PENN IN THE ALPS 2018

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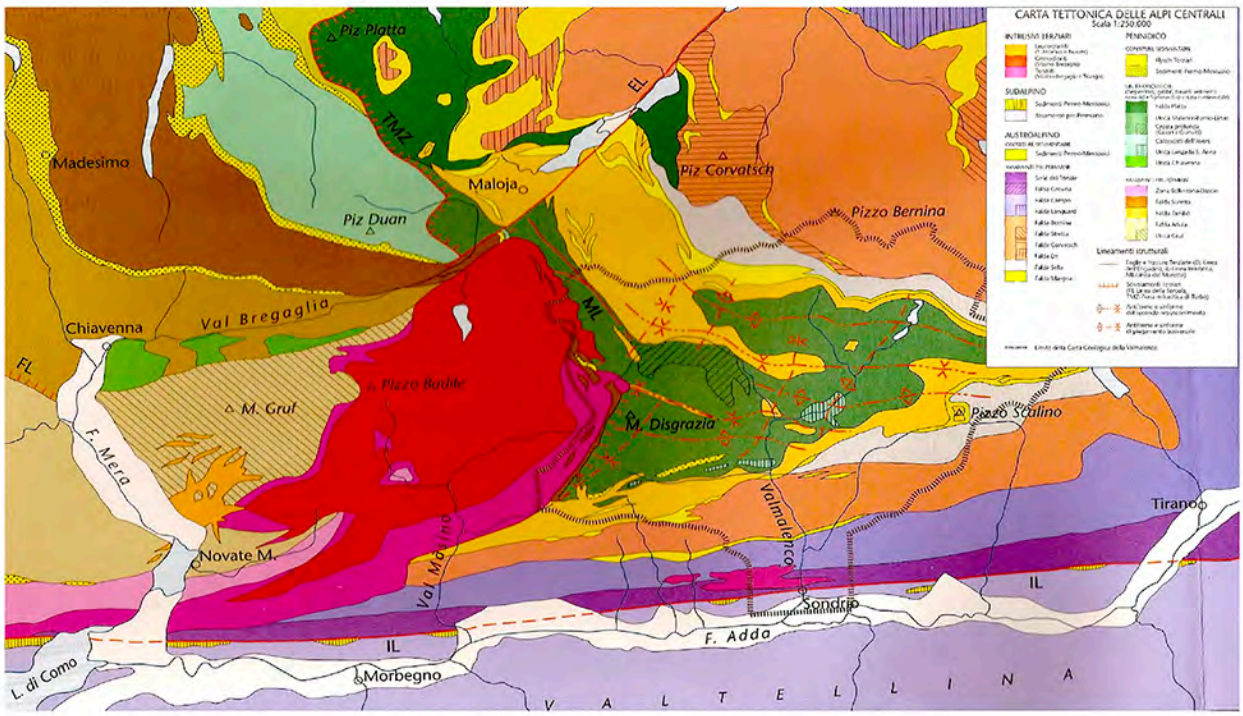
(Cover image) In front of Monte Disgrazia, Valmalenco, Italy. Photo credit: Steffi Eger

Approaching the Morteratsch glacier near Pontresina, Switzerland. Teia, Gabby, Zoe and Jeff in the foreground. Photo credit: Steffi Eger

CARTA TETTONICA DELLE ALPI CENTRALI



Tratto dalla Carta geologica della Valmalenco (A. Montrasio, V. Trommsdorf - Edizioni Lyasis- Sondrio)

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Tectonic overview from *Carta Geologica della Valmalenco*. Data contributed by Reto Gieré. Published by Lyasis Edizioni, Sondrio, 2004

Foreword

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In the late summer of 2018, fifteen students, one intrepid van driver, and one native Alpine expert set out on a twelve-day hiking expedition across the Swiss and Italian Alps. This journey marked the third year that Dr. Reto Gieré has led students on a geological, historical, and gustatorial tour of his home. As a geology course, Penn in the Alps takes an ecological approach on the study of Alpine culture. Lectures range from topics on Earth sciences to Alpine folk instruments, while emphasizing the interdependence between the natural environment and human livelihood. The following pages present each student's research paper on a selected aspect of the Alps or the Earth entire. The second part of the book contains their diary entries, in which each author shares their own gelato-permeated experience.

Hiking through the Cardinello Gorge near Montespluga, Italy. Photo credit: Reto Gieré

The Diaries

Castello di Montebello, Bellinzona, Switzerland. Photo credit: Steffi Eger

Driving in the Alps
Steffi Eger

The adrenaline rush lit up the nerves in my spine and careened down into my fingertips. I had just stomped on the brake pedal a bit harder than I meant to -- still not quite used to the sensitivity of that pedal in the van. I apologized (again) to my passengers for the sudden jolt, but we were all grateful that the oncoming car merely meters away from the front bumper was now backing up down the single-lane, windy mountain road along which we were driving. I released the brake and crept forward, hugging the rising cliff-side of the road while leaving a bit of breathing room between the van and the drop-off side where the river snaked along the floor of the valley. From this distance above the river, it is difficult to judge our height -- depth perception with no sense of scale can really mess with one's brain -- a phenomenon of which my passengers were more acutely aware than I at that moment. When the reversing car finally reached a wider pull-off, the driver scooted into an alcove while I waved a "Thank-you" and drove past him just barely clearing his bumper. And then I breathed again. Yup! Driving in the mountains is a rush, indeed! This scenario happened over and over again through the days of following Reto around the Alps as we shepherded the students by van from one place to another. And I loved every minute of it! Well, maybe I did not love the moment when the motorcycle zoomed around the van just as the oncoming traffic reached my front bumper forcing me to choose between clipping the motorcycle's rear wheel or scrubbing up against the guardrail as I tried in vain to give the bike more space on the already maxed-out road. I would rather not do that again. But the puzzle of combining trajectory and speed to move smoothly around the myriad hairpin turns and blind corners gave my spatially-driven brain days and days of enjoyment and fulfillment.

Several passes over which we drove held serpentine roads with more hairpin turns than I could estimate. Moving up the mountains was a slow grind which often found me in first and second gears on the corners. The left-hand turns were easy enough for me to sight on my own, but the right-hand turns were often completely blind from the driver's seat. These corners called for teamwork from the other front-seat occupants. Grace sat in the passenger seat at the window and acted as my eyes on those blind corners. As we approached such a turn, I would ask Grace if we were clear, and she would answer. I would then move ahead or stop based on her answer. The conversations went something like this:

(Moving up into a right-hand hairpin), "Grace, how are we looking over there?"

"You're all clear!" (I drive up around the corner).

(Thirty seconds later at the next right-hand turn), "Grace, anything coming?"

"Nope, you got it!" (Drive around the corner).

(Forty seconds later), "Grace, are we clear?"

"Hang on, there's a car coming!"

(Brake hard to stop before the corner. Everyone holds their breath while the oncoming car squeaks by with only inches to spare and we continue up the mountain.)

(Thirty seconds later), "Grace, how's it look?"

"You're good!" (Drive on).

(Sixty seconds later), "Grace?"

"Ummmm, a bus! How is that bus making these corners?"

(Jam on the brakes. All stare in awe as the tour bus glides past us along the impossibly narrow corner and rolls on down the road).

Over and over and over and over again up one side of a mountain and down the other side. Mountain after mountain after mountain. I wish that we had counted the turns on at least one of the passes -- I'll definitely count next time I'm there.

I love road trips, and I love driving. Driving through spectacular scenery is pure joy for me…even though I often feel like I am only able to get a sense of the grandeur of the landscape out of my periphery while still trying to keep my eyes on the road. Our Penn in the Alps 2018 trip was a pinnacle in my international driving experience. There will never be another road trip quite like this one with my van group in "Jumpy, the Party Van"!

Descending from Munt Pers, Engadine, Switzerland. Lisa (left) and Maggie (right). Photo credit: Steffi Eger

Arrival in Zurich, Switzerland

Freya Zhou

The first day of class began as everyone met at Hotel St. Josef (Figure 1) at 2 pm, a lovely three-story house not far away from the Zurich Main Station. After check-in, Reto led the group on a small "hike" up to the plaza in front of the Swiss Federal Institute of Technology (ETH). Some of us were already sweating and panting when climbing up the stairs, having no idea of the physical challenges that would await us in the days to come. Nevertheless, our minds were soon taken away by the breathtaking view of Zurich from the plaza (Figure 2), and we took advantage of it by taking photos with the old town in the background.

Fig.1 View of Hotel St. Josef at Night

Fig.2 View of Zurich from the Plaza in Front of ETH

The group regathered as Reto gave us a lecture on the history of Switzerland and Zurich. Switzerland has 26 cantons, similar to states in the U.S., and its capital is Bern, a small city in the Northwest. Since Swiss universities are state-owned, higher education is easily accessible to most citizens, and Swiss institutions such as the ETH attract students and scholars from all over the world. Switzerland has four official languages: German, French, Italian, and Romansh, which is only spoken by less than 1% of the country's population. Although the German written language in Switzerland is largely the same as that in Germany (except the use of "ss" instead of "ß"), the spoken language is completely different from standard German (Hochdeutsch). Native speakers from Germany often have great difficulty understanding the Swiss German dialect. Reto surprised everyone by mastering English and all four national languages of Switzerland.

Switzerland's political system is unique among modern nations in that all citizens directly decide on the implementation of laws proposed by the government by voting for or against referenda. This direct democracy allows citizens control over a wide range of affairs. For instance, Switzerland is not part of the European Union despite its location in the center of Europe because the referendum in favor of it has been voted down for three times. This decision is grounded in Switzerland's long history of independence and neutrality in times of conflict: no major battles were fought in Switzerland during WWII. Interestingly, the referendum that aimed to abolish mandatory military service for men was overwhelmingly rejected for the third time in 2013. In light of Switzerland's favorable health insurance policies and high salary levels, citizens of other European countries, especially those from Italy and Germany, often choose to work here.

As the largest city of Switzerland, Zurich is simultaneously the capital of the canton of Zurich and a world-renowned commercial and research center. Due to low tax rates and lax legal regulations, international corporations, such as Google and IBM, often set their headquarters and research labs in Zurich. However, Zurich's strategic importance has already been known since ancient times as foreign powers consistently fought for control over this transportation hub. Settlement in the town began in 1500 BCE, and the city was later conquered by invading Roman troupes in 15 BCE. This victory was hard-earned, as crossing the Swiss Alps proved to be a major challenge for Roman military. Zurich remained under Roman rule until 400 CE, when the Alemannic tribes invaded. The powerful Carolingian dynasty transformed Zurich into an important base within its empire in the eighth century. In 1218, Zurich became an imperial city with its own government. The abbess of the Fraumünster Church, having the rank of duchess, became the ruler of the city, acquiring the power to mint coins, collect tolls, and hold markets. However, the influence of the abbess slowly waned in the mid-fourteenth century, as her authority was successfully challenged by the newly arisen guilds. Representing the common people, guilds are powerful organizations with their own meeting houses (Figure 3) and flags (Figure 4) in the Middle Ages. Nowadays, they house boutiques and high-end restaurants. In 1351, Zurich joined the Swiss Confederacy. The city remained in relative tranquility until Napoleon crossed the Alps and invaded Switzerland in 1798, and French ascendancy replaced guild rule around 1800. Modern Switzerland was born in 1848 as Zurich voted in favor of the federal constitutions.

Fig.3 Guild House

Fig.4 Guild Flag of Zunfthaus zur Schmiden

After the short lecture, we headed towards one of the city's landmarks, the Grossmünster Church (Figure 5), walking by the University of Zurich (Figure 6) en route. The streets were particularly crowded as over a million tourists came to Zurich to participate in the 27th Street Parade (Figure 7), which is held in every August to demonstrate love, peace, freedom, and tolerance.

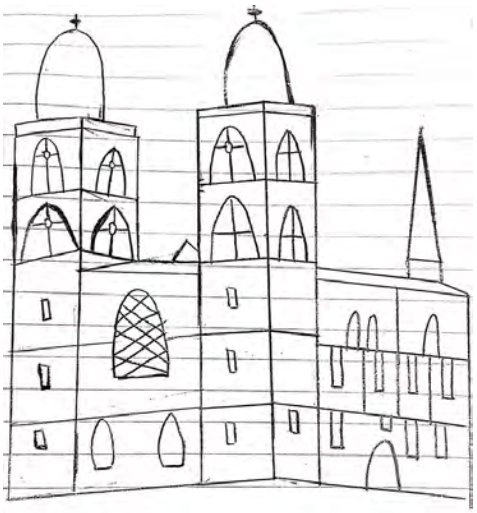

Fig.5 Hand Drawing of the Grossmünster

Fig.6 University of Zurich

Fig.7 Crowded Street with Tourists Attending the Street Parade

Fig.8 Statue of Charlemagne

The Grossmünster Church is closely tied to the history of Zurich. According to the legend, Felix and Regula, patron saints of Zurich, were decapitated by the Romans in 286 CE. After their execution at the site where the Wasserkirche is now located, they miraculously picked up their heads, walked forty steps uphill to the present site of the Grossmünster, and died after praying. The Grossmünster was later commissioned around 800 by Charlemagne, emperor of the Holy Roman Empire, after his horse fell to its knees in front of the graves of Felix and Regula. A large statue of Charlemagne (Figure 8) is preserved at the crypt of the Grossmünster, the oldest part of the church, to protect it from deterioration. Another figure important to the history of the Grossmünster is Huldrych Zwingli, leader of the Reformation in Switzerland. As the pastor of the Grossmünster Church, he preached on reform of the Catholic Church in 1519. Each week, Zwingli translated a new section of the Old Testament in the Grossmünster and a section of the New Testament in the Fraumünster Church. Consequently, the plaza in front of the Grossmünster is named Zwingliplatz (Figure 10). The rounded, Romanesque-style arches of the church are directly in contrast to the pointed, Gothic-style arches of the Fraumünster. After learning about the legendary history of the Grossmünster, we spent half an hour exploring the church, and some of us paid 3 francs to visit the tower.

Fig.9 Paintings in the Crypt of the Grossmünster

Fig.10 Our Group Standing on Zwingliplatz

We then crossed the Limmat River (Figure 11), a tributary of the Rhein, to visit the Fraumünster Church. The sapphire-blue water of the Limmat is so crystal clear that it became a paradise of the swans (Figure 12). Reto told us that the Pennsylvania Dutch actually originated in Switzerland and speak a dialect of German. They were only misnamed because they passed through Holland on their way to the U.S. The ubiquitous water fountains (Figure 13) on the streets provide pedestrians with handy potable water.

Fig.11 Limmat River

Fig.12 Swans

Fig.13 Water Fountain

One of the oldest religious buildings in Zurich, the Fraumünster (Figure 14) was founded in 853 and handed over by the abbess to the city of Zurich in 1524, after the Reformation. The church is most famous for its color-stained glass windows depicting the Book of Genesis. The paintings were created by the then ninety-year-old French artist Marc Chagall and funded by the Zurich couple Lou and Heinrich Hatt-Bucher, who preferred to remain anonymous at that time. In addition, the Fraumünster also houses the third-largest church organ in Switzerland, with the longest pipe reaching ten meters and the shortest only four centimeters. The crypt museum under the choir contains a multimedia exhibition that illustrates the history of the Fraumünster, the Reformation, and the city of Zurich.

Fig.14 Clock Tower of the Fraumünster Church

Fig.15 Clock Tower of St. Peter's Church

The last church that we visited was St. Peter's Church. It is the first baroque church after the Reformation, with an opulent architectural style. As one of the four main churches of Zurich besides the Grossmünster and the Fraumünster, St. Peter's Church earned its status through its church clock (Figure 15), which is the largest in Europe. Unfortunately, the church was closed on August 11, and we were not able to see its interior.

After completing the city tour, we were given a chance to buy lunch for the next three days at Coop, Switzerland's largest supermarket chain. Swiss law prohibits the use of genetically modified products. The Swiss people further plan a referendum that would prohibit the use of pesticides, thus minimizing food contamination. Most of us chose to purchase bread, meat or fish, cheese, crackers, chocolates, fruits, and orange juice after exploring the store. We then came back to our hotel to take a short break. At the end of our first day, we were rewarded with a three-course meal at a vegetarian restaurant in ShopVille (Figure 16). The charming sunset, delicious food, and lively speech together made the beginning of our 12-day trip unforgettable.

Fig.16 Three-Course Meal at ShopVille

Driving via Ruinalta, Viamala, and Zillis to Montespluga

Grace Johnson

Dear Diary,

It's the second day of our Alps trip! We woke up in Zürich at Hotel St. Josef and ate breakfast at the hotel. It was a typical European breakfast full of croissants, coffee, meats and cheeses. Of course, there were plenty of jams, cereals, fruit and bread as well. Everyone ate their fill and piled into vans excited to begin our Alps adventure. No one knew what to expect or what was planned for our day except the fact that we would spend the night at Albergo (Hotel) Vittoria in Montespluga, Italy.

We climbed into the vans for our first time. Basically, the first group of people out of the hotel rode in Reto's white van with their luggage and everyone else (including me) rode in Steffi's black van. Sydney later named the black van Albert, he was a Citroen Jumpy. Sydney quickly discovered how to work the van's stereo and we had tunes playing in no time.

