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Lessons from the Andes

A Call to Reconnect Mountaineers and Science

A contemporary picture of Lake Palcacocha in the Cordillera Blanca. *(Shutterstock)*

In the late summer of 1939, Dr Hans Kinzl and his German Alpine Club (DAV) companions were attempting Mount Huaytapallana (5572m), also called Lasontay, meaning 'smoking ice'. It was his third expedition to the Andes. By then, he'd climbed more than a dozen 6,000m peaks in the Cordillera Blanca and the Cordillera Huayhuash. He'd made the first ascent of Peru's highest peak, Huascarán (6768m), in 1932 and of Siula (6344m). As a University of Innsbruck glaciologist and geographer, however, he was interested in something more than setting records. He produced some of the first maps of the Andean ranges, studied the flora and fauna, evaluated the causes and consequences of a glacial lake outburst flood and, long before the general public started paying attention to climate change, he analysed the dynamics of glacier retreat. Tragically, an avalanche engulfed the group: three of his fellow climbers died, but Kinzl survived.

Three days later, Kinzl learned that the German army had invaded Poland. The government of Peru immediately broke ties with Germany and Kinzl became an exile. He spent a year trying to escape Peru and return to his wife in Innsbruck, at last slipping onto a Japanese freighter, taking only the gear, photographs and scientific records that he could carry with him.

Lake Palcacocha in 1939, a year before Hans Kinzl warned in an academic article published in Spanish that a glacial lake outburst (GLOF) was likely. A year after that, Lake Palcacocha burst out of its bed, generating a tsunami-like flood that killed at least 1,800 people in the city of Huaraz. *(Hanz Kinzl)*

After travelling across China, he snuck onto the Trans-Siberian Railway. In the spring of 1941, he arrived home. After the war, a denazification panel scrutinised whether his Andean mountaineering and scientific studies had been an arm of Nazi expansion. He was cleared of any wrongdoing but the implications of his work would go unheeded, at the cost of hundreds of lives.

Kinzl was part of that long tradition of mountaineer-scientists dating back to the beginnings of both modern alpinism and glaciology in the 18th century. His predecessors included the great Swiss mountaineer and natural scientist of the Alps, Horace-Bénédict de Saussure, famous for his obsession with Mont Blanc. In 1787, a year after paying the promised reward to the first ascensionists, de Saussure climbed the mountain himself, accompanied by 18 guides who transported lavish provisions and bulky scientific equipment to the summit, among which was a helio-thermometer, a large box lined with black cork whose cover consisted of three layers of glass separated by air spaces, with a thermometer inside. He used this to measure the power of sunlight at different elevations for nearly two weeks on the Col du Géant, in the Mont Blanc massif. De Saussure published his observations of the region's glaciers and geology in *Voyages dans les Alpes* (1779-96). The book contributed to his reputation as the 'father of alpinism' and also made Mont Blanc an enticing location for the study of glaciers.

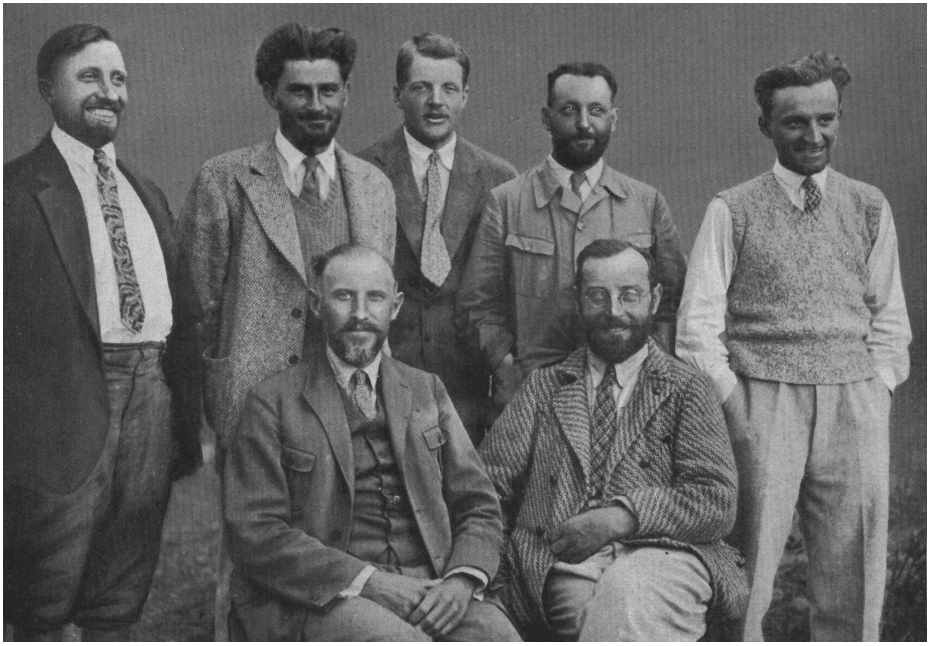
From the end of the 18th century until the middle of the 19th century, Swiss, Italian and French scientists dominated mountaineering in Europe.

