OPENARCH

A five year Cultural project with 11 partners, based on EXARC's key strength - its supportiv community and international perspective. OpenArch will build a permanent partnership of archeological open-air museums, rasing standards amomg participants and improving the visitor experience across Europe.

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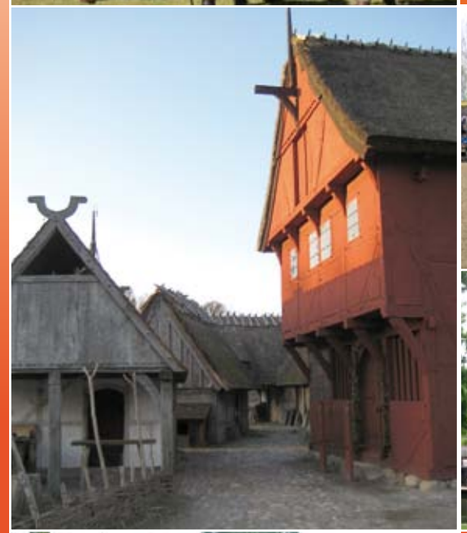
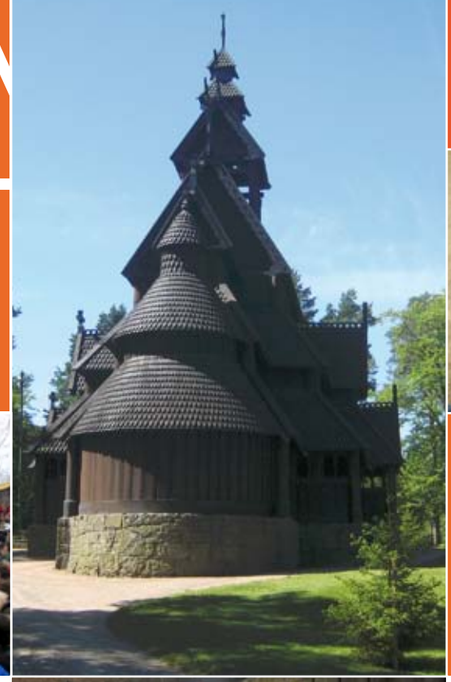




OPEN ARCH

MEETINGS & WORKSHOPS
STAFF EXCHANGES

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Management of Open-air Museums

Education and Culture DG
Culture Programme

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Workpackage 2: "Improvement of Museum Management"

This manual was commissioned by Foteviken Museum (SE) in cooperation with St. Fagans (UK). It's a product of the work package "Management of Archaeological Open Air Museums".

During the project all the OpenArch partners have been involved and taken part of the process of this manual. Questionnaires have been used to get detailed information from the partners. On the last meeting summarizing questions have been asked how they could show their best practices and what they have learned during the project about management.

From the team that handled the manual

The manual that you have in your hands is hopefully the starting point of managing an open air museum. Thanks to the OpenArch project we have been able to collect and analyze the practices and routines of open air museums from all over Europe. This manual will show and teach you valuable skills and techniques.

During this manual we will show the development and evolution of open air museums from their infancy to the present day and how to use the different ways of imparting knowledge. To better understand where we are headed, we need to know where we have been. We hope that this will give you a deeper understanding of why we do the things in the way we do. That is why we start with the history of open air museums and the ways they displayed and imparted knowledge to the public.

During the OpenArch project we have gathered testimonials, case studies and best practices from those that manage an open air museum to better give you an overview of different solutions and techniques. Hopefully you can use this manual as a building block and in time improve upon the knowledge contained herein.

October 2015
Björn Jakobsen & Steve Barrow

CONTENT

Management of open-air museums

Who runs, funds, leads and work there? What knowledge is had and what is required? What are the rules and what circumstances are in effect? Employees and volunteers, theoreticians, enthusiasts, craftsmen or academicians and businessfolk. Who visits and why? What is the age of the visitors? What do you wish to learn, and what is learnt? What is done and what can be done?

THE HISTORY BEHIND THE MUSEUMS

Background

Around 1900, national and regional open-air museums were established in all Scandinavian countries, notably in Norway and Sweden.

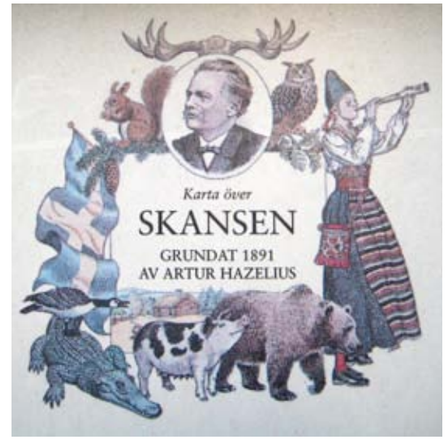
The more than 100 year history of how our museums came to be has its origins in a number of people collecting historical objects in their houses and barns to preserve them for the future. The collections were displayed for the local population and expanded to include buildings and farms.

Stave Church at Open Air Museum, Bygdø, Norway.

The world's first collection of relocated houses was Bygdø, the collection of King Oscar II in Oslo , Norway, opened in 1881. The purpose was to preserve medieval buildings that otherwise risked being lost. This included the stave church of Gol, the Hove cottage and a large hórreo. The royal open-air museum was later incorporated into the Norsk Folkemuseum, established in the 1890s. In 1891 Artur Hazelius founded the famous Skansen in Stockholm, Sweden, influenced by a visit to Bygdø. Skansen became a model for subsequent open-air museums in northern and eastern Europe, and in the rest of the world. The name "Skansen" has also been used as a noun to refer to other open-air museums and collections of historic structures, particularly in central and eastern Europe.

Artur Hazelus, originally a teacher – the greatest beggar in Sweden – using his enormous social network he could turn his ideas into reality.

In 1873 he founded Nordiska museet, the first larger daily life museum in the world. What made Hazelius unique was that he collected the everyday objects of ordinary people. Around the turn of the century the collection had grown to over 200 000 objects. In 1888 construction began of the large museum building in Djurgården. Nordiska museet became a museum for the people. During construction Skansen was added with the acquisition of the Skansen mountain and 7 months later Skansen was opened. It was originally called an open-air annex of Nordiska museet or " the newest section of Nordiska museet". In a newspaper article from 1892 the name open-air museum is used for the first time. Skansen was popularly called "a Sweden in miniature" by many.



The Environment at Skansen, Sweden.

Farms, pastures and even a Sami camp were moved to the Skansen mountain from various parts of the country. Hazelius did not just relocate buildings, he also furnished and decorated them. He populated the farms with sculpted mannequins posed in dramatic scenes, though the mannequins were replaced early on by living people. There were people in folk costumes from Dalarna county working in the environments. In the middle of Skansen an entire Sami camp was rebuilt with Sami inhabitants from Frostviken in Jämtland county. Living animals and livestock were also used. Reindeer and lapphund dogs were a part of the environments. In time 55 different races were kept and a zoological garden was created. Hazelius wanted to create a living museum that depicted everyday life as it was. When the term ”living history” was later used in the USA they probably did not know how close he had already come with his ideas.

Artur Hazelius was the creator of the first open-air museum in the world.

Typical old-fashioned item display at a traditional museum.

Environment from the Open Air Museum Old Town in Århus, Denmark.

There was a downside though. The established museum world with leading Swedish museum men like Oscar Montelius and Hans Hildebrand had many opinions on this form of museum. The rules for handling and display of historical objects were very strict during this time period. Everything was to be arranged into a systematic ordering of objects by time, type and place of origin. As an educator Hazelius insisted that objects should be displayed in their proper environment. This can be seen at Skansen, or within the display room with three walls where the objects are integrated into a historic environment. This was how he wanted to present history to the people.

The open-air museums were a success. This was how the public wanted to experience history. A major opponent of this was the Danish museum man and archaeologist Sophus Müller, who during a museum meeting in 1897 attacked the growing open-air museums.

The museums were also disliked for relocating the buildings from their original sites, violating the monuments. When objects were reconstructed to complete the recreated historic environments some considered it to be falsifying of archaeological finds since the objects displayed were not historic originals.

Despite this the attention and success of the open-air museums continued to grow. Skansen became a role model of great importance, and a challenge. Soon all the Nordic capitals had their own open-air museums. 1897 in Copenhagen, 1902 in Oslo and 1909 in Helsinki. Across the Nordic countries many smaller open-air museums also opened.

In Lund in southern Sweden Kulturen opened in the middle of the city. The founder was the Scanian son of a clergyman Georg Karlin. Popularly considered as strong as Hazelius and self-professed inventor of the concept of open-air museums, when he in 1882 brought up the idea to collect everyday objects for display in open-air museums.

To the north two equivalent regional open-air museums of importance were opened, Murberged in Härnösand and Jamtli in Östersund. Here the concept was expanded by making the museums into meeting places for festivities and festivals, like traditional Swedish midsummer celebrations.

In Denmark ”Den gamle by” (The old town) was founded in 1914. Here an entire city centre was recreated with streets, buildings and squares.

“Kulturen i Lund”. Farmhouse in Östarp, Sweden.

Open-air museums grew across Europe. In 2004 they received 5 million visitors across 25 countries.

Open Air Museum Jamtli, Sweden.

The Old Town in Denmark.

The world

Skansen as the site of our first museum is of importance to the east and world, where many open-air museums are called Skansen. In 1918 Nederlands Openluchtmuseum, the first open-air museum outside the Nordic countries opened in Arnhem, Netherlands. During the 1920s and 1930s more open-air museums emerged across Europe as well as in the USA. But it was not until after World War 2 that open-air museums became a true world-wide phenomenon. Today there are open-air museums in most European countries, across North America, Japan and Australia.

Research and education

Originally the self-taught collectors created the platfom to spread knowledge within humanities, history and archaeology. During these 100 years the museum world has been organised within ICOM, creating norms and methods of registration. Refined analysis of archaeological finds from buildings and excavations have widened the view of ancient history reaching back to before the Stone Age. Within the museum world gathering of facts, research and documentation has been of prime importance. Publications and exhibitions have been the result of this work. What has not been put on display has been gathered in barns and storage houses with digital databases for research purposes, but today also available to the public.

Typical traditional exhibition with items in glass displays.

Information from wikipedia and Sten Rentzhogs book "Open Air Museums - The history and future of a visionary idea".