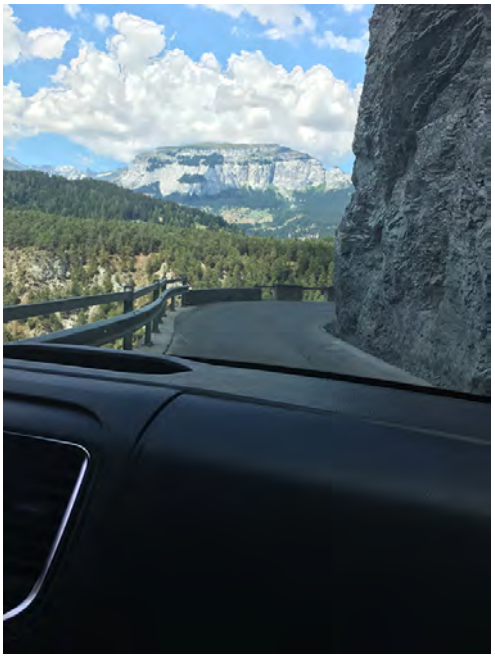

Fig.1 The drive to the first hike

About an hour into the journey, Reto pulled off the road. It was my first experience at a European rest stop. Who knew that you had to pay for the toilet?! Fortunately, the money spent on the toilet provided you a coupon to use in the store, so it encouraged your business for use of the facilities. The rest stop was in "Heidi-Land" and even had some goats on display! After using my coupon on a bottle of iced caffè latte, we all climbed into the vans and hit the road again on our adventure.

After driving for another hour, Reto stopped on the side of the road again. He had navigated from the highway to an exit, driving on progressively narrower and narrower roads. The last big town we passed was Chur. This was our first experience on a winding and twisting road where the side dropped straight off a cliff. Steffi drove the road like a pro, following until Reto pulled to a gravel patch on the side. We were near Flims. It was our first hike of the trip! Reto told us that all we would only need was our notebooks and it was not the main hike of the day. We still slathered on sunscreen. Before the hike began Reto pointed out some chamois, our first glimpse of Alpine fauna. As we climbed the trail, it began to test my fear of heights. On one side the ground dropped off and on the other side the mountain climbed higher. We quickly reached the top of the mountain and a nice bench sitting area. Reto began our first lecture using the beautiful view for a visual aid.

Fig.2 Valley with the Chamois

Fig. 3 The Rhine Canyon

Fig.4 Reto Lecturing

He started by pointing out that our stop at the rest area looked across at the mountains of Liechtenstein and briefly explained that country's similarity to Switzerland as a tax haven in the European Union. Reto began to discuss the reason for our hike. First, the area we were looking at was the Rhine Canyon and the Rhaetian Railway which is an UNESCO world heritage site. It was an overlook of the Rhine River in the lower lands. The overlook also viewed world class ski mountains (that Reto has skied and 'taught' skiing to students). Reto also pointed out cable car stations on the tops of mountains. Most importantly, it is the site of the world's largest landslide. The reason this landslide occurred was the retreating of the glaciers after the last ice age (about 2 Million to 11 thousand years ago). The layering of the rock is parallel to the valley. Because of the warming of the Earth and the loss of stability in the permafrost, the ground loses cohesion and starts sliding. Due to the warming process, the permafrost is constantly disappearing. This makes maintaining the skiing in the area very expensive and tedious. The repairs are both costly and difficult.

Fig.5 Meandering curve

After the world's largest landslide, the valley was full of debris. Eventually, the Rhine River carved a new path through the valley. This was the first evidence that rocks are soft. Scientists also know the forest is younger than the landslide in the area. The landslide was a natural behavior of the mountain, as well as a natural barrier in the mountain range. This is shown culturally by the fact Romansh is spoken upstream of the landslide and

German is spoken downstream. This geographic divide has independently created pockets of both language and culture. Additional landslides occur during and after big rain storms following a period of no rain. The fast saturation of the land leads to sliding. As a result of modern technology, there are alarm systems in place. Due to the use of these alarm systems, the last landslide in the area resulted in no locals dying. Just one tourist died because of not listening to the locals. Landslide insurance is an option in these areas but is expensive. There are now zones that are off-limits to construction and areas that were once safe are no longer safe. People need permission from the local government before they build.

Fig.6 The Flims Landslide

Further discussion of the Rhine revealed how the Rhine was able to carve itself through the landslide debris. Reto described how rivers are snake-like and meander with curves. On one side of a river, the water carves the debris and on the other the debris collects, making the snake-like curves

The second reason for examining the valley was the evidence of a specific fault, known as the Glarus Fault. It is world famous and a model of it is displayed in the Natural History Museum in New York City. This fault is a horizontal line that could be seen by the rocks above which are 250 Million years old and those below which are only 50 Million years old. This fault occurrence was different because typically the younger rock is above the older rock. In this case, the top was pushed higher by the underlying younger rocks. Scientists are able to determine the relative age by dating fossils found in the rocks. The fault is a result of plate tectonics as well as the African plate colliding with the European plate roughly 100 Million years ago. This fault line was active until approximately 30 Million years ago and is now considered no longer active.

A lake nearby was created by the landslide, which acted like a dam for the Rhine river. Since then, however, the lake has disappeared because the Rhine carved the canyon through the landslide material. Reto pointed this out as the blue patch in the packet of maps he provided to all of us on the first day of class. At the same time, he also pointed out that the red patches on the same map were the recent landslides in the area. Toward the end of the lecture, a train passed below in the valley. Reto pointed out that trains are both important transportation in the area as well as providing a UNESCO tourist excursion for the site.

Fig. 7 UNESCO tourist train in the Rhine Canyon

Fig.8 Tunnel built into cliff to protect against sliding rocks

After the lecture, we hiked back down the hill to the vans and drove back along the narrow, winding roads to the main highway. The next stop was the planned main hike of the day. We knew we would hike down first and return later by climbing up the hill. Reto told us it was an “easy” hike for our first day. After the next exit, a few switchbacks later and through a small town, Reto pulled over to the side. We had arrived at our main hike for the day. We did not fully comprehend what we were getting ourselves into on this hike. The first stop was an overlook into the valley that we would hike down into shortly. With Reto in the front and Steffi at the back, the group set off down into the valley. Reto set the pace and the group confidently followed. After stopping a few times, we finally reached the river at the bottom of the valley.

Everyone commenced photoshoots, stone skipping, and water drinking. We ate the lunches we purchased at the Coop in Zurich yesterday. We all felt great, but little did we realize what was planned after lunch. Reto spoke about the blocks of rock atop the rock pillars. He claimed the block acted as a roof for the pillar. We were able to see the differences in the rock material. The rock on the beach was very homogeneous and the rock from landslides was very heterogeneous. The rock of landslides is heterogeneous because of the landslide happening very quickly. Reto called our attention to the muddy areas where the water had risen during a storm and mentioned that thunderstorms are very violent after a drought. Therefore, Reto advised, it is never a good idea to camp in a riverbed because water

Fig.9 View at the beginning of the main hike

levels in a river can rise rapidly within minutes! It was a hot day, and fortunately Reto said that we could fill our water bottles with the river water, so we would have water for the hike back uphill. We waved to a few groups white-water kayaking and rafting, which looked like the perfect activity for the hot day.

Fig.10 Rock acting as a roof on a rock pillar

Fig.11 Flat part of hike back to the vans

Boy oh boy! The hike up was something to remember. Reto kept a brisk pace almost the entire way, only stopping twice. It was reassuring to hear the whole groups' breathing increase as we went up the side of the valley. At the top, people began to question how the rest of the trip was going to be, considering Reto's definition of "easy". At the top of the hill, some students attempted to fill their water bottles with the dribble that was coming from a spout and others snapped pictures of the valley they had just hiked. After attempting to cool down as much as possible, we all climbed back into the vans.

A beautiful drive brought us to Zillis. One van slept on the way and the other enjoyed the view as we drove. Before entering the Church of St. Martin in Zillis, the main attraction, Freya gave the first presentation of the trip. She introduced the church and the context of what we would be examining inside. The church is coined "The Sistine of the Alps" as a result of its beautifully painted ceiling. The paintings are 12th century Romanesque and were probably done by a local artist. The church started out as a Carolingian Church that was built at the same time that the Gross Münster in Zurich was erected by Charlemagne. The church was primarily used by those who had survived the Viamala Gorge, a daunting section of Roman road built to cross the Alps. The church is primarily known for its Romanesque

paintings and architecture. There is a fresco on the west face of the church of Saint Christopher, the patron saint of travelers. Due to the paintings inside, the church is a huge asset to maintain but completely worth the extensive effort. The architecture is unique because the choir area of the church is Gothic and the church itself is Romanesque. This clearly shows how it was built in pieces and at different time periods.

Fig.12 Church of St. Martin in Zillis

Fig.13 Romanesque paintings on the church's ceiling

Fig.14 St. Christopher

Following our visit to the church itself, we walked to the church's museum. After reviewing the exhibit, Reto had arranged a movie to be played about the museum for our group. We were very fortunate that the movie was shown in English. It reiterated many of the points made by Freya and provided some additional information. Following our featured presentation and quick restroom break, we were back in the vans.

Fig.15 Part of the group in the Museum

Backtracking on our drive just a tad, we stopped at the Viamala Gorge. This perspective showed the reason why people would stop at the church and pray after their treacherous trek through the gorge. It was such a spectacle to see with many natural features like folding, potholes and erosion. Many flights of stairs down and many flights of stairs up provided many different viewpoints of the gorge. It was great to see the Roman figures on the side of the cliff to truly grasp the danger involved in the journey. This was our last official stop for the day.

Fig.16 Viamala Gorge

Fig.17 Pothole in the gorge

Fig.18 Rock folding in the gorge

Leaving the gorge, it was on to Montespluga in Italy. Many switchbacks along the route provided a difficult drive with many beautiful views. Reto surprised everyone with a stop on the Switzerland-Italy border. We took photos with the 'Italia' sign and ran back and forth across the border. It was certainly a wonderful experience. A few mountain bikers had a good laugh at the excitement of our group. Little did we know how close we were to Montespluga.

Just a few switchbacks down the other side of the mountain we just climbed, we arrived in Montespluga. Montespluga is a town of summer residents, an inn and a few restaurants, definitely much smaller than Zurich. But the small family inn we entered was inviting, warm, and smelled wonderful. We checked into our rooms and prepared for dinner.

Fig.19 View as we drove up the mountain

Dinner was an amazing, and I mean AMAZING, meal. The blueberry gnocchi were out of this world as well as the fresh local meat, polenta, and wine. It all paired so beautifully together. After a dessert of tiramisu and local wild blueberries, a group of us strolled outside. The stars in the night sky were so clear. We could hear the cows in the valley coming in for the night with their delightful cowbells. We wandered out onto a jetty in the Lake of Montespluga. It was nice to see the group becoming more social and opening up to one another. It is truly remarkable what one day can do. I hope one day to return to this beautiful area of the Alps.

Best,
Grace Johnson

Fig.20 ITALY!

Fig.21 Descent into Montespluga

Hiking through Valle Cardinello, driving to Chiavenna

Eliza Koren

Today, I woke up in Italy. Specifically, the group is staying in Montespluga, a small town nestled at the base of the Alps; the visual of high peaks all around me as I stand in a cobbled street truly takes my breath away. The picturesque quality of the view stands in stark contrast to the disappointing quality of the Wi-Fi. Fortunately, the internet connection was not needed to hold my attention; we began our morning with a hike down the Cardinello Gorge, and the beauty of the thick morning fog as it settled over grassy crags kept me raptly engaged with my surroundings. Well, the fog and the goats.

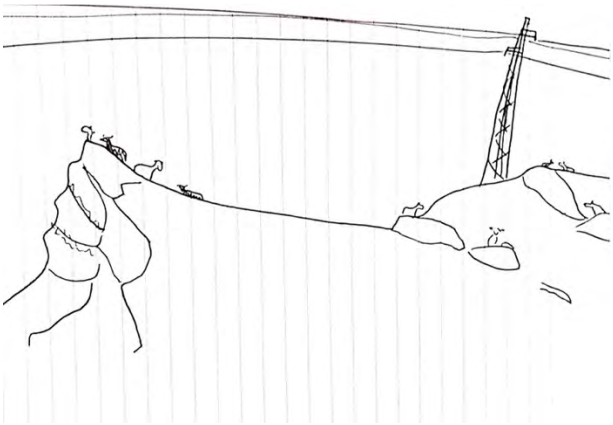

Fig.1 A highly detailed drawing I completed of the goats we saw.

Fig.2 A picture of the same goats beautifully depicted in the above photograph, from a different perspective. I love goats.

As we descended, most of my brain power went towards trying to absorb every detail of the view while also paying enough attention to my feet that I would not trip and tragically fall off the side of the mountain. It was a tough balance, but worth the effort; while managing not to die, I simultaneously was able to observe the several notable landmarks that Professor Reto pointed out. First, an artificial lake came into view, one of many man-made lakes that could be found throughout Italy. Often, these lakes were built by Mussolini ("before he became very mean", as Professor Reto put it). Soon after the lakes faded from view, Professor Reto pointed out an interesting tree: a conifer with needles that fall in the winter. As he spoke he encouraged the group to touch its unexpectedly soft needles. When it was my turn to reach forward, I was suddenly struck with an intense wave of disbelief; in what life was it possible for me to be learning about a soft Alpine tree that I could actually feel with my own hands? In Italy? With my own hands? In *Italy*?

Fig.3 The deciduous conifer pointed out by Professor Reto. It was super soft.

I didn't have long to spiral into existential gratitude. Soon, the group continued its descent. As we followed the narrow trail, additional small wonders popped up: a blueberry bush picked clean by other hikers, the chance to sample sweet Alpine raspberries, an up-close view of a mosaic of bright orange and white lichen. We came to a rest where the gorge finally became a valley, and we heard a presentation about the history and adaptation of human settlement and agriculture in the Alps. Professor Reto followed up the student's lecture with a few additional comments, pointing out that the path we were walking was likely the same path Napoleon's Army once took, albeit in far less treacherous conditions. His words made me feel like I was part of history for a moment. We also learned that much like the farm-to-table movement in the USA, Italy has its own movement, "chilometro zero", or the concept that food should be locally sourced and travel zero kilometers. Before we rose from the rocks we had come to rest on, Professor Reto noted that the Cardinello Gorge was part of the much larger Via Spluga and a continuation of the Via Mala that we had visited yesterday. I dorkily smiled to hear how purposefully connected every aspect of our trip was shaping up to be.

When the break was over we attempted to continue moving down the valley towards the tiny collection of houses where we would eat lunch. However, we soon hit a roadblock...

Fig.4 The roadblock.

The robust cow seemed incredibly reluctant to allow our passage but eventually sauntered aside to join her friends, the tinkle of her cowbell in merry juxtaposition to the grumpiness of her gait. Much like goats, I love cows. Moving past the grazers, we finally entered the village, Rasdeglia. The timing was perfect; as soon as we had reached shelter, the skies opened up. Tucked out of the rainstorm, we heard another presentation, this time about Alpine architecture. We had the huge fortune of hearing this presentation in front of a prime example of that same Alpine architecture we were learning about. Again, I was taken aback by just how incredibly cool this experience was. In what life do I get to hear a presentation about gorgeous Alpine architecture while *sitting in the shelter created by an example* of gorgeous Alpine architecture?

Fig.5 The house we saw as we heard about Alpine Architecture

After the presentation we walked around the village a bit, stopping to appreciate some of the features we had just learned about: stone roofs, small windows, wooden beams. Then, the part everyone really looked forward to: lunch. After we had finished eating we began our ascent, taking advantage of the rain's transformation into a slight drizzle. We again passed the blueberry bushes and took a moment to appreciate that these blueberry bushes were probably the same ones that had been used to create the blueberry gnocchi we had eaten last night. It was becoming ridiculous how cool it was to see how connected all the aspects of our trip were to each other.

The drizzle once more became rain, but wet, tired, and happy, I summited the mountain, crawled into the van, and napped until we reached our next destination, Chiavenna. This Italian town was larger than the town we just left but no less cozy. In the free time we had before dinner I took advantage of its superior Wi-Fi and watched a few episodes of Brooklyn 99. In a content stupor that was the product of a mix between a long, hard hike and Netflix, I prepared myself to eat only a little bit of that night's dinner. After all, I was ready to sleep and had been snacking all day. Ah, sweet innocence.

I gorged myself at dinner, particularly enjoying a gnocchi dish that I only discovered was a gnocchi dish after digging through a thick layer of melted local cheese. I believe the platter they gave us was meant for sharing, but I unashamedly report that I ate all of it. After dinner, the restaurant gifted us with permission to go down to their alcohol cellar where we were able to sample some of the libations that they made in-house. Sipping the sharp liquid, I was tempted to again ask myself in what life this experience was possible. I stopped myself. The answer was obvious and incredible: this life.

Fig.6 The multi-course menu from the restaurant where we ate.

Chiavenna

Caroline Curran

Fig.1 The courtyard and colonnade of San Lorenzo Cathedral.

For our first full day in Chiavenna, we met at the San Lorenzo Cathedral around nine in the morning. First, we learned about the history of Chiavenna, a peaceful Alpine town that served as a transport hub due to its pivotal location at the intersection of two Roman Roads, which brought travelers through the Valle Spluga and Val Bregaglia. The quaint beauty of the town can be partially attributed to the involvement of artist Michelangelo in Chiavenna's city plan.

The San Lorenzo Cathedral was built in the sixteenth century (although origins of the parish date back to the fifth century CE) as a post-Reformation Catholic church. Architecturally, the Cathedral exhibits Renaissance and Early Baroque elements, such as a seventeenth-century colonnade with Venetian columns. Each column is carved from a single piece of soapstone, which is a locally quarried rock that is easy to carve yet durable. The Cathedral also contains a bell tower, built in 1597 and adorned with a plaque featuring a poem written in local dialect by the poet Bertacchi. Surrounding the colonnade are burial plaques for noble families, a reminder that the colonnade was once a wall surrounding an ancient cemetery but now appears as an unassuming courtyard.

Fig.2 The bell tower and exterior of the church. I was surprised to learn that palm trees could thrive in Alpine valleys!

Inside the Cathedral, the decoration is ornate and detailed with eighteenth-century frescoes by Giuseppe Nuvolone and intricate golden altarpieces by Pietro Ligari. We explored the inside of the Cathedral and admired the artistry there before heading to the baptistery to look at a rare monolith of *pietra ollare*, or soapstone, carved into a baptismal fountain in 1156.

