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Final Report for the ATRIUM 3D Summer School

Arrival

I spent most of my time travelling from Germany to Vienna, then Brno, learning a bit about the history of The Czech Republic and basic phrases I thought that were absolutely important in order to navigate at least a small amount of everyday life. While I learned that “Ahoj” was used just like “Hi”, where in Germany it is commonly associated with maritime contexts of greeting (and pirates), other phrases I deemed important were “Dobri Den” (“Good Day”), “Nashledanou” (“Goodbye”), Djekuji (“Thank you”) Prominitje (“I am sorry / Excuse me”), “Ano” (“Yes)”, Ne (“No”). Putting much effort into that felt quite reassuring for me, considering I had never been to The Czech Republic before.

When I finally arrived in Brno and got out of the train, I was quite afraid it was the wrong place because I saw no sign saying “Brno” but only signs that said “hlavní nadrazí”. That was certainly not the city I had planned on visiting! On the other hand, I had studied the stations before quite cautiously, there was no way I had made a mistake… I had to ask someone. After approaching a person standing close by, I was not the least bit surprised when I forgot every single word I had taken the time to practice beforehand. Instead, I started the conversation with a good old “Excuse me, do you speak English?”, as a tourist (and someone that had not taken the time to learn at least a little bit of Czech) would have done. In the course of that conversation I found out that, thankfully, it actually was Brno. Furthermore, I had now learned a little bit more Czech, as I was told that “hlavní nadrazí” just meant “main station”.

After having had quite a turbulent arrival in Brno that included problems with getting into the apartment I rented because I had received the wrong keys and had been given a chip that was not working, things still worked out very well for me. I got to know both the security staff working directly opposite of the rented apartment whom I conversed with using more gestures than words and also met a resident, who was – much to my luck – leaving the apartment just as I was standing in front of the building door which neither I, nor the security staff were able to open with the instructions given by the host.

The resident that came out just as we were rocking and shaking the door frantically, did not only fortunately speak English fluently, she also was very helpful and polite, immediately providing me with options to reach someone living in the building, should I want to leave and reenter (which, of course I would have needed to do only on the next day). Not only that, but she also went out of her way with her errands and made sure I got in my apartment in the end. In Germany we say „Glück im Unglück” about a situation like this and I think that sums it up pretty neatly.

I was very glad however, after everything worked out and I was given the correct keys to be so close to the university and excited to meet the entire ARUB-Team and the other invitees on the next day.

Day 1

Before this Summer School, I had already learned the basic processes concerning SfM. I had been taught both the way photographs of objects needed to be taken and also how to use the images in a program in order to generate the 3D model. In my case, the program I had used was Metashape.

Coming in with this experience, I could outline three main goals for myself. The first being to refresh my already existing knowledge, the second one was getting more practice in the processes mentioned above and lastly, and most importantly, deepening what I knew with methods of other archaeologists and professionals regarding this topic.

I had already assumed that the processes might be different to the way I had learned, which was a further source of motivation. The more different approaches I know, the better I can adapt to different situations that require creative thinking processes.

What's even more, I can piece together the ways that work best for me. In addition to this great opportunity, I was also allowed to get to know the city of Brno that turned out to be very beautiful with its unique sights, atmosphere and of course, the people I got to know.

With that, the first day had started! We were greeted very cordially and even received a small bag which I assumed would contain things we would need for the Summer School and our work but it turned out to be small gifts!

The first session began with introductions which were very nice to situate oneself among the other invitees regarding the specialisation and interests one had.

After that, we started a rather technical session, learning how to take the pictures and what SfM actually was and how it worked. First, we were shown that the main technique used for SfM was triangulation and overlapping images. Control Points make it easier for the program to recognise the same points on different images. Overlapping images on the other hand are the most important aspect of SfM and generating a 3D object requires complementing the information of each image with that of a second one. I especially liked the heavy focus on the knowledge of the background functionalities. As one of our presenters said, we cannot rely on a device, we have to be the brain – and in order to do that, we need to understand the processes behind it – an approach I agree with very strongly.

What I also found to be very interesting is to use a turntable for objects – the way I had learned it, we circled around the object itself in order to take the images later required for the 3D object. It actually does make sense to use a turntable for many reasons.

First one being comfort and space: with a turntable, you don't need as much space as you would without one. Walking around the object of course requires the platform the object is placed on to be moved away from a wall. Furthermore, with the specific settings that were picked for the aperture to get the correct area looking sharp in the images, walking around the object would make the process a little more complicated as the same distance from all sides would be needed to take the pictures in the best way. Also, it's not very comfortable to walk around the object after each picture is taken. This makes using both a tripod more difficult and thus limits what would be possible adaptations for the shutter speed – especially when the lighting circumstances change.