What history is shown at open-air museums

The genuine buildings at our open-air museums – when were they built or moved to the museum? A time span of several hundred years. The problem with the buildings were that a house from the 17th century had been modernised over time and in some cases people had been living in them up until the time they were moved to the museum. Should the buildings then be shown with their current renovated modern windows, or restored to how they once were? The same thing applies to the objects tied to the buildings or farms. Several hundred years might separate some of the objects, and sometimes several of the same type were included.

Display cases and exhibition halls at the modern museums

Objects in display cases with descriptions and dates. Exhibition of stone axes placed in rows on shelves. The room with three walls at the museum showing an environment with furniture and objects, models etc.

Wear and tear of objects

Visitors wear out objects at both traditional museums and open-air museums. Rooms are blocked off with ropes or glass windows only allowing visitors to look into the room. "Do not touch" signs are put up.

Typical closed off section at a museum where you only get to look and can't enter.

Sponsors and donators

From Nordiska museet with stately buildings historical monuments and collections were created. Our museums. Without the funding of sponsors like today, but with the help of donations from wealthy people, businessmen etc. In return they got their names carved into stairwells and placed on signs in entry halls as recognition. But what is the difference?

Advanced information technology

Using digital technology we can today show buildings, environments and parts of towns using digital 3D rendering. Information at the museums can be downloaded using QR codes to apps on smart phones in a language of the visitor's choice. Advanced technology is becoming increasingly commonly used for presentation at our museums.

When Artur Hazelius two exceptional museum concepts divided Nordiska museet into a traditional exhibition museum and Skansen as an open-air museum it also placed these museums into two separate divisions. With the traditional museums as high culture and the open-air museums as popular culture of lesser cultural dignity.

QR-Codes as an information concept.

Before sponsors with company names there were the names of donors in the entrance.

ARCHAEOLOGICAL OPEN-AIR MUSEUMS AND THE EXPERIMENT

What are our archaeological open-air museums and how can and should they be used?

- a reconstruction
- an experiment
- an educational concept
- a museum visitor attraction
- a gathering place for enthusiasts and reenactors
- or a free mix of the above?

Unlike the open-air museums where farms, buildings and churches are moved to the museum from around the country creating a miniature world, the archaeological reconstructions can be a strong educational option and complement to the exhibitions of the traditional museums and the genuine buildings of open-air museums. In addition to all the knowledge acquired when making the summaries and theoretical buildings on the drawing board, the reconstruction itself results in knowledge previously lacking by constructing the buildings in full scale. These experiments have their own purpose and goals.

The experiment as a construction and model for other constructions Longhouses or roundhouses?


1.

Tom Hansen at Leire Försökscenter was responsible for starting the reconstruction of the so called longhouses in Scandinavia. During roughly the same time the British archaeologist Peter J. Reynolds, known for his research in experimental archaeology, created a working replica of an Iron Age farmstead in Hampshire.

Tom Hansen laid the foundation for the Scandinavian wave. With his experiments he stimulated others to perform experiments with everything from the reconstruction of buildings and barrows to techniques in various old crafts.

With the house reconstructions and Leire as models several similar buildings from the Stone, Bronze and Iron Age were reconstructed across Scandinavia.

In Sweden we can see clear traces of this in the Scanian project Forntid i nutid at the Frostavallen open-air facility, along with reconstructions in Falköping and the ancient village Ekehagen. In Norway there is the Landa facility in Rogaland. This practice of comparing and using the experiences of other experiments can also be seen at Gene ancient village in Övik Sweden and the Iron Age village in Stavanger, Norway.

The problem with this wave of reconstructions of historical buildings were that the end goal was often not clearly stated, other than seeing if a full scale replica of a building could be made. While this goal in itself does not present a problem, the problems arise when the same concept is applied for other end goals. Then problems arise with what is shown, how it is used, how it is maintained and preserved.


2.


3.


4.


5.


6.

(1)Sagnlandlejre, Denmark. (2)Gene Forntidsby, Örnsköldsvik, Sweden. (3) Årsunda Viking, Sweden. (4) Ekehagen Forntidsby, Sweden. (5)Landa, Norway. (6)Jernaldergården, Stavanger, Norway.

ACTUALISATION & RECONSTRUCTIONS

The concept

We have arrived at the Gordian knot. Purpose, goal and meaning.

What are we building with a reconstruction, an experiment, an educational concept, a museum visitor attraction, a gathering place for enthusiasts or a mixture?

Reconstructed house in decay.

A) Constructing a historical building as a scientific study from theory to practice.

After construction is done the building is left to decay. Or it may be set ablaze to study the remnants and compare with the original archaeological find.

B) Constructing a historical building for educational purposes.

The building is constructed on a site planned for this activity. It is not necessarily in the same area where a reconstruction would be made meant for visiting tourists. It means close proximity to toilets, storage facilities for school supplies, changing rooms, storage areas for bags and clothes, etc. It allows the use of modern lighting, concrete foundations, heated floors, but not visibly. It is perceived as a historically accurate building. Around the camp fire there are benches allowing a school class to gather for storytelling or simpler crafts. It is possible to stay indoors all the time in case of bad weather.

Typical arranged long house for educational purposes directed at children.

C) Constructing a historical building to portray a historical environment.

In this environment you are meant to experience history. It is furnished like if an inhabitant has just left the room. Visitors may touch everything, there are no signs and a fire may be burning in the fireplace. It is not visible that the building has been constructed on a small platform and the surrounding area drained of water. Macadam in the foundation prevents moisture from reaching up into the walls and floor even if the building is not constantly heated. Hidden floor heating may be installed to keep the building dry. The roof is secure and durable. Beneath the peat or concealed between double wooden layers there are modern water seals. Entrances and doors allow handicap access.

Middelaldercentret, Nyköping-Falster, Denmark.

Reconstructed Viking farm with hidden modern technology, Rosala, Finland.

A clever way of hiding a heating source.

Mexican Village, High Chaparal, Anderstorp, Sweden.

D) Constructing a historical building for bringing history alive.

Similar to the museum scenario, it also allows visitors to see the life going on inside the building. Emergency exits and hidden heating is included to be used during gatherings and overnight stays. Minimal fires reduce the smoke while still providing the experience of smell.

E) Does the Disney concept have parts we can make use of?

This may give the appearance of a Disney theme park, but what we do ensures that everything is historically accurate. Natural materials are seen and felt, we have real fires etc. What has been borrowed from the Disney concept however is their skill at hiding modernities that improves the environments and reduces wear and tear and the need for maintenance.

From rural to industrial buildings

The first open-air museums were focused on rural buildings and rural culture. This is still the main focus for most open-air museums. From 1909 Den Gamle By added a focus on urban culture, and from the 1960s this focus was extended to the industrial culture. During recent decades the diversity within open-air museums has increased.

In the USA this type of museum with living history grew into a large success. The father of the Ford, Henry Ford, made one such investment, the Greenfield Village. A monument over himself and industrial development. Already in 1960, just a couple of years after opening, the museum had over 600 000 visitors per year.

Williamsburg was another investment that would become a shrine to early American history, visualised in its proper environment. This project was developed by the visionary Goodwin with financial aid from Rockefeller. The entire town was bought and restored to an 18th century state. All power and phone cables were dug down, signs were altered and modern decorations were removed.

Everything was shining clean and proper. To many it reminded them of a movie backdrop. Goodwin was the first to use the phrase ”interpretation” when he described the activity of his museum, and compared the presentation with theatre.

Typical traditional Open Air Museum.

Colonial Williamsburg, USA.

The entire town should be populated.

There were ideas in 1930 about slave settlements populated by ”elderly blacks” who would work with cleaning and sanitation of the museum environments. This idea was met with resistance however, and thus the slaves and the poor that made up 90% of the population of the time were excluded. Williamsburg was thus strangely segregated and hotels and restaurants in the area were dedicated to visiting ”whites”. The guides hired presented the image of elderly white women within the museum town.

Williamsburg became a model for other museums, with high requirements for scientific knowledge, quality and accuracy. Unlike many European open-air museums where it was considered anachronistic for the staff to wear historical clothing, it became the norm and rule in America. Even for crafts in the environments.

Living history

Old Sturbridge Village recreated a village from the early 19th century, intending to show how people lived during this time period. The museum is a pure reconstruction comparable to our Viking and medieval facilities in Europe. In 1976 when the USA celebrated its 200th anniversary there were about 500 open-air museums in North America. Under the motto ”living history” new conditions were created. This can be seen as a counter to Disney’s opening of Disneyland in 1955 and Disney World in 1971. The theme parks were adult adventures and became family activities for all ages, where visitors were no longer passive spectators but active participants. Several theme parks opened with themes like gold digger towns, wild west villages, cruises with paddle steamers, using historical backdrops and people dressed in clothing of the time period, but no scientific foundation in what was presented.

The museums went on a counter offensive. If we cannot compete about the audience we can learn from the Disney concept and win them over with knowledge and historically accurate content. The goal was to provide visitors with an experience of how people lived, tales of life in the past, the people, illness and death.

The concept was a success. ”Living history” can be described as a movement, a method, a philosophy and an educational tool. It is a way of stimulating all five senses along with the intellect and emotions.

The reenactment movement

Activities related to “reenactment” have a long history. The Romans staged recreations of famous battles within their amphitheatres as a form of public spectacle. In the Middle Ages, tournaments often reenacted historical themes from Ancient Rome or elsewhere.

Military displays and mock battles and reenactments first became popular in 17th century England. In 1638, a staged battle between

Re-enactors doing a fighting in Trelleborg, Denmark.

Christian and Muslim forces was enacted in London, and the Roundheads, flush from a series of victories during the Civil War, reenacted a recent battle at Blackheath in 1645, despite the still ongoing conflict.

Historical reenactment came of age with the grand spectacle of the Eglinton Tournament in 1839, a reenactment of a medieval joust and revel held in Scotland, and organized by Archibald Montgomerie, 13th Earl of Eglinton. The tournament was a deliberate act of romanticism, and drew 100,000 spectators.

It was in the 19th century that historical re-enactments became widespread, reflecting the then intense romantic interest in the Middle Ages. Medieval culture was widely admired as an antidote to the modern enlightenment and industrial age. Plays and theatrical works (such as Ivanhoe, which in 1820 was playing in six different productions in London alone) perpetuated the romanticism of knights, castles, feasts and tournaments.

The re-enactment of the battle of Hastings, 1066, Hastings, UK.

Reenactment and education at open-air museums

It is interesting to note, about human activities at Acheological open air museums (AOAM), the incredible increase in the number of reenactment actors. Across Europe the numbers grow to the point that one might call it one of the larger cultural activities on the international arena.

Medieval re-enacting at Nyköping-Falster, Denmark.