In 1840 the Swiss-born biologist and geologist Louis Agassiz, who later emigrated to the US to teach at Harvard, set up a camp on the Unteraar glacier in Switzerland, building a hut next to some overhanging slabs of rock. Known as the Hôtel des Neuchâtelois, the shelter became Agassiz's summer research residence, attracting a stream of visiting scientists. He and his group of guides and porters hauled scientific instruments to his 'hotel' to study the glacier and measure its motion. He bored holes into the ice to test flow at various depths, and pounded wooden stakes in different regions of the glacier to record its pace. After two years, he noted that the hut had moved 486ft downhill. His work contributed to ideas about the Ice Age. He also proved that breakthroughs in glaciology arose from personal interactions with ice and snow, from time at high elevation and from expertise in mountaineering. An example of scientists taking real risks in and around mountains with a strong connection to the Alpine Club is John Tyndall, who slept on the summit of Mont Blanc, surrounded by thermometers he placed in the snow.

Those first ascents of Mont Blanc, and the broader link between mountaineering and glaciology, were inextricably linked to the political climate of the time and the struggle over sovereignty in Chamonix and Geneva. Mountaineering and science were part of the process of political control. Knowledge acquired by mountaineer-scientists facilitated understanding of, for example, glaciology, made the landscape legible and consequently governable and exploitable. Glaciers formed natural resources to be traversed, explored and exploited as part of a particular view of citizenship and state power. Ventures into the Alps, or beyond Europe, ended up extending the sphere of states, thereby facilitating European government control not only over the Alps, but also the Himalaya, Andes, Rwenzori, Arctic and elsewhere. The marriage of mountaineering and glaciology has not always been a benign link, free of politics and power.

This is the tradition that Kinzl stepped into on his first journey to Peru. Kinzl was born in 1898 in the small town of Sankt Florian, 10 miles from Linz. From his home, he could gaze out at the jagged, snowy line of the Alps on the horizon, a view that lingered in his mind, drawing him to high mountains for the rest of his life. That fascination with landscapes and rural places only increased after he joined the army. On Christmas Eve, 1917, Kinzl's troop was ambushed and he was hit by gunshot fire in the right hand. He never recovered fully, having to hold a pen in his middle fingers and greet people with his left hand: one can assume this also affected his climbing. After the war, Kinzl was able to combine his passion for mountains and intellectual rigor through graduate work in geography.

