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Traces to the oldest flint and rock crystal mining places in the Austrian Alps

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Fig. 1. Map of Western Austria with the four find-spots in the investigation area (Landsat/ESA ©).



Fig. 2. The wooded hilltop of the Bärenkopf in the Gemsteltal. The red circle marks the mining area (© Walter Leitner).



Fig. 3. Stepped formation of the radiolarite layers as a result of man-made reduction (© Walter Leitner).

Traces to the oldest flint and rock crystal mining places in the Austrian Alps

Walter LEITNER*

Abstract. Recently the Institute of Archaeology (Dep. of Pre- and Protohistory) of the University of Innsbruck has undertaken excavation work in the Kleinwalsertal (Vorarlberg). Actually all sites and finds belong to the Mesolithic period. The lithic artefacts are made to a large extend from a red and green radiolarite which has been mined in the very close surroundings. Finds of corresponding raw material in the river gravel of the valley led to the primary layers on precipitous slopes in an altitude of 1600 meters. This place can therefore be defined as the oldest and highest mining site in the Alps. From the actual explorations we can deduce that the so called fresh raw material was stroken off in form of steps. In 2007 a mining tool corresponding to a stone-hammer could be found. The raw-material is of good quality and the localized rich natural deposits in this area permits a kind of small supplying center for the western region of Austrian Alps in the Mesolithic age. Other studies were conducted in the Lechtaler Alps and in the Rofan Mountains in the upper and respectively in the lower Inn Valley of the Tyrol. There Silex resources appear in great quantities so that prehistoric mining is to be expected. Further exploration work is done in the Tuxer Alps where big quartz clefts show traces of prehistoric extractions of rock-crystal.

Les plus anciens sites d'extraction de silex et de cristal de roche dans les Alpes autrichiennes

Résumé. Les travaux de ces dernières décennies ont révélé ques les chasseurs-cueilleurs de l'époque postglaciaire avaient occupé de manière intensive toute la région des Alpes, que ce soit dans les vallées, en moyenne altitude ou vers les sommets. Pour fabriquer leurs outils en pierre, ils puisaient alors dans les différents types de chert. Les outils de meilleure qualité parcouraient souvent de longues distances avec leur propriétaire. Mais *où trouver* des mines où extraire ces précieux matériaux ? Contrairement aux excavations néolithiques que l'on retrouve dans toutes les Alpes, il n'y a pratiquement pas de traces datant du Mésolithique dans cette région des Alpes autrichiennes. Les travaux récents conduisent à s'intéresser aux zones calcaires du Tyrol et du Vorarlberg. L'institut d'archéologie (département de pré- et protohistoire) de l'Université d'Innsbruck vient de commencer une campagne de fouilles dans le Kleinwalsertal (Vorarlberg). Tous les sites et les objets trouvés remontent de fait à la période mésolithique. Les artefacts lithiques sont pour la plupart fabriqués à partir d'une radiolarite rouge et verte, extraite dans des mines voisines. Les matériaux bruts correspondants trouvés dans le gravier de rivière de la vallée nous ont conduits aux couches primaires présentes sur les pentes escarpées, à 1 600 m d'altitude. Un outil de mineur (maillet en pierre) a été mis au jour sur place en 2007, ce qui pourrait permettre de conclure à la présence, à l'époque Mésolithique, d'un petit centre d'approvisionnement pour la partie occidentale des Alpes autrichiennes. D'autres études ont été effectuées dans les Alpes du Lechtal ainsi que dans les Montagnes du Rofan, se situant dans la vallée supérieure et inférieure de l'Inn au Tyrol. Dans ces régions, des affleurements de silex sont fréquents, une exploitation préhistorique est très probable. D'autres recherches ont lieu dans les Alpes de Tux, où des failles alpines avec présence de cristal de roche démontrent aussi l'évidence d'une exploitation préhistorique.

This work is part of a special international research project of the university of Innsbruck called HIMAT (History of mining activity in the Tyrol and adjacent areas), supported by FWF, Austria.

Silex belongs to the most important raw materials for the Stone Age tool production, and we know many exploitation zones in the whole of Europe. But looking at the alpine arch we notice a big gap. The few verified exploitation zones can be found on the outermost outskirts of the Alps, like for example in the area of Vaucluse in the Provence and in the area of Olten and Lägern in Switzerland. Mauer, a small exploitation site near Vienna (Austria), lies basically outside already. In the south we have the most obvious traces in the mountains of Lessini near Verona (Italy).