SCA (Society of Creative Anachronism)

The Society for Creative Anachronism is an international organization dedicated to researching and recreating the arts and skills of pre-17th century Europe.

SCA was founded in the USA in the 1960s when a few friends who were history, fantasy and science fiction fans arranged a large outdoor party in Berkeley, California.

Since 1966, the Society has grown and today cover the USA, Canada, Europe, Asia, South Africa, and Australia. There are over 30,000 paying members of the organisation, and the total number of participants is around 60,000 people. Members, dressed in clothing of the Middle Ages and Renaissance, attend events which feature tournaments, royal courts, feasts, dancing, various classes, workshops, and more.

Fighter re-enactors at the Trelleborg Market, Denmark.

In Europe in the 1970s new winds are blowing after the construction of museums has been at the forefront. A new generation of historians and ethnologists has, like in America, a new aim. They wanted to spread knowledge of the fate of the common man and the local history. At the open-air museums the focus was shifted from the buildings and objects to the people behind the objects. The open-air museums were lifted up as a unique educational opportunity to visualise history in an easily understandable way.

The Welsh open-air museum St. Fagans has a row of six miner's homes showing different time periods from 1805 until 1985. Here the differences between the generations are shown in a visual and educational way.

Re-enactors, craftsmen and families gathering at the Trelleborg Market, Denmark.

What was the purpose? There were different ideas what the main theme should be, the buildings or the people. Preservation or education. In Denmark during the 1950s one museum stood out from the rest. During a few weeks in the summer with the motto "the countryside awakens" the open-air museum Hjerl Hede had a project where all the buildings, schools, mills and workshops were manned. People wearing time typical clothing lived and worked in the environments. A strange phenomenon also occurred in their reconstructed Stone Age village. Adults and children showcased life and work in ancient time from behind a fence, like watching animals in a zoo, where the visitors could not communicate with them.

This has probably indirectly influenced the development of open-air museums. This is the origin of the founder of Försökscentert Lejre (now Sagnlandet Lejre). When museums across the world sought new inspiration they looked at Lejre.

Miners homes at St. Fagans showing different time periods, St. Fagans, UK.

Early stages of live interpretation where the interpreter is on display segregated from the audience.

The visitor demands hands-on

There is a large interest among visitors for a more active museum visit where they can partake in ”hands on” activities.

The phenomenon is connected to large measurable differences in museum visitors and tourists during the last 10-15 years. People no longer wished to passively observe objects in traditional museum display cases, but wanted to actively participate in reliving history. Stepping into a historical role and acting it out along with other actors in historical environments is now a reality to many.

By actualising these recreated environments with people in historic clothing the immaterial cultural heritage of old customs and traditions, stories, music and songs is illustrated.

What is the purpose of this? Knowledge and adventure. Visiting another time and place and experiencing something different. This can be offered by a reconstruction of a historical environment. A historic or prehistoric time can be experienced with all senses, a different way of thinking and another life style. The surroundings then become important and need to be as seemingly authentic as possible to preserve immersion. Clothes, attitudes, movement patterns, life rhythms are all of importance.

The purpose of the journey and adventure can cary. An escape from the dull everyday life, fulfilling a need for fun and games, a desire to learn or to relax are all reasons to undertake this journey through time.

Quote from Bodil Pettersson's book “Beliefs about the past”.

Hands-on demonstration.

MOTIVATION & ENTHUSIASTS

The creators

The theoretical subjects in archaeology and history were attempted in various experiments, large and small. At first with scepticism like when Thor Heyerdahl constructed the balsa raft Kon Tiki in 1947 and sailed across the Pacific Ocean.

One of the first experimental archaeological achievement, Kon-Tiki raft at the Kon-Tiki museum, Oslo, Norway.

Hans-Ole Hansen

Lejre försökscenter in Denmark is one of the forerunners in experimental archaeology. Analysis and practical tests of objects and tools was the foundation of these activities that started around 1964. With the building patterns of the Iron Age, about 400 AD as a base, an entire countryside village was constructed. Initially the focus was placed on the experience of an ancient environment; the visitor should suddenly find themselves way back in time, meet people and, without any foreknowledge, form their own image of how the buildings and people of the time were.

The great success of Lejre generated a large interest in history and crafts in reconstructed environments in Denmark. This avenue of research is closely tied to the reconstructed of ancient environments.

The first experimental facility, Lejreforsökscenter (Sagnland), Denmark.

Gerda Boëthius

In 1932 the excavation of a longhouse from the Iron Age in Lojsta on Gotland, Sweden resulted in the first reconstructed building. It was reconstructed on site and done as an experiment. The purpose was only to illustrate the construction of the building. No interiors were created and thus the building became a monument and not a living ancient environment.

The reconstruction is primarily based on the knowledge from the recent excavations on Öland and Gotland. Thus a fairly large reference material was available. In

Lojsta, Swedens first reconstructed long house.

the cases where information was lacking the gaps were filled in using known construction techniques from the first millennium, or when such was missing, using regional country architecture and other antiquated construction forms preserved on the island. Though the original was likely more richly ornamented than the reconstruction of the Lojsta hall.

Forntida Teknik – Short descriptions of hands-on experimental archaeology. The key to success of experimental archaeology in Sweden.

Thomas Johansson

An important event for the Swedish experimental archaeology was when the "Institutet för forntida teknik" (Institute of ancient technique) was founded in 1980 in Östersund. The initiator and enthusiast behind the project was Thomas Johansson and the activity was integrated into the Bäckedal people's college. Under his leadership the institute was developed into the the leading Swedish institution within its subject area. The institute worked not only with archaeology but also related disciplines of science, like nature science, anthropology and older crafts.

An important product of the institute was the periodical "Forntida teknik" (Ancient technique) that was released during 15 years in 2000-3000 copies with a total of 800 pages. The internet web page of the institute was also very extensive and generated interest in experimental archaeology far beyond the geographical region of the project.

Erik Nylén

Reconstruction of the stone fortress of Eketorp, Öland, Sweden.

The excavation of the ancient ring fortress Eketorp on Öland resulted in a desire to recreate a part of the fortress stone wall

and some of the excavated buildings. The work was planned already in 1972 but only began in earnest in 1978. Even here through the main goal was initially focused on the reconstruction effort itself and not on what to do with the final product.

In the same year, 1978 work started to reconstruct a Viking Age farm at Stavgård, Gotland. Here, unlike earlier project, the main goal was to construct an educational ancient environment. The buildings became backdrops true to the time period around which the activities took place.

Stavgård, Gotland, Sweden. The cradle of educational hands-on program for schools.

The project "Forntid i Nutid" (the past in the present) started in 1980 at Skånes djurpark. Here a number of Stone Age settlements were recreated for the first time in Sweden. There was a recreated summer settlement from the Hunter Stone Age (about 5500 BC) and a winter settlement from the same time period. The model was the excavations of the large Slateholm settlements between Trelleborg and Ystad. At the same time a longhouse from about 2200 BC was reconstructed, built from the archaeological results of an excavation in Fosie, Malmö. In the same region a long barrow from about 4000 BC had been excavated, and subsequently reconstructed in full scale as part of the project "Forntid i Nutid". The experimental part was the main focus of the project, for the first time in Sweden reconstructions were made of stone age environments, settlements, a longhouse and a megalith grave. Much of the base knowledge and ideas can be derived to Lejre. Soon the project gained a followup in the Ekehagen prehistoric village complex in Västergötland and the project inspired several other projects.

Frostavallen, Sweden. From experimental to educational site.

The archaeologist Sven Rosborn and the archaeologists and later professors Göran Burenhult and Lars Larsson were leading the project along with representatives from various research institutions. The project became an important step toward the open-air museums of today. Bengt Fredriksson was developing the educational form with actualisation and hands on techniques on site.

Göran Burenhult's ideas about ancient boats and their function were inspired by his travels with a dugout boat with outriggers and a small tail tested in the open sea. Bengt Fredriksson performed several of these experiments with longer journeys with this boat "Ålakragan". One of these journeys were between the towns Travemünde in Germany and Trelleborg in Sweden, meaning several trips across the open sea.

Anders Ödman

In the mid 1980s the archaeologist Anders Ödman from the archaeological institution at Lunds University initiated the first experimental reconstruction of a longhouse in Hög, along with a pair of pit houses. It was done for an experimental purpose, using archaeology students and volunteer workers. Experimental archaeology within other fields was also performed, including blacksmithing and iron working where the archaeologist P U Högberg was an obvious collaborator. Successful attempts were made with overnight stays during cold nights when temperature measurements were made.

Iron smelting in Hög, Sweden.

During the 2000s he has become a forerunner in the field of experimental archaeology, arranging university classes of the subject and contributing to a higher acceptance of the experimental field of archaeology.

In the 1980 there was a large establishment of Swedish reconstructions. Several facilities were however only made up of one of several smaller buildings from prehistoric times, with the Viking Age being dominant. Not just buildings but also a number of replicas of ships from this time period have been reconstructed.

During the 1990s interest across Sweden increased to do building reconstruction. An important cause of this were the extensive, legally protected archaeological activities that had generated interest in ancient times among the general public. The high unemployment during the 1990s also factors in. The public sector of the country could place unemployed into projects to reconstruct ancient times, resulting in economical feasability for many projects.

Fotevikens reconstructed viking village, Sweden.

Reconstructed farm house, Hög, Sweden.

Reconstructed fortress, Trelleborg, Sweden.

Chieftain hall in Ale, Sweden.

THE ORGANISATIONS GATHER FORCE

Organisations ICOM, AEOM, ALHFAM, NOOAM, IMTAL , EXARC,

Bunge Museum, Gotland, Sweden.

The International Council of Museums (ICOM) is the international organisation representing museums and museum professionals.

Since 1946, ICOM has assisted members of the museum community in their mission to preserve, conserve and share cultural heritage. ICOM also takes advice from institutional partners to achieve its objectives.

ICOM is governed in an inclusive and hierarchical manner, on an international level. The organisation gathers more than 35,000 members and is made up of National Committees, which represent 136 countries and territories, and International Committees, which gather experts in museum specialties worldwide.

ICOM Secretariat is situated at UNESCO House, Paris, France.

icom.museum

The old village, Odense, Denmark.

Associations of open-air museums

In Europe the most important open-air museums are organised in **AEOM** - Association of European Open-air Museums. The aim of the AEOM is the exchange of scientific, technical, practical and organisational experience relative to open-air museums, and the promotion of the activities of open-air museums in general. www.aeom.org

ALHFAM – Association for Living History, Farm and Agricultural Museums In North America most open-air museums are members of the organisation ALHFAM . In several countries open-air museums are organised in national networks. www.alhfam.org

NSLF- Näteverk Sveriges levande forntid

Swedish network meeting – Ancient villages in Ekehagen, Sweden.