Fig.3 The altar inside the San Lorenzo Cathedral

Fig.4 The baptismal fountain at the San Lorenzo Cathedral

The baptismal fountain is world-famous because its half-relief carvings depict details of the twelfth-century tiered social structure of Chiavenna—the aristocracy, the merchant class, and the peasantry. The reliefs depict the benediction of the water and the administration of the baptism.

Next, we walked to the nearby Parco Paradiso, a botanical and historical landmark located atop an ancient fortified hill. First, we looked at an artificial gorge carved by the Romans as a soapstone quarry, called a *caurga*. The irregular shapes on the cliff faces are evidence of how the Romans cut boulders from the rock walls to make pots from the soft stone. Furthermore, the conical leftover rock from pot making, the so-called *botòn*, was not discarded but was rather reused; circular cross sections of the leftover rock can be seen in the cobblestone pathways throughout Parco Paradiso.

Fig.5 The gorge at Parco Paradiso

Fig.6 Circular cross-sections of leftover soapstone used as cobblestones

We then climbed to the top of the hill and appreciated the panoramic view of the entire valley. We could see the Cathedral and its courtyard just below alongside the rooftops of the old city. Vineyards spanned the mountains around us and church spires poked up from the trees. Then, Alison presented her topic of transportation in the Alps, explaining how transportation developed from its role as a historical necessity to its modern-day focus on pleasure and entertainment. Given Chiavenna's location along the Splügen route, the most important North-South route through the Alps until the opening of the Gotthard route, Allison's presentation felt particularly apt in the context of our day. The view from the top of Parco Paradiso emphasized not only the beauty of the mountains, but also the treachery they might have posed for travelers before modern times.

Fig.7 The view of Chiavenna from the top of Parco Paradiso. The San Lorenzo Cathedral can be seen in the foreground.

Fig.8 The Gate of Saint Mary, erected in the eighteenth century.

We meandered back down the hill, continuing to admire the flora and architectural detail of Parco Paradiso. We then settled in a grassy area by the cathedral to learn more about the history of Chiavenna from Reto. Chiavenna has origins as an Iron-Age settlement along frequently traveled valley paths. The Romans occupied Chiavenna from 15 BCE to 400 CE, improving the roads established by the Celts—can you sense a theme? Hint, hint: it's transportation. During the Middle Ages, under Charlemagne's rule, transport guilds were established in Chiavenna, employing local people in the flourishing trade. In addition to its historical importance as a transportation hub, Chiavenna is also unique because of its history of religious freedom—Protestants were not discriminated against despite the strong Catholic presence of the San Lorenzo Cathedral and parish.

Today, in addition to its cultural draw, Chiavenna maintains relevance due to its railway proximity to Milan.

After learning this, we broke for lunch and walked into town. Longing for shade and a breeze, we found a table underneath a tent. We managed to communicate with the waitress via Gabby, our fearless Italian speaker, with the help of Google Translate. We ordered pasta and salads and white wine because we're sophisticated. Then, of course, we went for gelato nearby, because, well, when in Italy…

Fig.9 A map of the old city of Chiavenna, numbered where we studied specific sites.

After indulging, we embarked on an architectural exploration of Chiavenna. We walked the cobblestone streets of historic Chiavenna, over the Mera and through the ancient gates that protected the city. We studied sites within the oldest part of Chiavenna within the gates, as noted in Figure 9. Many of the buildings in Chiavenna have plaques with the name of the building and the date of its construction. We walked up and down the streets of the old city and recorded our findings—the age of the building, its distinctive architectural style and features, and the name, if there was one listed. A "?" within this chart indicates that information was unavailable.

1. Danielle Foglivio Pestzi	1617	single-stone arch, lion head engraving
2. ?	1598	single-stone arch, floral engraving
3. Casa Balbiani	16th century	single-stone arch, no engravings
4. Birthplace of Clyde Geronimi	?	triple archway with overhead balcony, painted yellow
5. Potstone Portal	1570	arch engraved, overhead stone balcony with stone support
6. Pestalozzi - Luna Palace	16th century	large arch with wide stone path, river view through arch
7. Casa di Niccolo Stoppanti	157?	potstone portal with coat of arms, relief carvings, arch with capstone
8. Casa di Antonio Pestalozzi	1517	rectangular doorway, coat of arms carved "ANPE"
9. Casa Stampa con Portale	1582	arch circumscribed in rectangular doorway, geometric, features coat of arms
10. Casa Mascaránico	1592	contains wall shelf
11. Chiesa di Santa Maria	1327	ornate Venetian columns, tall rectangular doorway topped with statues of Maria and angels, floral engravings
12. Casa	1586	engraved rectangular doorway
13. Gate of Saint Mary	1741	tall city gate with plain arch and engraving above center of arch, painted yellowish
14. Casa Giani	1632	massive balcony atop doorway, rounded arch within boxy outline
15. Casa	1727	post-and-lintel arch, painting atop doorway in recessed nook
16. Casa	1613	simple post-and-lintel arch, engraved
17. ?	1632	green stone, relief engravings, Venetian columns, Doric capitals and pediment, bell tower
18. Chiesa S. Bartolomeo	1629	baroque elements

From the architectural data we collected, it seems that single-stone archways are the most common portal style, particularly in the late sixteenth and early seventeenth centuries. That said, the simple post-and-lintel construction was also used during this time, although it was more common on the outskirts of the neighborhood. The map shows that this construction was more common on an outer street like Via Rosalia, across the river from Chiavenna's main thoroughfare Via Dolzino. Engravings were present on most sites—their rare absence seems to be more indicative of frugality than of location or date. The oldest building, the Chiesa di Santa Maria, is one of the most ornate, exceeded perhaps only by the Baroque Chiesa di San Bartolomeo. Religiously affiliated buildings are the most ornate.

Fig.10 The Chisea di San Bartolomeo, built in 1629

Fig.11 The Chiesa di Santa Maria, built in 1327

After wandering around and recording our observations, we met up again to go to a produce market near our hotel. The market, called Mastai Ortofrutticoli, was practically outdoors, even though there was a roof and walls, because the entire front was open to the outside. Inside, there were fruits and vegetables, chocolate, local items, dry goods like beans and farro and a bunch of sauces and spreads. We shopped for our lunches for the following few days, most of us buying things like carrots, apples, and cheese.

Fig.12 Mastai Ortofrutticoli, a produce market cooled by the boulders it was built adjacent to.

You might be wondering, what does a produce market have to do with geology? Well, along the back wall of the market is an exposed boulder—the building is built up against the existing rock, which had fallen from a cliff in a rockslide at some point. Cold air filters from the bowels of the mountain and keeps the produce cool, essentially functioning as a natural air conditioning unit.

We then walked to a butcher's shop and bought more food, including bresaola, which is a popular dried and salted beef. Even I, the group's token vegan, found some really delicious canned

lentils at the butcher's, so we were all set for delicious packed lunches the next day.

We had some free time to relax before dinner, the day of learning and exploring behind us. We walked from the Hotel San Lorenzo to a pizzeria in town. After the previous night's debauchery, it was probably a good idea that we were seated outside. We ate lots of bread and dipped it in olive oil, which is apparently not customary in Italy but delicious nevertheless. At one end of the table, we were lucky enough to sit with Reto and, as usual, asked him endless questions about his travels, the many languages he speaks, his job, and what he does for fun (did you know he's quite the cellist?).

We ate until we were satisfied, and then we ate some more. (But if you thought we were done eating for the day… just you wait.) This was the first time we had pizza on the trip, and it was well worth the wait.

Fig.13 The group enjoying appetizers al fresco

Fig.14 Old fashioned punishment in Chiavenna. Poor photo quality because the photographer was laughing and couldn't hold the camera steady

At the end of the meal, Reto asked if any of us had misbehaved, which was a startling question and an unexpected turn of events. When Eliza admitted that she had stayed up too late the night before, Reto led us to an old (and no longer in use) set of chains hanging from one of the buildings nearby. In old times, public humiliation was often the punishment for misbehaving Chiavenna residents. Unfortunately—or, fortunately, depending on your perspective—the chains were locked closed, so we couldn't actually discipline Eliza for her misdeeds. Oh well.

Then, the opportunity for dessert presented itself. By "presented itself," I mean that someone suggested we get dessert and we all immediately agreed that it was a fantastic idea. We got another round of delicious gelato and, at long last, our stomachs were satisfied.

Fig.15 Happy students enjoying their final gelato of the day.

Driving through the Bergell Valley to the Engadine

Allison Day

Today was our last day in Chiavenna before going back to Switzerland. The morning started with breakfast at Hotel San Lorenzo. The buffet had lots of bread, fruits, and chocolate croissants that disappeared as soon as we came down for breakfast. There was also a coffee machine that was very popular with our group. After breakfast, we got our day packs with our lunches in them and loaded into the vans. We drove for only a short time before stopping in a small parking lot. We got out with our bags and sat in a little park next to the parking lot to listen to a short talk from Reto about the valley that Chiavenna sits in and about the Italian palace we were about to go visit.

The Chiavenna valley is very prone to landslides. In 1618 a massive landslide killed thousands of people and destroyed the town of Piuro. The fruit and vegetable shop with the boulders protruding from the walls that we visited the day before to buy lunch from was built in the aftermath of that landslide. Chiavenna has lots of chestnut trees. Chestnut trees are part of the beech tree family. They are widespread around Europe and Asia because they require a temperate climate with full sun and lots of rain to grow. Chestnut tree forests can survive up until about 800 to 900 meters above sea level and a chestnut tree can be up to 500 years old. The wood from a chestnut tree is very durable and is used for building things like outdoor furniture. The fruit from a chestnut tree is whitish in a dark brown skin that's encased in a green spiny capsule. In late September or early October, the spiny capsule turns brown and falls to the ground, signaling the fruit is ready to be eaten. The fruit is gluten free, low fat, low calorie, rich in vitamins B, C, and phosphorus. People in Chiavenna used chestnuts as a substitute for grains to make pasta, cakes, and purées. Deer also love to eat chestnuts.

Chestnut trees have been cultivated since 200 BCE. They were originally introduced to Europe from Turkey by the Romans. Chestnuts were a staple food in Southern Europe until the potato was introduced. After the potato took over as a staple food, the chestnut began to be perceived as poor people's food because it could be found on the forest floor. After a disease in Europe wiped out most of the chestnut trees, the US helped revive it by exchanging trees with Europe. Today, Italy produces 50,000 tons of chestnuts per year, making them the third largest producer in the world. In Chiavenna there is a festival in late September or early October when the chestnuts are ripe.

After the talk on chestnuts, we walked over to Palazzo Vertemate Franchi. Our hike for today was supposed to be later but the walk to the palace was still up a slope and most of us were pretty winded when we got there. Reto introduced us to our tour guide for the palace, who was an Italian woman who didn't speak much English (Figure 1), so Reto had to do some translating for us. We followed her into the chapel of the mansion where the tour started

The exact date of construction of the palace is unknown, but in one of the rooms, the date 1577 is inscribed on the wall, which is the earliest date found anywhere in the building. The palace was built by the Vertemate brothers, Guglielmo and Luigi. The Vertemate family was important in Italy for trade. When the Vertemate family line ended, the house was purchased privately. The house changed hands several times before the last owner left the

property to the town of Chiavenna to be opened to the public. The property is entirely self-sufficient. The gardens are well irrigated with water that comes from the fish ponds on the property. The palace vineyard produces a sweet dessert wine (Figure 2). The wall of the vineyard sits at an angle to reflect the morning sunlight into the vineyard. The mansion was the only building in Piuro that survived the 17th-century landslide.

Fig.2 Our tour guide in the Palazzo Vertemate chapel

Fig.3 Vineyard of Palazzo Vertemate Franchi

The whole house was beautiful. The entrance to the mansion was a grand wood and glass double door that led into a hallway with frescoes of Roman gods (Figure 3). In the hallway were frescoes of Heracles, Vulcan, Neptune, and Tempus. The ceiling was also decorated with sirens and other mythological figures. The tour guide pointed out that past visitors to the palace had graffitied the walls with their names. One of the names on the wall was Mozart, but the tour guide doubted it was the famous composer.

The first room we went into had frescoes of Mars, Apollo, Diana, and Minerva (Figure 4). There was an ornate fireplace with a table and chairs set up in front of it and a wooden curling board table in the room. The curling board was carved out of one piece of wood.

Fig.4 Front door of Palazzo Vertemate Franchi

Fig.4 Frescoes of Mars and Minerva

The next room we went into had frescoes of Juno and Jupiter on the ceiling. The room was used by the Vertemate brothers to hold business meetings. There were lots of drawers in the walls and a smaller room off the side where a scribe would sit, listen to the conversation going on in the main room and record it. The room also had a large stove heater decorated with green ceramic tiles that was fed from the next room over so that smoke would not get into the meeting room. The room where the stove was fed had a fresco of Perseus riding on Pegasus on the ceiling.

The next room was the simple dining room, which used to be a kitchen. The room was not painted like the other rooms we had seen already but had a large fireplace in it. On top of the fireplace was a poem from a local poet written in Italian.

Next, we ventured upstairs. The tour guide pointed out that the wood ceiling in the upstairs hallway was made of panels that started as squares but slowly became more rectangular as you walked down the hall. The difference in the shape of the panels created an optical illusion where from one direction it made the hallway appear longer and from the other direction, it made it appear shorter. The portraits hung in the hallway were all members of the Vertemate family. One of the paintings had a ghost story associated with it. The painting was of a man who the tour guide described as a “playboy” before he was killed. The tour guide told us that his ghost haunts the palace but that if you greet him, he won’t bother you.

The first room we visited upstairs was the Napoleon chamber, named for one of the men in the Vertemate family, not Napoleon Bonaparte like we all immediately assumed (Figure 5). This room had a little side room in it, like the meeting room on the floor below. The wooden ceiling of the room curved inward a bit to give the feeling that you were on a ship. The room was designed that way because the Vertemate family was prominent in the shipping industry.

The next room was the lady's room. The room was called this because a lady would sleep here while her husband slept in the Napoleon chamber. Just off the lady's room was a dressing room with a wardrobe and a beautifully decorated chest of small drawers that was used for sending and receiving letters. The tour guide told us that bathrooms were not installed in the house until the house's owners decided to build some in 1902. They built the bathrooms as an addition to the house so that they did not have to disrupt the original rooms. The next room had representations of the scholarly arts around the walls. There were frescoes of men that represented fields of study such as math, astronomy, and philosophy.

Fig.5 The Napoleon Chamber

We then went back out into the hallway where two large paintings of Piuro were hung on opposite sides of the hall. The first painting we examined was of Piuro before the catastrophic landslide that destroyed the town in 1618 (Figure 6). The painting depicted the town from above and shows the buildings in the town, including the mountains on either side of the valley and a waterfall. The buildings in the painting with blue roofs were owned by the Vertemate family. The second painting depicted Piuro after the landslide (Figure 7). This painting is noticeably darker and moodier than the first. The town is replaced by dark-colored earth and a river and the only building that remains is the Vertemate mansion. The tour guide explained that 28 Vertemate family members died in the landslide. The current town is built to the left of where the old town was out of fear that another landslide could come down.

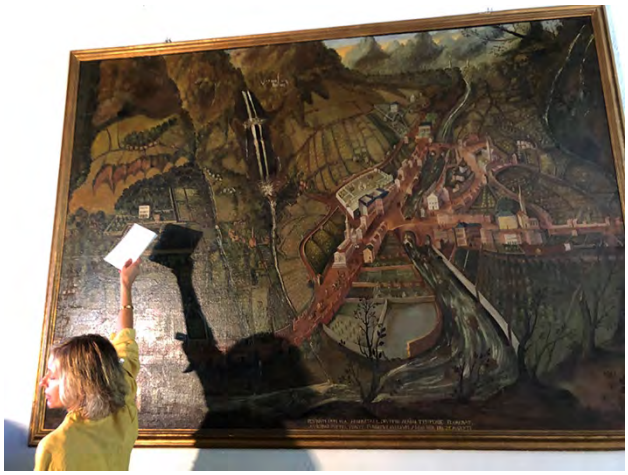

Fig.6 Painting of Piuro after the 1618 landslide

Fig.7 Painting of Piuro before the 1618 landslide

The last room we visited in the house was the festive room. The walls were decorated with frescoes of the 12 months that were depicted as 12 men dressed for the activities that would take place during each month. Each man was also accompanied by the astrological sign associated with each month.

As we were leaving the mansion after the tour, we noticed one painting at the top of the stairs of a woman holding a goblet in one hand and holding up two fingers on the other hand, like a peace sign. Naturally, we thought this was awesome, so we took pictures of everyone in our group posing in front of the painting holding up a peace sign (Figure 8).

Fig.7 Penn in the Alps posing with the painting

We then went out in the garden on the side of the mansion. In the garden were two large fish ponds that were connected to the irrigation system. The garden was also filled with flowers and plum, pear, and apple trees. Some of us picked some of the fruit off the ground and tried it, but it was not very good because it wasn't ripe. We had fun taking pictures in the garden for a while and then left the mansion to go back to the vans.

We drove for about an hour across the Italy-Switzerland border to the town of Bondo, where we were going to do our hike for the day. We all got out of the vans and slathered on sunscreen because it was hot and sunny. Unlike our first two hikes, we began this hike by going up the mountain. This hike was on the side of the valley in which Bondo was at the bottom. The terrain was more varied than the other two hikes we did. The uphill parts went from relatively flat to very steep very quickly and there were even a few times when we walked downhill on our way up the mountain. We were walking through a forest so there were tree stumps and roots to climb over, as well as plenty of rocks. This hike up might have been made a little easier by the makeshift stair cases made of stones put in the path. At one point when the trail had a couple of switchbacks, Reto yelled for the people below to look out because a snake was slithering/falling down the slope and it just barely missed hitting Hannah. That was our first encounter with wildlife that wasn't a dog or cow on the trip.

On our way up, our path crossed the remains of a landslide. There were lots of large rocks spilled all the way down the slope. About halfway up the mountain, we stopped to take a break and hear a talk from Reto about the town below. From where we stopped you could see the whole town and the mountains that rose up behind it (Figure 9). The big palaces we could see used to belong to wealthy merchant families that lived in the town. At one point these families unsuccessfully attempted to invade Chiavenna to expand their power. Today only around 300-400 people live here.