In 1930, while he was a professor at the University of Heidelberg, Kinzl received a letter from the DAV asking if he wanted to join an Andean expedition. 'Of course,' he replied, thrilled to explore what he considered some of 'the most beautiful high mountains in the world.' Kinzl argued that being in the mountains for extended periods, often with a need to assess ice conditions to stay alive, yielded important observations and tremendous knowledge about mountain processes. 'A great number of scholars, especially



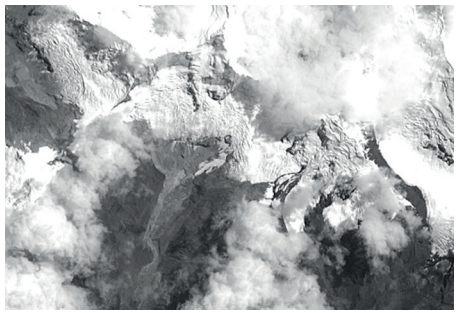
The glaciologist Dr Hans Kinzl, seated right, and his German Alpine Club (DAV) companions, who attempted Huaytapallana (5572m) in 1939.

geologists, have become famous for being researchers of the natural world and also as mountaineers,' he wrote, 'in this way representing living symbols of the fundamental ideals of mountaineering [where] we find this intimate union between mountaineering and science.'[1] In 1940, in an article printed in Spanish, he noted that 'glacial lakes represent certain dangers for the Cordillera [Blanca] valleys and the people directly at the foot of the mountain range.'[2] A year later, Lake Palcacocha burst out of its bed, generating a tsunami-like flood that killed at least 1,800 people in the city of Huaraz. Kinzl had predicted that such floods would be rare. Believing that the only way to protect nearby populations would be to construct enormous retaining walls, he had concluded that the 'economic value' of the upper valleys was not 'sufficiently large to justify such high costs' of disaster mitigation, and that people should move. Nonetheless, residents protested that the authorities had ignored Kinzl's warnings.

Local newspaper journalists praised Kinzl for his willingness to get to know the Andean landscape in ways that non-mountaineering scientists never did. Not only did he publish in Spanish, he learned some Quechua, the regional indigenous language, gave lectures in Huaraz and Lima and

1. H Kinzl, 'Las Tres Expediciones del Deutscher Alpenverein a las Cordilleras Peruanas,' *Boletín del Museo de Historia Natural 'Javier Prado'* IV, no 12, p4.
2. H Kinzl, 'La Ruptura del Lago Glacial en la Quebrada de Ulta en el Año 1938,' *Boletín del Museo de Historia Natural 'Javier Prado'* Año IV, no 13, 1940, p164.

even planted Peruvian flags on summits as a sign of respect. In 1945 a Huaraz resident complained about the government's neglect of glacial lake flood prevention programs: 'It is important to remember that more than ten years ago a German scientific commission – the most extensive and capable that has ever been in the region – lived in and explored the entire Cordillera Blanca of Ancash for a year.'[3] A decade later, the Innsbruck professor received the Peruvian Order 'al Mérito' for his distinguished services to the country.



NASA's ASTER satellite image of Lake Palcacocha, April 2003. Note the supposed 'crack' in the glacier above Palcacocha at the centre of the image. *(NASA)*

In the years after the Second World War, universities and research centres extended their control of mountain science while climbing boomed without any scientific justification or, increasingly, political aspirations either. This had surprising consequences. For example, in 1962, US mountaineer-scientists David Bernays and Charles Sawyer spent several weeks analysing rock-ice instability on Huascarán, seven months after part of Glacier 511 had slid off the mountain, triggering an avalanche that killed 4,000 people. When they reported the imminent threat of the severely fissured glacier, the Peruvian government authorities forced them out of the region, telling residents to 'return to your homes with your faith placed in God,' threatening anyone who spoke in favour of the Americans' conclusions to be charged under the penal code for 'disrupting public tranquillity.' Eight years later, a rock-ice slide from Huascarán killed nearly 10,000 people.

The sharp separation between climbing and scientific studies only grew stronger in subsequent decades, not just in Peru, but worldwide. By the 1970s, mountaineers did not need to rely on science for credibility, justification or prestige. At the same time, satellites, remote sensing, and GIS were gaining momentum and influence, which put glaciologists in front of computers instead of out in the field analysing ice. The Ohio State University glaciologist Lonnie Thompson recently lamented about how difficult it has been to find glaciology graduate students who want to spend their time in the mountains. While these technological advancements have massively increased understanding of mountain glaciers and alpine regions, they also have significant limitations: if the images are not coupled with first-hand fieldwork analysis of environmental conditions, they can lead to misinterpretations.