On the 26th of October 1999 all representatives of all ancient villages and facilities in Sweden gathered in Ås. Thomas Johansson and Harriet Löwenheim thus initiated the creation of the organisation Nätverket Sveriges Levande Forntid (NSLF), people also associated with the institute of ancient techniques and Stavgård Viking farm. After their all too early demise a team of representatives from the leading facilities in Sweden took over as board of directors, lead by chairman Björn M Jakobsen. A lot of work was put into increasing quality and knowledge among the roughly 40 members of the organisation.

NOOAM, the Nordic Organisation of Open-air Museums

Nordic Network meeting – Gunnes gård, Sweden.

In 2007 another step was taken toward a broader approach with

the remake of the association into the Nordic Organisation of Open-air Museums, NOOAM. See www.nooam.se.

EXARC

At the founding of the Swedish network the goal was to develop the Swedish concept into an international concept. Thomas Johansson had this thought when he established a close collaboration with Martin Schmidt who was then head of the classic "Archäologisches Freilichtmuseum" in Oerlinghausen, Germany, and the Dutch archaeology student Roeland Paardekooper. In 2001 the foundation was laid for EXARC, the European Exchange of Archaeological Research and Communication. See www.exarc.eu.

Exarc meeting – Lejre, Denmark.

AOAM - Archaeological Open-air Museums

A common name was needed to describe organisations of this type. Around 2010 the name "Acchaeological Open-air Museums" became commonly used. Several different terms were used across Europe to describe the same kind of facilities: Park, centre, ancient village, historic workshop, etc.

Project meeting – Bratterli, Greenland.

THE EU PROJECTS

EU project Geir Sör Reime and Björn M Buttler Jakobsen

The first established EU project where Fotevikens Museum participated was in 1997 with the Danish Roskilde museum. "Öresundregionens historia - förr och nu" It involved the charting of historical events taking place around the Öresund region.

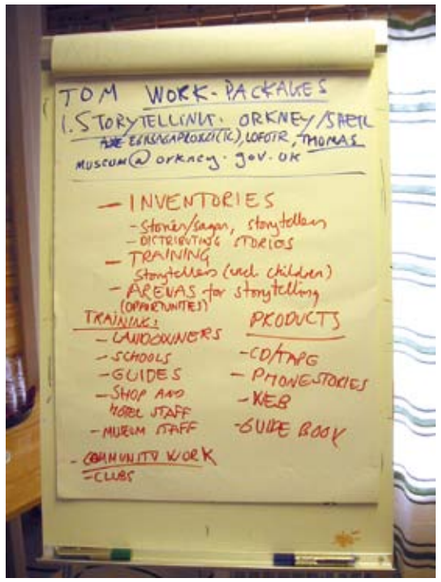
Tourism development - Cooperation meeting in Gothenburg between the EU project Balder and North-Sea Viking legacy.

Geir Sör Reime from Rogalands fylkeskommun, Norway initiated the project North Sea Viking Legacy which intended to identify and put a spotlight on Viking Age monuments. Informational signs posted in nature was an important way of imparting information about the sites. The project also created hiking trails to visualise the historical cultural landscape. The following year Björn M Jakobsen participated in the creation of an equivalent project for the Baltic Sea region, Balder. The project was about the countries around the Baltic Sea and their common history from the Viking Age to our present time. The two men met and became observers in the other's project.

This resulted in further projects. Destination Viking Living History. The Baltic Sea. Eight partners from four countries participated in the charting of the Viking Age history of the local area near the museums with associated source studies and field work. Destination Viking Saga Land, the project was about studies of Viking Age monuments and older tales and sagas of the Nordic periphery.

These were followed by several other EU projects like KNOT (Culture, Nature and Tourism). The project was about finding solutions for a digital map accessible online where people can

Swords in the mountain, Hafrsfjord, Norway.



Project development.

Destination Viking Sagalands meeting in Iceland.

Visit to the Faroe Islands.

search for knowledge and find interesting sites to visit. Exchange of experience was a large part of the project as all participants had been lead partners in their own earlier projects.

LiveARCH. The project was a network of archaeological open-air museums. It is a part of the conceptual development of ICOM (International Council of Museums). Here EXARC, (then lead by Björn M Jakobsen, Geir Sör Reime and Roeland Paardekooper) with the help of EU funding, could further develop this branch of museums with reconstructed environments, actors in type typical clothing and interiors, actualisation and education using a new approach.

On the way to Knot – EU meeting between project managers at north Iceland.

LiveArch meeting in Modena, Italy.

An important milestone in this work toward a common set of guidelines was reached at a large EU meeting within the LiveARCH project hosted at Fotevikens Museum on the 9th of November 2007. Here a consensus was reached to use the term archaeological open-air museum. Terms like criteria, guidelines, tool kits, marketing development plans and event coordination could now be grouped under a common umbrella and further develop archaeological open-air museums in Europe and the world.

Here a connection was also made to the international museum organisation ICOM,

Conference LiveArch in Eindhoven, The Netherlands.

Meeting in Crannog Center, Scotland.

which already in 1957 laid the foundation for this kind of museum. The ICOM protocols state that an archaeological open-air museum contains reconstructions of historical buildings that no longer exist, built with strict scientific methods and adapted interiors. Thus AOAM was within the official museum world.

Another important piece of the puzzle of running and developing archaeological open-air museums is for example Amaprof, where the experiences of working with employees and volunteers of Fotevikens Museum in Sweden and Middelalderscentert in Denmark were recorded.

Openarch has become a direct followup and development of this. It is a 5 year project started in Barcelona 2011.

From Wales, Amgueddfa Werin Cymru - St Fagans National History Museum www.museumwales.ac.uk.
Germany Archaeological-Ecological Centre Albersdorf (Stone Age Park Dithmarschen) http://neues.aoeza.de/
Netherland Archeon Archaeological Open-Air Museum www.archeon.nl
Arheološki Institut Serbia www.ai.sanu.ac.rs

Viminacium open-air museum conference, Serbia.

Fotevikens Museum is the Swedish partner. www.foteviken.se
Hunebedcentrum from Netherlands www.hunebedcentrum.nl
Kierikki Stone Age Centre north of Finland www.kierikki.fi
La Ciutadella Ibérica de Calafell Spain www.calafellhistoric.org
Parco di Montale Italy www.parcomontale.it
University of Exeter, Department of Archaeology, UK http://humanities.exeter.ac.uk/archaeology/

Destination Viking Association board meeting, Lervik, Shetland.

The latest EU project iovolves 15th partners around Europe in four year project Follow the Vikings. Part of theCreative Europe programme .The project is about how to develop cultural tourism around Europe – looking at where the Vikings came from and where they went.

Pre-meeting for the EU project Follow the Vikings.

OPEN ARCH MANAGMENT OF AOAM

Workshops can be tricky.

Seminar at a project meeting - Pfahlbaumuseum Unteruhldingen, Germany.

The partners of the Open Arch project

As study forthe OpenARCH project we have performed a survey. This involves 9 of the 11 partners as 2 are not open-air museums, Exeter and EXARC.

Here we can note that one partner is old, founded already in 1948 as the first open-air museum in Wales. Recently another section has been added with experimental buildings and education with round houses. They have a large area for all their activities and a lot of people work there. Thus we only include their experimental section in some parts of our survey.

With 9 participants the survey covers a very small part of the AOAM that exist in Europe. The spread across Europe is good, though there is some concentration around Northern Europe.

In addition to this our own experiences serve as comments in the summary.

THE ORGANISATIONS

Amgueddfa Cymru - St. Fagans Natural History Museum, Wales, UK.

The partners

The AOAM museums are fairly young – mostly and only work with historical and archaeological reconstructions. Only one is from the late 1940s and can be considered a traditional open-air museum with the addition of some new reconstructions. This organisation also has the largest area of about 480 hectare and about 43 buildings.

The others are significantly smaller in size and their areas are either directly connected to a place with archaeological finds, making them harder to reach for tourists, or on land of no significant value, thus far from main roads, inaccessible or with marshy ground that is poor for construction purposes, etc.

Historical reconstructed village, Ukranenland, Germany.

Entrance and shop

All participants have an entrance building with a museum shop. The size of the shop and café, as well as what is offered, varies greatly. Just over half the museums run the shop and café on their own, while the rest have them outsourced to third parties.

The difficulty with outsourcing is that you lack full quality control, in particular of the shop and café environments if you want to maintain a profile connected to the museum activities. This also includes the products for sale in the shop and café. Profit easily becomes more important than quality.

Museum shop, Middelaldercentret, Nyköping-Falster, Denmark.

In Sweden the World of Astrid Lindgren mirrors a world in the 1940s. Here they have returned to sell products that were available at that time in their shop, the café does not sell any french fries or hamburgers, but the fast food available during that time. You can sell anything in your shop but is best when it has a direct connection to the activities, or a balance between books, replicas, local products, souvenirs and children's toys. It obviously also depends on economical conditions.

Museum shop at Archaeological-Ecological Centre Albersdorf, Germany.

At most museums the visitors buy entry tickets in the shop or café. This means that if the third party provides this service and the museum retains the entry fees, or if the museum itself handles this, then the shop and café generates funding for the museum activity.

Five of the nine facilities have a restaurant in the museum, many of which are run by third parties. This offers good service to museum visitors. Middelaldercentert in Denmark has a genuine medieval restaurant serving historical food, and a simple fast food kiosk by the children's playground. A good combination of quality and price that satisfies a broad audience.

Open and visitors

Unfortunately visitor numbers are not evenly divided aross the year. This is mostly apparent in Northern Europe where facilities are usually only open during the warmer part of the year.

We can see a variation between 12 000 and 250 000 annual visitors. Free entry is a factor here. At some facilities the local population

Den Gyldne Svane – Fully licensed restaurant, Middelaldercentret, Nyköping-Falster, Denmark.

School kids at the Roman Arena at Archeon, The Netherlands.

uses the area as a recreation area with no entry fee. This means no funding for the museums. Free entry mostly applies when the museums are owned by a town, county or such. It can also be a facility that is still under construction, in its experimental stage offering no additional services.

Open season varies from 4 months to all year. This is mostly dependant on the visitor numbers and the climate. Further north facilities have a shorter season.