Last year in August there was a landslide in Bondo. The landslide occurred after lots of rain destabilized the rocks above the town. However, the landslide was not unexpected. The face of the mountain above the town, Piz Cengalo, had been moving for a while and there were several mechanisms in place to warn the inhabitants of Bondo when a landslide was about to come down. Laser beams that focused on the face of the mountain and measured any movement of the rocks were installed as an alarm system. Another, less high-tech alarm system consisted of ropes with rocks on the ends of them hung over the river next to Bondo. If the river level rose in response to a landslide, the alarm would go off.

Fig.8 View of Bondo

Fig.10 Rebuilding the dams in Bondo

Geologists predicted the volume of rocks that would come down in a rockslide from Piz Cengalo and that it would take 4 minutes for the debris to reach the village, which gave the villagers 4 minutes to evacuate. They had practice evacuations to prepare for the landslide. When the landslide alarm went off last year everyone was evacuated and no one from the village died. Unfortunately, there were 8 tourists who ignored signs that the hiking trails in the landslide area were closed and were caught in the debris and presumed dead. The people in the village who evacuated were not allowed to return for more than a month because the mountain was still active.

Sometime before the landslide, dams to contain the predicted amount of debris were constructed. However, no one predicted that the debris from the 4 million cubic meters of rocks would fall onto a glacier. When the rocks from the landslide landed on the glacier, they instantly melted it. The added water created a mudslide, or lahar, that destroyed the forest on its way down the mountain and out of the canyon. The amount of debris overwhelmed and destroyed the dams that had been built to contain it. In addition to the dam, the debris destroyed a few other buildings, but nothing from the old village.

Another landslide occurred the day after the first one. This one swept away the equipment that had been brought in to clear away the debris from the first landslide. Much of the debris from the landslide has been removed and some is being used to rebuild the river bed (Figure 10). In the future, the area will become more prone to landslides because of climate change. A warming climate means that the ice and permafrost holding the mountain together will begin to melt, and as this happens, landslides will become more frequent in Bondo and other areas of the Alps.

Fig.11 Sketch of wildflower

After our break, we continued up the mountain for about another half an hour. As we neared the top of the hike, our trail flattened out over a grassy meadow filled with flowers (Figure 11). It was very Sound of Music-y. We followed the trail up to the village of Soglio. As we entered the village, we walked by the visitor center, where a little wooden creature greeted us with a “Benvenuti” sign (Figure 12). It was time for lunch, so we were all free to find a place to sit and eat and explore the town. A bunch of us went to a small graveyard that overlooked the mountain to take pictures, which turned out great (Figure 13). Some of the group stayed by the first square we found and a few of us ventured farther into the village. A group that started with Maggie, Grace, Sydney, and myself ended up just

being Maggie and I eating lunch on a little wall with an unobstructed few of the mountains. As we were eating, villagers and other visitors walked by and we all greeted each other with friendly “Buongiorno’s” and “Ciao’s”. Eventually, Sydney and Grace found their way to where we were eating right as a man walking a black dog passed by. We asked to pet the dog whose name was Leone and he was 8 months old (Figure 14). He was very friendly and loved to be petted. After we finished eating, we did some more walking around and exploring. The village was relatively empty except for a few more visitors and some kids playing in the street.

Fig.12 Wooden creature outside the visitor center in Soglio

Fig.13 View from the graveyard in Soglio

As we were walking, we saw a little white dog, who ran right up to us to play. We went up to the dog’s owner who told us the dog’s name was Jimi and that he was accompanying his owner on a work retreat she had in Soglio (Figure 15). She showed us a couple tricks Jimi could do. He was a good boy.

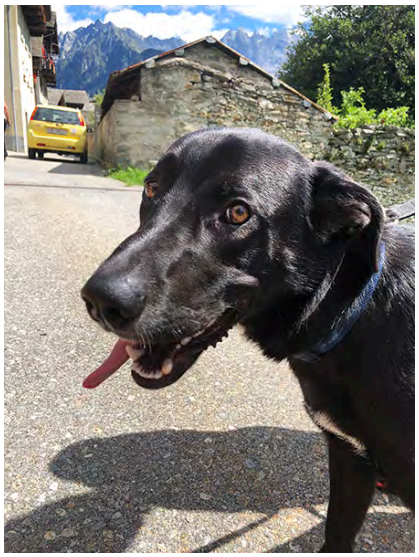

Fig.14 Leone, the dog

Fig.15 Jimi, the dog

We walked around some more and passed some beautiful gardens. We saw some others from our group sitting on a grassy hillside, so we walked out to meet them. They had just finished eating so we took a few pictures and then started walking back towards the village. On our way, we ran into others who suggested that we check out the Baroque garden of one of the hotels in Soglio, so those of us who hadn't already seen it broke off to go find it. The Baroque garden had areas of clean-cut grass encircled by short hedges where hotel guests could lounge on chairs, lots of bushes with colorful flowers, and a couple of huge trees. The trees were different than all the other ones on the hillside, so they stood out from all the way across the village. One of the giant trees had a chair that was about 3 meters off the ground that we had fun taking pictures in.

After we had had our fill of the garden, we met up with the rest of the group by the visitor center. There was a little shop in the square that Reto suggested we buy chestnut tortes from since it was a local specialty. Maggie and I bought a small one to try and to let anyone else who wanted a bite try it. The torte was sweet without being too sweet and the chestnut flavor was something I'd never tasted in a cake form before. Steffi set up her camera on a timer to take a photo of the group and got to her spot just in time. An older Italian man walked by just in time to witness the photo and applauded Steffi's speedy maneuver.

Fig.16 The landslide remains on our hike down

We then began our descent down the mountain, taking the same path as the hike up. When we crossed the grassy meadow again, Reto pointed out a huge blackberry bush so we stopped for a while to pick and eat them. Someone figured out that if you went up the small but steep slope the bush was on, there were a lot more berries, so a few other people and I all tried to scramble up the slope without falling. The blackberries were so good and tasted so fresh! When the few of us who went up the small slope tried to come back down, there were some tumbles and spills, but it was all worth it for the blackberries.

The rest of the hike down was uneventful. The stone stairs were much easier on the way down than the way up. At one point a couple of us got separated from the rest of the group, who were waiting by the landslide on the trail. As we approached them we sang as much of the words to "Sweet Caroline" and "All Star" as we knew. When we caught up we took a pretty great class picture in front of all the rocks from the landslide (Figure 16). We went the rest of the way down the mountain and right at the bottom some stinging nettle brushed against my shin and it stung really bad. I had never been stung by stinging nettle before, so I asked Reto what to do and he said to just wait it out. It was very unpleasant.

Once we were all at the bottom we took another look at the river bed at Bondo and how the debris has destroyed it, but it was being rebuilt now with the very same debris. After

being above the town and learning about exactly what happened there, we all had a much better appreciation for the destruction that a landslide can cause.

Once we were all loaded back into the vans, we began our drive to Pontresina. We had several stops along the way. The first was to take care of some unfinished business from the day before. We pulled over in a little town that we were just driving through and got out of vans, not really knowing what was going on until Reto walked over to a building that had a neck shackle attached to it. Last night in Chiavenna when we had tried to lock Eliza up, the shackle didn't open. Reto just happened to spot this one while we were driving and this one opened. Eliza got up on the wall of what used to be a courthouse and served her sentence (Figure 17). Justice having been served, we got back in the vans and continued towards Engadine.

Fig.17 Eliza shackled to a wall

Fig.18 View from the lookout at Maloja

After a long series of switchback roads to take us up out of the Bergell valley, we stopped by a small town called Maloja that was sort of the gateway to the plateau of the Engadine that we had just driven up to (Figure 18). There was a lookout point that we walked up to where we could see all the way down the valley we had just driven up, and then when we turned around we could see that we were in another, much wider valley. The change in elevation was very apparent from the drop in temperature at our now higher altitude. After taking some pictures of the valley below we got back in the vans.

After driving a few minutes, we stopped by a lake with crystal clear water for a bit. Some other people were packing up a picnic they had by the lake and we went over to meet their yellow Lab whose name was Otto (Figure 19). He was overwhelmed with happiness at the number of pats he was getting from all of us. A couple of us mustered up the courage to step in the lake to feel exactly how freezing cold the water was. After a few minutes of standing in the water, I'm not sure if I got used to the temperature or if my feet just went numb. After we dried our feet off we met yet another dog. Her name was Leah and she was a border collie (Figure 20).

Fig.19 Otto, the dog

Fig.20 Leah, the dog

After we said bye to Leah, we walked up the road a little bit to a small town called Sils. Reto explained that this town spoke Romansh, which was his mother tongue. The architecture in the town was very different than what we had seen in previous towns. The houses all had very thick walls with small windows that were set back very far into the wall. The walls were painted solid colors, some pastel and some vibrant, and looked very clean. The part about the houses that stood out the most to me was the designs on them. All the houses had designs around the windows, doors, and corners that were scratched out of the plaster that covered the walls (Figure 21). Some of the designs were geometric and reminded me of Greek and Roman architectural elements, while others seemed wavier and more modern. We walked up the main road of the town to just look around and then turned back to go back to the vans. On the way back, Danny pointed out some edelweiss that had been planted in a flower pot, but we decided we couldn't count that as actually seeing edelweiss since we didn't find it in the wild.

Fig.21 Designs on wall of a house in the Romansh-speaking village of Sils

When we got back to the vans we continued our drive to Pontresina. We arrived at the youth hostel late in the afternoon and had just enough time to put our things in our rooms and come down for dinner. For dinner, there was a cold potato and cucumber dish, curry soup, and giant meatballs. There were mixed reviews on the food because it was nothing like the amazing meal we had just had in Montespluga some nights before.

During dinner Reto told us he had a surprise for us, but it meant that we had to leave as soon as we were done with dinner and that we had to wear sweaters and jackets. No one had any idea what it was and as we got into the vans to go to the surprise we made guesses that it might be gelato. We were wrong though. We drove to a cog railway station called Muottas Muragl and got in the railway car (Figure 22). It was a new experience for most of us since cog railways are not common in most the of the

US. While the car was still in the station the floors felt slanted a bit because the track was. When the car pulled out of the station and started going up the mountain it was fun but a little scary because the car was going up such a steep track. Our car was attached to a long cable that connected to the station at the top of the mountain so that our car could be pulled up the track. About halfway up the mountain, the track split into two, forming a sort of an oval shape and then going back to being a single track after the oval. As we approached the split from below, a second car was coming down the mountain on the track above us. At the split, our car went to the left and the other car took the track on our right. We passed each other and continued going up the mountain. As we climbed higher the track grew steeper and the floor of the car was no longer level. The angle of the floor became steep enough that you could lean so far forward it looked like you were about to fall over but be perfectly balanced. As we approached the station at the top we could see a restaurant and a platform for looking out over the Engadine valley. We got off the cog railway and everyone was immediately struck by how cold it was. We had climbed to an altitude of about 2400 m and could see the whole valley below. We took lots and lots of photos as the sun was setting (Figure 23). There was a more casual restaurant open at the top and they had hot chocolate so a few of us got some and brought it outside to drink. Pretty soon almost everyone had bought some and were enjoying

Fig.22 Cog railway car

Fig.23 View from top of Muottas Muragl cog railway station

it in the cold. We decided we wanted to stay up on the mountain until the stars came and the cog railway departed every half hour, so we could basically leave whenever we wanted. While we were waiting for the stars to come out, Danny, Caroline, Freya, John, and I discovered an amazing playground behind the restaurant. The playground had swings, slides, a zip line, a little gondola, a life-size statue of a cow, and lots of other things to climb on. The air was pretty thin up on the mountain which made playing on the playground a lot harder than we thought it was going to be. Once it was dark enough, we rejoined the group out on the deck and I used my stargazing app to show everyone what constellations and planets were visible.

We took the cog railway down once everyone had had their fill of hot chocolate and stargazing. We got back in the vans and agreed that, although going up to Muottas Muragl was a pretty great surprise, we would have also been okay with getting gelato. When we got back to the hostel everyone was sufficiently tired from our jam-packed day so we went straight to bed.

Muottas Muragl, Engadine, Switzerland. Photo credit: Steffi Eger

Exploring the Engadine, walking to Morteratsch glacier, and climbing Munt Pers

John Bonetti

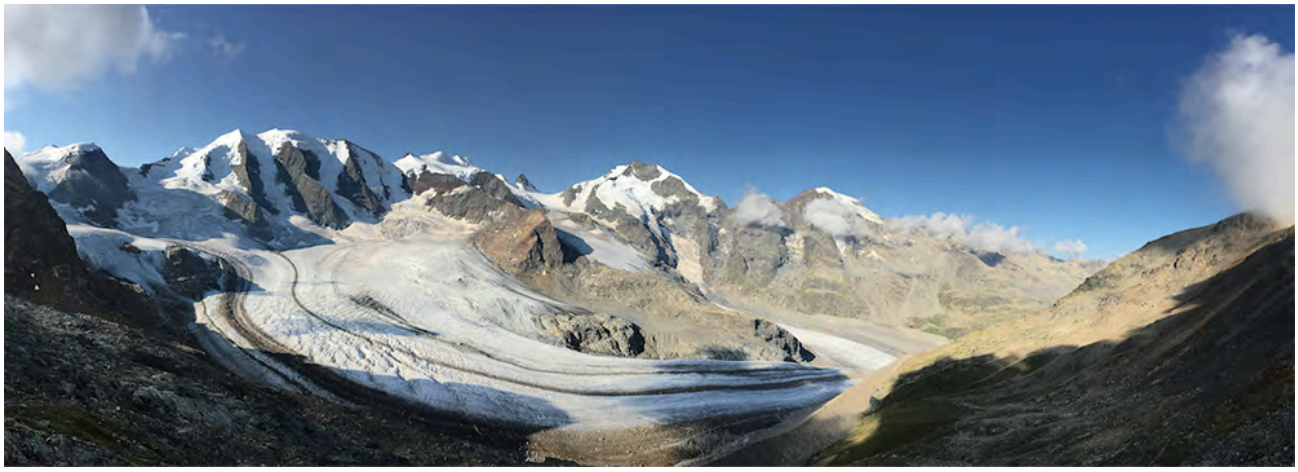

Fig.1 Morteratsch Glacier

Today we set our alarms for 7:00 a.m. to ensure enough time for breakfast before our 8:08 a.m. train departed from the youth hostel in Pontresina. After a few stops, we got off the train to take our next mode of transportation: cable car!

We then made our slow, but scenic, ascent up to the ski lodge of Diavolezza overlooking the giant Morteratsch Glacier (see the first image), our main learning objective for the day: glaciers. Before our glacier discussion was held, we had to hike to the summit of Munt Pers (translated as Lost Mountain). During our hike, I tried to make close observations of the rocks composing the slopes of the mountain ridge.

Fig.2 Cable Car

Fig.3 Hiking regime and rocky terrain

Fig.4 Oxidation

Firstly, I noticed the variability in the size of rocks, ranging from big boulders to smaller pieces, all in different stages of weathering: both mechanical and chemical weathering occur here and are very noticeable. Many of the rocks were stained with an orangish-yellowish tinge due to the chemical process, oxidation, wherein reduced iron on a rock's surface reacts with the oxygen in the atmosphere, weakening the rock and causing a change in color. However, most of the rock's substantial degradation here is due to physical processes such as frost wedging, the process which happens when water fills the joints and fractures of rocks, freezes, expands, and breaks the rocks into fragments. Another major component of mechanical weathering here is simply rocks falling and cracking upon impact. In July and August, the weather is much warmer and far from freezing temperatures, so these weathering processes do not occur nearly as regularly as during the rest of the year.

Fig.5 Two pieces of gneiss: one metamorphosed from igneous (left); one form sedimentary (right)

Fig.6 Reto showing us a topographical map of the Alpine region

Despite wide variability in size, the opposite was true for rock type. Practically all the rocks here were different forms of gneiss, a common metamorphic rock that is relatively soft and breaks easily, giving the sloped side of the mountain a loose, rocky surface. Within many of the gneiss pieces, you could find veins of quartz and sometimes signs of other minerals present like chlorite, which gave the rock a greenish tone.

Fig.7 Gneiss w/ chlorite coloring and quartz veins

Fig.8 Crevasses

Our hike up to Munt Pers allowed us to reach a maximum altitude of around 10,500ft (3,200m)! From the summit, when we weren't in the middle of a cloud, we had a magnificent view of the Morteratsch glacier and how it opened up into the wide and long U-shaped glacial valley. While we were gathered at the top, we learned more about glaciers. Munt Pers does not have any glaciers because it exhibits mostly a southern exposure, which means it receives sunlight throughout the day and that prevents ice from developing. Glaciers form where snow can accumulate and turn into ice if the climatic conditions allow it to happen. Just like water, ice is also susceptible to gravity and flows downward, but this is a much slower process. When the ice meets steeper slopes, it tears and breaks, so rough topography perpendicular to the ice flow combined with friction causes the formation of crevasses. Farther down the mountain, ice later turns into water at the equilibrium line, which can only be measured and cannot be seen. Yet, under the glaciers, the temperature is just about 0^{o}C, so liquid water actually runs below the glaciers as well, which you can hear along the trail if nobody is talking. The snow line, on the other hand, divides the two areas of glaciers: those covered in snow all year round and those exposed for part of the year. The exposed glaciers can become "dirty," meaning they are susceptible to being covered in dust that falls from the sky. The dust particles are transported by clouds all the way from the Sahara Desert and are dumped when the warm air from the desert meets the cool air of the Alps. This collected dust actually plays a role in the preservation of the exposed glaciers because it prevents some of the glacial ice from being revealed to the sunlight. However, the sunlight is absorbed by the dust, especially the dark colored dust, which means that it is warmed up, leading to increased melting of the ice underneath it. At the sides of the glacier, moraines form when ice plows rock debris to the side that accumulates and forms lines parallel to the movement of the glacier, which can be seen in the panoramic photo of

the Morteratsch glacier (first image). There is also the terminal moraine, which is where debris collects in a tongue-shape mound at the end of a glacial advance. These can be dated to determine when the glacier was last there. Of all glacial features, one of the most extensive and vast is the creation of the U-shaped valley. Unlike V-shaped valleys that are formed by running water eroding the surface, the U-shape is a sign that the valley was carved out by an enormous glacier.

