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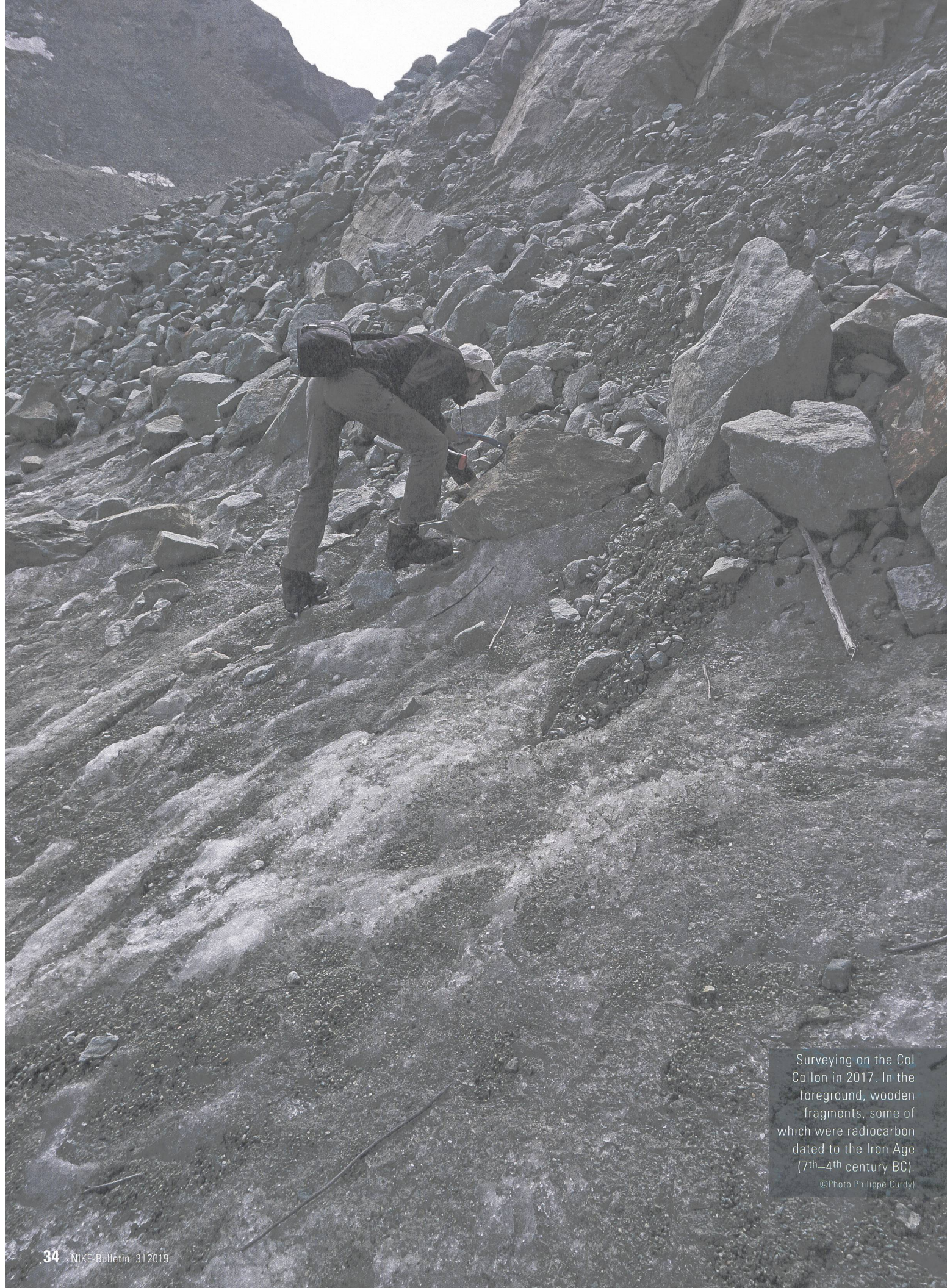
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Surveying on the Col Collon in 2017. In the foreground, wooden fragments, some of which were radiocarbon dated to the Iron Age (7th–4th century BC).
©Photo Philippe Curdy