Employees

In general the museums can be claimed to be undermanned, in relation to the activities and number of visitors. The museums staff number varies between 3 and 370 employees in this survey.

Off season half of these include both full time and part time employees.

During open season the museums staff variations between the various facilities in the survey become even greater. It varies between 6 and 188 employees, depending on the length of the season. 0-15% are full time employees while 0-85% are part time employees.

If the season is not all year it also affects who the facilities employs. Three types of people work at the facilities. Guides and actors during the tourist season, educators during the school season (spring and autumn), and maintenance workers and planners during off season.

Many have a small core group of employees that work all year and run the facility even when it is closed to visitors. Managing direc-

Problem – Different time periods at the same museum, Stone Age and Medieval walk together.

School group at Archeon, The Netherlands.

Historical skiing in the very north of Sweden.

tor, finacial manager, educational managers, marketing managers, maintenance staff.

Work hours is generally 40 hours per week with different scheduling systems, including weekends. Vacation during the high season is generally minimal, and short time employees have none. Often short time employees work between 11:00 and 15:00.

Many season employees return every year. Most of the partners do not do any employee surveys.

School

The facilities with school activities have a longer and earlier season than the ones intended for the general public. Between 10-70% of their visitors are school children.

This is an important group for museums. During the past 15 years educational activities at museums have become a more important part of their overall activity.

Conditions and goals of the organisation

In general economical conditions control the activities.

Costs to construct the environments can be as great as the marketing and content. Who in the organisation keeps track of the big picture, leads and markets the concept? How is branding and management handled, what tools are used to control and develop the organisations?

School group in training.

When it comes to marketing the answers from the survey vary, with everything from a marketing coordinator and appointed archaeologist, "someone within the organisation" or the managing director.

Social media and web presence is managed by the PR director, a web group or designated media manager.

5 participants have their own branding policies, 2 have a partial policy and 2 have none. 6 uses SWOT and 2 does not.

This part of the organisation is generally the weakest, though most have used tools to educate, market and communicate with the public.

The smaller organisations the more roles the managing director assumes. With a background in science without experience in marketing, economy and management this can be a weakness for facilities that have to compete with theme parks and other amusements for the attention of the public.

MANAGEMENT

Typical staff and project meeting.

Who leads and runs the facilities

At the traditional museums, the trend is still that it is the archaeological and historical knowledge that govern who gets the jobs as managers.

AOAM have their origins in more diverse concepts. With everything from non-profit organisations, amateur archaeologists, wildlife people, historians, educators and craftsmen, management is more random, based on chance, enthusiasm and interest. Thus many of these facilities have problems with being short-staffed, uneven economy, narrow competence and lots of volunteer work. Few have competence within the fields of marketing, staff welfare, HR, economy, management, education and actualisation. Information technology.

This mostly applies if the organisations behind the museums are non profit organisations, associations or companies. Two of the partners have no board of directors of their own, being part of the city organisation.

Six of the participants of this survey has a board of directors made up of between 5 to 16 members, offering a broad area of expertise.

The organisations

Leaders or managing directors are evenly divided between men and women. This is the trend across Europe today. Everyone has a long involvement and remains on the job for a long time. Only a museum that has been active for over 65 years has changed managing director more than once. It is probably common that the facilities that started during the 1990s or later still has one of their founding members leading the organisation.

The leader generally has an academic, archaeological or historical background, and only two within this group has a background in marketing or business. This is likely indicative for this whole field.

Traditional meeting.

Directors

We asked the question of what the managers do with their time, and the answers, in no particular order, are:

- Administration and economy
- Research
- Quality assurance
- Communication and PR

At the smaller facilities the managing directors have a more hands on approach, working directly with these topics, at larger facilities they have a more overall responsibility and delegate to other managers.

When asked what they would want to spend their time doing and develop, the answers were:

- Maintenance
- Quality assurance
- Development and fund raising
- Personnel issues
- Lectures and publications

The role of the managing director is based on the size of the organisation. In the smaller organisations the MD handles many questions and areas of operations. This requires a certain kind of leadership. The larger organisations have a layered organisational model.

This is also mirrored in the internal communication, where for example half of the participants have a human resources manager, while the managing director handles staffing issues on their own in the other half.

The work load is great, in particular in the smaller organisations. A 40 hour work week is normal. This increases during special events and activities, often without monetary or extra time off. This applies to the staff in general.

Non-traditional meeting.

WORKING CONDITONS FOR STAFF

Personnel

The personnel at the facilities have a very varied background, common education and higher education, craftsmen, academics with archaeological and historical background.

Communication with the staff

Communication is important and here we can see large variations. Depending on culture and size of the organisation it is handled differently: regular lunch meetings, meetings only when the need arises, daily morning meetings, monthly meetings, communications via newsletters, mail and so forth.

This is generally lead by a manager or appointed team leader. We can see clear guidelines based on concepts with clear routines and unplanned ”run and go” meetings.

Many ways of running meetings.

How are the staff doing?

Asked if a survey was performed for their staff and volunteers 3 answered that they did so, 4 that they did not and one replied that it was enough to talk to the staff. A recommendation is that a survey is performed at the start and end of each open season. This may provide advise on how to better improve work flow and general well-being of the staff.

Work load

Many common denominators here depend on the extent of the museum activity. Based on the number of visiting people and groups. We can note a mix of stress and irritation, calm and understanding.

Working environment

When asked who leads the work environment, two reply that they have no leader or someone with training within the field, two reply they do not have this, one answers maybe and three answers it is lead by the managing director or someone appointed by them.

Inhospitable work environment

Everyone works in an inhospitable work environment. Especially

Who says it doesn't snow in the Viking time?

when dressed in historical clothing. Rain, wind, cold, heat and sunburn are all negative factors.

No raincoats and umbrellas can be used, nor a cap or sunglasses. Well-fitting shoes and work gloves cannot be used when actualising a historical environment with visitors.

Smoke

Fire is something special. A camp fire by the sea at sunset, the fire burning by the historical building. The blacksmith working his bellows sending sparks flying. Inside a dimly lit house a pot of stew boils spreading scent around. Fire is a part of the life we wish to portray, but there is a downside – the smoke. The early houses we show and work in lack a chimney, causing the smoke to hang heavily from the ceiling. Why? Several factors affect this. The firewood, is it dry and in suitably large pieces. The more dry the wood and the smaller the pieces, the less smoke. But the smoke we do get, how do we get it out? First and foremost, one litre of smoke must be replaced by one litre of clean air. If the room is closed the smoke is just gathered inside. By leading in cold air

No smoke without fire.

An open fire makes it cosy, but …

directly by the fireplace it may be somewhat mitigated, but the biggest fault is that the building is not used all year. The building is not heated, so when the hot smoke rises up and reach the cold ceiling it is falling down along the walls and gathers at the floor. This is most apparent when using a dense wooden roof. A thatched roof lets much of the smoke through.

Staff and smoke inhaling

It is not healthy to constantly be in smoke. Thus most of the work with fire should take place outdoors and under a roof cover without any walls, protecting from the weather.

Asking how the partners manage, the answer was that the buildings were so well ventilated that it was no problem. Only one did not use fire in their activities, one only had fires outdoors, one only indoors and four did both. Asked how long staff would spend by a fire, the answer varied between half an hour and 4 hours.

Not everyone appeared to be clearly aware of the risks with spending much time in smoky environments. This was especially true for smokers. Thus it is preferable to mix indoors and outdoors work and give staff working in such environments annual health checks to examine their lungs.

Many ways of fighting fire.

Fire Safty

Fire damage is a key risk factor for archaeological open-air museums, and it is an issue taken very seriously at Parc Montale in Italy.

In the past they have had issues with fire damage - a particular problem for them as their buildings are very close to modern dwellings. The Montale solution is extremely comprehensive. Heat detectors are placed within the building and are used out-of-hours, thereby providing an alert should a dampened fire flare up. Motion detectors are placed around the buildings so that any movement towards the structures out-of-hours can be identified and reacted to. Lastly, the houses are protected by an automated sprinkler system, of the type used in petrol stations. This means that should a fire be detected, it can be extinguished quickly.

These methods provide a truly "belt and braces" approach to fire safety and were considered in detail at St Fagans. However, the St Fagans situation is slightly different as our new roundhouses are not close to modern buildings. This means that, while a fire would be disastrous, it would not endanger life, once the building had been evacuated.

The solution chosen at St Fagans were as follows: to install CCTV to the site, so that any movement outside of hours could be monitored. Lock the doors so that no one could access the house without permission. Provide a water supply with sufficient pressure up to the buildings. Maintain a clear access route for emergency vehicles.

But sometimes it doesn't work.

EXPERIMENT OR EDUCATION

The building as experiment

These exciting experiments to reconstruct buildings and environments were performed with archaeologists and students, along with a large group of volunteers and enthusiasts, including many very skilled craftsmen.

Based on theoretical models from excavations and studies of building monuments as an example we can see for example the longhouses with vaulted walls, wattle-and-daub construction of walls, thatched roofs.

Why reconstruct?

The reasons behind reconstructing are many. There are many opinions about the reconstructions. Some have a positive view of reconstructions, that they can provide knowledge, but also see problems that there has to be solid evidence of how the building actually would have looked like. Avoid anything that is uncertain. Since reconstructions and images are easy to understand one can easily falsify history by providing a false image. As new knowledge is gained new interpretations may be made.

A typical example is the interpretation of the outer line of poles of the longhouse of the Trelleborg. In Slagelse and Trelleborgen they

First reconstruction with straight supports, Trelleborg, Denmark.

are placed straight, closer study has revealed they were supports, thus affecting the reconstruction of the equivalent building in Fyrkat.

Typical is also the empty halls without furniture.

Second reconstruction. New evidence showing the angled supports, Fyrkat, Denmark.

The empty house

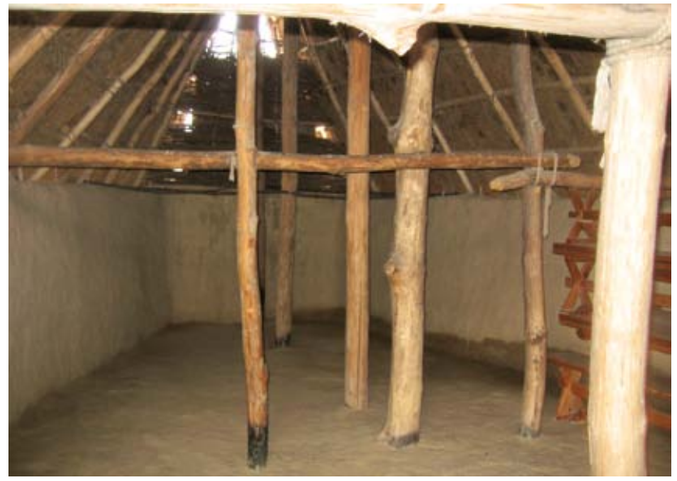
The experiment only included reconstructing the house based on the interpretations of the finds on the ground at the excavation. This meant that knowledge of what was more than a meter above ground was left for comparison with historic building construction. The parts of the finds could be interpreted were supplemented with creativity and common sense. Many times it was also exciting to see if the theoretical interpretations and drawings would actually work in practice.