The second reason as to why the turntable is much more practical is the lighting: Lighting is a very important factor for taking pictures, as under different circumstances there are not only differences in how specific object details are made visible but also in how the colours are displayed – depending on how much light hits the object – or depending on how soft or hard the light is. With a turntable, the light source stays the same no matter the side that is being taking a picture of. Walking around the object will at some point either lead to standing in between the object and the light source, thus throwing shadows – or lead to more work as the light source must be moved and placed differently in order to

avoid this. It will also be a lot easier for later processing if – once the optimal lighting conditions are created – they stayed the same for each image that is taken afterwards.

These insights were very valuable, as SfM can be a very tiring and time-consuming process – decreasing the difficulties decreases barriers that in other cases would narrow down the ways SfM could be used.

The second topic of the first day was 3D-scanning and we were shown the parallels between the two methods and approaches. Both being viable choices, it was made clear that for the most time it is a question depending on many factors whether to use 3D-scanning or SfM. Factors in this decision are mostly the availability of 3D-scanning devices and of course, the monetary restrictions on equipment choices possible. After the first section of the day was finished, we had a lunch break on which we followed up with the second section of the day. This time, the topic was to understand the basics of photography as tomorrow we would be on the field, taking our own pictures in order to use them for generating our own 3D images.

Thus, we learned the basics of the exposure triangle and what to look for when manually setting the ISO, Shutter Speed and Aperture. Of course, there were also much more information given, such as what lens to use and how the focal length of the lens affects our images.

After this, Lenka Starková, who couldn't make it to our session in person, held a lecture online and gave us a presentation on Photogrammetry, LiDAR, and HBIM in Archaeology and Heritage Care. With her being mainly focused on Middle Eastern Archaeology, she showed us the different methods that were used on the Erbil excavation project, namely Laser Scanning, Aerial and Ground photogrammetry and finally, photographic documentation.

What I found to be even more valuable than her approaches and in-depth explanations in these processes were actually two different topics of her presentation. The first of those was the platform HBIM which has the 3D model as its main focus and connects all the information around it. This sparked my interest especially because I had already many contact points with having so much different data connected to excavations or 3D projects without really being able to put them together in a way that all the information felt connected. I knew where the data was and how to access it but seeing how great the advances could be regarding the way archaeologists document the past, I was very glad to see those kinds of improvements also in respect to how the data was structured to relate to other data.

Another topic was the inclusion of local workers in the working process as a way to both improve upon their knowledge and make archaeology more inclusive. I agree with the notion of responsibility we have as archaeologists that excavate foreign places to disseminate both the knowledge attained during and the knowledge already given before the projects are carried out. I believe that inclusion has a very important effect on the democratisation of science that should not be neglected but rather built and improved upon.

The final topic that was very insightful was the processes that precede the actual project, namely the planning phase. I was very glad to have received a glance into what it means to work for stakeholders with specific interests who may or may not have a grasp on how much data such projects include. Lenka Starková for example mentioned in this context a quote that basically said "Give me all the data. I want everything." as something the stakeholders might ask for – without really knowing what they are going to be confronted with once they have the raw data. Talking to the stakeholders and other instances included in the project on what the project objectives are on grounds of what is possible, the time limitation that functions as a frame for those possibilities and the clarification on what is actually deliverable really put in perspective the different factors that must be regarded when working in such environments.

I think it's important for every specialist in every field to always be able to step out of their perspective every once in a while. Being grounded in your knowledge does mean that you'll see a lot of specifics

others with lesser experience might miss out on but being stuck in it might also lead to situations in which you'll lack a communication basis with people who will necessarily have a different attitude or interest in the same aspects of the work. That's why the presentation was very helpful to clarify that aspect and even give leads on how the communication could be approached / started.

Concluding this day, we had a nice get together at the university, where we could get to know each other a little bit better. It was also very nice to see that we all had a different background both regarding the fields we worked in and the knowledge we had on SfM and 3D modelling in general.

I stayed until 8:15 PM, whereafter I went back to the place I had rented up until Sunday. I was happy that I would be able to just go to sleep and start the next day much fresher than today. So, I walked back to the apartment, used the new keys I had received, and the door just opened! What a refreshing experience considering what was the case yesterday. So, I used the elevator to get to the flat, walked down the stairs to get to the apartment door, input the code and …. The door just replied, in an automated, pre-recorded message: "Security lock engaged. Access denied." I couldn't believe what I had just heard. I tried again. – "Security lock engaged. Access denied." I looked up whether I had put in a wrong code but that was not the case.

The absurdity of the situation struck me more deeply than the disappointment I experienced after having had such a long day without being able to get in the apartment – again. In the end, I was very calm even though I was annoyed. I called up the host and was told he'd call back in an hour, as he was still working. That meant that I was stuck in front of the door for the next hour.

The hour I was going to spend would be the same, whether I was frustrated or planning for alternatives. Best to make use of the time, then. So, I explored different possibilities, as I did not really mean to stay at this place anymore. After talking to the others in the group I quickly was offered the opportunity to stay at the university, much to my luck! So, the plan was clear: get in, take my stuff and move out. Simple enough.

When the host finally appeared and tried opening the door with the code, he was met with the same problem as me. I didn't talk much. I just waited and observed. In the end, he asked me why the door was not opening.