After spending some time at the summit, we climbed back down the trail to the ski lodge at Diavolezza to have some lunch. From there, we hopped back on the cable car to the train station, waited around for a bit, took the train a couple stops back in the direction of Pontresina and stopped at the trail leading to the tip of the Morteratsch Glacier. Along the trail, there were signs marking the location of the glacier's edge at a specific year -- starting sometime during the 1800s! Walking towards the glacier and reading the signs, its steady retreat could be noticed throughout the 19th century and much of the 20th century. But as we closed in on the tail end of the 20th century and beginning of 21st century, the rate of retreat started to become more exponential,

Fig.9 (above) 2010 Glacier Location Marker; 2015 marker a bit further down the trail; (2018) glacier receding up the slope in the back

Fig.10 *Mortal Danger!* Found on one of the signs warning of rockslides falling along the glacier

significantly so within the current decade, which we can attribute to global warming. Earlier, on the peak of Munt Pers, Reto roughly estimated that the glacier could have receded 30-40m in the last year alone based on what he could see on this and last year's Penn in the Alps trip.

Fig.11 Closest section of glacier to the trail, which was covered in sediment from the eroded rock seen above

When we arrived at the base of the Morteratsch glacier, the visible sections did not even look like glaciers at first glance. This was due to the lower parts of the glacier being covered in loose sediment that eroded from above. The shrinking of the glaciers revealed bedrock, which then allowed weathering and eroding processes to strip the rock from the cliff-sides. Above one tongue of the glacier on the west side, rockslides were happening somewhat frequently so we were not allowed to get too close. However, we were able to make our way to the edge of another part of the glacier, crossing the river and climbing over boulders so that we could get a taste of the giant chunks of ice. After all this, we headed back down the trail to the station and then to the hostel, where we had a pasta dinner and chilled for the night after a long day of adventuring.

Castello di Montebello, Bellinzona, Switzerland. Maggie giving her presentation on electricity generation. Photo credit: Steffi Eger

Cog railway to Muottas Muragl and hiking to rock glacier

Lisa He-Wu

We woke up this morning around 7:00 am to get ready and to get breakfast before heading out to one of our hardest hikes. Although every day was a tough hike for a short girl like me, I do have to say that the journey and the destination were definitely worth the pain and sweat. For breakfast, we had a variety of foods to choose from. The youth hostel had bread, cereal, prosciutto, cheese, fruits, and orange juice. After eating, we ran to the train station to catch the Rhaetian Railway Train from Pontresina to Punt Muragl. Figure 1 shows a map of our train ride to Punt Muragl. It was surprising to me how this single train could go to so many places.

Fig.1 Rhaetian Railway Train Map

We were afraid to miss the train because then we would have to wait an hour or so for the next one. Trains don't come as often as they do in Philadelphia (they come every 10-15 minutes in Philly). We got on the train at 7:56 am and then got off after a stop and walked a little bit to the Muottas Muragl Cog Railway. Our group got on the Cog Railway at 8:16 am to go up the mountain. It took us around 8 minutes to get to the top. Besides bringing people up to the mountain, the Cog Railway we were on was importing orange and pineapple juice, Coca-Cola, and water. In my opinion, it was an efficient way to transport things up to the top. Figure 2 shows all the drinks put in front of the Cog Railway to be transported up.

Fig.2 Goods brought to the mountains

Fig.3 Breathtaking view from the top of Muottas Muragl

During our ride, we were scared that the drinks would fall off the Cog Railway because there was nothing protecting it from either side. To our surprise, nothing fell off to the sides. When we got to the top of Muottas Muragl, the clouds were covering the mountains. It was a breathtaking view! As soon as we got there, everyone started taking pictures of the beautiful view. It was unbelievable how perfect it was. Figure 3 does not do any justice to what we actually saw with our own eyes.

We began hiking at 8:33 am. It felt like we were walking through the clouds because they were still covering the mountains at that time. We were hiking through a narrow trail with a lot of fresh cow dung. Reto warned us that we had to be careful while we passed by the cows because they tend to be very protective of their calves. There was also a sign warning hikers in the trail. In Figure 4, we can see the sign that was posted at the beginning of the trail.

Fig.4 Warning sign for hikers

On our hike up, we passed by cows. We even stopped to look at them. We were very excited to see cows in the pastures so early in the morning. The cows did not look friendly to me. It was funny watching one of the cows because he seemed to display an angry expression when we got closer. By the face the cow made, it seemed like he was telling us to leave him alone because it was too early in the morning to be bothered. Some of the other cows did not seem to mind though, they just kept eating. In Figure 5, we can see the cow that seemed to be angry at us.

Fig.5 Cow with angry facial expression

We made our first official stop at 9:20 am for our first presentation of the day. Before John started his presentation, Reto pointed out the trail that we would be hiking through. The trail was a zigzag path. As I saw the trail, I took a deep breath to shake off my fear and excitement. Figure 6 shows the zigzag path that we hiked on.

After enjoying the view around us, we all sat down to listen to John's presentation on the Weathering of Rocks. We learned about the two major types of weathering: mechanical and chemical. Chemical weathering is more effective than mechanical weathering because water and carbon dioxide causes rocks to change in color and size faster. Mechanical weathering also relies on water but is mainly driven by changes in temperature and pressure. In chemical weathering, tropical regions are better than temperate regions because they are quicker in weathering the rocks since tropical regions have warmer temperatures and more rainfall. Weathering of rocks is also related to oxidation. Oxidation occurs when a compound loses an electron. According to John's presentation, oxidation most often occurs in wet environments rather than in dry environments. A common example of oxidation is the transformation of iron into rust.

Fig.6 Zigzag path of our hike

After John's presentation ended, Reto showered us with his knowledge on the weathering of rocks. He said that in this area of the world, mechanical weathering is dominant because of the fluctuation of temperatures. Chemical weathering is not important in the region we were in since it is not a tropical region. Rocks in this area tend to freeze in the evening and break in the morning. We learned that when chemical reactions occur, ions are released, and they end up in water, which is why we call it mineral water. Reto said that we can tell where the water we drink comes from by looking at the "minerals" that the water contains. Minerals themselves are not found in water but instead, the components of the minerals are. An example that Reto gave us was the mineral Calcite; its components are in water but not the mineral itself.

From where we were standing, we could see a rock glacier. We were looking at the north-facing slope where the permafrost is more extensive because there is less sunlight. Reto pointed out the rock glacier and began teaching us about permafrost. Figure 7 displays the rock glacier that we were discussing. A fun fact we learned was that it used to be a real glacier, but it was too small to be sustained. There was a lot of debris and rocks falling that covered the ice in the glacier. It is currently an active rock glacier and it is a healthy one because it is concave up. It does not have a glacial river stream emanating at its bottom because it is permanently frozen. However, it is beginning to melt because of climate change.

Permafrost is soil that is permanently frozen for two years or more. We were actually all sitting on permafrost when this lecture was happening. Reto told us that if we were to drill a hole about one meter in the soil then it would be frozen. The top layer that we were sitting on was not frozen because it was facing south. The top layer is the active layer, where it continuously thaws and freezes. In the summer, the active layer thaws. The second layer is the permafrost layer. Permafrost is decreasing in all areas because of global warming. The melting of permafrost is a problem in the Alps because it puts in danger the infrastructure of the villages in the Alps. The infrastructures must be constantly monitored because, if they are built on permafrost, they will move down as the permafrost melts. It is an economic burden in the Alps to constantly need to change and repair infrastructure due to the melting of permafrost caused by global warming.

Fig.7 Rock glacier on a North-facing slope

After our discussion about permafrost, we began hiking at 9:49 am and arrived at the lake at 10:50 am. We were able to refill our water bottles at that clear lake. We stopped to take some pictures and then we were on our way again. As we were walking, Reto pointed out the teasel plants that were along our hiking trail. The teasel plant looked hairy, spiky, and had grayish comb (Figure 8).

Fig.8 Teasel plant along our trail path

It was delightful to look at the flora in the Alps while hiking. It was interesting to learn that most flowers are protected in the Alps. People get in so much trouble when they are caught picking the plants. Reto informed us that as we went down the mountain, we would see more vegetation. We saw a small tree between the rocks during our hike. It was surprising to find that, because of global warming, soon we will have a forest where we were hiking. In Figure 9, we can see the little tree growing above the tree line.

Fig.9 Little tree growing between rocks

Fig.10 Maggie, Danny, Eliza, Allison and John climbing a steep rock hill (the front side of a rock glacier)

We made another stop at 11:54 am where Maggie, Danny, Eliza, Allison, and John tried to climb up a hill full of rocks while the rest of us had fun watching them. John almost went all the way to the top and everyone else eventually came back down because it was hard going up and the rocks were falling down. Figure 10 shows them going uphill.

We had lunch at 12:02 pm. I ate cheese, prosciutto, and a Nutella sandwich. It was relaxing to sit back and eat while enjoying the beautiful view. After almost an hour of lunch break, we started hiking again until we reached Munt da la Bês-cha, which is also known as “Sheep’s Mountain”. We were about 2700m up in elevation. Reto was telling us that the weather was very unpredictable where we were because of the elevation.

When we were at the top of the mountain, some of us got hot chocolate at the restaurant. Hot chocolate was $5 CHF and water was $6 CHF. Everything was pricey because they had to transport things up by helicopter. Sometimes they even carried the goods that they could by foot. The owners of the restaurant live up on the mountain during the summer time and go back down to the valley during the winter. The restaurant was also a home to the owners. From the top of Munt da la Bês-cha, we could see the youth hostel that we were staying in. The view was spectacular, and it seemed so easy to just walk down the hill to get to the youth hostel but that was not the case.

We started hiking back down the trail and we stopped for a little bit to talk about the rock glaciers. The rock glaciers in the mountains are regularly monitored because it is predicted that one day all the debris will fall down and cover the valley of Pontresina. People are taking measures to protect themselves from potential danger.

We were talking about winter in Pontresina and Steffi asked how the community got rid of the snow and to our surprise, Reto said that they throw the snow into the rivers to clear the roads. Although the snow is polluted from the dirt of the cars, the method of throwing the snow into rivers is better than using salt to melt the snow. It is illegal to use salt to melt the snow because of environmental concerns but also because the temperature is so cold, the salt wouldn't be of any help. The community uses sand to cover the snow and ice and then they collect the sand back up.

As we were walking down the trail, Reto suggested that we spoke quietly to avoid scaring away the mountain goats, also known as "Alpine Ibex". At 4:05 pm, we stopped to look for Alpine ibex, but we did not see any. Reto even used his binoculars to see if there were any nearby but they were nowhere to be found. Figure 11 proves how focused and determined Reto was.

Fig.11 Reto using his binoculars trying to find Alpine ibex

After ten minutes or so, we gave up looking for the Alpine ibex and resumed our hike down. The plan was to hike down to the chairlift so that the lift could take us back to the valley. The problem was that it was already around 4:20 pm and the chairlift closed at 5:30 pm. If we were not able to get down to the house where the chairlift was then we would all have to hike all the way down to the valley. Reto decided that we should all take a detour from the trail and go down a very steep rocky hill. We trusted our fearless leader so much that when he proposed the idea we didn't even question it. It was the hardest part of the hike for me and I usually loved hiking back down more than I liked going up the trails. At some point going downhill, I stepped on the wrong rock and fell. I felt a very sharp pain in my right ankle, but I was okay when I got all the way down back to the trail. The rest of the group was almost down while Hannah, Grace, Steffi, and I were still coming down. Reto was having so much fun watching us struggle up there while he got down to the trail without even breaking

a sweat. This was the day that Maggie ripped her pants going down the hill because she thought it would be easier to slide down to the trail, but it turned out that it was not an effective way to do it. We all had a good laugh. Hannah went down using her crabwalk method. I had to use Steffi's hiking sticks to get down. When Hannah and I got down to the trail, most of the group already left to take the chairlift. Hannah and I ran the rest of the trail to the chairlift so that we wouldn't miss it. Luckily, we got there around 5:12 pm and we were able to get on it or else we would have had to walk all the way down to the valley. Figure 12 shows the chairlift that saved my legs for the day!

Fig.12 Taking chairlift down to the valley

We were also rushing because Coop, the grocery store, was closing at 6:00 pm and we had to buy lunch for the next three days. When we got to the store, there was still time left to do our shopping. I bought more bread, cheese, prosciutto, and Nutella. To treat myself for such a hard hike, I bought myself an Oreo ice cream bar. It was delicious! After grocery shopping, we went back to the youth hostel.

As soon as I got back to the youth hostel, all the showers were already taken since there were only four of them. I had to wait twenty minutes to get in the shower. After showering we all went down to dinner. We had very good pasta that night. Reto wanted to have a meeting after dinner to discuss the next day's plan. We discussed who was doing presentations and the diary for the next day. I was exhausted after such a long but fun day. I went back to the room and found Maggie and Danny in the room. We were all planning to sleep early to get ready for the next day, but we stayed up until 10:30 pm talking about our life stories. It was a very wholesome day for all of us!

Lisa He-Wu

Driving via Bernina Pass, Cavaglia and Poschiavo to Chiareggio

Sydney Balfan

The day began with a nice breakfast at the Youth Hostel before our departure. After many tough hikes this week, Reto told us that today would be a no-hiking day. But of course, we ended up hiking into the forest in Pontresina for Hannah to give her presentation on hazards in the Alps, which I didn't mind. Maggie, on the other hand, struggled to make it, but that's why we love her. Once we got to the bridge over Val Giandains, it was time for Hannah to present.

Natural Risks and Hazards in the Alps

Because the Alps are such a highly desired place for tourists, it is becoming increasingly more important for preventative measures to be taken towards natural hazards. Additionally, the natural environment in the Alps creates a larger vulnerability for landslides, avalanches, etc. to occur. And in the past 70 years, over 1000 lives have been claimed in Switzerland from natural hazards alone. It is common for locals to understand the potential risks and take preventative measures to ensure their safety, but for tourists who don't know the risks, it can be more difficult. The tourism industry also knocks down the natural landscape to create things like chair lifts and ski resorts, which can be harmful to the environment. But that is not to say that tourists are harmful to the Alpine region because they produce an economic gain for the country.

In addition to the impacts tourism has on natural hazards, climate change also has a large impact on these natural hazards. Glacial melt especially has become more common which can lead to flooding, mud and debris flows, and ruptures in meltwater reservoirs. The increased glacial melt reduces the support in the mountain region and can lead to a lack of stability making landslides even more prevalent. Lastly, this can ruin the environment and harm the habitat of flora and fauna in the surrounding regions.

After Hannah's presentation, Reto told us how these hazards have affected towns in Switzerland, specifically Pontresina. This town and some neighboring areas were somewhat damaged in the past. Eventually, in 2003, a new dam was built to prevent any further damage. Pictured below is the map of the area constructed to guard the town of Pontresina from possible disasters. The project consisted of various components that would create a barrier between the landslides/mudslides/avalanches and the town. The total cost of the project amounted to around $8.2 million. But this investment is well worth the money as the potential disasters have been projected to cost the town around $300 million. Additionally, in the image it shows that 60 percent of these funds came from the government, 20 percent from the village municipality, and another 20 percent from the national forestry service. If you know me, you know that I relentlessly questioned Reto about the funds until his head nearly blew off. Reto explained that in Switzerland to get the government to vote on legislation, all anyone had to do was get 100,000 signatures from people saying that they agree with the legislation. Now, I say "all anyone had to do" because in America, to get the government to vote on any legislation, one would have to go through years and years of work. Of course, getting 100,000 signatures is a lot of work, but it is nowhere near as much work as it would take to propose legislation in the states, which I found super interesting.

Anyway, back to the hazards in Pontresina, another important aspect of the "Project Protect Pontresina," (PPP) I'll call it (yes, I made that up), is that climate change can create the potential for flooding and debris to plunge into the town. But, as displayed in the image, the rocks were placed specifically in that squiggle shape to drain the water in conjunction with the steel gate. As difficult as it might be for these locals to live with the potential thoughts of losing their homes, they've made it possible to live harmoniously with the environment while staying protected.

After that presentation, we were off in our vans to the next stop where Danny would present. But the fun doesn't stop just because we're in our vans. I can't speak for the boring van, but the party van sure did enjoy this ride, as we do on every ride. (Sorry Reto and the sleepies) ((No tension)) This installment of the ongoing party consisted of some oldies played by DJGJ (DJ Grace Johnson) in which dancing and singing ensued. I would also like to note that there was definitely no passenger wine drinking in the act of this drive. We next stopped at a prehistoric rock fall site near Pontresina. Here, Danny presented to us about Flora in the Alps.

Flora in the Alps

There are over 13,000 species of flora and fauna in the Alps, so it is obviously a great place to observe gorgeous plants. The figure below shows the different vegetation zones in the Alps which are extremely important especially as climate change affects the area. Global warming can cause a reduction in one or many of the zones, and therefore decrease the habitat available for flora and animal life to survive. In turn, this can disrupt the rest of the environment. For example, in Australia, the tree kangaroos specifically live in the northeastern part of the country. When climate change causes it to be a warmer zone where kangaroos can't live, it causes them to become either endangered or extinct. Additionally, climate change causes a rising of the tree lines which makes less room for species at the top zones.

