blockage in the vent was opened up.

La Soufrière volcano is a Peléan type volcano, named after the nearby Mont Pelée volcano. It is characterised by having viscous magma that rises but blocks the vent. As gases and magma continue to rise the subsequent eruption is explosive often with nuée ardentes - pyroclastic density flows of super-heated material that kill and destroy anything in their path.

Following such eruptions poor weather conditions also create further hazards, especially in valleys close to the La Soufrière Volcano. Ash can be mobilised as Lahars or mudflows in rainy conditions. Flooding, landslides and heavy accumulation of volcanic ash can result in collapsed roofs of buildings. Vegetation and livestock can be severely impacted. History suggests that the volcanic activity may persist for six months to a year before recovery of the human population can get underway. Meanwhile those affected must rely on friends or the government for help and shelter. The only upside is that the volcanic ash is very fertile and with a warm wet climate vegetation soon gets growing again once the volcanic activity stops.

My visit to La Soufrière in 2013 has certainly left me with a memorable impression and appreciation for the hardships faced by those who live on the volcanic island of St. Vincent.

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Foot Note

*In researching this article I discovered that back in the 1980's the Richmond Vale Academy, where we had stayed, had been accused of embezzlement, financial mismanagement, cult-like behaviour and questionable associations. In addition, Social Services in London had sent a number of young offenders here for rehabilitation in a tropical setting, a world away from their experience. I might have met some of them? Everyone was very pleasant, including the Russian who spoke no English and the Venezuelan who was continually high on marijuana.

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Girls into Geoscience, 28th-29th June 2021, virtual event summary

by Harriet Carlill

Girls into Geoscience (GiG) is an award-winning STEM outreach initiative based around an annual event. Co-founded by Dr Jodie Fisher and Dr Sarah Boulton from the University of Plymouth, the event aims to bring together women working in geoscience and girls interested in the subject in what is a predominantly male-dominated field.

Fig. 1: Girls into Geoscience logo

This year's Girls into Geoscience event, as in 2020, was an online affair. Spanning two days in June, there was a huge range of subjects on offer, both in the virtual field trips on the first day, and the Q&As and subject lectures on the second. There were contributors from all over Britain, as well as from overseas, who had come to talk in the area of expertise to the around 100 girls who attended.

After a short welcome on the first day, I spent the afternoon on two very different virtual field trips. The first - 'Ancient Landscapes and Life! How did the Yorkshire coast change 170 Ma?' with Dr Amanda Owen - explored a sequence of rock on the Yorkshire coast, and how analysing the rock and fossils could determine how they formed. With interactive polls and questions, we were able to work out that over around 26 million years, the area went from a deep marine environment, to a fluvial environment, to a shallow marine/beach environment, and then back to deep marine. Dr Owen then went on to explain why doing this sort of analysis is important. Not only can it show how past environments, animals and plants responded to changing conditions, helping us understand possible changes in the future, but it also helps to find resources based on the environment of deposition (e.g. hydrogen and carbon dioxide storage in geological formations

The second field trip was 'Hidden Glaciers on Earth and Mars' with Dr Katie Miles and Adam Hepburn. Using Google Earth, we were able to fly around the globe and see glaciers from our own screens. After briefly looking at the Perito Moreno glacier in Argentina as an example

of a 'typical' glacier, we moved to high mountain Asia and the Khumbu glacier - the highest glacier in the world, and more importantly, an example of a hidden glacier (bumpy and covered in debris and depressions).

Fig. 2: Google maps view of Khumbu Glacier

The debris zone of the glacier is also the ablation (melting) zone. Although the glacier is not actually receding (it is still up against the end moraine) it is still melting, but in the middle instead (shown by a dip in the ice). The thickness of debris varies, with a thin layer increasing melt due to the albedo effect, and a thick layer (at the end of the glacier) acting like a blanket and preventing melting. Dr Miles had spent many months out on the glacier studying it, and she talked about some of the work she had done collecting bore holes and using sensors to measure the temperature of the ice. What she had found was that the temperature was worryingly high - around -2°C compared to up to -20°C in the accumulation zone in the western cwm of Mt Everest (where the glacier forms) (Wikipedia, 2021).

Adam Hepburn then took over to talk about how researching hidden glaciers on Earth can help us understand Mars. The planet is covered in canyons and channel networks, with two polar ice caps and active sand dunes.

Fig. 3: view of Mars

Viscous flow features of a similar scale to Khumbu have been found, made up of 90% ice and covered in debris - analogous to the hidden glaciers on Earth. By gaining a better understanding of hidden glaciers on Earth, we can better understand past climates on Mars, and hopefully we will understand more fully how to study Mars in the future (Hargitai, 2014).