Needless to say, I didn't have that much of a response to that. When he finally then produced another key after another keycard and chip both didn't work and handed it to me, I declined politely. He could keep his keys; I just wanted to get my things and leave. After some attempts at trying to convince me otherwise and strangely, trying to find out where I would go, he switched to trying to make it up to me. I thankfully declined again, as I just wanted to leave.

After having packed everything together, I gave him back his keys and left for the university, where I was greeted and asked, what had happened. Cutting the story short, I just said that I had received the wrong key, a non-working chip and today the code for the door did not work. It was very ironic, after these words, to receive a chip from my new host that would open the outer door. We laughed both about the situation, whereafter I arranged my luggage and went to bed in order to start the next day.

Day 2

On this day, we went to the Cathedral of St. Peter and St. Paul, located in the city center, we were taught how to take the picture according to the methods and principles we had heard and were taught about the day before. This hands-on experience was very helpful to situate the knowledge in direct practice. We were shown both the techniques via which the pictures needed to be taken and the specifics of the objects we were photographing – the requirements that needed to be met and the factors that were actually not important. For example, it was not important to take pictures of the entire wall and the structure above the wall inscriptions as we did neither have a drone or a pole that went high enough to make a model out of that – nor did we require one, as the wall inscriptions were the focus of interest. On the field, it is not only important to know what to do but also – from a workflow perspective – what is obsolete, unimportant or simply time consuming.

We took the pictures as instructed, had a short lunch break in the city center and then returned to the university to get to work on the processing steps.

We worked with RealityScan, a software I was not familiar with before. I was quite happy to get to know it. RealityScan required more work than what I had experienced in Metashape but I was glad about the extra work, as I had the feeling that I had more control over what I was doing and what happened step by step.

Creating your own control points after having drafted the alignment and defining the distance between different control points we set in the scene ourselves was a very rewarding task. Getting to know the work in these deep specifics taught me very much in regard to preparing the object and environment I wanted to create a 3D model of. Aligning the images only after this step and setting the reconstruction region, tilting the object and setting the ground plane was more intuitive than what I had seen in Metashape, wherein you can only shift the center point of the camera, not the object itself, which always felt weird and gave me slight motion sickness. Furthermore, I had more control over the perspective I had on the object and could move much more freely using the camera as compared to Metashape, in which the gizmo moved the view, not the object. It felt a lot more restrictive and annoying to do it that way.

Following the step-by-step instructions and taking notes along the way made the process very insightful and easy to do. It also gave me a good understanding for what is required to create a good model.

What I liked most about the contents shown to us was how the polygon count could be reduced to have smaller data size while on the other hand keeping the texture as accurate and sharp as possible.

The results of this workflow step were very fascinating, as it became clear that the most details were made from the texture, not the number of polygons. We used models that had little depth in them, as we were doing the models for wall inscriptions. Whether this holds true for 3D models with more depth and to what degree, that still needs to be explored.

Day 3

This day commenced with information about the different types of 3D scanners that are available and their specific advantages and disadvantages. We were also introduced to a non-reflective coating spray that could be used for objects that have reflective surfaces. These kinds of objects normally make the photogrammetry a lot more difficult and has also been something I was struggling with in an attempt at creating 3D models of lithic artifacts. I was very excited to see it in action. Different than on the day before, today we were going to repeat the SfM process with smaller artifacts. After the presentations and the break that followed, we started working on taking the pictures of the artifacts we chose in our respective groups.

A little bit too motivated, maybe, our group picked an artifact that was a replica with different kind of sections made specifically to practice the difficult parts of SfM. The replica was pottery that had different kinds of surfaces on it: a hole, different colourings on different parts, some of them the result of simulated restorations, other parts were darker than the rest… This object was made to cause difficulties that required specific ways of treating the object and the conditions under which the images would be taken… basically, as a practice template to be able to solve each and every problem. In the end, we took too many pictures – and us being quite new to SfM – later on opted for images that were provided to us that we could work with.

I was very glad about this option as the following steps would have been rather difficult to carry out with the images of the specific replica we had picked. In the end, everything worked out nicely.

What I especially liked about the lessons that were shown today was that we were taught how two different sides of an object could be put together into one model using the exported depth masks of the respective sides. Having followed the steps from yesterday's lesson, this was very easy to understand and follow through. The result was still very surprising: RealityScan actually managed to merge different shards together by analysing how they would overlap.

Day 4

On this day, Jiri Unger gave a presentation on how information can be designed and modelled in a way that makes it more interesting and engaging – even for non-archaeologists.

He not only showcased detailed plans of models but also how animations can be part of information dissemination. Moving through a model of a city and finishing in top-view from where the city planning foundations and the reconstructions made on top of that are shown is a lot more intuitive and easier to understand than having that information separated. He also made cuts in the models so that a side view was possible which was very insightful. With one glance you could both see the layers around and beneath the excavated part and how the archaeological features were situated in the pit. What's even more, he also used animations that showed how those reconstructed, possible models of archaeological remnants might have been constructed back in the time they were built.