All these features mainly indicate to be Neolithic in date. We know, that hunters and gatherers have already heavily populated the inner alpine region during the postglacial period and used the higher alpine regions as their hunting areas at regular intervals.

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Where did they get their silex material from?
What about the spatial distribution?
Were they dependent on imports?
Has silex already been systematically exploited in the Mesolithic?
In connection with the special research program mentioned before investigations have started in the western Austria in the provinces Tyrol and Vorarlberg, where Silex from the point of geological view is frequently found in the northern limestone Alps (Leitner 2006-2007).
The archaeological investigations on that topic are in an initially phase. The situation will be lifted up on the base of by four site-examples (fig. 1).
Only in case 1 clear statements can be made. Concerning the sites 2, 3 and 4 the preconditions for the exploitation of silex and rock crystal are given, but need to be further investigated.

Site 1 (Bärenkopf, Kleinwalsertal, Vorarlberg)

Between 1999 and 2004 several Mesolithic camp-sites have been excavated in this region.
In nearly up to 100% red and green radiolarite was used for the production of the stone tools. The material is of good quality and can be found as secondary deposits in the gravels of the main stream of the valley. So, looking for the primary deposits, the prehistoric hunters only needed to walk upstream because the material has been transported down into the valley via rock slides ending in the streams (Binsteiner 2008; Leitner 2008a).
Close to the top of the valley rises a rocky hill formation, the so-called Bärenkopf. It forms the centre of the radiolarite occurrences. The research area is located on a very steep and wooded hilltop. Typically enough, this formation is called *Flintstone-hill* by local people (fig. 2).
At this point the layers of radiolarite appear at the surface at several spots.
One could recognize small terraces, which in contrast to the surrounding steep incline, did not seem to be natural. After digging away the soil, the stepped structure of the radiolarite formation surfaced at several points and gave proof of an intentional knocking out of the silex material relevant to a mining activity (fig. 3).
The main colours of the exploited radiolarite are red and green, in very few cases with fine black lines. At the other side of the valley dark grey to black material can also be found. Knapping experiments indicated, that the green raw material is of best quality. The geological/petrographical report proofed a particularly qualitative radiolarite variety. It is a recoverable material. Concerning the age of this mining site we have some indirect, but also some direct indications: It is significant that all the stone tools excavated in the valley till now, are just a few kilometres remote of the exploitation area and they are all Mesolithic in date. Important is also the fact that there is no historical tradition of mining activity on silex in the whole valley. Among the direct indications of age determination are several finds of stone artefacts of the mining site with characteristic marks of prehistoric flint knapping technique (Leitner 2008b).
Tools are rare. In most cases we have some fragmentary small blades, rarely retouched on the edges. Not without reason. Precisely said, people came up here, but just to exploit the raw material and not to produce tools. One could suppose it was levered by antlers. Apart from the fact that there were no relevant finds, the space between the layers is surely too narrow to fit in an antler pick.
We don't have even traces of wooden wedges to crack the silex layers. And even no indications of the oftentimes used method of heating to crack the rock easier.
According to experiments this material can be mined best by continuously hammering the lateral surfaces. Finally the so obtained chunks were reduced to smaller pieces. So plentiful flakes and angular debris were produced while the material was tested on the spot in order to take only the best cores away finally. The most decisive finds of the excavation came out in summer 2007.
At a depth of 1,10 m in the investigation area 5 three spherical objects appeared. Without any doubt one of these was shaped intentionally by picking the surface. Traces of splintered parts make clear that the tool was used as a stone-hammer to knock out silex from the rock.
The finding spot also corresponds with the most planar situation in the steep terrain. Only this one point corresponds to the position where mining tools could have been laid down (fig. 5).
While the material of the hammer-stone is radiolarite two other spherical stone-tools consist of sandstone and limestone. They seem to be a kind of grinding stones based on the fact that on the surface some very flat and rubbed off areas can be seen (fig. 4).
All these circumstances approve the mining activity in this section. Around 16000 survey points were taken in the area of investigation to get a three dimensional model of the situation.
On fig. 6 the seven excavation areas are charted. Note the long stripe of exploitation and the red spot where the mining tools were found.
Relating to several surveys in the surroundings of the Kleinwalsertal it turned out, that there are, as far as quantity and quality are concerned, no comparable radiolarite deposits. Of course stone tools made of comparable radiolarite are present in the immediate vicinity, but also in the alpine Rhine valley and in the southern region of the Lake Constance. Due to its quality it is quite possible, that the radiolarite had a certain circulation. In summary we can

say that the Bärenkopf is not a big mine with tunnelling and shafts like we know from the Neolithic. But the exploitation of the quarry-site in the Kleinwalsertal certainly represents a small supply centre in the west of Austria and is up to now at an altitude of 1600 m above sea level the highest and oldest silex exploitation site in the Alps.

