles Bridge, and I would recommend ordering the fried cheese. Seriously it’s amazing. Pro tip: get there before noon to beat the crazy rush.

Day 8-9- Monday- Tuesday- Back at the Reactor

We went back to the reactor hall from Monday to Wednesday to conduct real experiments with the reactor! Each day started with a couple hours of lecture. First, we would review some of the basic physics principles behind the experiments that we would conduct in the late morning or afternoon. The experiments we ran ranged from measuring neutron flux to monitoring the decay rate of irradiated materials. While the lectures were interesting and very informative, it was the experiments that really solidified the physics concepts by demonstrating how these principles play out in the real world. Another topic was radiation safety, where a couple of the students got to put on full protective gear that radiation workers use when changing the fuel or doing repairs in the reactor core!

Cool Factor: 4/5
New Things Learned: 5/5
Tiredness Rating: 1/5

Highlights: While these days might be tedious or difficult for those who are not huge fans of science, I personally had so much fun each day at the reactor. Pro tip: when the reactor staff ask for volunteers, raise your hand! They often choose you to do cool things with the reactor: you get more hands-on experience and it helps you stay awake through the long day!

Day 10- Wednesday- Running the Reactor!

Most of us awoke this morning with an extra pep in our step, because we knew we’d finally get to operate the reactor today! First thing in the morning, they divided us into two groups of 6 and 7, so that each person would be able to have ample time to operate the reactor. I was in the group that first went upstairs to run an experiment on Neutron Activation Analysis. This technique uses the unique neutron signatures from irradiated materials to determine what the material is composed of. Here’s an awesome video (from the staff at the VR-1 reactor at CTU!) explaining how it works.

After lunch, our group had our turn operating the reactor. I went last, so I had the chance to increase the power, decrease the power, then manually reset the “safety threshold” to shut down the reactor. While it sounds complicated, the staff were really helpful and fun during the process and did a great job explaining what was going on in the reactor as we controlled it. Also...how many people get to say that they’ve operated a nuclear reactor??

Cool Factor: 5/5
New Things Learned: 5/5
Tiredness Rating: 0/5

Highlights: These past few days are the [nuclear] core of the whole program (see what I did there?), and the reason why most of us wanted to participate in this practicum. Running experiments on the reactor and even getting to operate it are opportunities that are so rare
and valuable for nonproliferation policy students! If none of the previous days convinced you to consider the practicum, I hope this last one did.

**Day 11- Thursday-**

We spent this morning having one last class in the reactor hall. This one was on safeguards compliance and where the nuclear waste and other sensitive material is stored in the reactor hall.

Then in the afternoon, we went back to the original classroom to participate in course evaluation where we were able to talk to Dr. Moore, the reactor staff, and Judy, the coordinator, about all the pros and cons about the practicum.

Then after a long but awesome couple of weeks in Prague, we took a train to Vienna.

**Cool Factor: 3/5**

**New Things Learned: 3/5**

**Tiredness Rating: 2/5**

**Highlights:** I can’t reiterate how great the CTU staff is, both in terms of teaching difficult material, accommodating students with little to no science background, and being so receptive to feedback about how to improve their courses for the future. I really wish I had the opportunity to spend more time here!

**Day 12- Friday- IAEA and CTBTO**

We walked from our hotel to the Vienna International Center (VIC), which was only a 10-minute walk away. Here we met up with Judy, the coordinator who helped put together the whole practicum program, and received our guest badges for the day. We then walked through the courtyard where every country’s flag is arranged in a regal half-circle below the modern skyscrapers. I quickly noted that the massive and queenly buildings perfectly portray the gargantuan missions of the United Nations, International Atomic Energy Agency (IAEA), Comprehensive Test Ban Treaty Organization (CTBTO), and other organizations that they house.

We traveled though several large halls to find the correct elevators (yes, there are many, many sets of elevators) that took us up to the 23rd floor. Judy led us into a conference room where we would receive presentations for most of the day. The presentations ranged from the roles and mission of the IAEA to the future of the CTBTO and visiting the International Data Center (IDC).

**Cool Factor: 2/5**

**New Things Learned: 3/5**

**Tiredness Rating: 2/5**

**Highlights:** As policy students, most of us yearn to work at an international organization like the IAEA or the CTBTO. Talking to my fellow students, we all felt that spending at least one day at the VIC gave us a glimpse into what a workday at an IO is really like, and really confirmed for many of us that this is the career path we want to pursue!
I came into the practicum expecting to learn a lot, but I couldn’t imagine how much I would actually learn and how much fun I would have learning it! Having the opportunity to run experiments and operate a nuclear reactor was phenomenal, not only for the chance to say we were able to do such a cool thing, but more importantly for us as policy students to develop a clear understanding of the physics principles behind nuclear nonproliferation issues. I would like to thank Judy Vishniauskas for coming up with the idea and bringing it to life, to Dr. George Moore for his fantastic class on nuclear reactors and chaperoning us on the trip, Dr. Lubomir Sklenkla for hosting us at his program in Prague, to all the CTU staff for the great lectures and spending the time to explain difficult concepts to non-science students, and to all of the aforementioned people for creating this truly unique and amazing opportunity for us.