In these animations, among many different showcasings of which only one will be mentioned here, wooden logs moved into different spaces, rested on each other, pits were dug out of which both the depth and the area were shown according to the features. Finally, those areas and even furniture was placed according to interpretations. An example for this can be seen one of the videos he published1 while his webpage portfolio offers even more links to animations.2

The work of Jiri Unger convinced me that archaeology holds so much more potential when compared to the information we are used to being shown on excavations and floorplans. While it was interesting even for me to see and grasp the information and how elements of the past might have looked like, I cannot stop thinking about how much more meaningful these kinds of animations might be for non-archaeologists or those that are not familiar with it.

Having worked in rescue archaeology, these thoughts extend even beyond the museum context towards landlords and construction companies that tend to get quite impatient when excavation projects take longer than what they expected or wished for. This is mainly due to the fact that landlords and excavation companies only see us carefully digging out pits and assume all we do is hope to "find things" and think that, if we don't find something, the excavation was useless or wasted time. While finding archaeological artefacts might be an interesting part of the work, another part that is equally, if not even more important, is to understand the contexts of the features and the way they relate to one another.

If I look at archaeological work from the eyes of a non-archaeologists, I wouldn't see either, why features as a whole would be important and assume all archaeologists did was excavate and hope to find interesting objects. With the animations though, it becomes quite easy to understand why features that in our time and world on excavations look simply uninteresting, much more if there is no artefact in them, are actually quite important. I think that these kinds of animations can bridge a lot of the gaps that exist between what non-archaeologists think archaeology is about and what archaeology actually is concerned with.

I also enjoyed very much how he took the time to answer questions concerning the requirements to create such experiences for specific audiences. It really put into perspective how easy or difficult it would be to work on such projects on our own which I appreciated a lot.

In the presentation of Martin Kostal, I came across the term "Virtual Archaeology" for the first time and was also happy about the possibility to explore that more in depth after the Summer School ended. He also presented to us the workflow and the thought processes that went into his reconstruction of

[1] Unger, J. (2022) https://www.youtube.com/watch?v=25TdtxpEZ9M – minute 3:10 and onward (accessed on 11th of October 2025; 14:22)

[2] https://www.jiri-unger.cz/portfolio/ (accessed on 11th of October 2025; 14:23)

Castle Blansek. I liked the fact that it was very technical and went in-depth about the methods he used and how they were applied.

After that followed the presentation of Simon Radchenko who was working with Archaic, an NGO focused on preserving and protecting cultural heritage. He gave a lot of insights into topics that normally would not come to mind when thinking about working with SfM, 3D modelling and what this work might mean for individuals on an everyday basis.

The project he was working on was focused on what Lena Starková had also presented in her talk what I had named the democratisation of science: making the methodologies available to non-archaeologists. His interest went towards giving participants of all backgrounds tools and methods for working with SfM and creating models. The important thing about this was that the participants received only the tools and the guidance, they were not "forced" or taught that there was only one way of doing it "right", only one way of going about the projects.

With the war going on in Ukraine, this was quite a different perspective on the importance of archaeological work. He explained how he sparked communal creativity in the projects and made it possible for participants to define the priorities of their own projects, also defining the terms and methods of digitization. He also said that cultural heritage is an institution, not just a pile of objects. It is primarily the people who preserve, protect and study the artifacts.

With this focus shifted from objects to the people and the way they go about documenting the past, it made sense as to opening up the possibility for people to have their own projects, priorities and the way they would go about digitizing the cultural heritage. He also mentioned that next to the documentation of cultural heritage and its preservation via SfM, this project was important in an everyday aspect for the people participating.

It deepened their interest and kept it high for a long time, as well. He even said that it was of enough importance to open up the possibility for the participants to go out and scan the objects and work on that without being bombarded, attacked… and have a different way to live their everyday lives. This is a perspective on the matter that would not have arisen in other ways – that archaeological heritage work could have these benefits and taught me that what we do can have a greater impact beyond a scientific one.

Day 5

On this day – being the final one – we were shown RTI, had two open lectures about CloudCompare and Blender, the way those programs worked and what could be done with them. Parallel to that, we were also able to start our own projects. I picked an axe replica that Mr. Nosek provided, and we went to work with our former group to take the images of the axe in order to generate the 3D model.

We had quite the nice setup for that, using once again a turntable and also the non-reflective coating spray that was presented to us before. I was very excited to be able to finally use it. I also had learned a lot about the workflow and since we were shown the specifics steps needed to merge two sides of an object so the model is whole, I could apply that knowledge to the working process whilst I was taking pictures.

That meant that beforehand, I considered how many angles I would be taking pictures of and how many there would be in the end if I added them all together. We decided on approximately 15 images for every angle of the axe, as not only were we going to take images of two different angles for one side but also have that side sprayed with the coating, resulting in the end in 4 perspectives on one side – of which two would have the axe with the spray and the other two have the axe without the spray.

In the end, we would have less than 100 images for the entirety of the axe, which I deemed sufficient.