Empty houses don't give much to your imagination.

Educational concept

An educational concept that is tried and tested is to have a section that shows the work of the archaeologists, or a section of the wall revealing how the wattle-and-daub wall is constructed.

Purely scientifically reconstructions in full scale can also reveal that this was not how they were built.



Which roof supports are from the same time period?

Reconstructions on display.

Determine what to build

It also happened that it could not be determined what layer or which parts belonged to what time period, thus ending up placing all the poles after the pole hole finds, ending up with a maze of poles within the building.

The monument

When the building is complete and the work of the scientists and enthusiasts is done, the question sometimes arises, if had not already done so. What happens to the building now?

A monument has been built. A time capsule that cannot be touched or changed. Everything built in accordance with the cur-

Reconstruction of Bronze Age houses at Vitlycke Museum, Sweden.

rent scientific interpretations. Sometimes a fireplace is built where it has been found, but it is never used. No furniture is included.

We have reached our goal of building the house. What next? Should it stand empty and decay? Should we study its decay?

When this empty monument is left on its own it is affected. No heating affects the building. The thatched roof is not exposed to smoke, allowing vermin to settle in. Birds work their way into the roof, damaging it. If the fireplace is not used daily moisture will work its way into the walls sitting directly on the ground, damaging them, leading to fungus growths and such.

The monument becomes a visitor attraction

Interpretation at Viking house, Birka, Sweden.

These experimental reconstructed buildings often gain a new purpose once they are completed.

During construction people have already become interested. Either on the museum grounds where the reconstruction is made, or the remote area where archaeologists and volunteers have gotten permission to build. It comes a display object, at first perhaps as an empty building, which later is connected to a volunteer group who move in and actualise it, or perhaps a site for school education.

In many cases the empty building created by the reconstruction became the site of museum activities and education, or a gathering place for enthusiasts.

Economy

An complete calculation should have been done already in the initial phase of reconstruction to have a better economical foundation to develop the reconstruction. In addition there should be a clear goal for the reconstruction from the start. It should be mentioned that it would have sufficed to reconstruct a part to show how it was built and how it may have looked. Perhaps the question should be asked if there were alternatives to a full reconstruction.

Historical Workshop. Hands-on and experimental area at Fotevikens Museum, Sweden.

Live interpretation area at Fotvikens Museum, Sweden.

MAINTENANCE OF BUILDINGS

Reconstructions of buildings are the core assets of most archaeological open-air museums. Around them are built events programme which in turn attract visitors and provide a revenue stream. However, many reconstructions were not designed with this purpose in mind, instead, they were built to test archaeological theories relating to construction, without a clear management plan for their subsequent use and maintenance. In the short term this is not particularly problematic, but all buildings require investment in order to ensure their longevity. Without it organisations will, eventually, be faced with the need to secure the considerable capital investment needed to renew buildings completely. This is a particular problem for organisations which invest in reconstructions of wattle and daub roundhouses since these comparatively simple buildings have a finite lifespan.

Wet area around the round house ruin the building.

This was the situation faced by St Fagans National History Museum at the start of the OpenArch project. St Fagans was home to three roundhouses built in 1992 by Peter Reynolds. Over the years they had been re-thatched, re-roofed and in one case completely rebuilt, but around 2010 it became apparent that the rate of investment in repair of the old "Celtic Village" offered less value for money than would be afforded by beginning again with a new "Iron Age farmstead".

This gave the opportunity to consider several factors which are central to the longevity of a building:

- Location. What are the ground water conditions on the chosen site? How exposed to prevailing winds will the buildings be? Will the buildings be overlooked and thereby unable to dry?
- Choice of materials. Wood rots quickly if in contact with the ground, and thatch decays if it is not maintained. What modern compromises will be considered acceptable in order to manage these issues?
- Visitor foot fall. How many visitors are expected? For how many can the building reasonably cater? How will wear-and-tear be managed?

As a result of consideration of these factors it was decided to place the new Iron Age farmstead at St Fagans at the top of hill which should help the building dry and reduce the speed at which rot affects the structure. The materials used in the build were also considered carefully and, drawing on archaeological evidence from sites in Wales, the walls of the new buildings were made from clay rather than wood thereby reducing the rate of structural decay. The chosen location was also moved further from the main visitor centre at St Fagans, in order to reduce visitor footfall to levels which are manageable for small buildings like these.

How effective these measures will be in producing buildings which are sustainable in the context of an archaeological open-air museum will only become apparent over the course of the next decade.

New round houses at St. Fagans for educational purposes.

Heating in houses

Unfortunately this is a view not shared by everyone.

Inhospitable since people do no continuously live in the building and keep a balanced indoor temperature. Environments that are not believable. Fireplaces that have never been used. Such a living environment, with crumbling clay walls, does not really depict reality of life in the past.

Incomplete finish where traces of the chainsaw can be seen in the cut logs. This can be solved in many ways. Modern objects,

Fake fire area.

More fake fireplaces.

Reconstructed house to live in during winter, Storholmen, Sweden.

Good example of a fake lamp.

power sockets, tube lights, signs protruding from the walls or dangling. Signs ruining the visual image, preventing pictures from being taken of the historical experience.

Concealed modernities

In Storholmen, Sweden, which has a large scale school activity and a very active partner association and volunteers with hundreds of actors, terms have been extended a lot. The now passed managing director and chief Mats Geswind is the originator of these ideas. His son Emil has since taken over and continued development of their concept. This is based on the facility being located far from nearby communities. Thus the goal has been to stay overnight in their houses even during the colder part of the year. To the uninitiated the buildings may look like any reconstruction. But using hidden modernities many ingenious solutions have been developed. The fireplace in one of the building has a concealed chimney. This adds atmosphere and heat, but no smoke. In the same way there are hidden radiators in the sleeping alcoves of the buildings. The buildings are constructed on a concrete foundation concealed with clay.

In Bengtfors, Finland heating coils and a heat pump has been concealed in ingenious ways. Archeon in Holland has pleasant ceiling lights and smart solutions for power sockets. In Erik the Red's house on Iceland a light trail has been hidden in the ceiling, providing a dimmed light alongside oil lamps with a candle wick made of LED lights.

Using genuine reconstruction and surface finish combined with hidden modernities, concealed water seals in the roof and macadam foundations, several gains are made. The lifespan of the building increases dramatically and the presentation of how the original building may have appeared inside becomes more believable. The experience matches the expectations visitors may have had of the visit.

QUALITY ASSURANCE

How do we want our visitors to experience the visit? Foteviken Museum has chosen using a traditional smaller exhibition with objects and video to educate about the Viking Age and foremost what the visitors will experience in the Viking town and hands-on experimental area. There are no signs within the reconstructed environments, all information is provided using dialog between the visitors and staff.

At Foteviken Museum there are no signs.

Signs would spoil the feeling of a "real environment", more so if nailed to the buildings. Only Photoshop work could save that situation.

At Foteviken Museum we have chose to provide visitors a map of their own describing the town and buildings within the museum area. Visitors may touch objects, try out things and not least have a dialogue with the population of the town, learning about techniques, crafts and life within the town.

Some signs are mandatory however, like emergency exits. But

Example of bad signs disturbing the live interpretation, especially if mounted on the houses.

Good example of sign boards that doesn't disturb the scenery if only being used for showing reconstructed houses.

in buildings like these where you always see the exit even through smoke it can be unnecessary.
Fire protection is important though. Fire

extinguishers or other kinds of fire suppression systems in each house is required. Signs can be placed with finesse to avoid ruining the general feeling of the room. At Foteviken Museum we have chosen not to put up any signs. All staff is well informed that there is a fire extinguisher behind the entrance door of each building.
Some form of illumination in the dark chambers of our reconstructed buildings may be necessary. Today there are many smart LED constructions where light sources are hidden above beams

Think before you put up needed safety sign boards and equipment so it can be integrated in a good way.

and rafters. Oil lamps can be cleverly remade into flickering LED lights that look natural.

At Foteviken Museum we have chosen not to use any form of electrical lights. We have chosen ceramic oil lamps that are robust and can be both hung and placed on tables. The time period is not quite accurate, but it is a choice we have made.











There are plenty of bad examples of illumination and electrical installations in historical buildings even if attempts have been made to conceal some of it with paint.

Hide chainsaw marks.

Another poor result sometimes seen is the representation of how timber was worked in a time period when the saw did not see widespread use. In many reconstructions you can often see clear chainsaw traces within plain sight.

All objects are reconstructions. This allows interaction with all objects, letting visitors touch and pick things up. They are not exhibits. The environments serve to provide the illusion of an inhabitant having just left the empty room.

Today the primary activity in the Viking town at Foteviken Museum consists of 6 crafts. Ceramics, textiles, metal, wood, leather working and food. The farms and estates are divided across these types of crafts. Every craft has one person who is primarily responsible for it. Our modern facilities include a smithy, carpentry, sewing workshop, leather working, pottery with a kiln.

Iron smelting – The whole process, from bog iron to finished steel.

An area at Foteviken Museum is called the Hands-on experimental workshop. Every craft has a small building here where it is practised. Experiments are conducted here.

As a part of this a larger workshop with Exeter University was performed as a part of the dialog with Science. Cooking pit food was made, animal hides were tanned, ropes were braided, nettles wre experimented with for food and material to weave cloth, to mention a few examples. Wood working was made with whittle horses, lathe and bowl crafting.

Historical workshop for the public to try hands-on crafts.

This area is also used by visiting school classes to try out various activities. During the summer there is a weekly schedule for visiting tourists to try out various crafts during their visit to Foteviken Museum.

In the same manner the various farms and estates within the town work as a part of actualising the environments. Having two separate areas creates one area for actualising historic environments and one area where crafts can be worked and experimented with.

A mixture of first and third person is used to guide and educate the visitors, who may also try their hand at the various crafts stations that are open. The environment serves more as a backdrop and in some cases modern tools are used at the experimental area.