In April 2003, NASA issued a press release warning about an 'ominous crack' in the glacier above Lake Palcacocha: 'Should the large glacier chunk break off and fall into the lake, the ensuing flood could hurtle down the Cojup valley into the Rio Santa valley below, reaching Huaraz and its

3. G Alejandro and F Roél, 'La catástrofe de Chavín,' *El Comercio*, 21 Jan 1945, p 11.

Palcaraju glacier and Lake Palcacocha in 2013, with siphons removing water to reduce the possibility of a GLOF. *(Paribesch Pradhan, National Snow and Ice Data Center)*

population of 60,000 in less than 15 minutes.' Worried residents demanded details about their fate, and visitors cancelled plans to travel to Huaraz. The lost tourism revenue alone was estimated at $20m. But NASA based its analysis on a satellite image, not the kind of eyewitness account that a mountaineer-scientist could have offered. And the report was stunningly wrong: when Peruvian scientists arrived on the glacier, they discovered the supposed crack was a rock.

University of Arizona glaciologist Jeffrey Kargel, among others, explains that satellite image analysis, ground and aerial observations, and ground-based instruments all combined together provide the most comprehensive glacier hazard monitoring.[4] In recent years, amid a rise of so-called citizen science and calls to diversify environmental knowledge, researchers and organizations have called for a resurgence of climber-scientist programs. Some groups such as Adventure Scientists engage mountaineers in collecting scientific data. Others, like the Office de Haute Montagne in Chamonix, focus on studying glacier and avalanche hazards that threaten not only climbers but also alpine villagers.

Those who spend time on the world's glaciers – mountaineers, guides, porters and local residents – possess tremendous knowledge of changing glaciers, but their observations often don't get into scientists' hands or computers. A tighter link between mountaineering and glaciology could help

4. J Kargel, R Furfaro, G Kaser, G Leonard, W Fink, C Huggel, A Kääb, B Raup, J Reynolds, D Wolfe, and M Zapata, 'ASTER Imaging and Analysis of Glacier Hazards,' in *Land Remote Sensing and Global Environmental Change, Remote Sensing and Digital Image Processing 11*, (ed) B Ramachandran, C Justice, and M Abrams, New York, Springer, 2011), p325-73.

A 2003 photo of Lake Palcacocha's security dam that was partially destroyed when a landslide fell into the lake, creating waves that overtopped the strucutre. *(Mark Carey)*

uncover dynamic mountain conditions, understand and chronicle glacier change, and provide timely reports about hazards to protect people and help climate change adaptation. Increased collaboration could also change perceptions of climbing. Historians have often linked alpinism to a legacy of colonialism and exploitation of natural resources, characterizing it as a pursuit for wealthy, urban-based, generally white, outsiders, often undertaken at the expense of local people and diminishing their control over their own mountains. But mountaineering doesn't have to be just a race to bag peaks, set speed records or establish hard routes and go home again climbing can also be an intimate experience with a mountain: with increasingly active and ever-changing landscapes that scientists and societies are struggling to understand, especially amid the impacts of climate change.

One way to overcome the imperial tradition of dominating mountains and extracting experiences is to give back some of the knowledge and experience gained on the mountainside. Climbers can play key roles in a rapidly transforming alpine world, reporting on changes that affect their routes and alter the landscapes they've come to know so well. This information could be helpful, not only to scientists and policymakers but also to local residents living within those changing mountain landscapes crumbling mountains.

Without the mountain skills of climbers, glacier research would be much harder and much more expensive. And without their spirit of exploration, scientists would be more confined to the same old places. Mountaineering and science need a reconnection that can transcend their shared legacy in colonialist expeditions of the past and look to the future. As glaciologist Lonnie Thompson declared, 'There are a lot of words in the world of science and everyday affairs, but words don't work on mountains; you have to experience them.'

• A version of this article first appeared in *Revista de Glaciares y Ecosistemas de Montaña* (2016). For more information about Adventure Scientists see: *http://www.adventurescientists.org.*