Considering that on the attempt before – the one with the replica pottery – we had 354, which was a total overkill in that regard, I was curious to see what the result would be like.

Taking the pictures was a very comfortable task, as we had set up our light the way we considered was best – using the turntable, a tripod and a background that was offering a high contrast. As we went along with taking the pictures, we also changed the way the camera would save the images in different folders. So, for each perspective, I deemed it best to have 1 folder, since later on we would export the mask for each side (and perspective / coated and non-coated) and put them together. This was a very important learning experience for me, as I had understood how the program works beforehand and needed to consider the steps that were best for the task at hand. It was nice to realise that the information was already taking root, being implemented for the processes involved. This is exactly what I was hoping to learn. Having a frame of knowledge as a vantagepoint for optimising workflows.

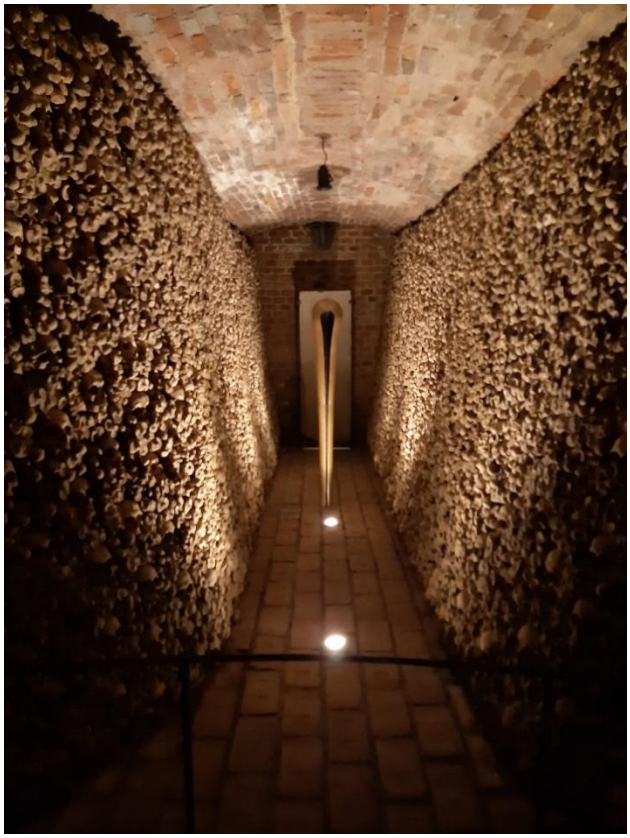
With the images being finished, I then turned to using RealityScan and much to my dismay realised I didn't have an Invidia Graphics Card installed and was – unfortunately – left to doing it on my computer at home. I had not realised this because on past days we used the laptop of another attendee I was in the groups with. With that, the further steps would need to be done at a different time.

Since most of the other attendees were either packing their things up or preparing to go into the city to have their final evening before leaving on Saturday morning, I thought it'd be best to just join them and continue the work when I returned back home.

In the course of the day, we went to a restaurant closeby, took pictures together that we were not going to use to 3D model but rather keep as reminders to the beautiful time we had in Brno. We later on went into a souvenir shop in the city center to get even more keepsakes. In the evening, there was quite the event with a lot of different foods that could be purchased. We sat down together and celebrated the fact that we met such a fun group of people, hoping that in the future we'd stay connected.

Day 6

This is the day most of the people had already left either in the morning or would in the afternoon. I booked my ticket for Sunday, which mean that I had another entire day to see Brno. I decided to visit the St James Ossuary.



It was a very fascinating installation. Considering they had only used 15% of the total amount of people who were buried there, even that amount seemed enormous due to the fact that they had stacked the skulls and other human bones on top of each other, until entire walls were to be seen.

It does make quite the difference, if you think about it. Reading about a number on an information sheet is one thing – seeing the amount of the dead stacked in rows on top and next to each other, having their remains presented before you until they form an entire corridor is something different entirely. This installation really showcased what it means to "experiencing" numbers and went a very fascinating way of displaying them.

There was also a column of skulls and bones and even a pit filled to the brim with them, kept behind a glass case. I took a picture of those, too. But the rest I will leave to the curiosity of those that have not went to Brno yet. It really is worth a visit.

During the time I toured the ossuary, I also came across stone tablets with inscriptions in old German, which I naturally tried to decipher. It worked quite well, considering how old they were. It was just towards the end that I realised that every stone tablet had an information sign next to it where the text was copied so you wouldn't have to read it on the old stone.

