

**GARNETS FROM THE ZILLERTAL –
AN INTERDISCIPLINARY (MINERALOGY/PETROLOGY –
ARCHAEOLOGY – HISTORY) PROJECT**

Simon Wagner^{1*}, Bianca Zerobin², Roland Köchl³, Peter Tropper¹,
Gert Goldenberg², Gunda Barth-Scalmani³, Walter Ungerank⁴

¹Institute of Mineralogy and Petrography, University of Innsbruck, Innrain 52, 6020 Innsbruck, Austria

²Department of Archaeologies, University of Innsbruck, Innrain 52a, 6020 Innsbruck, Austria

³Department of History and European Ethnology, University of Innsbruck, Innrain 52d, 6020
Innsbruck, Austria

⁴Citizen scientist/Mineral collector, 6274 Aschau im Zillertal

email: simon.wagner@uibk.ac.at

Background of the project

From the 18th to the beginning of the 20th century, gem quality garnet was mined in the high alpine regions of the Zillertal in Tyrol and processed locally into rough stones for trade. Two families in particular - the Hofer and Kreidl families - were involved in garnet mining and the international trade in this coveted gemstone for several generations. In addition to garnets extracted from chlorite-mica schists, which occur in shear zones within the „Zentralgneiss“ of the Tauern window, in the Zillertal and Ahrntal, the study also involves garnets from Radenthein in Carinthia, which shared a similar lithology within the Austroalpine Radenthein Complex. The highest quality of raw garnets was sent to gemstone cutters in Bohemia, where they were subsequently cut and manufactured into gemstones. There is further written evidence that there were other customers besides the Bohemian workshops, such as the garnet cutters of the Black Forest. Mechanical processing of garnet in stamping mills and tumblers also resulted in the creation of a finely grained granulate, which, owing to the mineral's hardness, was also sold as an abrasive thus providing an extra revenue stream for the mining families (Fig. 1a). From the heyday of the garnet trade in the Zillertal, extensive collections of objects, as well as large quantities of handwritten documents (under ongoing examination), in the possession of the descendants of the families of the garnet traders and of private collectors still exist these days (Fig. 1b). A particularly rich collection of objects, which is available for this research, is maintained by the local chronicler and mineral collector Walter Ungerank. It is also thanks to him that numerous former workshop sites in the remote and partly impassable terrain of the high Zillertal could be localised during the project preparations in 2019 which have been used as starting points for the extensive and systematic field investigations. All together these in part spectacular legacies form a unique Alpine cultural heritage, which tells

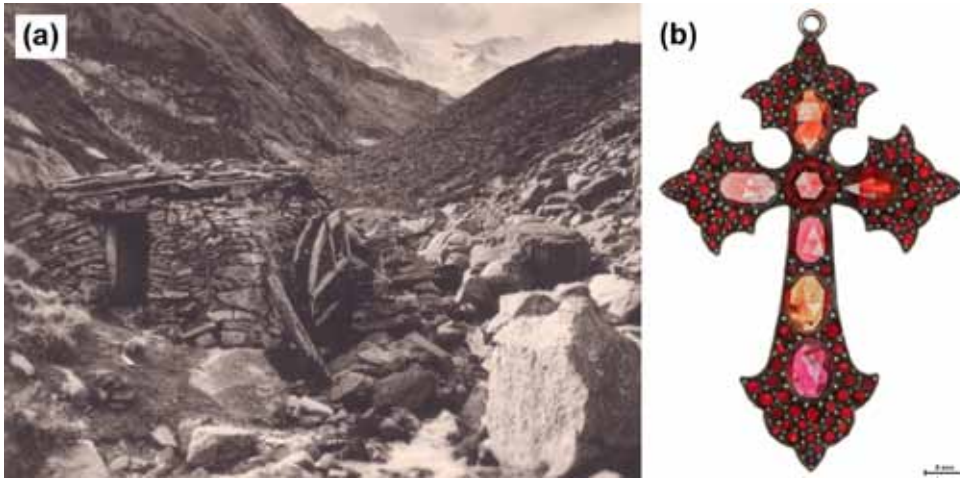


Fig. 1: (a) Remains of the garnet mill in the Zemmgrund around 1900 (Private collection A. Mühlbauer) (b) Typical garnet jewellery from Tyrol in the shape of a cross (Private collection J. Hofer) The small garnets in the outer area of the cross show the typical blood-red colour of the Bohemian garnets. The large gemstones inside show differing colours, which is already a good indicator for the use of different garnet deposits.

the exciting story of an eastern alpine small-scale local industry from the 18th to the early 20th century, which is today in danger of being completely forgotten. Due to the many unanswered questions about the garnet trade into and from the Zillertal, an interdisciplinary project was launched in the summer of 2021 to examine the topic from different scientific perspectives (Fig. 2). The project itself is financed by the Heritage Science Austria funding programme of the Austrian Academy of Sciences and by the Vice-Rectorate for Research of the University of Innsbruck. Three PhD students from the fields of archaeology, history and mineralogy are working on different questions, such as „What geological conditions lead to the formation of garnets of jewellery quality?“ or „What infrastructure was necessary for garnet mining and processing from the 18th to the early 20th century?“. All three are supported by their supervisors in their respective fields and are also in close contact with the other project partners (Tiroler Landesarchiv, Hochgebirgs-Naturpark Zillertaler Alpen and the Citizen Scientists). (GOLDENBERG et al., 2021; SORKO, 2022; ZEROBIN et al., 2023)