In regard to Switzerland especially, the Edelweiss is a very important flower. It prefers rocky limestone areas and has dense hair that adapted to high altitudes. It is a symbol for alpinism and is used as a national symbol for many countries as well. As shown in the figure below, it is an important part of the Flora in the Alps. There are many other types of flowers in the Alps as well, such as the Rhododendron ferrugineum and Rhododendron hirsutum. The Rhododendron ferrugineum grows in acidic soil whereas the Rhododendron hirsutum grows in alkaline soil. There are also many "glacial buttercups" that can be found about 4000 meters high

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Luckily, while wandering the area, we were able to find one last Edelweiss plant for everyone to drool over. It was found on one of the rocks that we were examining due to the rocky limestone area we were in. The rocks examined mostly consisted of sediment fragments following a landslide. These angular fragments mix with mineral cement to bind the rock together forming a sedimentary rock known as breccia. Then, we were off on our vans to a lunch stop at the lake nearby. Here, Zoe gave us her presentation regarding the Glacial periods.

Extent and History of Glacial Periods in the Alps

There have been five ice ages over the last 2.4 billion years of the Earth's history. (Note: Tectonic plates take millions of years to shift and create anything). The little ice age specifically caused glaciers to extend further which ruined many agricultural lands and societies due to starvation and physical unrest. Furthermore, it caused Western European civilizations to suffer once black carbon emissions increased. Some scientists believe this caused a glacial retreat from darker glaciers and therefore more absorption of sunlight. An important note is that when the glaciers retreat it is not just the length of the ice that melts away but also the volume and thickness of the ice which can be extremely harmful.

In addition to environmental impacts, the glacial retreats can also create conflict in world politics. This is because people tend to dispute over water and land which goes to show that the issues are far more complicated than just destruction of glaciers and the ecosystem.

Next stop was a tour of an area where potholes were formed and continue to form. Legend says that these massive rock holes were used by giants as pots to cook food. But as Reto explained, the potholes were caused by erosion. Glaciers would melt and erode onto the land where weaker sediment was taken by the glacier along with underlying bedrock to eventually form potholes. The large circular rocks at the bottom of the potholes would fall in later on and were not the reason why the potholes formed. I found this super fascinating

because these holes seemed to be perfectly carved and smoothed by only the sheer force of nature. As shown in the image, the ladder can give you a perfect representation of just how deep the potholes go. But even more fascinating is Steffi's ability to constantly remind us that she's perfect without trying, as seen in the figure below. Thanks, Steffi, we love you.

Then, we went back to the van to jam out. After a nice performance by DJGJ, we stopped in the most adorable town called Poschiavo. By random coincidence, there was a beautiful wedding with a band in the square of the town, which we were lucky enough to witness. And by the way, the bride waved at me, so I'm kinda famous. Then, after scarfing down all the pastries in the town, we stumbled upon the most adorable puppy in the world. Maggie and he really bonded and there were tears upon departure. But don't worry, dog, we'll be back. Then we ate dinner and went to bed to prepare for more hiking tomorrow.

Sydney

Palace in Poschiavo, Switzerland. Photo credit: Reto Gieré

Hiking from Chiareggio to Rifugio del Grande and Val Sissone

Hannah Wolfer

Our second day in Chiareggio started out yet again with another carb-filled breakfast and an abundance of caffeine to gear up for the full-day ahead. After eating as much as we could, we proceeded to leave our hotel and start our hike. We all did our best to keep up, but some of us were lagging behind as we were feeling the effects of the strenuous hikes from the past week.

After climbing to the half-way point, we stopped to catch our breath and listen to a presentation on human behavioral adaptations to alpine ecosystems. Figure 1 below highlights our captivating view during this time.

Fig.1 View during today's first presentation

During the presentation, we learned about mountain agriculture and land ownership. After the presenter concluded, and all of our questions were answered, we continued to hike uphill. Despite the fact that today was one of our most difficult hikes, and we were at the tail-end of our trip, we exceeded our expectations. Having made significant progress uphill, we proceeded to listen to a second presentation about the formation and cycling of rocks. We applied our newly acquired knowledge about the different classifications of rocks when asked to examine rocks and identify our findings.

With the completion of the second presentation, we finished our hike uphill and then sat down to eat our much-anticipated lunch and to enjoy the spectacular view. Having worked up an appetite we devoured our lunch and still had room for dessert. Chocolate, breathtaking views and being sedentary hit the spot. Besides eating, our second favorite activity was photography. Pictures continued to be taken to document our trek uphill and to remind us of our accomplishments. Figures 2 and 3 represent our view from the top as well as where we ate and rested our legs.

Fig.2 View from the top of the mountain

Fig.3 Place to eat and rest on top of the mountain

After rejoicing and relaxing, we made our way downhill feeling thankful that the hard part was behind us. There was a resounding sigh of relief from the majority of us who preferred to go downhill, although there were a few exceptions.

Our group managed to finish the hike in one piece and slowly made our way back to the hotel. After showering quickly, we rushed to dinner, once again excited for the next meal. Like our previous meals, we scarfed down our food and jumped at the opportunity for second and third helpings. Exhausted, stuffed and sore, everyone headed up to their rooms to get a good night's sleep. Our eyes closed as soon as our heads hit the pillow. Sleep could not come soon enough!

Fig.4 My drawing of a cow we saw while hiking

Hiking from Chiareggio to Val Ventina and Alpe Zocca

Jeff Manner

The day started at 7:30 am with our second breakfast at Albergo Chiareggio, located in Valmalenco Valley, Lombardy, Italy. Breakfast consisted of assorted pastries, dry cereals, yoghurt, juices, and coffee. We consumed as many calories as we could stomach and gathered in front of the hotel for our next hike. Morning chatter about the hike and an afternoon chance of rain slowly subsided as pre-departure excitement kicked in. We set off for our daily hike just after 8:00 am and followed our trusty leader Reto to the trailhead.

The trail began as we crossed the bridge over the glacial river. Signage provided directions and estimates of several routes, and a clue to our destination (Figure 1). A thick forest of European larch (*Larix decidua*) and Swiss stone pine (*Pinus cembra*) covered the mountainside. The trail was wide and smooth compared to many of our previous hikes. The condition of the trail was due in part to its usage by the shepherds. Several times during the hike we were passed by ATV's loaded with supplies pressing up the mountain path. While the trail was in good condition, the steep slope made the hike rather challenging.

Fig.1 Trailhead Signage.

As we proceeded up the path, we came across several pine trees with bent trunks. The trunks are misshaped due to a response to the downhill movement of soil on the slope. The term for this response is reaction wood, for which conifers develop extra growth on the underside of the bend to straighten and support the tree trunk. These peculiarly shaped trees are often harvested to be carved into alphorns. Alphorns were historically used by the mountain shepherds for communication with their families below. Teia, whose presentation was on the alphorn, wasted no time climbing on one of the misshaped trees for a photo opportunity.

After an hour on the trail, we arrived at our first destination of Rifugio Gerli-Porro (Figure 2). The shelter is positioned in the valley (Val Ventina) at the base of Pizzo Ventina and has spectacular views of Ventina Glacier (Ghiacciaio del Ventina) (Figure 3). The shelter has rooms available for hikers to stay overnight, along with food, beverages, and souvenirs. As usual, many of my classmates indulged in a cup of hot chocolate from the bar. There was also quite the commotion from the discovery of several small frogs near a pond next to the shelter. A glimpse into the pond revealed a large congregation of tadpoles, along with the small green adornments being guarded by several of our group members. After the appeal of frogs and hot chocolate wore off, we gathered for a short lecture on dendrochronology

Fig.2 Rifugo Gerli-Porro

Many of the oldest trees in Europe reside in the area around Rifugio Gerli. There is an old growth forest located within a short hike from the shelter, though we did not have the time to visit. The forest contains larch species up to 1,008 years old, and stone pines up to 435 years old. Not all the trees are still alive, though their remains provide insight into a millennium of environmental conditions. Scientists can date the trees through a technique called dendrochronology, which provides ages for the trees by the number of annular rings they contain. The distinction of annular rings is facilitated by differential wood densities between the growth in the early and the late growing season. This variation produces a visible ring pattern from seasonal growth that may be counted to estimate tree age.

Next, we visited a chapel that is dedicated to those that have died while climbing the nearby mountains (Figure 4). Inside the small building are the names of the fallen men that did not return from their expeditions. The number of names is astounding for a mountain which most outside of the Alps have never heard of. A single candle burns inside the chapel as a tribute to the departed. 92 nameplates list those that perished between 1944 and today. Though I assume that since the record started in 1944, there are many names omitted from the list.

Fig.3 Ghiacciaio del Ventina

Fig.4 Chapel Ai Caduti delle Nostre Montagne

We then gathered in front of the chapel for Eliza's talk on the structure of Earth's interior (Figure 5). The Earth's interior is divided into the core, mantle, and crust. Eliza passed around a ruler that was marked with a line representing the depth to which man has drilled into the Earth. The mark was approximately one millimeter on the foot-long ruler, representing the 12 miles man has drilled into the 7,917-mile-wide Earth. We then learned how scientists use seismic waves created during earthquakes to assess the composition of Earth's interior. Two types of waves are measured, S and P waves, of which S waves do not transmit through liquid. This has enabled scientists to determine that Earth's outer core is liquid and the inner core solid.

The composition of the core is believed to be both liquid (outer) and solid (inner) iron and nickel. These calculations center around the components found in meteorites that have fallen to Earth. Meteorites represent the constituent materials of which Earth was created from 4.5 billion years ago. While there seems to be some controversy around the composition of Earth's core, the previously mentioned theory is widely accepted today.

Fig.5 Eliza's presentation on Earth's interior.

Earth's crust is much simpler to assess as it is 45 miles deep at its thickest. Continental crust is thicker than oceanic crust, which average 25 miles and 4.5 miles thick respectively. Oceanic crust tends to be younger than continental crusts, as crustal formation occurs at mid-oceanic ridges. Earth's mantle composes a much larger proportion of Earth's interior than the crust. However, we must rely on xenoliths, exposed sections of crustal material, and seismic interpretations to determine mantle composition.

I cannot write about Eliza's talk without mentioning the drama that ensued. In the middle of her presentation, three geese that had been wandering around decided that they did not like us in their feeding area. The geese hissed and chased several of our group members away, including Reto (Figure 6). Eliza

Fig.6 Reto and the geese.

finished her talk; however, she kept a close eye on the geese as they continued to cause a ruckus with other hikers.

After Eliza's presentation, we hit the trail again, crossing the river and heading up Pizzo Ventina. Reto pointed out that the floodplain in Val Ventina is missing trees and other large vegetation. Part of the mountains on both sides is also lacking vegetation. This semi-barren landscape is due to glacial advances during the Little Ice Age. Glaciers scoured the valley pushing rocks and soil downslope, accumulating a collection of debris called the terminal moraine at the front. After the Little Ice Age ended, circa the 1850's, the glaciers began to retreat. However, the glaciers had cleared all vegetation and habitable soils away leaving only bare rock. Bedrock must be transformed and conditioned into soil by weathering and microorganisms in a slow process called primary succession. The lack of vegetation in this area today provides evidence of the glacial advance and the slow pace of recolonization by plant species.

A few minutes into our ascent we climbed over a very rocky stretch, before reaching a flatter, more vegetated area. Reto explained that we had just hiked over the top of the lateral moraine from the Little Ice Age glacier. As the glaciers move, they not only push debris in from of them, but their edges scour and push up debris as well (Figure 7). The more vegetated areas were older than the last glacial advance, allowing for more accommodating soils for plant growth. In this area, larch and stone pine species grew tall and dense, creating a thick canopy cover. Underbrush filled the spaces between the pines, with highbush blueberry (*Vaccinium corymbosum*) dominating the landscape.

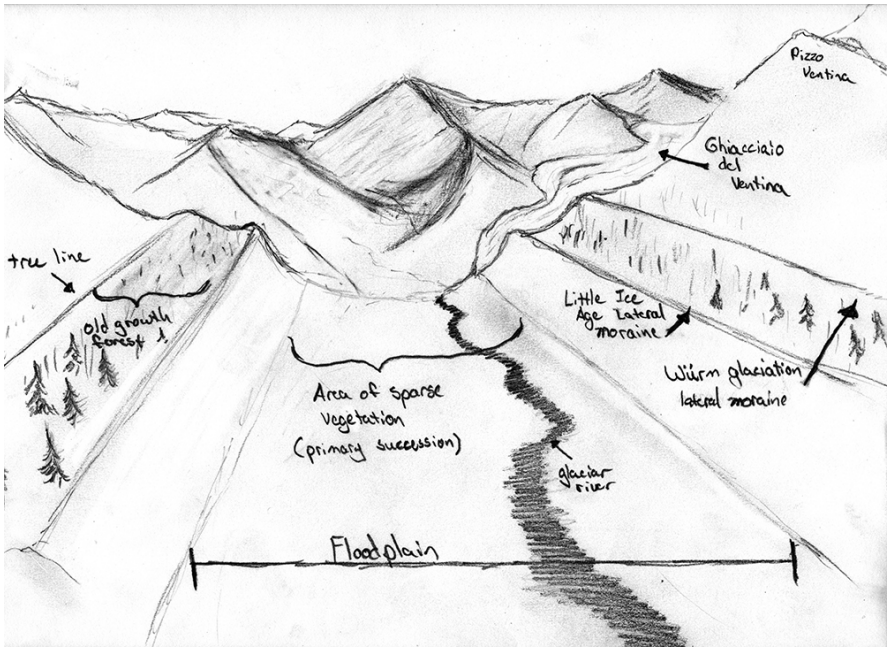


Fig.7 Lateral moraines in Val Ventina.

A few hundred meters further upslope we reached another rocky area followed by a lowland (Figure 8). We had once again crossed a lateral moraine created by glaciers moving down slope, scraping the sides of the mountain. This moraine was created by the last glacial maximum of the Würm glaciation (10,000 years ago). The area was highly vegetated and had several marshy sections.

Fig.8 Hiking through an upland marsh

The marshes were created from the lateral moraine's damming effect on the mountainsides flowing water. This created a very diverse habitat of mountain forest and upland marsh, contrasting itself from the previous barren floodplain below.

We stopped for a break in a flat, grassy open area slightly elevated above the marsh. After catching our breath, Gabby began her presentation on Human Effects on Alpine Fauna (Figure 9). She talked about climate change and how it was affecting local animals. Gabby focused on ungulate species such as roe deer (*Capreolus capreolus*), red deer (*Cervus elaphus*), ibex (*Capra ibex*), and chamois (*Rupicapra rupicapra*). Roe and red deer are the least affected by climate change because they live in temperate climates of lower altitude. Ibex and chamois, however, are highly affected as climate change quickly warms their ecosystem. As the climate warms, the distribution of these species must shift to higher altitudes to keep within their preferred thermal range. These species may soon reach their thermal maximum, leading to rapid declines in populations.

Several other species in the Alps have been hunted to extinction. Brown bears (*Ursus arctos*), lynx (*Lynx lynx*), and wolves (*Canis lupus lupus*) have all been eradicated from the region. Reintroduction and recovery programs have enabled the return of small populations throughout the alpine regions. However, run-ins with farmers and other populated areas have led to some public upset about the reintroduction programs. The

Fig.9 Gabby's presentation on alpine fauna.

ecological benefits of such large predators should be conveyed more convincingly to the public to enable the continuation of these efforts.

After Gabby's presentation concluded, we hiked a short distance through the upland marshes to the old shepherd's houses. Several of the structures had crumbled from lack of upkeep, yet one house stood firm. The last standing shepherd quarters had a lock on the door and well-kept appearance. Perhaps it was being maintained for its appeal, as it made a perfect location to stop for lunch. We scattered into social groups, unpacked our meals, and reveled in the mid-mountain views from Pizzo Ventina. The weather had cooperated to this point in the day; however, some ominous clouds we gathering. We contemplated taking a group photo but decided to hold off for better lighting. While we waited for the perfect photo opportunity, we settled in for Grace's presentation.

Fig.10 Grace presenting on clouds and cloud formation.

With a chance of afternoon thunderstorms, and an obvious change in the overhead clouds, Grace's presentation on cloud formations and types was rather fitting. We listened as she described ten different types of clouds, their characteristics, and accompanying weather patterns (Figure 10). The most pertinent clouds at this point in the day were the cumulonimbus which were forming overhead. Grace also touched upon the Alps' specific weather patterns, which can become unstable due to the mountainous topography, variations in temperature, and the effects of the nearby bodies of water. Reto added a bit about inversion, in which warm air traps cool air in a valley. Wood burning can lead to smoke being trapped in these weather patterns and creating unpleasant and unhealthy conditions in the regional valleys.

For the rest of the afternoon, the clouds continued to roll in. Shortly after Grace's talk, we found a moment of good sunlight for our group photo (Figure 11). We then traveled up to a high point for a quick talk on plate tectonics, uplift, and mountain building. Reto explained to the group how the region around us had previously been underwater between the African and European continental plates. The collision of these two plates caused the formation of the Alps and caused portions of the Earth's mantle to become exposed. On one of the mountains in the valley, a portion of the rock is crustal material, while the rock next to it is mantle. A visible line delineates these two sections and is apparent even to the untrained eye. Higher up on the same mountain, a mountain lake, Lago Pirola, sits at the junction of these two layers. This enables a person to swim from the Earth's mantle to the crust, which is on every geologist's bucket list.

Fig.11 Group photo on Pizzo Ventina

Fig.12 Cows grazing near Pizzo Ventina

Fig.13 Rain showers in Valmalenco

We started our descent down the mountain with a game of 20 questions. Some 400 or more questions and 300 meters later we came across some of the shepherd's cows (Figure 12). The cowbells had become a regular sound among our hikes, and we often found ourselves saying "we gotta have more cowbell". After some photos with the cows, and we will leave it at that for customs declaration reasons, we headed on our way again. It took an hour or so to make the full descent and reach the river. We then spent half an hour searching for rocks to identify in the floodplain. Our rock identification activity was cut short by storm clouds and a slight drizzle. We headed for the albergo, and one loud crack of thunder added some motivation to the group. The rain seemed to surround us on all sides, however, it never fell on our group (Figure 13). We arrived back at our lodging early due to the rain, though this provided us some much-needed time to rest before dinner.