After I was done there, I was looking for further places to explore and visited the tourist centre – something I maybe should have done on the first day or should've thought about earlier to plan specific things. On the other hand, I had quite the troubles on the first two days with the place I had rented and the amount of sleep I was missing, so it's only natural I had no time for that. Also, maybe it was not the

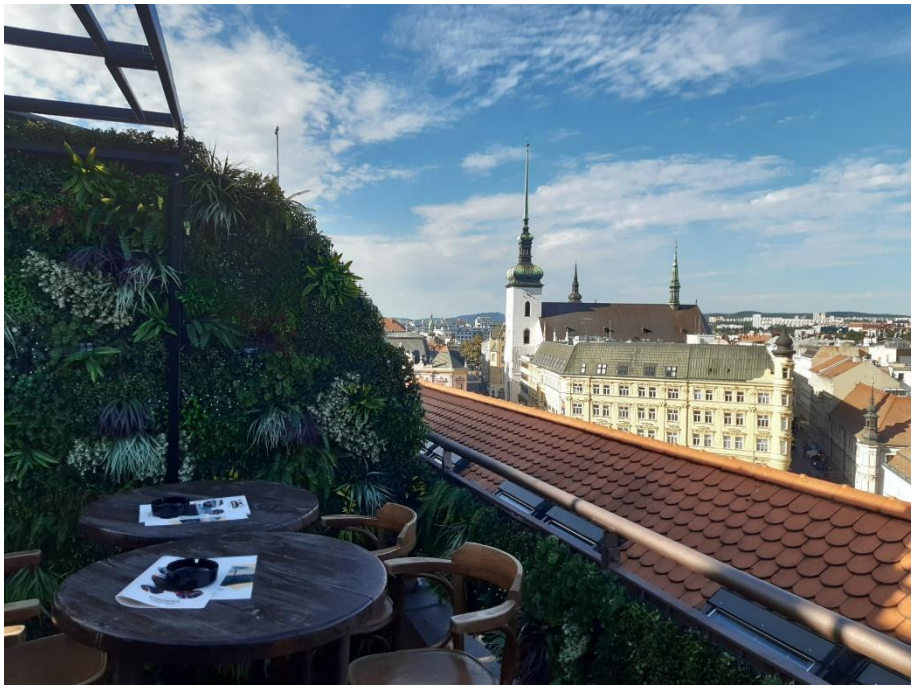
last time coming to Brno. After that, I roamed the streets and had some food. Interestingly, I had already heard from the locals that the food always was served with soup. The place I went to on that day followed that tradition and it was quite nice and interesting to have it like that. Finishing up, I was again looking for sights of the city and stumbled upon a rooftop bar. I assumed that the sight on top of that would be quite amazing and I was not wrong.

I first went into the building, where a doorman was sitting at the counter. I asked him about the rooftop bar, and he told me there was no rooftop bar here. I showed him the name on the mobile phone, which he did not recognise. Not even the fact that it was the correct address seemed to change his mind on that. The bar was not here. I pointed upstairs, asked again in English, even tried to use a translator to say it in Czech – much to my dismay, he held on to the fact that it was the wrong place and added that it was closed. I wondered, of course – how can a Rooftop bar be closed when it's not even there?

So, I went out back on the street, saw a sign claiming it was open until the night, and went back in. This time showing him the picture. I don't know what had changed for him but suddenly he said I could just go upstairs, and the bar was there – and pointed to the elevators other people had used before me.

I was very glad about being persistent in a way I normally never am. It was an interesting experience to make and soon I would see that it was totally worth it.

The sky was very clear and the sun shone nicely on that day.



One level lower to the image before, there were these tables set next to a very green wall that looked very cozy. From here, I could see the streets I had walked on when I was below.

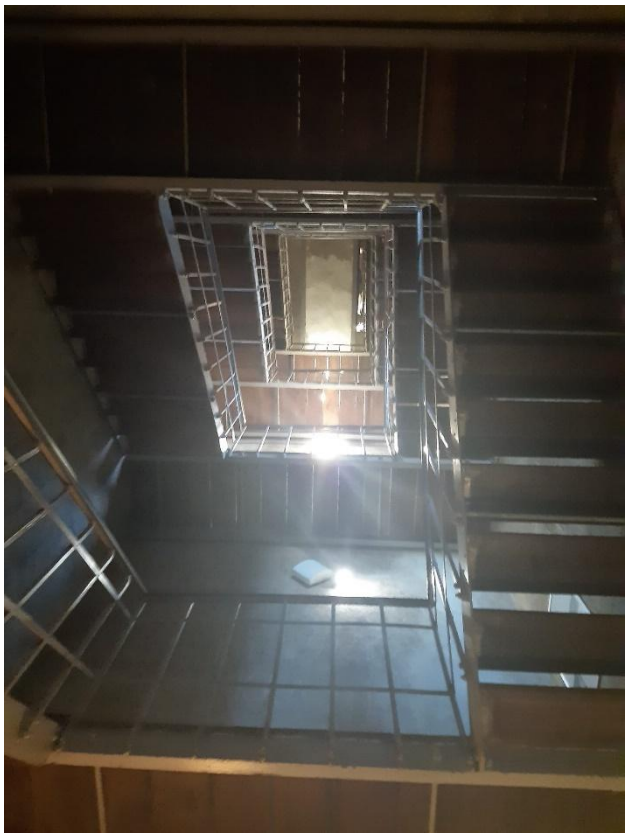
This is where I took a seat, in the end. I stayed for quite some time, enjoying the view, reflecting upon the past days whilst having a drink.