Site 2 (Schafgufl, Tyrol)

Indications of radiolarite exploitation are given also in the Lechtaler Alpen in Tyrol (fig. 1,2).
A big cave of particular interest is located in a side valley of the river Lech at 2000 m above sea level. The so-called Schafgufl gives actually permanent shelter to a modern shepherd, and we can suppose that it also offered ideal preconditions for a Stone Age hunter-camp with a nice forecourt, for which we could list many comparable examples in the alpine region. Why does this cave site attract our attention? The chalk formation of the overhang is streaked by beds of radiolarite (fig. 7).
Bigger unnatural hollows remind on artificial exploitation (arrow). In a manner of speaking the raw material – apart from the fact that it was not of best quality – was in front of the hut.
Excavations, that could illuminate those circumstances, unfortunately could not take place, because it was not possible to evacuate the shepherd and destroy his cosy summer camp.

Site 3 (Rofangebirge, Tyrol)

The Rofan-mountains in the northern limestone Alps (fig. 1,3) form a big silex resource as the geological situation shows. Corresponding to these circumstances numerous Mesolithic silex tools were found in this area, mostly at altitudes between 1800 and 2000 m above sea level. One of these sites is the so-called Grubalacke (fig. 8*)*. Numberless debris, flakes, chips and also small exhausted cores and bigger nodules of red radiolarite are spread over the entire area.
Evidences suggest, that people have spent time here to test the surrounding raw material, a material which most of all reaches the quality that is required for the production of stone tools. Investigations started in summer 2008 on the western lakeside area (fig. 9).
First results show that red radiolarite formation is overlaying the white limestone in this area. The radiolarite layers are very weathered and not good enough for use (fig. 9). But here and there bigger nodules of best quality were integrated in these layers, ready to be picked up or easily be quarried out of the weathered layers directly beneath the top soil. So mining in regular sense was not really necessary. The best nodules were collected, battered and then the best pieces were used for the production of flint blades. First results verify the quantitative and qualitative significant flint resources in the entire Rofan Mountains and their earliest usage by Mesolithic hunters-gatherers. The area around the Grubalacke proves to have notably abundant finds and possibly resembles a central site for the prehistoric utilization of flint resources in the lower Inn valley.

Site 4 (Riepenkar, Zillertal, Tyrol)

Finally a site should be presented, which is important for the earliest rock crystal exploitation. It is located in the Tuxer Alps in the very back Zillertal in Tyrol. This region belongs to the crystalline zone of the Alps. The area encircles the so-called “Tauernfenster”, a sector with an extremely rich rock crystal occurrence. The research area lies at an altitude of 2800 m above sea level at the so-called Riepenkar on the southern foot of the mount Olperer (fig. 10).
Here one of the biggest quartz clefts in the Zillertaler Alps we know of was discovered. Based on mineralogical investigations the biggest amount of the material is of an incredible and incomparable transparency and purity.
Amongst these pieces we find flakes with traces of retouching and percussion negatives indicating a prehistoric technique. That proves that this zone has obviously already been prospected for rock crystal by the post-glacial hunters (fig. 11).
Besides the usual chert varieties rock crystal provided an additional source for the production of stone tools for the prehistoric hunters in the high-Alpine terrain. Even though the material may be pretty difficult to work, the effort is obviously compensated by the optic qualities of the stone. Shape, transparency and sparkle make these crystals a sought-after material within the hunters-society.
Amidst the finds a piece of black chert must be noted. This material does not occur in-situ and was therefore must have been brought here by the hunters. Referring to the slightly convex outline of the stone and pick-marks on the surface it can be suggested that it might have served as an oval hammer stone to quarry out the crystals.
Predominantly they are the product of on-site flaking attempts on the rock crystal. A stationary camp at this altitude is not to be expected. The site has rather been visited on purpose for sourcing the treasured raw material. The actual tool-manufacturing took place at respective base camps.
It is to be assumed that this site probably played a significant role in the early countertrade across the Alps based on its central geographical position on the main ridge of the Alps.



Fig. 4. Grinding or rubbing stone-tools from section 5 (© Walter Leitner).