The area used for experimental archaeology.

Map of Foteviken Museum

Activity Area

1. Archery Range
2. Stones of Hola
3. Trebuchet
4. Cairn of Fote
5. Activity spots a, b and c

The reconstructed Viking Town

Buildings:

6. Tannery
   - *a. living area*
   - *b. fish shed*
   - *c. smokehouse*
   - *d. shed*
7. The Merchant's Home
   - *a. living area*
   - *b. high loft*
   - *c. woodshed*
8. The Bakery
   - *a. living area*
   - *b. storage*
   - *c. cookhouse*
9. The Weaver
   - *a.living area*
   - *b.weaving house*
10. Smithy
11. The Potter
12. The Law Man's House
    - *a. living area*
    - *b. shed*
13. Ting Hall
14. Pig Pen
15. Serf Shed
16. The Guard Tower
17. Pit House
18. The Old Smithy
19. The Carpenter's House

Plots:

20. Nyfedet
21. Skomagerfedet
22. Långhusfedet
23. Konefedet
24. Timmermansfedet
25. Maglefedet
26. Rödskäggsfedet
27. Hyntingefedet
28. Tölpafedet
29. Pottefedet
30. Lillfedet
31. Pilefedet
32. Tvärfedet
33. Gråfedet
34. Skrivarefedet
35. Mjödfedet
36. Spiggafedet

37. Area for Experimental Archaeology

38. The Museum's Main Buildings

- *a. entrance, restaurant and shop*
- *b. exhibition hall*
- *c. public restrooms*
- *d. office*
- *e. Area for Schools*

Volunteers

An organisation that really works with volunteers in the Middelaldercentret in Denmark. They have a volunteer association with over 100 members. Twice during the spring new and old volunteers are invited to a two day volunteer education. Here they are taught everything from facts about the historic period being represented, quality assurance, proper clothing, authentic food, rules etc.

Foteviken Museum collaborated with Middelaldercentret as part of the EU project Amaprof during two years. As part of the project we produced guidance materials, booklets about crafts and Youtube videos about volunteer activities, crafts etc. See Amaprof on Youtube.

Meeting between staff and volunteers, hands-on or in a class room is very important for success.

Based on this material we have later on developed the concept of out 6 main areas and farms where each have gotten a binder where people can read about the museum rules, how to light a fire, the crafts practised at the farm and the basics of Viking Age life, history and background materials.

This material is used during summer programmes where youths

around 16 years old work at the site every summer during two two-week periods for 4 weeks.

The same material is also used for the broad crowd of Nordic volunteers. A pleasant problem that has arisen during recent years is volunteers coming in from the rest of Europe like Serbia, Kosovo, Germany, Spain and France. This includes both enthusiasts who enjoy the Viking style of life and PhD and MA students. The extensive work of translating all the material into English has thus commenced.

We have a volunteer building and facilities, like the Middelalder-centret where visiting volunteers can live, relax and socialise outside of museum opening hours. Although some of the re-enactors prefer living within the historic environments and sometimes even bring their own tents.

Accesibility for visitors

Accessibility or science and education

The background of many of the buildings found at our museums is based entirely on the research done and finds made at excavations of the original buildings. But narrow low doors, sills that become an obstacle on the ground, cobblestones, dark smoke-filled environments and inhospitable stairs, just to mention a few things, are not only problematic for a healthy human.

How can we invite handicapped people into these environments? It is not easy and our partners have made varying choices, ranging from making everything accessible, to making reasonable and legally obliged changes,

The disabled should have access to the location.

to having no special consideration for accessibility.

Answering the question who is responsibility to ensure accessibility, most respond it is handled by the managing director. Two respond that nobody has such a responsibility, and one reply that it is everyone's responsibility.

Every organisation should have a clear policy on how to handle this. From the whole facility down to each individual building.

In the United Kingdom, the rights of people with disabilities are protected by the Equality Act 2010. This requires organisations which offer services to the public to make reasonable adjustments to their facilities in order to ensure that disabled visitors are not put at a substantial disadvantage in accessing their sites. One of the

New extension building integrated in the building with elevator and stairs. St. Fagans.

Ramp that blends in with the historic environment.

most obvious areas where this impacts on AOAMs is in mobility around buildings, particularly in the case of buildings with more than one floor, where access to upper levels is via stairs.

The response to the issue of first floor access can be to provide "intellectual access" to the first floor (eg, through illustrations showing what the mobility-impaired visitor is unable to access), although whether this constitutes a "reasonable adjustment" under law is a decision for the user and, ultimately, a judge. The installation of a modern lift to give access to the upper floors raises serious questions about the intellectual credibility of the reconstruction. However, it is possible to install a lift into the fabric of a historic building in such a way as to enhance accessibility without detracting from the appearance of either the building, or the visitor experience. This has been achieved to an exemplary standard by Llancaiach Fawr in Wales, where a lift was set against the rear of a Tudor manor house. Here, the lift casing has been enclosed within a stone shell helping it blend with the original building to all but the most practiced eye.

At this building it is planned a new accessibility for disabled.

New media

Virtual reality

To actualise historic environments with electronic aid has become increasingly useful. Naturally this cannot replace or even match the special experience of being on a site where a particular event has taken place in history – being on the actual site. Likewise it cannot replace the feeling of studying an original object, whether an older object or an old building. The electronic virtual world should be seen as a complement to understanding history and archaeology. As such it has an enormous educational but also scientific value. The latter by enabling simulations of various situations, like analysis of building constructions. Smaller objects can also be recreated physically with great accuracy compared to the original object. This is useful for making copies for e.g. temporary exhibits.

Archaeological remains are often very difficult to understand for someone without much knowledge in the field. Information is almost always required. A sign is posted that tells of the site or the object. All outdoor signs fade and often soon become outdated. The cost involved means they are left without being updated. With digital virtual applications, downloadable to personal mobile appliances, you can nowadays achieve another experience and dissemination of knowledge. Such systems are already in use. In Scania for example this has started to be used at the large excavation Uppåkra south of Lund. Here a town like community has been found that existed for almost a thousand years up until the late 10th century AD. There are posts with QR code markings. By scanning these images are presented of reconstructed buildings that once stood at the site, along with an explaining story. Similar information systems are found at various other sites across Europe.

Often though it is just still images, sound and/or recorded video clips that are presented. The virtual technique does however provide opportunities to walk around in a longhouse that stood at the site. By turning the telephone or pad the three dimensional image is also turned. This provides additional effect and you can literally talk about standing on the site where it once happened. The possibilities are many, but we are still only at the beginning of something big in the future.

Using the iPad to breathe life into the past.

Fotevikens museum started using digital tools for communication early. During the 1990s the museum was one of the first in Sweden to have its own web page on the Internet. We were also among the first to offer free multimedia software about the Nordic cultural history. A large step was taken when we laid the foundation for recreating the city of Malmö as it was in the 17th century, the project ”Malmö 1692”. This was to become the largest digital history project in Northern Europe.

Detailed plans of Malmö from medieval times to the present can be found at the Malmö city archive. Accurate and detailed inventory of all of the city’s 780 yards are available. More than 25 000 such descriptions have been transcribed and made searchable by computer. Then each house has been remade exactly a real building would have been built, with poles, doors, windows etc. This means you can enter all the buildings and furnish them exactly the way they looked according the the preserved descriptions. Using various 3D software more than four thousand buildings have been digitally built in this way. Using a sophisticated game engine environments with vegetation has been created where people and animals move freely among the streets and squares. You may wander around the city freely and explore.

The project was created when Malmö City wanted help from Fotevikens museum to find knowledge creating tasks for long time unemployed. With the project initiative and specialists of Malmö and Scanian history from Fotevikens museum a working organisation was created that today has a life of its own. Today all of 17th century Malmö is available as a huge digital site to visit, constructed with meticulous historical accuracy. The home page of the project is http://www.virtualhistory.se.

Malmö City - Year 1692

CASE STUDIES

Case study on lighting as a safety issue: St Fagans National History Museum

Introduction

Light levels have an important impact on the safety of staff and visitors working in reconstructed buildings. Inability to see clearly within a space, makes it difficult for visitors to navigate the interior of a building, increasing the risk of trips and falls, and making it harder for people to reach exits. In pursuit of authenticity, museum managers might argue that their structures should be presented with the same light sources as existed when the house was in use, but in practice they must be aware of the potential hazard that low light levels create.

This study was undertaken to see how light levels within a reconstructed Iron Age roundhouse (based on excavations at Moel y Gerddi in Wales) compared to the modern standards. The information from this study was then used to inform the lighting solutions employed in a new Iron Age roundhouse (based on Bryn Eryr, also from Wales).

The Moel y Gerddi house

The Moel y Gerddi roundhouse at St Fagans was constructed by Peter Reynolds in 1992. It was built in a woodland clearing surrounded by high trees at a distance of 12m to the south and southwest, extending to 24m to the west. To the north the house is 2m from the Moel y Gaer roundhouse. The immediate landscape is more open to the east.

The Moel y Gerddi house has wattle and daub walls and a thatch roof, with the only points for light ingress being the two opposing door ways on the northeast and southwest sides (100cm wide x 130cm high) – neither of which have doors – and in the 20cm gap between the tops of the walls, and the overhanging thatch. Artificial light is provided by a fire lit in a central hearth, although this is managed to provide heat rather than bright flame. On warm days the fire is not lit at all. The roof space is smoke blackened, the walls are whitewashed, and the floor is maintained as bare compacted earth.

The interior of the house is kept relatively open on its north side. The only furniture is a line of benches arranged between the inner ring of posts. The south side is segmented into a series of bays delineated by wattle panels, some are used for storage, others for display of items. These wattle panels block the light from the doorways making the bays very dark inside.

Throughout its life Moel y Gerddi has been used as a school classroom during term time with an interpreter leading classes from a seat beside the hearth while the children sit on the benches. At other times the house is accessed by general visitors some of whom stand and some of whom make use of the benches. Most visitors enter and leave via the southwest doorway, although both are always open.

The darkness of the house's interior is often commented upon, particularly on bright days when the contrast between the interior and exterior light levels is especially pronounced. And in the past re-enactment groups have noted the difficulty of performing basic tasks like food preparation when visitors are blocking the light from the door ways. In addition, the wattle panels that run from the inner post ring to the outer wall on the south side of the house serve to block light from entering the storage and display bays. This has led to these areas being poorly maintained and becoming an unintended dumping ground for infrequently used items and general rubbish.

