Surfaced – the digital pile dwellings

Discover a UNESCO World Heritage Site digitally and immerse yourself virtually in Austria`s collections.

Making an invisible cultural heritage visible

Since 2011, five of the currently 29 known prehistoric pile dwellings in Austria have been part of the transnational, serial UNESCO World Heritage Site "Prehistoric Pile Dwellings around the Alps". For 7000 years, extraordinary finds have been preserved at lakes and moors around the Alps. Almost 1000 prehistoric settlements from the Neolithic to the Iron Age are known. The archaeological monuments, the material found from them and their unusually good state of preservation due to the conservation of wet soil were an important criterion for the selection of 111 sites for the UNESCO-World Heritage list (International Management Plan 2019-2023, 2021, pp. 5-9).

All of the Austrian sites are located below the water surface in the lake beds close to the shore. Due to their hidden underwater location, it is not possible for the general public to visit them on site. The spatial distribution of the sites over several lakes, as well as the storage of the finds in different collections, makes it difficult to convey the entirety of the UNESCO World Heritage Site (Dworsky, Poppenwimmer and Seidl da Fonseca, 2022, pp. 55-68). With the project Aufgetaucht – Die digitalen Pfahlbauten, an attempt is being launched at a national level to build a virtual bridge between the sites, the find material, the collections and exhibition venues in Austria and therefore provide an inclusive access to the hidden cultural heritage.

The *Pfahlbau Kompass*- Digitizing and Networking

In 2023-2024, 500 objects and documents were scanned in high resolution and are now presented mainly as three-dimensional models in an open access web application. The use of structured-light 3D scanning is effective and offers high geometric accuracy, but it has deficiencies in texture quality. Therefore, in this project, on the one hand, an image-based approach (Image-Based Modelling, IBM for short) incorporating Structure-from-Motion and Multi-View Stereo algorithms, and on the other hand, structured-light 3D scans were used according to the significance of the objects, and the importance of a photorealistic texture for the presentation. If either of the two criteria was rated as high, the object was scanned using IBM. Otherwise, a structured-light 3D scan was performed. For the IBM capture of archaeological finds, a specially developed setup was used. This allowed for a semi-automatic and thus cost-effective scanning process. The finds had a size of no more than 0.5 meters in extent. In contrast, organic remains such as fish bones, seeds, or fruits, as well as objects like beads or small spindle whorls, had a very small size of less than 0.01 meters. For the very small objects, the open-source scanner scAnt developed by Imperial College London for 3D scanning insects was used.

The selection of the objects was made in cooperation with the local collection management, the 3D studio Crazy Eye and the *Kuratorium Pfahlbauten*. It represents only about 1-2% of the total Austrian find material and thus represents a relatively small digital archive. However, the digitized copies include all types of material from various sites in Austria and include finds from large national museums, small, regional heritage houses, university study collections, as well as private collections. In order to gain access to the properties, contacting and supporting the individual contact persons was an important and time-consuming task. At the same time, it was possible to transfer the benefits and application possibilities of the project results to the responsible collections. Furthermore, the collections were able to contribute content and functions relevant to them in the structure of the web application.

The *Pfahlbau Kompass* is a web application that offers the possibility to view the pile dwelling objects and get information about the prehistoric artefacts, the time of their use and the pile dwellings themselves. The users can search for specific objects, create their own digital collections of 3D models (embedded from Sketchfab) and download them for offline use. During digitization, care was taken to create long-term, high-quality models so that even the smallest ornamental details or traces of prehistoric processing are visible in the finished model. Thus, the digitized copies are suitable for scientific investigations, as well as for virtual exhibitions and educational projects. In addition, the *Pfahlbau Kompass* contains basic information on the prehistoric pile dwellings in Austria and the transnational UNESCO World Heritage Site. It is therefore not a pure 3D object archive, but resembles a virtual exhibition for your pocket. Users not only get an overview of the available material, but also the contact points for further studies.

Costs and benefits

The project digitizes, secures and visualizes an outstanding part of the cultural heritage in Austria thanks to a grant of the Austrian Ministry for Arts, Culture, the Civil Service and Sport. This presentation shows the thoughts behind the development of the web application, as well as the thoughts behind the choice of the objects and collections. But is the effort worth the benefit? The future will show to what extent the *Pfahlbau Kompass* and the individual digital elements will actually be used by a broader public - some application examples can already be presented. In addition, the recording of accesses and downloads, since the web application is publicly accessible, is to be a basis for further evaluations. How we can measure a real benefit and compare it with the effort of creating such virtual archives is a question that the authors would like to bring to the discussion.

References

International Management Plan 2019-2023 (2021). *UNESCO World Heritage Prehistoric Pile Dwellings around the Alps*. Available at: https://whc.unesco.org/document/192715 (Accessed: 18 June 2024)

Dworsky, C., Poppenwimmer, F. and Seidl da Fonseca, H. (2022). ‘Die Prähistorischen Pfahlbauten um die Alpen: Ein Unterwasserwelterbe mit Herausforderungen.’ *Mitteilungen der Anthropologischen Gesellschaft in Wien (MAGW),* 151-152, pp. 55-68.