Fig. 5. Spherical hammer tool in "in situ" position (arrow) with the very proximate and clear traces of mining extraction in the radiolarite layers behind (© Walter Leitner).

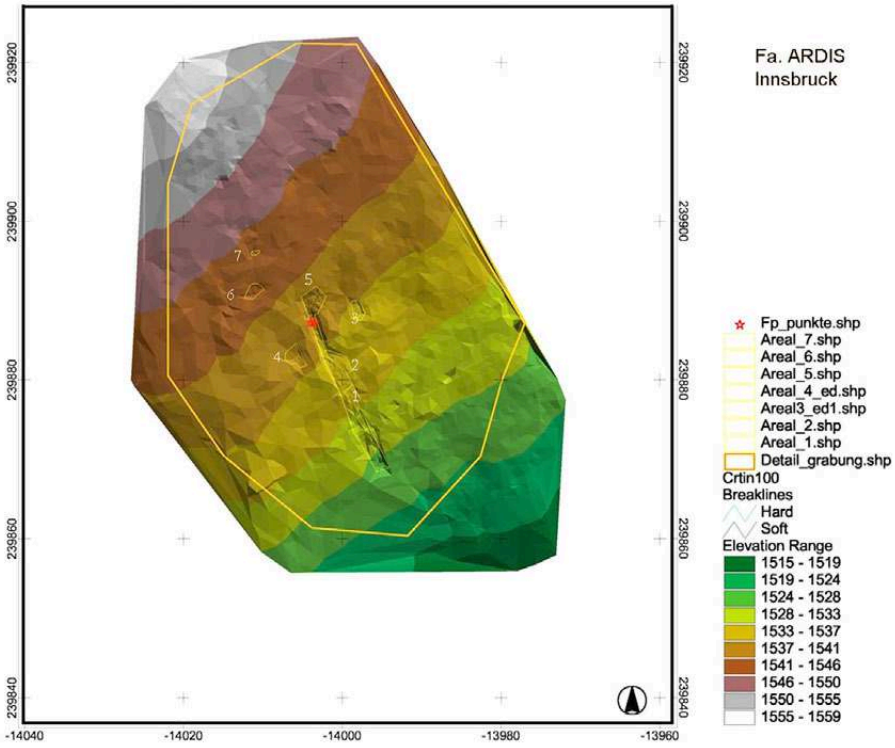


Fig. 6. Three-dimensional plan of the silex mining area on the Bärenkopf with the excavated sections (© Ardis).



Fig. 7. The Schafgufel abri shows traces of silex exploitation on the arched slab (arrow) (© Walter Leitner).



Fig. 8. The excavation area of the Grubalacke in the Rofan mountains (© Walter Leitner).



Fig. 9. Section with weathered red radiolarite layers near the Grubalacke (© Walter Leitner).



Fig. 10. On the southern inclination of the mount Olperer several quarz-clefts are situated (red circle) (© Walter Ungerank).



Fig. 11. Excavation site of a prehistoric mining place of rock crystal at the Riepenkar (2800 m) (© Walter Leitner).

Both northwards and southwards of this place several Middle Stone Age sites with artefacts of rock crystal are known andsuggest a north-south running connection. It seems pretty obvious that the Riepenkar plays a certain key role concerning the raw material and it's exploitation. From this point of view we can reconstruct a possible prehistoric transalpine rock-crystal route leading to the northern and southern areas, where the valuable and beautiful rock crystal material does not exist and needed to be imported.

Bibliography

Binsteiner 2008: BINSTEINER (A.) – Steinzeitlicher Bergbau auf Radiolarit im Kleinwalsertal, Vorarlberg (Österreich). Rohstoff und Prospektion. *Archäologisches Korrespondenzblatt,* 38/2, 2008, p. 185-190.

Leitner 2006-2007: LEITNER (W.) – Spuren zum ältesten Bergwerk in den Alpen. *Jahrbuch des Vorarlberger Landesmuseumsvereins*, 151, 2006/07, p. 71-77.

Leitner 2008a: LEITNER (W.) – Steinzeitlicher Bergbau auf Radiolarit im Kleinwalsertal, Vorarlberg (Österreich). Archäologische Ausgrabungen. *Archäologisches Korrespondenzblatt,* 38/2, 2008, p. 175-183.

Leitner 2008b: LEITNER (W.) – Steinzeitlicher Silexabbau im Kleinwalsertal. *Archäologie in Deutschland,* 4, 2008, p. 28-29.