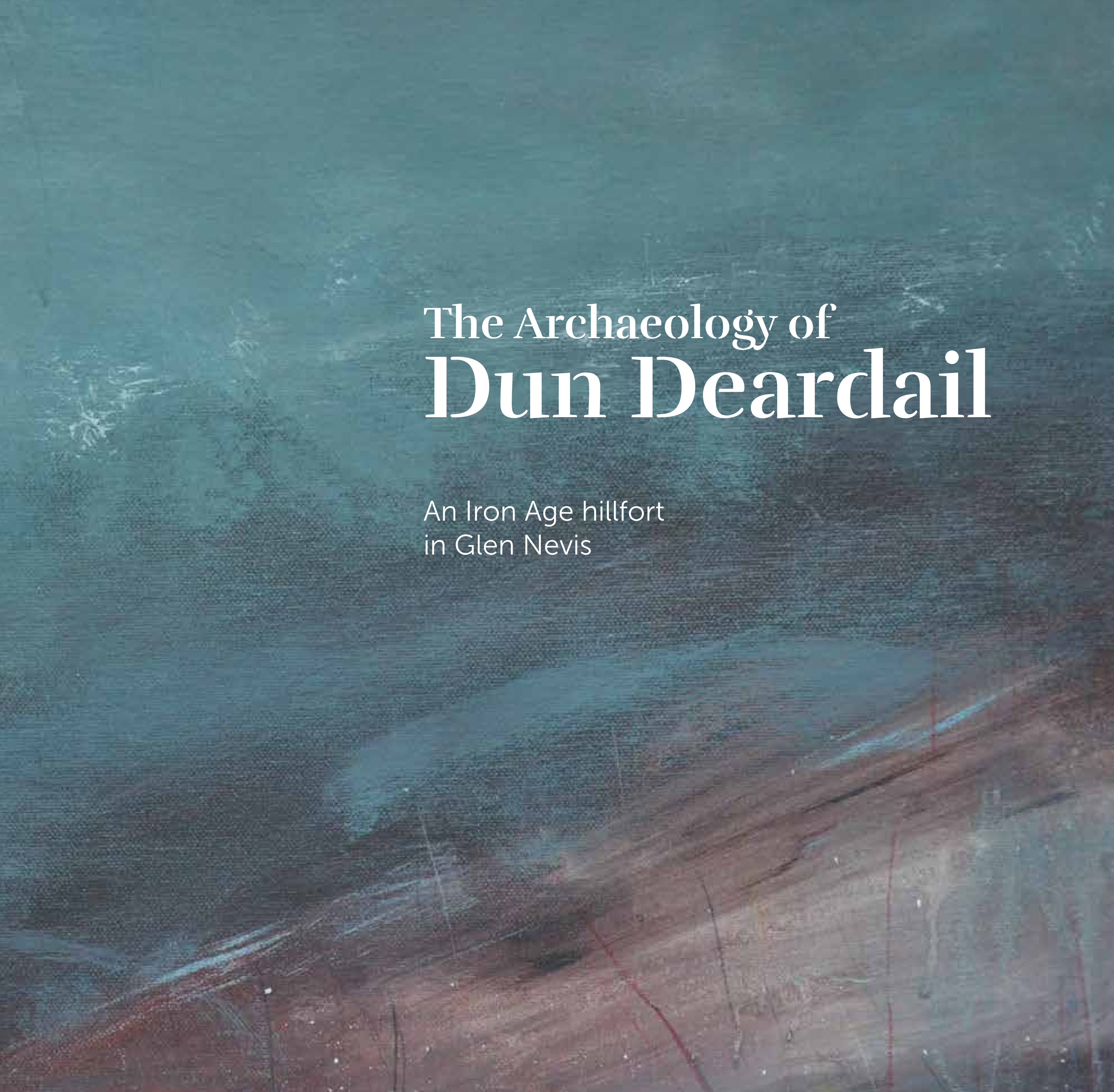

The Archaeology of Dun Deardail

An Iron Age hillfort
in Glen Nevis

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Is ann mu seach a thogar an dun
It is by degrees the fort is built

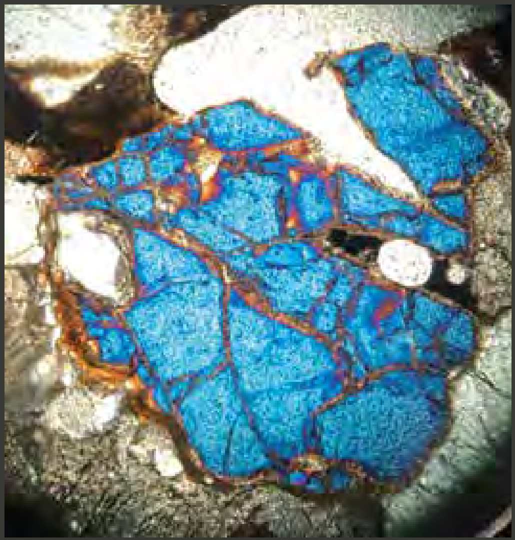
The Story of a Clast

What can one sample of vitrified rock – known as a clast – tell us of its creation? Formed in the great fire of Dun Deardail, our clast formed as minerals melted, glueing together bits of rock. What stories are hidden in it? What can it tell us about the vitrification event of Dun Deardail? We can look at this clast using differing scales of analysis from the hand-held samples examined with the naked eye, down to the microscopic analysis of single elements. Combined, the information contained at each scale can help write the story of the construction and destruction of the hillfort.