While I was sitting there, looking at the cathedral we had visited on the second day, I realised that I had never went up and wondered, if it would still be possible.

I decided to pay it a visit and see what it's like inside, after having seen and taken pictures of the exterior.

When I got to the cathedral, there was almost no one there. It made me wonder if I was either too late or whether this was normal for Brno. After walking around the cathedral, I saw an open door which I entered. I came across an altar that was behind a glass door. It looked magnificent. There was only a sign that forbade taking pictures. I was considering going inside, but in the end opted for the spiral

staircase to my left. I started climbing it and climbing that many small but steep steps, I thought I must have went up quite high, which I did. It was only when I got to a cash register with a cashier upstairs that I saw some windows that proved I was higher up than I assumed I was. To my right, there was an entrance to the artifacts of this cathedral and above me there was a staircase that led to the top part of the cathedral.



This is the stairway I gazed up at. It made me dizzy and shaky just thinking about going up. After all, I was afraid of heights. So, I did what every other sane person would have done in my situation.

I bought some tickets to go upstairs.

While I paid, I was told we didn't have much time, which of course didn't help with the nervosity. But then again, I was going to experience my fear soon, anyway. What's a little more nervosity going to change?

Going up the stairs was much more daunting of a task than I thought it would be. I realised that the wooden planks the staircase and steps were made of had a lot of room in between the steps and always a little space between the platform parts that went just straight on one level. Perfect for a see-through experience to find out how high it was. Also, it made the entire experience feel a bit shakier. I focused on only going one step at a time and locking every thought out except for just walking the next step.

It was a very interesting experience to have so consciously and deliberate in my mind to ignore so much and focus on so little. In the end, it worked quite nicely. When I reached the top, I had the slightly nauseating realisation that I had to climb the stairs down again. Best not to think about it – I thought.

I enjoyed very little of the view I had upstairs. How many times was it that I either read or heard of people advertising the thrills they had overcoming their fears, arguing that after they reached their aim, everything became so crystal clear, and they had the feeling of having grown beyond them and all the other romanticising one could fit into such sentences…

I felt none of those romanticised feelings of conquered fears, as I was still scared standing at the balcony that allowed for a sight over the entire city.

I was too busy leaning my entire weight against the wall, always holding some part of the cathedral that I was absolutely sure it wouldn't break off.

Considering I was on a cathedral that already stood for centuries, that might have been quite a lot of spaces. But of course, in my head it was very little. I tried to enjoy the view anyways.

But it's strange how my memory is even warped from the state of fear I was in. Had I not taken the picture, I'd just be remembering the balustrade.

In the end, I took some pictures of which I am glad they weren't too shaky and realised there was another balcony. I hadn't come to just look at one! After all, I had paid the full price.

So, I went to the other one, too.

This view seemed more familiar. Some of the sights in front of me had been visible from another perspective – namely from the rooftop bar.

I could have taken some time to try and pinpoint the exact place the rooftop bar was to be seen from here, but alas – the height got to me.

This time, I had an even smaller area to stand on compared to the other balcony. There was only one step to walk out – and me being a little taller than the average person, the balustrade felt frighteningly low.

So, I took this picture not even standing on the balcony but rather the entrance to it.

After all, I could look for the rooftop bar on this picture at home – to me, it was only important to do that whilst standing on firm ground again.

Now for the descent! As much as I would have liked to take a picture of that, I really didn't know how much time I had left – and having to hurry up during the more difficult part of descending the stairs is something I'd rather avoid as much as possible. In addition to that, taking a picture of how far it really leads down would have, let's say, not helped regarding my fear of heights. So, this time I focused my attention on the wall opposite of me and went down the stairs step by step, careful to never look down. That too worked nicely.

I had quite seldomly been so happy to see a cash register and of course, the cashier I didn't really know. I realised that my ticket included the small exhibition of the cathedral, as well. I asked him, if there was still time to see it. He glanced at his watch, then at me and replied with "10 minutes". 10 minutes being better than no minutes at all, I decided to go in and have a look. I was not allowed to take any images of the exhibited objects. He explained that the sensors reacted to cameras and set off an alarm – and that it was an obsolete, old alarm system that needed renewing.

I didn't really understand how exactly those sensors might be working, nor had I ever heard of anything like that. In my mind, I assumed that he maybe told me a lie he tells children as well, so they don't

question his “no” but just comply with it. To me, it didn’t really matter which one it was, as I just wanted to see the exhibition and not take any pictures anyway. Also, it mattered more to me to respect the rules that were set for me and other visitors.

With that being said, I can’t really say much about the objects. All of them had information signs in Czech (or English ones hidden somewhere). I read some of the inscriptions on the objects that were written in Latin and puzzled together as much as I could from there. I looked around for 7 minutes and before I wanted to go, wanted to talk to the cashier again – but sadly he just replied “I really need you to go right now” and that was the end of that conversation, even though I had left even a little earlier to ask him some questions. He probably was done for today.