Methods and tools

Due to the interdisciplinary nature of the project, diverse methods are utilised to gain varied perspectives on the topic of garnet. Furthermore, significant emphasis is placed on engaging the local community, particularly Walter Ungerank, an expert mineral collector, and Josef Hofer (decendant of the garnet traders), providing valuable insights and conducting initial investigations. Following the project's completion, the results will be prepared accordingly and made available to the public.



Fig. 2: Project team of the different disciplines.

Mineralogy

The mineralogical investigations initially focus on documenting the relevant georesources found in the crystalline basement of the Zillertal Alps. Garnet mainly occurs in chlorite-mica schists and can be mechanically extracted with ease. The quality of garnet as a gemstone is dependent on its colour, transparency, and purity. The iron-aluminium orthosilicate known as „almandine“ garnet, found in the Zillertal region, is valued for its distinct dark red hue. Mineralogical, petrological, geochemical, and spectroscopic analytical techniques are utilised to determine the compositional range (including main, minor and trace elements) as well as the genesis of garnets in the Zillertal, but also in the Ahrntal and in Radenthein with respect to their metamorphic history (pressure-temperature-time history). The objective of this study is to determine the key distinguishing features of garnets stemming from the Zillertal area, in order to establish a reliable method for identifying them correctly in pieces of historical jewellery. It is important to differentiate these garnets from those found in other Central European deposits, such as in Bohemia, which may possess similar optical and gemological characteristics.

Archaeology

An extended archaeological survey has been conducted in different grounds of the Zillertal Alps, with a focus on the Zemmgrund, to record and document all mining and processing sites, including miner's huts and rock shelters with crushing and sorting workshops, stamp mills and tampers. The remains of the infrastructure in the high alpine terrain at altitudes between 1,900 and 2,900 metres are documented

using photogrammetry techniques with drone assistance and integrated into three-dimensional terrain models referenced by GIS. First excavations were carried out at the miners' huts in the Zemmgrund to better understand the miner's lives and their working conditions in an extreme climatic environment. Additionally, garnet samples from processing heaps have been taken and provided for analysis with respect to mineralogical, petrological, and geochemical characteristics. Material legacies, including garnet jewellery objects from private collections and the Tyrolean Provincial Museum, are documented, recorded in a database, in the ongoing scientific investigation.

History

The historical investigations mainly refer to private documents on garnet production and trade from the records of the descendants of the two prominent garnet merchant families Kreidl and Hofer. These documents were transferred to the Tyrolean Provincial Archives, preserved, archived, digitalised and transcribed. Their historical reappraisal is supplemented by the review and examination of relevant sovereign documents from the public holdings of the provincial archives of Tyrol, Carinthia, South Tyrol and Salzburg.

The main focus is on tracing the lineage of Eastern Alpine garnet gemstone mining from its beginnings in the late 18th century to the 20th century. Questions of mining law are just as relevant as political changes on the macro level and climatic conditions in the high mountains where the mining areas were mainly located. Other central aspects are, in addition to the qualitative content analysis of relevant files, above all the quantitative processing of the gemstone sales volume, their prices and the various steps of the trade. In addition, the historical trade routes within the Austro-Hungarian Monarchy and beyond are elaborated.

Furthermore, an attempt is made to work out the socio-economic and socio-political relevance of this small-scale mining industry for the region as an identification feature and to present the present-day significance and reception of garnet mining.

Geography

The High Alps Nature Park Zillertaler Alps aims to integrate the remaining structures of the garnet industry into the existing nature park concept. It also utilizes its extensive geographical knowledge to reconstruct the high-altitude cultural landscape, accounting for environmental factors such as glacier advancement and retreat. Therefore, it offers valuable insights into how the high-Alpine cultural landscape has been utilized during changing climatic conditions and economic advancements throughout the past few centuries.

Outlook

The project is currently in its final year, and the focus now is on collecting and processing the numerous scientific insights gained into garnet mining and trading for the three dissertations. At the end of the project, a general scientific publication

will be provided for the public. With the new permanent exhibition “Verborgene Schätze – Hidden Treasures”, opened in June 2023 for the public, the Nature Park House in Ginzling presents fascinating aspects of the regional alpine geology and its spectacular mineral-world, with a special focus on garnet and its history. A documentary film “Der Zillertaler Granat – ein Edelstein aus dem Herzen Tirols” – “The Zillertal Garnet – A Gemstone at the Heart of the Tyrol” has been created specifically for this exhibition, exploring the history of the Zillertal garnet and the project’s research activities (ROSE, 2023).

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