We met in the bar of Albergo Chiareggio before dinner for a talk on geology and the next day's activities. Perhaps it was just a chance for Reto to show off the beautiful map to which he contributed to with the work from his Dr. sc. Nat. thesis (Figure 14). Either way, it was an interesting and informative talk about regional geology. *Carta Geologica della Valmalenco* is a geological map of the underlying bedrock of Valmalenco. Reto had spent two summers up in the mountains we had been hiking for the

last few days, mapping rock outcrops and compiling data for this map. In collaboration with a dozen or so other scientists, the geological data was assembled into a map that can be found on the wall of every local geologist's office, rock and mineral museum, and even some bars and restaurants.

We ended our lecture and reconvened in the dining room for our last dinner in Chiareggio. Buckwheat pasta with local cheeses was the highlight of the night, with veal as our second course. Splendid desserts, wine, and comradery kept us cheery right until bedtime. The albergo owner's daughter brought us a taste of Genepì, which is an alcohol flavored with local flowers. The flowers are from the genus Artemisia, which is the same genus as absinthe. The flavor of the Genepì was exquisite and was an excellent end to an amazing day. By this point in the night, I had run out of energy, as had my classmates. We laid our heads down for one last time in Chiareggio, before heading on to our next destination.

Fig.14 Reto explaining *Carta Geologica della Valmalenco*

Quarries and mines in Val Malenco, followed by the drive through Valtellina and along Lago di Como to Bellinzona

Danny Cooper

After a long hike the day before, we all woke up in beautiful Chiareggio, Italy for a delicious breakfast. We met at 8 AM and enjoyed delicious fresh croissants. Allison especially enjoyed her breakfast of a chocolate croissant and a piece of cake as shown in Figure 1. Caroline wasn't as lucky as her milk spoiled. After breakfast, we all returned our keys and packed into the vans. John almost forgot his rock from yesterday but thankfully remembered in time. We then started our daylong journey to Bellinzona, Switzerland.

Fig.1 Allison with Croissant

The road down from the hotel was especially difficult, but Reto and Steffi had no problems. As Taylor Swift would say, this slope was treacherous, we-we-we liked it. From this road, we could see many serpentinite quarries, which are common in the area. Serpentinite is special for its green color. Reto explained that serpentinite had many uses. It is used decoratively in kitchens, bathrooms, floors, and even the staircase at Hotel Chiareggio. Whilst driving Reto abruptly pulled over and declared "I have to stop and say hello." Reto recognized a worker at a serpentinite quarry and wanted to have a chat. The worker was making shingles out of serpentinite. Reto also shared that the craftsman works as a skiing instructor in the winter and that the road to the town of Chiareggio is closed in the winter. Further down the road, we stopped at another serpentinite quarry and Reto enlightened us with some more information on the quarries. Many of the quarries in the area are family owned but there are a fair number of corporations as well. The serpentinite rock is dark green and the ones we were looking at had many veins. It is a typical metamorphic rock with parallel foliation. The quarry used big cables with quartz sand to saw down the serpentinite

Fig.2 Reto & Maggie

Fig.3 Serpentinite Quarry

Fig.4 Sydney and Teia performing

These excavated rocks are given to family businesses where they are hammered down into a variety of things. These workers know exactly the sound the rock will make when it's ready to break. Reto talking at the quarry can be seen in Figure 2. A picture of the quarry can be seen in Figure 3.

At this stop, the inmates of the two vans got to congregate and we learned Steffi's van jammed out to some Hannah Montana and Jonas Brothers (and Flume). Maggie didn't want our van to be left out and serenaded us with a moving rendition of "Shots". Continuing with the musical vibes, Teia and Sydney performed a song for us with the serpentinite rocks!! Reto shared at this moment that there is an instrument made of serpentinite called a lithophone. Teia and Sydney's lithophone cover of "We Will Rock You" was really something to see!!

After hopping into the vans we drove a short way to the Bagnada Mine in the Comune di Lanzada. In Figure 5 we can see the sign at the mine. We piled out of the vans and headed inside where Lisa signed her name in the guest book. We also saw Reto's map of the area again and were thoroughly impressed. We met our tour guide for the mine, Carmen, and her husband Diego and walked up to the mine. I want to mention here that Reto claimed that there was no hike today and I have one thing to say about that: Reto lied. If the steep walk up to the mine doesn't count as a hike, then what does?! Anyway, as we all huffed and puffed up the hill, Carmen and her translator Reto started to give us some background about the mine. It was clear they did not break a sweat. Reto shared that he had studied geology with Carmen's advisor back in the day. From Carmen, we learned that the valley we were in was notably rich in minerals with over 265 mineral types found within it. This is a super high diversity of minerals for one valley. It was concentrated in this valley because of faults. The Bagnada mine was mined until 1975 for white talc, other mines for asbestos, gray talc (like soapstone), and serpentinite. White talc, magnesium silicate, was especially important. It is used in talcum powder (baby powder). The white talc is found in Dolomite marble.

Fig.5 Sign at Bagnada Mine

We looked at a graph that showed the location of different types of rock in the vicinity of the mine, as can be seen in Figure 6. The green of the graph represents the serpentinite mantle. The orange represents marble crust. The blue is quartzite veins and the gray are talc veins. The talc veins stop abruptly at the serpentinite boundary as the conditions for talc to form were not given in serpentinite. The presence of quartz in the valley was discovered in the late 1800s. Quartz is valuable because during wars quartz was used in optical instruments. When squeezed, quartz produces an electrical current making it useful for binoculars, scopes, and bombs in war. For this reason, the valley does have somewhat of a dark history from WWII. The mining engineer of the valley worked for the SS and had a positive relationship with the locals. The locals liked him because they were able to work in the mines instead of fighting in a war.

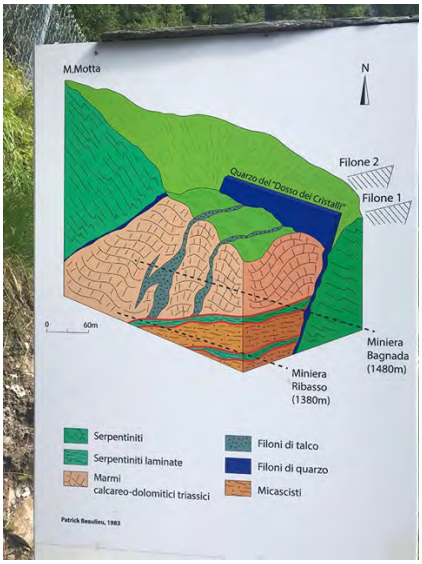


Fig.6 Diagram showing the geology of the Bangada mine

Fig.7 Zoe & Gabby in helmets

Fig.8 Mining Cart

After hearing all of this from Carmen and Reto, we all headed into a room to get our hairnets and helmets on. Gabby and Zoe were super prepared as seen in Figure 7. Maggie is kindly demonstrating what the hairnets looked like. After getting our safety helmets on we headed to the mine. Outside the entrance, we saw a cart shown in Figure 8 that had to be moved by one man. He was surely very strong. As we walked into the mine we felt the cold. The mine is at 7 degrees Celsius year-round, similar to how the Crotto was kept cold in Chiavenna. As we entered the mine we learned that the Bagnada Mine opened in 1931 before WWII and closed in 1985. In the beginning, they only mined if material was requested but as white talc became more commonly used it was in full operation. Until the 40s the mine was only mined by chisel and hammer with 25 miners. These miners had to wake up very early in the village below and hike up to the mines. We also learned that the mine has 9 different levels; we toured 4. The mine always had a chief of the miners and before geologists were brought in, excavation was simply done by intuition. The geologists and engineers came

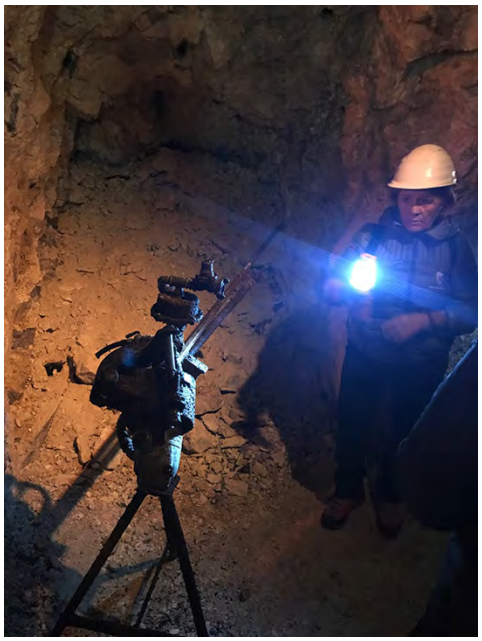


Fig.9 Carmen with compressed air machine

to the mine in the 70s and 80s. The ground level, level 0, was the only one with rails and a cart. So, any material excavated from above was brought to this level via ropes and chutes. Carmen also explained that levels below Level 0 were often filled with water for part of the year. This created a need for a major job in the mine which was pumping out water. We also learned that the tracks of the cart were tilted toward the exit, so the carts filled with talc could be pushed out easier. Carmen next showed us a compressed air machine which was used to destroy rock, this is shown in Figure 9. It was a dangerous task but eventually became more modernized to be remote and much safer. It was so dangerous before modernization because of the dust that came off the rocks. This dust could cause the lung disease, silicosis.

Next, we ventured further into the mine where we noticed a shiny copper-looking mineral. Reto explained that this mineral was green mica and not really copper. We also saw some failed excavations where miners were looking for talc but didn't find any. We stumbled upon some Dolomite marble where we learned that one of the reasons it could host talc was the presence of magnesium. We learned that the metamorphic marble was made from a sedimentary limestone from a shallow sea between Europe and Africa from around 200 Million years ago. The sea had a depth of about 200 meters, which Reto noted was similar to the Bahamas. We also came across an area of smooth rock which was a fault. The rock chipped around the fault came off smooth, revealing the fault. The faults in the Bagnada mine have not shown seismic activity. Next, we climbed some stairs to an upper level to watch a movie. We walked on a nice metal staircase and it was noted that the miners did not have this luxury. The movie we watched talked about technology and explosive use in the mine. We were all impressed with the movie's special effects.

Fig.10 Movie showing the miner's life

After the short video, we walked to another room for another movie. Figure 10 shows the projection in the mine. This second video was about the lives of the miners. The miners had to endure a 500-meter elevation change every day of work. Their work often did not stop in the winter.

The video also spoke about the role of women in the mining business. Women looked at discarded material outside the mine for useful minerals and materials. They also carried materials down from the mine. Women were often paid by the weight of the baskets they carried down, encouraging them to carry as much as they could in one trip. There were about 80 women working in the mining business of the area.

Fig.11 St. Barbara statue

After the video, we continued our exploration of the mine. We saw what the tunnels looked like when the miners worked there, which were much more claustrophobic than the mines we were walking through. Reto also pointed out the dust in the air – which was in fact not dust at all. It was mist which occurred because the rocks retained water. It was especially misty from the rain from the last few days. We also saw some lamps, which were a lot dimmer before WWII when brighter ones were introduced. We learned about what conditions are needed to form minerals: hot water with fractures to circulate and heat and pressure. The circulating water needed to bring silicon into the mix. At temperatures of 400 degrees Celsius, dolomite marble can form talc. At temperatures a little higher than 400, a not as useful mineral called tremolite forms.

At this point in our tour, we passed over to the quartz vein. The discovery of the quartz came about in a very interesting way. While building an emergency exit for the mine, quartz was discovered. The miners thought they should be able to claim the quartz because the mine owners only had a permit for talc mining. So, the miners did get the quartz. However, the owners did not like this. So, the owners destroyed the quartz so no one could sell it. People still sneak into this part of the mine today collecting quartz. In this area, Reto also pointed out fool's gold. It looks like gold but is a mineral with iron and sulfur in it. After this area, we went to where the explosives were stored. They were stored in the naturally driest part of the mine for protection. They were behind two doors that only one person in the mine had the keys to. The pathway to the explosives chamber was zig-zagged so if something went wrong, the turning of the path would weaken the effect of the explosion as it traveled. We passed a Statue of St. Barbara, who protects miners, while we entered the explosives chamber, as seen in Figure 11. We passed through a very heavy door that had to be brought up from the valley below. Here we learned about the cord used when detonating explosives. The cord transferred fire via gunpowder, fabric, and asphalt. It was usually around 2 meters long with the fire traveling at about a half meter a minute. As we exited this room of the mine,

Fig.12 Reto & Carmen with dynamite

Steffi noted that she saw some fungi on the rock. Reto quipped a Seinfeld reference about fungi (fun guy!!) - He's just like us!! After leaving this room we came to an area of the mine with holes drilled into the wall and Carmen and Reto demonstrated how using the explosives worked, as shown in Figure 12. Dynamite would be stuffed into the holes with wood where a cord would then lead to the detonator. The dynamite would then go off from the core to the outside. While showing this to us, Reto almost lost a piece of dynamite by sticking it too far into the hole, demonstrating for one of the first times in the trip that he was capable of a mistake – He's just like us!! During the walks between sites where Carmen was teaching us, Sydney was using her time wisely and playing some Candy Crush.

Fig.13 The New Romantics performing

After this area, we headed down some stairs into a bigger room with a stage on it. Walking in Teia noted that this would be a great venue for the newly formed Taylor Swift a capella group composed of Teia, Caroline, me, Gabby, and Zoe. The New Romantics got on stage and performed for the class as seen in Figure 13. They were all honored to be in the presence of our talent. Leaving the stage area, we all started to notice a peculiar smell. I first

thought the smell was Maggie, but we later learned it was fuel for a lamp. Diego demonstrated the technology of the lamp for us all and even helped Maggie light a lamp to lead us out.

Fig.14 Reto with gray talc pot

Fig.15 Asbestos

Leaving the mine, everyone was incredibly relieved, especially Caroline and Steffi who are not the biggest fans of confined spaces. But nevertheless, they persisted. We headed down the path we took up to the mine and entered the little museum in the building where we arrived. Here we learned about the different minerals of the mines of the area. First, Reto told us about gray talc, which is like soapstone. He was holding gray talc from Chiesa in Figure 14. This stone was used for making pots used for cooking and for insulation. The pots were made via hydropower and lumber. This was a tiring and delicate task. We saw pots that were specifically made for the cooking of minestrone and polenta. The polenta pots were made of copper as well. From one piece of stone, it was possible to make eight pots. We then talked about serpentinite again and we discussed its use in roofing. Serpentinite roofing was exported to the Engadin region of Switzerland from the valley. We also saw some asbestos in Figure 15. Asbestos formed in the rocks in strands that were remarkably soft. Asbestos was often used in fireproofing but, as we all know, it is incredibly toxic so it is banned today in many countries. The asbestos we saw was especially useful as a fabric. It was also the least toxic asbestos, so we were able to touch it. Asbestos formed in a fracture of serpentinite that filled with water.

Next, we packed into the vans and headed to lunch. This was a short ten-minute drive but Teia and I still managed to fall asleep. We had a great time eating lunch at a playground near the museum we were to look at next. Gabby and Zoe smiled with their lunches in Figure 16.

Fig.16 Lunch at the playground

Fig.17 Maggie on the zipline

Maggie enjoyed the zipline on the playground in Figure 17. We also changed into our bathing suits at this stop in preparation for our upcoming stop at Lake Como. After lunch, we walked a short way to the mineralogical museum associated with the Bagnada mine. Carmen joined us again here. We explored this museum which held some fascinating minerals. The museum contained the largest piece of Perovskite in the world. It also contained a variety of demantoid, or green garnets, which are indicative of the region. There was one piece of demantoid worth 25,000 Euros shown in Figure 18. We also saw some toxic minerals, including bright orange minerals containing mercury and arsenic. We also saw black antimonite which contained antimony and was toxic. The bright pink rhodonite matched Steffi's beautiful hair. Rhodonite is a manganese silicate. We also saw some black quartz, which was just quartz covered in chlorite. We were all impressed by a variety of rocks that glowed in the dark too.

Fig.18 Demantoid

Fig.19 Bright pink rhodonite

After the museum, we all departed to get some gelato nearby. The gelato was, of course, delicious, and we had a ball playing 20 questions during it. I guessed Sydney's answer of Big Time Rush in one try. Maggie also snorted at Caroline's hilarious joke. After the gelato, we packed into the vans to head to Bellinzona, Switzerland. As we got into the

vans Gabby shared that she had met Corbin Bleu's father and Ashley Tisdale – interesting! We drove from Lanzada to Sondrio. The town of Sondrio is the capital of the province of Sondrio. Sondrio had an almost Mediterranean climate, which was a big contrast from the alpine climate of Chiareggio. We saw vineyards in Sondrio from the road, which Reto shared made the wine we had with our dinners in Chiareggio.

Fig.20 Swimming at Lake Como

Fig.21 Gelato in Menaggio

We then drove from Sondrio to Menaggio, where we got out and went for a swim in Lake Como. Figure 20 shows Allison, Teia, Zoe, Maggie, and myself at Lake Como. The rocks were very slippery, and I fell trying to walk out into the lake, but it was still amazing. The temperature of the water was perfect and the scenery around us was stunning. We swam out far and tried asking boats passing by if they could take us to George Clooney but we sadly had no luck. Our swim in Lake Como went by in the blink of an eye and we soon had to dry off and get back in the van. We drove a short way and parked again for some more gelato, seen in Figure 21. You can't go wrong with gelato! (Although some people got smoothies instead). After our gelato-smoothie-pastry break, we again packed into the vans and drove the final way to Bellinzona.

We passed through Italy to the city of Lugano, Switzerland. Here Reto shared that many people lived right across the border in Italy and traveled to work in Lugano, Switzerland. This 30-minute commute is definitely worth it. It is much cheaper to live in Italy and by working in Switzerland you get the benefit of almost double the salary you'd get for the same job in Italy. And you were living near the beautiful Lake Como and Lago di Lugano. These people really had their lives figured out. Reto also shared that both these lakes are glacial lakes.