Day 2 was a full day of activities and talks. After a brief welcome and introduction from Dr Sarah Boulton, we had four short talks from Dr Natasha Dowey, Dr Marie Cowan, Dr Rehemat Bhatia and Prof Anjali Goswami about their respective careers and how they got into their particular field. Afterwards we were able to ask all of the speakers questions in a Q&A session. After a short break we then had two more Q&A sessions. The first was 'Dealing with change, challenges and opportunities' with Lingli Zhou, Jen Brooke, Polly Foster and Jenny Wiggins, and the second was 'University Life' with several current undergraduates and recent graduates from all over Britain and Ireland.

After lunch we moved onto the workshops. Prior to the event all participants had been sent a form with a choice of a range of subjects to choose from. The first of the two workshops which I attended was 'Peruvian glaciers and water resources' with Prof Caroline Clason and Dr Sally Rangecroft. The workshop began with an introduction to the importance of glaciers as water sources, with ice making up 70% of freshwater globally, despite only covering 10% of the Earth's surface. Due to low rainfall in South America, especially on the western coast (west of the Andes), around 250,000 Peruvian people are 80 to 100% reliant on glacial meltwater for drinking, sanitation, energy and agriculture. The second part of the workshop used Google Earth to allow us to look at five locations in the Peruvian Andes that are significant in relation to glaciers as water resources. The first stop was the city of Huaraz. At over 3000m high, it is around 15°C all year round, and has both wet and dry seasons. We then moved to a glacier near Huaraz, which flows to the west and has several well-studied melt ponds. This glacier feeds the surface and groundwater towards

Fig. 4: Laguna 69 nr Huaraz

Huaraz, contributing 20% of water annually, and up to 90% in the dry season. Glacial retreat in the region has been around 30%. The next stop was Laguna 69, a glacial lake also near Huaraz. It's a beautiful turquoise colour due to the glacial flour and high turbidity causing the minerals to reflect the light.

Lakes in the region have very different colours depending on what's in them (e.g green = organic matter). The fourth stop was the Rio Negro, or Black River. It's a more red/brown colour than black due to oxidised iron from surrounding iron rich rocks, particularly at the top of the river. Due to this, the water has a very low pH (it's acidic), making it unsuitable for consumption or irrigation, and not a viable water resource in the area. The final location was an area of steep, terraced agricultural land near Ticllos. This was an example of typical farming techniques in the very mountainous area, with the soil terracing creating flat land and reducing soil erosion.

The second workshop which I attended was 'Microfossils as windows to a past climate' with Dr. Tracy Aze. We started off discussing what we can learn from biodiversity. Tropical regions tend to have the most biodiversity, whereas higher latitudes are sparser. This is called the latitudinal diversity gradient. However, it's difficult to prove that this trend is true for all of Earth's history due to an incomplete fossil record

Fig. 5: Planktonic Foraminifera , http://www.microscopy-uk.org.uk

Planktonic Foraminifera can help fill in the gaps in the fossil record and help us understand past climate. Foraminifera are very simple micro-organisms that live in the upper 2km of the water column all over the planet. They can be used to determine past climate as they have been preserved for their entire stratigraphic history (170 million years) and they have clear temperature associations; much higher diversity at high temperatures, and low diversity at low temperatures. They are also much larger at high temperatures than low temperatures. We were then split into smaller groups, and we had to work together to assign latitude zones to five samples of Foraminifera based on size, shape and diversity within the sample, choosing from Tropical, Subtropical, Temperate, Subpolar or Polar.

Our final thing for the day was thank yous and a goodbye from Dr Jodie Fisher, and instructions on how we could access our free membership to the Geological Society after taking part. We took a group photo on the Zoom call to round off the event. It was a really fascinating couple of days, and a great opportunity to hear so many brilliant speakers talking about such a huge range of topics.

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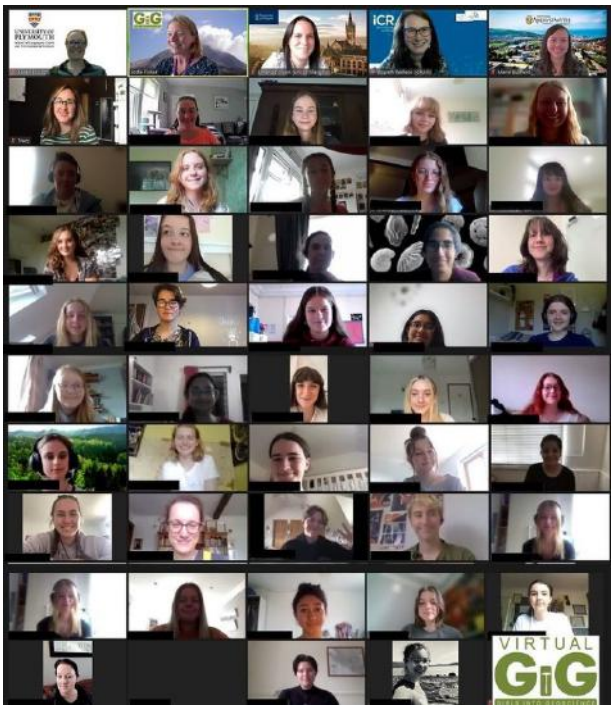

Fig. 6: Group photo from Zoom

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