Glacial archaeological heritage in Switzerland: opportunities and risks

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For more than 150 years, global warming has caused melting of glacial masses at the poles and, even more strikingly, in the Alps. In the high mountains, this phenomenon – which succeeded the cold period of the Little Ice Age (14th–19th centuries) – has exposed many areas previously covered by ice. It is estimated that between the middle of the 19th and the end of the 20th century, glacial surfaces decreased by 50% in the Alpine massif. Archaeological objects, some of which are several millennia old and preserved by freezing, are appearing in the open air. These finds are profoundly altering our understanding of the use of high-altitude passes and the life of communities outside inhabited areas.

The last glacial maximum occurred about 25 000 years ago. Subsequently, prehistoric communities recolonised the Alps, using the resources available from the plains to the high mountains. These groups spread relatively quickly in areas above the upper limits of the forest to regions amenable to hunting and gathering, grasslands used by shepherds and their herds, and sites where raw materials could be extracted. High-altitude passes were regularly used for transport and movement from valley to valley. In deglaciated areas, mainly on the northern slopes of the mountains and above 2700 m, remains are emerging that bear witness to these activities, sometimes quite touchingly.

A «new» field of endeavour

At the end of the 20th century, following the accumulation of discoveries resulting from glacial retreat, steps were taken in several regions of the world to safeguard and study these remains. These efforts gave rise to a new field of research called glacial archaeology, which deals with a heritage threatened with short-term extinction: organic remains (wood, leather and textiles), preserved by ice for millennia, are suddenly being exposed to the open air and are at risk of rapidly degrading.

In the Alps, glacial archaeology is said to have been born in 1991 with the discovery of Ötzi, the Neolithic Iceman in Tyrol,

the archaeological excavation of the discovery area and subsequently the organisation of a symposium, which was the prelude to a first major monograph in 1992¹. In one of the scientific contributions to that volume, Werner H. Meyer, archaeologist and professor of medieval history in Basel, detailed the discoveries made in Switzerland. Believing that the latter would continue to accumulate, he urged researchers not to delay in undertaking multidisciplinary cross-border approaches. In Switzerland, his appeal went unheeded until 20 years later, when, following discoveries on the Schnidejoch (Berne/Valais) and archaeological excavations carried out at the pass (2004–2007), research projects were launched in the Alps of Valais (2011–2014) and Graubünden (2015–2016), in parallel with rescue operations.