When I finally was standing on firm ground again, I went around the cathedral, I saw another entrance that led to the nave of the cathedral. It was quite beautiful inside and I was impressed seeing the architecture and the murals. The High Altar was only visible from far away, as it had been closed off for sermons and services. I took some moments in front of each mural to get a feeling for the stories that are displayed on them. I was considering whether they had been made in such a fashion that even atheists like me would be able to understand the depictions on it. While I understood some (at least I think I did), many things must have eluded me, as well. Mostly because I knew nothing about the symbols that were displayed and probably had a lot of meaning I just had no knowledge of.

Later, a group of tourists came in, made the sign of the cross and then commenced with breaking the silence with the clackings of their photo cameras and mobile phones with the volume turned on. They walked to the murals I had started at, pausing at each for a second or two to take a photo and then continue. The same thing happened in front of the High Altar and then continued the right side. Their entire visit only took about 5 minutes. I considered that to be a little weird. Me being an atheist, I of course didn’t have that much of a deep connection to any religion. But I always thought that religious people considered cathedrals and churches to be “houses” of god – and in that context, I would have expected them to a show a little more respect to their god. There must be some difference between the way I view a cathedral and the way they viewed it, I thought. And I always assumed that religious people would be more mindful. Maybe it cannot be really said from this short visit and they do a lot more during other activities. Another thing is maybe that me being a non-religious person projected too much into what it means to be religious? It’s also possible that they had very little time and were on a tight schedule – I could neither know, nor form an opinion due to the small amount of information I had.

After I was done, I left the cathedral as well. I was quite tired from the amount of sightseeing I had done on this day, so I was ready to go home and pack my things up for departing tomorrow. I walked my way to the next station while the sun was setting and wondered, when would be the next time that I’d be standing here and walking through the streets of beautiful Brno.

Epilogue

The 3D Summer School in Brno was a complete success in my eyes. When I rethink what I had written in my application, all aspects have been successfully attended to and even surpassed in ways I didn't really expect they would.

I improved my workflow by having attained a deeper understanding of the things that need to be considered before taking the images. Lighting conditions and how to improve upon them – where to put Measure points and why, what to look out for when picking the object I was going to work on… these are some technical aspects of the direct process. Even apart from that, creating different folders during the fieldwork (of taking images) that allow for easier processes during the time working with the program to create the 3D model (and when to do that and why) is something that I think I would have figured out very late (if I would have, at all), had I not benefitted from the shared knowledge of the presenters.

Working with RealityScan also taught me a lot about things I think I would have overlooked otherwise. How a mask differs from the actual model (and how that difference can matter during model creation), the selection and creation of Control Points to help the program align the images (and scale them correctly), seeing how the texture impacts the way a model looks much stronger than the number of vertices and the model itself… those were some of the things I wouldn't have known had I not learned about it in the Summer School.

The knowledge I attained there, of course extended beyond the Summer School. After I got back home, I started working on some other projects and kept learning about specifics I was not sure how to make work. Having the basis of knowledge the Summer School provided, understanding and implementing the newly learned content was fairly easy and it reduced the time I would in the future require to learn something new, drastically.

I especially liked the implementation of a Blender basics course in the Summer School as well – showing how we could rework models and the textures to use them for other purposes. As I had stated in my application, I am very interested in using this knowledge beyond my master thesis even for digitalising museums. This aim became much more real thanks to the all the information we received in the course of the past days. It even got me so far as to start a retopology in Blender after I created the 3D model for the artifact, once I got home – one of the projects I started working on. The number of vertices the final SfM models have, are quite big. This needs to be optimised in order for the digital artifacts to be used in different contexts. One cannot create a well-functioning virtual experience of a museum or any virtual exhibition if the models are so big that they would crash either the program or lead to performance issues. Trying to balance the level of detail with the size of the data and vertices is something I am excited about being able to optimise and look forward to the things I will learn in that regard.

I was also very impressed by the bronze axe and knife replica Mr. Nosek brought for the course. The level of detail was amazing, considering it was made using an imprint of a 3D printed SfM model in a special casing that, after it hardened, turned into the mold he then poured the bronze in. I was quite impressed by this piece he created, as the level of detail was amazing, as well. There were small incisions and lines on the replica that were so fine-grained it took me some time to be convinced it was actually a replica. I am also very excited to find out how this method fares in comparison to printing the 3D model and having an AR overlay on top of it. Which one is more cost and time efficient to do for museums and other projects? Which one is more insightful and feels more "real"? These are all questions that were sparked which I am very thankful for.

I can even imagine how these objects – being 3D printed or bronze replicas could be used in gamified context for children to have an interactive experience with artefacts of the past and started considering, what those interactions would look like and how they could be made to work. With Archaeology being

a science that is mainly concerned with the materiality of objects, I think this step is especially important to both evoke interest, as to maintain it.

Finally, I can confirm what I had written in the application: that in visiting the summer school, I would see myself being in a much better disposition to make experiences and projects such as mentioned above, available for a wide range of people and have a greater influence on how archaeology might be displayed, known and finally, experienced by non-archaeologists, as well.