Looking at the outside of the clast, we can see that the rock is covered in small holes known as vesicles. These show that the water in the minerals of the rock was boiling off during vitrification. Imprints of charcoal are also visible in the clast. This is evidence of the timber framework that was part of the structure of the hillfort. At this point, it is difficult to see exactly what rocks have been fused together, so we cut the rock open. In the freshly cut surface of the clast we can now see the different rock types that have been fused together by the intense heat. Using a hand lens helps us to determine what these rock types are. From this we can see that the main rocks used have been the local calc-silicates, pelitic rocks and quartz rocks. Several pieces of granite were also observed.

A thin slice of the clast is then bonded to a glass slide and ground down to a thickness of 30μm, around the width of a human hair. At this thickness, light can pass through the rock and this allows us to look at the mineralogy of the rock under the microscope. We can compare the rocks making up the hillfort ramparts to the rocks in the surrounding area to see if they are the same. This allows us to see if the rocks that the ramparts were built with were local or were imported from elsewhere. As with the visual analysis, the petrology confirms that the rock used to build the ramparts and fill the rubble core were local rocks. Certain minerals only form at set temperatures. These are known as index minerals. Using this index, once we know the mineralogy of the rocks in the clast we can determine a temperature range at which these formed. The temperature of the melt in the hillfort will vary over and around the hillfort due to varying conditions. The presence of mullite in some of the clasts informs us that the temperature of that part must have been greater than 800^0c. In other parts of the melt the temperature must have been lower and this is shown by the presence of biotite and orthoclase feldspar. These areas would have only reached between 700^0c and 800^0c.

The next scale uses x-ray fluorescence to investigate the geochemistry of geological samples. Samples are irradiated with x-rays and when these interact with the minerals in the cut rock sample a packet of energy is emitted. Every chemical element produces a different energy signature and this provides us with another means of identifying the minerals that are present in our clast and to better understand how they have altered during vitrification.



Above: This light blue crystal is a fractured olivine crystal observed under crossed polarised light under a petrology microscope. The crystal measures about 500 um in diameter. The olivine crystal fractured due to the melting of the rock.

When we compared the results from our vitrified clast from the ramparts of the hillfort to samples of the local rocks surrounding the hillfort, we found that the results are very similar. It seems that the rocks in this clast were most likely local rocks, chosen for their ready availability, rather than rocks that had been imported from elsewhere.

Scanning electron microscopy allows us to investigate the clast on an even finer scale, allowing us to investigate single crystals and to build up a picture of chemical changes within the molten rock fragments that are within our clast. Using the chemical composition of certain minerals in the clast, such as orthoclase feldspar and silliminite, we can estimate the temperature of the rock as it melted. Our clast from Dun Deardail appears to have the upper range of between 850°c and 1100°c for the melt. There must have been a sustained, intense fire to allow the rock to melt like this.

Finally, we use Mössbauer spectroscopy to look at just one element: iron. The form in which iron is found in the clast can tell us of the maximum temperature that the rock reached when it melted. It also indicates whether oxygen was in abundance or was absent at the point when the rocks were melted. If there was a lack of oxygen, then we can conclude that something was covering the melt to prevent oxygen getting into the system, or that the fire had used up all of the available oxygen in the combustion process. This may have been an intentional covering to increase the temperature of the fire; or an unintentional covering, such as the melt smothering itself. At Dun Deardail the results from our clast show that the rocks melted and solidified in an oxygen-poor environment. Something was preventing oxygen getting to the melted rocks.

If we take many such clasts from all of the different areas that have been excavated across the hillfort, and repeat the same analyses, we can produce a story of its construction and destruction. From our work to date it appears that local rock was used to build the rampart core at Dun Deardail. It does not look like the rocks were specifically chosen for their melting qualities. This points to the burning event and vitrification being an event that occurred at the end of the hillfort's life, rather than it being a deliberate constructional technique. It also looks like temperatures in the rampart core reached between 850°c and 1100°c as it was burnt, causing minerals to melt and the rocks to vitrify in an oxygen-poor environment. However, different parts of the structure may have had different peak temperatures. Once all our samples have been analysed we will be able to build a better picture of conditions during burning around the ramparts.

Dun Deardail – Derdriu's fort – sits high above Glen Nevis, overshadowed by Ben Nevis looming opposite. It was built in the middle of the first millennium BC, around 2500 years ago, and was eventually destroyed in a catastrophic fire. Recent archaeological excavation has shed light on the construction, occupation and destruction of the hillfort.

Nevis Landscape Partnership

Forestry Commission Scotland
Coimisean na Coilltearachd Alba

AOC Archaeology Group

SCOTLAND'S ARCHAEOLOGY STRATEGY

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Le taic bhon Chrannchur Nàiseanta tro Mhaoin-Dualchais a' Chrannchuir