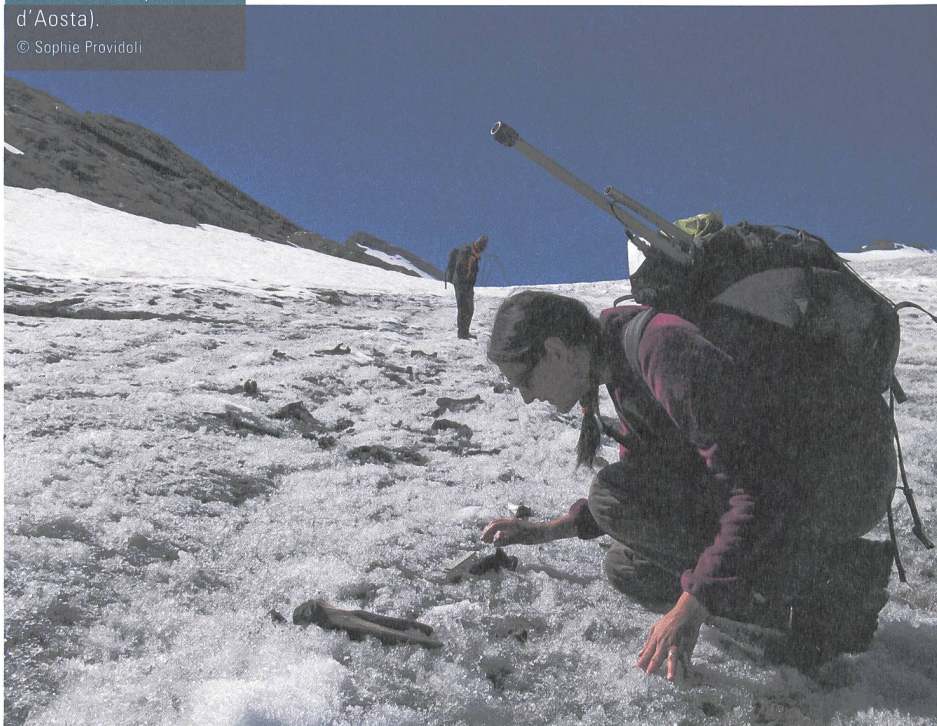
Glacial archaeology encompasses all periods from prehistoric to modern times. In addition to hunting gear and weapons, finds include items related to transport and travel in the mountains: snowshoes, gaiters, shoes, leggings, carrying equipment and pack saddles, as well as more distinctive pieces, including ornaments, coins and votive objects. In Switzerland, the oldest find comes from Graubünden: at an altitude of 2800 m

¹ Frank Höpfel, Werner Platzer, Konrad Spindler (Eds.), *Der Mann im Eis* (Vol. I), (Veröffentlichungen der Universität Innsbruck, 187). Innsbruck: Universität Innsbruck, 1992.



Upper Theodul Glacier (Valais): the “Theodul mercenary”, discovered between 1984 and 1990 by Annemarie Julen Lehner and Peter Lehner. The objects are the belongings of a young man of wealthy background who disappeared in the glacier around 1600.
© Musées cantonaux du Valais, Michel Martinez

Upper Theodul Glacier (Valais): collection of mule bones from the glacier, not far from the Theodul Pass (3296 m, Valais/Italy, Valle d’Aosta).
© Sophie Providoli



a.s.l., near Fuorcla da Strem Sut, in a rock fault freshly freed from the ice, a crystal hunter retrieved an 8000-year-old pickaxe made from deer antler. Research carried out on the site confirmed that this rock crystal deposit was already being exploited around 6000–5800 BC. Among the most spectacular modern remains are those of a farming couple from Valais, the Dumoulin, who disappeared in the Tsanfleuron Glacier in 1942 and were recovered in 2017.