Day 11

After passing through Lugano, we arrived in Bellinzona about a half hour later. We unpacked the vans and checked into our hotel to prepare for dinner. We had pizza at the hotel restaurant and it was absolutely delicious. I had ordered the Popeye pizza which was regular pizza with spinach and egg and I am still thinking about it now. It can be seen in Figure 22. The group enjoying our meal can be seen in Figure 23. It was an amazing meal, which to no one's surprise ended in the third gelato of the day. Sydney was ambitious and found a way to finesse herself four gelatos. We all respected her gelato game. After our dinner we had one more thing to do before heading to bed. We walked a short way to Castelgrande, the lowest of Bellinzona's iconic three castles. From here we could see the two higher castles, Montebello and Sasso Corbaro. Caroline and I had a photo shoot with the castles in the background as seen in Figure 24. The castles lit up at night were an unforgettable sight and a perfect end to a perfect day. We were even more excited to explore Bellinzona tomorrow!

Fig.22 Popeye pizza

Fig.23 Dinner in Bellinzona!

Fig.24 Caroline & me with two of Bellinzona's three castles

Bellinzona and the return to Zurich

Zoe Kraus, Gabby Rosenzweig, Teia Ross, and Maggie Smith

Dear Diary,

For the second-to-last night of the trip, we stayed at the Hotel Croce Federale. We had breakfast at the hotel restaurant. As per usual, many of us had a mixture of bread, cheese, and meat, complemented by coffee and hot chocolate. After breakfast, we packed up our rooms and left our luggage in a lounge room and were off on a stroll to the Montebello Castle. We walked up stairs to a grassy hill, overlooking the city of Bellinzona. Here, Reto talked about the history of the castle and the surrounding areas.

As we sat on the lawn of Montebello Castle, Reto explained the history of the location and its geographical advantages. He noted that the Lago Maggiore was carved by a major glacier during the Ice Age and dammed by a terminal moraine. Now, it's the largest lake in Southern Switzerland and second largest in Italy. Although we weren't able to swim in this lake, Reto explained that the water was warm because it takes so long for it to travel away from the glaciers of today.

Initially, when the new Gotthard route became important, the previous Splügen trade route lost significance. Because Bellinzona was along this new route and along the Ticino River, it gained popularity. Reto continued to discuss the history of this location in relation to the Alps as a whole, by telling us that Milan had been very interested in conquering the Alps. The Romans also wanted to cross the Alps, but they were afraid of the mountain tribes that worked to stop them from taking over. In fact, the Visconti family battled the Swiss tribes here quite often.

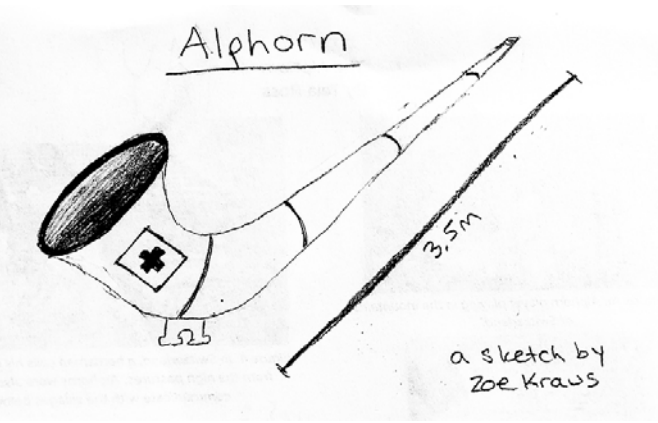
In regards to the castles of Bellinzona, they get younger the higher up in the mountains they are located. These were used as watch towers in the city at one point. Also, there is a main wall that continues through the city to the other side of the valley that closes off the valley to ward off intruders.

Reto continued to explain that in more recent years, Bellinzona has become a large transportation hub due to its proximity to the highway and train routes. The town is now a stop on the high-speed train; the fastest route between the North and the South. In order to make the travel time even less, a new base tunnel through Monte Ceneri is being built. It will save another 30 mins by going through the mountain instead of climbing it.

In the last part of his lecture, Reto emphasized the castle's importance by telling us that Bellinzona is a UNESCO World Heritage site. It was also all created because of geology. After concluding, Reto handed the floor to Maggie Smith for her presentation.

Maggie gave her presentation on sources of electricity, as well as energy consumption in the Alps. Energy consumption in the Alps relies primarily on renewable sources. Hydroelectric power is a popular generation tool in both Switzerland and Italy. The method was first used by Greek and Roman farmers and has been utilized for over 4,000 years. It simply requires water wheels and flowing water. Today modern nations build large dams to meet greater energy demands. These dams use hydraulic turbines, which date back to their invention in the 1800s. Through continual technological improvements, hydroelectric power has reached eighty percent efficiency. In other words, as the water flows past the turbines it possesses a certain amount of kinetic energy, which is lost during the energy transfer. Through better technology hydropower plants can keep eighty percent of the flowing water's total energy.

Solar power is also a popular method of renewable energy and is cost-effective. Italy is currently a world leader in solar power research and implementation. Most solar power systems use photovoltaic cells, which absorb sunlight and generate electricity through semiconductor material. Multiple cells make up a solar module and multiple modules make up solar panels.



Finally, Teia Ross gave the last presentation of the trip. She talked about the Alphorn, an instrument originating in the Swiss Alps. The Alphorn is a long horn that gradually gets wider over lengths around 3.5 meters and curves into an upward facing bell that rests on the ground. It is manufactured using a crooked tree or branch of solid softwood, usually spruce but occasionally pine. The wood is split through the middle lengthwise, then the two sides are hollowed out. After this process, which can take up to 70 hours, the pieces are glued back together. They are wrapped together by beef strips while they dry. With new technology, alphorns can be made by machinery rather than by hand, but traditional alphorn-makers still exist. Furthermore, some alphorns are created with plastic or carbon fiber rather than wood, which makes the process cheaper and the instrument easier to transport.

The alphorn is believed to have been created around two thousand years ago. Art has depicted the alphorn since at least the 2nd century CE, for example in a Roman mural discovered near Boscéaz, Switzerland. The first known documentation of the alphorn was in 1030 when a monk from the monastery of St. Gallen in eastern Switzerland described a herdsman playing alphorn music to his cows. There was also a Swiss accounting book from a Cistercian monastery in St. Urban's Abbey that recorded the payment to a traveling alphorn player. From the seventeenth to the nineteenth century, central European myths had been told that instruments similar to alphorns were used. The "Büchel" and the "Allgäuisches Waldhorn" or "Ackerhorn", are all wooden labrophones like the alphorn.

The Alphorn is a multipurpose instrument. It's used for communication, herding, and entertainment. The length of the instrument helps the sound of an alphorn carry over a far distance, across mountains and valleys. A shepherd would have an alphorn up in the mountains with their cattle. After a storm or at sunset, he would play a melodic tune to the village below to signal that all was well with the herd. However, if a storm was too dangerous or caused harm to the cattle, the shepherd would play single, repeated notes to call for villagers to come up the mountain to help. The alphorn also replaced church bells in medieval times, signaling a village that it was time for the service. Finally, it gathered villagers for a council as well as called the men to rally for war, as seen in the 1653 Peasants' War.

The alphorn is also used directly with the cows. The alphorn's "deep timbre" innately attracts the cows, without them having to be trained to come at the sound of the horn. The low notes were found to be soothing and reassuring to the cows, which drew them to the alphorn player. This method also was used to calm the cows when they were to be milked; the sound made it easier to milk the cows. Nowadays, the alphorn is used primarily for entertainment. The Swiss Yodeling Association has about 1,800 Alphorn players across the world, although many are concentrated in Switzerland. The Swiss Yodeling festival has an alphorn appearance, and the Swiss Association for Traditional Costume hosts parades in which the alphorn is displayed as well.

After the presentation, we took a number of photos against the castle wall. Then, we were free to wander the town by ourselves. We broke off into smaller groups and shopped around. There were many boutique stores, where a few of us bought items of clothing. A cute jewelry store was a fan favorite, providing a place to buy gifts for family. After shopping, most of the group ate at the same outdoor restaurant. Various pasta dishes were ordered, from lasagna to gnocchi. Here, to the water-drinkers' dismay, a glass of water cost more than a glass of wine. However, the food was delicious and everyone enjoyed their meal, except perhaps Zoe a little less because she accidentally ordered fusilli pesto pasta instead of gnocchi.

After lunch, the group met back near the hotel and piled into the vans for the last time. The drive back to Zurich took around four hours, but we made a caffeine-stop at a gas station to break up the ride. Danny bought over $70 worth of souvenirs, and Zoe and Gabby bought stuffed ibexes. Use of the restroom cost a franc, but you earned a coupon worth a franc. Teia used the restroom; Zoe used the coupon.

Back in the city where it all began, we arrived at the Hotel California and unpacked our bags. We had some time before dinner and wandered around this corner of the city. There is a Brandy Melville near the hotel, and many of the girls on the trip shopped around here. There was also a Subdued, but the higher prices deterred any purchases.

At 19:30, we met at the hotel to walk to dinner. Zurich was bustling with people at this time, and we walked by children playing in the fountain and street performers on the river. The city is so clean, despite the large crowds that we walked past. The venue, Tibits, is a vegetarian, buffet-style restaurant. The price of the meal depended on the weight of your

plate. The highlight of dinner was meeting Pamina, Reto's wife. Quite frankly, I have never seen a couple more in love. Sydney questioned them about trivia facts on each other to test the strength of their marriage, and they passed with flying colors. We talked about some of our favorite highlights of the trip, and the variety of favorite moments seemed to exhibit how each event was so special.

After dinner, Sydney was ecstatic because she was one step closer to getting to see her bear! Reto told his wife that the St. Josef hotel was only a mere five-minute walk away. However, she figured out soon enough that it was more like 20 minutes. Basically, this was the equivalent of Reto saying "there's no hike today." Everyone had great conversations with Pamina as we walked Sydney to the hotel. Pamina even led us on the route closest to Lake Zurich. She knew that most of us were unable to see the beauty of the lake because of the Street Parade the first day we were in Zurich. Although that was a fun time and definitely a once in a lifetime experience, it was a great end to the trip to see Zurich at night. The lake was lit up, reflecting the light of the moon and city.

We finally arrived at the St. Josef, and Sydney was reunited with her bear! It was a beautiful sight to see. Pamina then offered to celebrate the occasion by buying us all gelato. It was super sweet, and we caught the first gelato place we saw because it was about to close. We got extra lucky. Danny was especially appreciative of the gelato stop. Gelato as a whole was definitely one of his favorite parts of the trip. He even licked some off the floor because he didn't want it to go to waste! It was hilarious.

After everyone's gelato craving was satisfied, we began our walk back to the Hotel California. It was our last hurrah before we had to say a heart-wrenching goodbye to everyone on the trip, especially Reto. As we were walking, Sydney got distracted by the brightly-lit candy shop along the way. She just had to stop! She bought a bunch of candy (which we all took part in eating and enjoying).

Soon after, we came to a stop outside the hotel, and both Reto and Pamina gave a great speech saying that we were equally as good as the first group that had come through the program. All of us are proud that we had made such a lasting impression on Reto because he definitely has left a lasting impression on us. It was an amazing, once-in-a-lifetime trip that Reto planned and executed from start to finish. We are all in agreement with the idea that there is no better man for the job. He really cares about each and every one of us, and we all cannot wait for our reunion!

With love,
Zoe Kraus, Maggie Smith, Gabby Rosenzweig, and Teia Ross

Reto at Lej Muragl, between Muottas Muragl and the Muragl rock glacier, Engadine, Switzerland.
Photo credit: Freya Zhou

Cast of Characters

Sydney Balfan (Penn)

small but feisty / always hiking behind Reto / #Ateamonly
I'll stop on any and every hike for a dog
lost my beary in Zurich but got it back alive
I'll eat everyone's gelato when they don't finish it
the most undecided major / never wears a hat or sunglasses
gas pains are my thing

John Bonetti (Bard)

John's enthusiasm and ability for hiking have earned him the labels of "mountain goat" and "Spiderman" from his companions. He hails from the greater Philadelphia area and is a sophomore up in the Hudson Valley, pursuing photography as a major. John's greatest coup of the trip was buying a bottle of Vin Blanc at the CO-OP in Pontresina for 1.95 CHF, thereby earning the additional sobriquet of "Vin Blanc" for finding the cheapest wine in all of Switzerland. It's strange how people like to call John names.

Daniel Cooper (Penn)

Danny is a sophomore from Washington Township, New Jersey, who is undecided about a major. He's still nibbling all the options at the academic salad bar. However, he is absolutely certain about his alphorn solo with the up-and-coming Taylor Swift a capella group, The New Romantics, debuting in Spring 2019. (Assuming that the choreographer can figure out how to do a "dip" with an alphorn.)

← *Danny is the one without the bell*

Caroline Curran (Penn)

Caroline is an English major from Alexandria, Virginia. She's also a lead vocalist in the up-and-coming a capella group The New Romantics, which will debut in Spring 2019. When given the chance, Caroline can, and will, talk for hours about running, the Oscars, American politics, and the necessity for the Oxford comma.

← *One of these ladies is Caroline*

Allison Day (Penn)

Allison would like to thank TSA for not detaining her for trying to smuggle enough pasta to feed a small army and enough rocks to build a castle into the US.

← *This cow was on commission!*

Steffi Eger (un-matriculated)

Steffi, van driver and non-student (except of life), is an avid adventurer and a self-proclaimed adrenaline junkie. When she isn't running marathons in the Arctic, careening down the mountain bike trails of the Wissahickon Gorge, or backpacking across the Hoth System, she can be found learning the words to every song imaginable so that she can fully annoy a van-full of students when she sings along with every song played on a road trip. Her passions of teaching, art, and language are an integral part of her life's work with at-risk teenagers -- she says it keeps her young.

Reto Gieré (Penn)

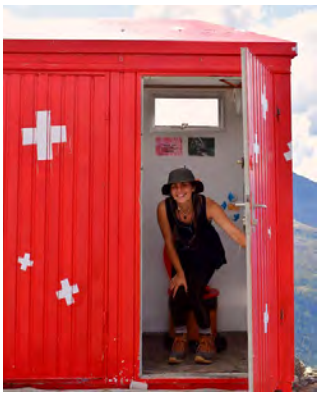
Reto is Professor and Chair of the Department of Earth and Environmental Science at the University of Pennsylvania. He hails from the gorgeous Engadine valley, one of his most favorite places in the Alps, which he wants to share with the world. Passionate about exploring nature, he also loves his Swiss cheese and chocolate and all the delicious Italian mountain food. If you cannot find him in his office, try climbing a nearby mountain. In his next life, he will be an ibex.

Lisa He-Wu (Penn)

Lisa is a junior from Puerto Rico studying Nursing. She loves to travel, take pictures/videos, and most importantly, eat. Her favorite part of the trip was definitely all those delicious dinners that lasted three hours.

Grace Johnson (Penn)

Grace hails from Connecticut and studies Economics and Classical Studies. Her love for animals was showcased by petting every dog and cow within reach. She worked on her fear of heights during the trip and even rode a chair lift!



Eliza Koren (Haverford)

Eliza patted a cow and lied to US customs about it, which is pretty edgy. She also ate cheesy gnocchi in its native habitat and now dreams of it every night (which explains the teeth marks on her pillow.) She cannot wait until the Penn Alps reunion, where she will cry over Reto's relationship with his wife again.

Zoe Kraus (Penn)

Zoe is a sophomore majoring in Economics with a minor in Consumer Psychology. She is an attacker on the Varsity Women's Lacrosse team, and a Big Quaker Captain for the Young Quakers program which focuses on bringing sports and after-school enrichment to young students in West Philadelphia. Lastly, she is a member of OAX, a philanthropic women's organization that works to raise money for Women Against Abuse.

Jeffrey Manner (Penn)

Jeff is an undergraduate student majoring in both biology and environmental science and plans to eventually pursue a doctoral degree in ecology. His hobbies include fly fishing and hiking. Prior to beginning his scientific studies, Jeff had a 15-year career as a chef.

Gabrielle Rosenzweig (Penn)

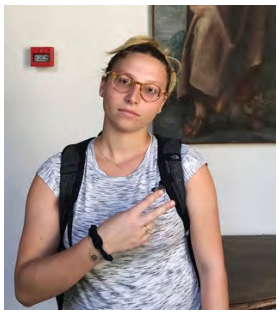
Gabby is a junior communication major, minoring in consumer psychology. She is also an attacker on the Penn women's lacrosse team, a member of the One for the World chapter at Penn, and a mentor to at-risk youth in West Philadelphia through Young Quakers. This was her first time traveling in Europe, and the experience has inspired her to push her Italian studies further.

Teia Ross (Penn)

Teia is a Philosophy, Politics and Economics major in the School of Arts and Sciences, with a minor in Legal Studies and History. She plays on the women's lacrosse team, writes for the Daily Pennsylvanian, and volunteers with the Young Quakers program.

Margaret Smith (Penn)

Maggie is a senior studying International Relations with a minor from Wharton in Legal Studies and History. Maggie originally picked this trip for the Italian food but came to love the Swiss views more (they are just as fulfilling but have fewer calories.) She brought enough snacks and sun-screen for the whole group!



Hannah Wolfer (Haverford)

Hannah just completed her Freshman year, and she participated in two Penn Abroad programs this summer. She attended both the sustainability trip to Germany and Amsterdam and the Penn in the Alps trip to Switzerland and Italy. Although both programs had different focuses, one on sustainability and the latter on geology, she found both to be incredibly stimulating and enriching.

Freya (**Qingyang Zhou) (Penn)**

Freya is a junior from Shenzhen, China majoring in German and Cinema & Media Studies. She always orders food in German when going to an Italian restaurant. She is also a masterful player of Cards Against Humanities.

In the Bagnanda Mine, Valmalenco, Italy. Photo credit: Reto Gieré

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For a very special video from Gabby