A brief chronicle of some discoveries in the Swiss Alps

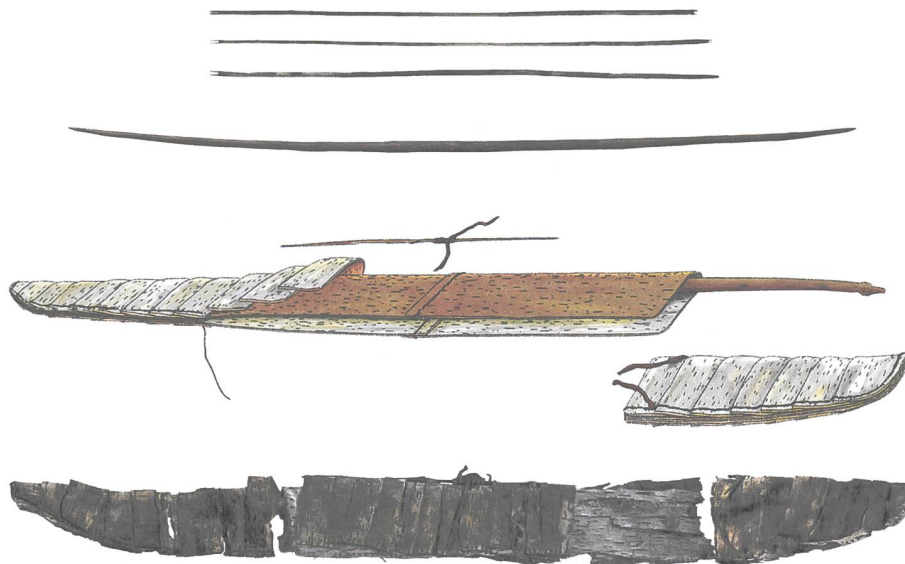
The first references to glacial finds were made by alpinists: an article in the English magazine *Alpine Club*, published in 1854, mentions the presence near the Theodul Pass (Valais/Italy, Valle d’Aosta) of remains of men and mules with their cargo. In the 1940s, Albert Nyfeler (1883–1969), a painter who lived in the Lötschental in Valais, collected many objects near the Lötschen Pass: wooden bows, Roman coins, cross-bow bolts, fragments of leather, etc. Fifty years after they were retrieved, the bows were finally studied and radiocarbon dated to 2200–1700 BC. Even more recently, the Archaeological Service of Canton Berne has been collecting fragments of prehistoric bows, a container made of birch bark, etc. in the area. The «Theodul mercenary» (late-16th century) with his personal belongings were discovered in the summer of 1984 by Annemarie Julen Lehner and her brother Peter Lehner of Zermatt (Valais), who over the years collected many objects and published some of them. In 1992, the «Porchabella Glacier shepherdess», a 20-year-old woman who disappeared at the end of the 17th century, was recovered. The most sensational discovery was made in 2003: at the Schnidejoch, hikers collected prehistoric objects that would be the source of major rescue excavations by Bernese archaeologists (2004–2007) and, later on, by their Valaisan colleagues (2007–2010). The hundred or so wooden, leather and metal objects collected are evidence of the passage of humans between 4500 BC and the early Middle Ages. It is generally worth noting

that almost all of the discoveries were made by non-professionals and that collection was not always carried out with sufficient care to ensure proper preservation.

A heritage under threat

The artefacts released by melting ice are at risk of rapid degradation; this extremely fragile heritage, located in high mountains in sometimes inaccessible places, entails delicate and costly sampling operations. The preservation of these pieces and their restoration require the commitment of specialised personnel and substantial infrastructure, as evidenced by the Ötzi mummy. These finds are often located near passes and ridges, straddling a political border. In Switzerland, each canton is responsible for safeguarding the heritage located on its territory, and there are major disparities in the financial resources available for this type of undertaking. It would therefore be prudent to think seriously about coordinating efforts, not only within Switzerland but also in the border regions with Italy, Austria and France.

As mentioned previously, a few research projects have been initiated in Switzerland to identify the most vulnerable areas with-



in a territory currently covered by more than 900 km² of ice. From 2010 to 2014, a project supported by the Swiss National Science Foundation was carried out in the Valaisan Alps. Based on the least-cost-path principle, this work has made it possible to identify preferential routes through the massifs and to map the most critical locations from a glacial archaeological perspective.² The theoretical routes established by geographers have been compared with

Schnidejoch (Berne/Valais): bow, arrow quiver and arrows, dated to the Neolithic period (2900–2500 BC).
© Archäologischer Dienst des Kantons Bern, Max Stöckli and Badri Redha

² Stephanie Rogers, Philippe Curdy, Muriel Eschmann-Richon, Ralph Lugon. «Glacial archaeology in the Pennine Alps, Switzerland/Italy, 2011–2014». *Journal of Glacial Archaeology*, 3.1, 2016, pp. 27–41.



Schnidejoch (2755 m, Berne/Valais): archaeologists clear remains. On the right, a fragment of the Neolithic arrow quiver.
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data from historical documents (archival texts, etc.) and followed up with surveys in the field. More than a hundred prehistoric, ancient and modern tools, stakes and wooden fragments have been collected. In the Graubünden Alps, an approach that is also based on the archaeological potential of ice patches has led to surveys in some 40 spots; at the same time, outreach efforts have been targeted to the population and hikers.³

Despite this pioneering work, the areas affected by melting are so extensive that ensuring proper management of them seems impossible. The situation is urgent. In the Valaisan Alps, for example, global warming is expected to result in major glacial retreat; it is expected that by 2060, nearly 80% of the current surface will have disappeared. It is therefore essential to establish coordinated efforts between institutions that also involve the participation of non-archaeologists in locating, exhuming and preserving this very fragile but immensely valuable heritage. ■

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³ Leandra Reitmaier-Naef, Thomas Reitmaier. «Cold ice: a survey and monitoring programme of high-Alpine cultural heritage in the Central Alps, Switzerland». *Journal of Glacial Archaeology*, 2.1, 2015, pp. 25–34.

Resümee

Seit über 150 Jahren beschleunigt die Klimaerwärmung das Abschmelzen unserer Gletscher. In den alpinen Regionen hat dieses Phänomen, das auf die Kälteperiode der Kleinen Eiszeit (14./19. Jahrhundert) folgte, zur Entdeckung mehrere Jahrtausende alter archäologischer Objekte im Hochgebirge geführt. So zerbrechlich diese oft sind, sie erweitern unsere Kenntnisse zur Benutzung hochgelegener Übergänge und zum Verhalten der damaligen Menschen jenseits bewohnter Zonen grundlegend. Die ersten Erwähnungen von Gletscherfunden in der Schweiz stammen aus dem 19. Jahrhundert, stark zugenommen haben sie gegen Ende des 20. Jahrhunderts. Aber erst mit den spektakulären Funden auf dem Schnidejoch in den Berner Alpen im Jahr 2003 begannen Rettungsmaßnahmen und Projekte zur Lokalisierung der sensibelsten Fundstellen.

Es ist voraussehbar, dass weitere wichtige Funde gemacht werden, vor allem in den Grenzgebieten. Dies sollte für die verantwortlichen Fachstellen Anlass sein, zusammenzuarbeiten oder ihre Unternehmungen mindestens zu koordinieren. Bedingt durch die Grösse der Fundgebiete wird ein grosser Teil der Entdeckungen durch Wanderer und Bergsteigerinnen gemacht werden. Darum sind breit angelegte Sensibilisierungsmassnahmen und der Einbezug von Laien absolut notwendig.

Résumé

Depuis plus de 150 ans, le réchauffement climatique provoque la fonte accélérée des glaces. Dans les zones alpines, ce phénomène, qui succède à la période froide du Petit Âge Glaciaire (XIV^e-XIX^e siècle), a conduit à la découverte d'objets archéologiques en haute montagne, vieux pour certains de plusieurs millénaires. Souvent très fragiles, ils renouvellent en profondeur nos connaissances sur la fréquentation des passages de haute altitude et sur le comportement des hommes au-delà des zones habitées. Si, sur le territoire de la Suisse, les premières mentions de trouvailles glaciaires remontent au milieu du XIX^e siècle, leur nombre a fortement augmenté à la fin du XX^e siècle. Ce n'est qu'après la découverte spectaculaire faite en 2003 au Schnidejoch dans les Alpes bernoises que des interventions de sauvetage ont été entreprises avec, en parallèle, la mise en place de projets visant à mieux localiser les zones les plus sensibles.

Il est à prévoir que d'autres trouvailles importantes vont survenir, en particulier dans des secteurs frontaliers; cela devrait inciter les instances en charge de la protection de ce patrimoine à s'associer et à coordonner leurs opérations. Au vu de l'étendue des zones à surveiller, une grande partie des futures découvertes sera le fait des randonneurs et utilisateurs de la haute montagne, nécessitant des actions de sensibilisation à large échelle et l'association des non-professionnels à ces opérations.

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