Weather conditions

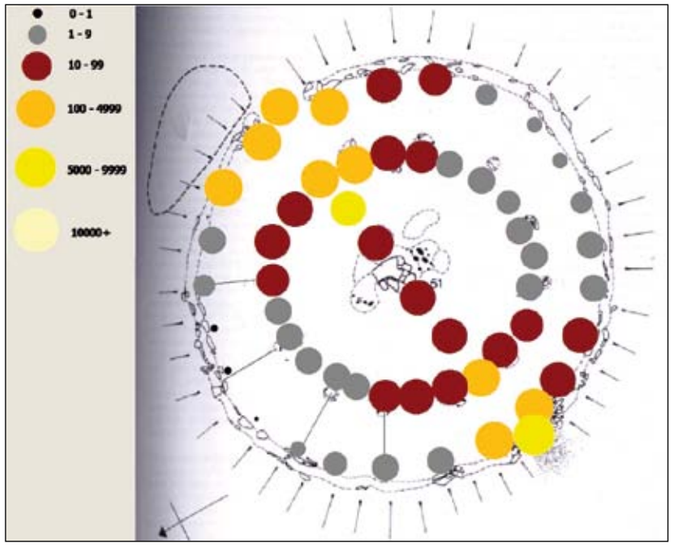
The survey was conducted over one hour from 14:00 on 22 March 2012. No fire was lit in order to provide a "worst-case scenario" for light levels inside the house. Throughout the survey the sky was overcast, providing around 8,000 lux.

Equipment and analysis

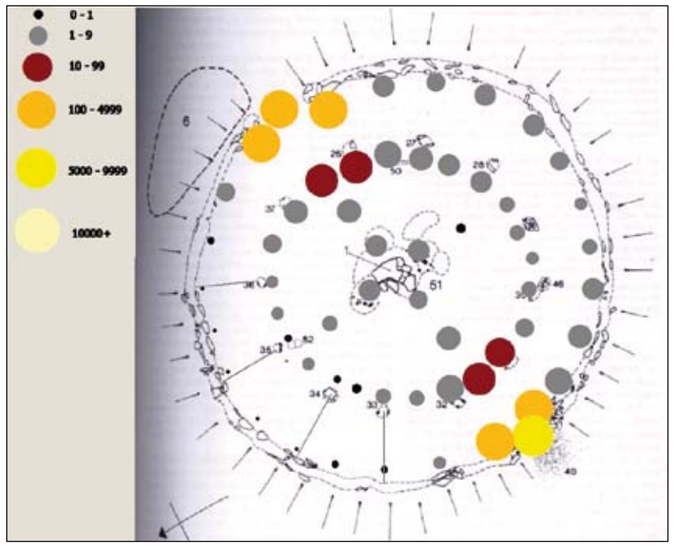
The survey was conducted using a Velleman DVM401 4 in 1 digital multimeter. This multimeter included a basic lux meter with a recording range from 0 – 20,000 lux and an accuracy of +/-5% of readings.

Readings were taken at regular intervals throughout the round-house with each reading being repeated twice. Both sets of readings were intended to simulate light levels experienced by an individual while sat reading or carrying out basic work. The first set recorded light levels experienced while facing the centre of the roundhouse and concentrating on material held on the lap. The second were taken with the lux meter positioned to capture the maximum amount of light from whichever doorway was closest, as though the individual had deliberately positioned themselves so their work caught the most light. These two sets of readings are titled here "lap work" and "maximum working light" respectively.

Data was recorded manually onto a plan of the roundhouse and was then digitised into ESRI's ArcView 3. Subsequent visualisations of the data were also produced in ArcView.



Light level survey showing maximum values which could be obtained from each location (scale in lux).



Light level survey showing values which could bae obtained for "lap work" at each location (scale in lux).

Results

Light level survey showing maximum values which could be obtained from each location (scale in lux).

The funnelling of available light through the doorways and towards the centre of the house is apparent in the illustration, and just 2m into the inside of the house, light levels have dropped to the equivalent of "twilight". Around the sides of the house light levels are lower still, with the readings on the south side (which is mostly used for storage) being close to 0 lux. The north side, which has less furniture and white walls, is slightly lighter, but even here readings fall as low as 1 lux in places.

Light level survey showing values which could be obtained for "lap work" at each location (scale in lux).

The fall-off in light levels away from the doorways is even more apparent when the light levels available for lap work are considered. Away from the doorways, light levels are generally 10 lux or lower, with almost the entire south side of the house reading 1 lux or lower.

Conclusions at Moel y Gerddi

Light levels like these are equivalent to those available at twilight (10 lux), or indeed in the middle of the night (0-1 lux). By comparison, The Chartered Institute of Building Services Engineers recommend 500 lux for reading, and 300 lux for less-demanding visual tasks.

Clearly light levels were an issue in Moel y Gerddi but the solution is not straightforward. Low light levels are part of the character of the building. The visitor enters from the light and their eyes slowly acclimatises to the darkness and they begin to discern the interior of the house. Raising light levels fundamentally alters the visitor experience and the character of the interior.

These were the issues that were considered as plans were developed for the new roundhouses at St Fagans.

Learning from Moel y Gerddi

The design of the new roundhouses, based on examples from Bryn Eryr, are very different from that at Moel y Gerddi. Considering light levels, Bryn Eryr has thicker walls which suggests that light will be channelled even more narrowly into the interior space. This assumption was tested at the Welsh School of Architecture, using an Artificial Sky Facility in 2012, using a 1:40-model produced to a design developed by Gerallt Nash, Curator of Historic Buildings at St Fagans.

The model was placed within the Artificial Sky and light levels within the building were measured using a Hagner Architectural Model Light Meter. The photocells used were 19mm high which translates to a scale height of 760mm, and an "external" cell was placed adjacent to the model at roof height, to provide reference light level values. Photographic recording was undertaken using a Nikon D3100 with 10-24mm lens (necessary to convey the scale of the space at close distances).

The study demonstrated that light levels within the new roundhouses would be similar to those in Moel y Gerddi, and consideration was therefore given to how the visitor experience could be improved, and made safer.

Next steps

The studies in Moel y Gerddi and with the model of Bryn Eryr have shown the need to install modern lighting within the new roundhouses in order to ensure that all visitors are able to explore the interior of the buildings safely.

At the time of writing, electric cabling has been run up to the houses, and a junction box prepared. A ring of lights will then be placed in concealed position against the eaves of the buildings. When turned on, using a dimmer switch, these will enhance the effect of light coming in through the eaves, thereby improving illumination in the space without compromising the ambience of the interior with visible electric fittings.

The light levels will be managed by the facilitator working in the houses, allowing them to judge whether a particular audience needs the additional illumination at particular moments during their visit – for example to help them to find seats within the space, or on leaving the building.

Health and safety issues: artificial sky testing of an architectural model

Goal

To test the light levels that will be available in the proposed reconstructions of the Bryn Eryr roundhouses, due for construction at St Fagans in 2014, in order to assess levels of visibility for the public.

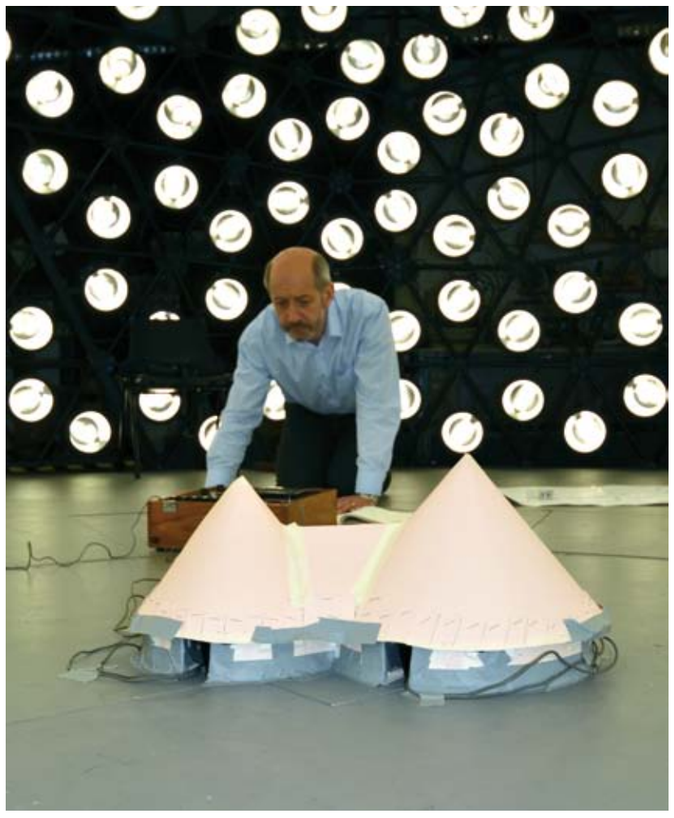
Background

Experience in the wattle and daub roundhouses built by Peter Reynolds at St Fagans in 1992 has shown that there interiors are very dark. The Bryn Eryr roundhouses are similar in shape to the earlier versions - essentially they are cones planted in cylinders - but they differ in other respects. First, the walls are much thicker - 1.5m of clom, compared to just a few centimetres of wattle and daub - which will affect the spread of light into the interior. Second, Bryn Eryr consists of two roundhouse built against one another. For the purposes of visitor-flow a doorway will be built linking the two "rooms" which will also have an affect on light levels, as will the roof structure which bridges the two roof cones.

It was decided to build a model of Bryn Eryr to test how these factors will affect light fall within the buildings. In order to assess whether additional measures needed to be put in place in order to increase visibility within the interior and make it safe for members of the public after construction.

This work was undertaken with the help and facilities of the Welsh School of Architecture.

Architectural model of Bryn Eryr (Iron Age roundhouses) used in study.



The model

The model was built to a design produced by Gerallt Nash, Curator of Historic Buildings, St Fagans. It was constructed at 1:40 using thick card. Off-white card was used to reflect the whitewashed walls of the final buildings and black card to reflect a smoke-blackened roof space.

In order to test different lighting possibilities, 8 x 40cm square windows were inserted around the circumference of each building, just below the top of the wall height. These were designed to be blocked if necessary during testing.

Planned points of light entry into the building were: the two doorways, the eaves gap between roof and walls, the temporary windows. All unplanned gaps were sealed with tape.

During testing, the doorways of the model were cut away at a c. 45 degree angle on their inner face, to allow a greater light spread into the buildings.

No provision was made in the model to represent the presence of trees surrounding the St Fagans site although these may also have some impact on the overall daylight availability.

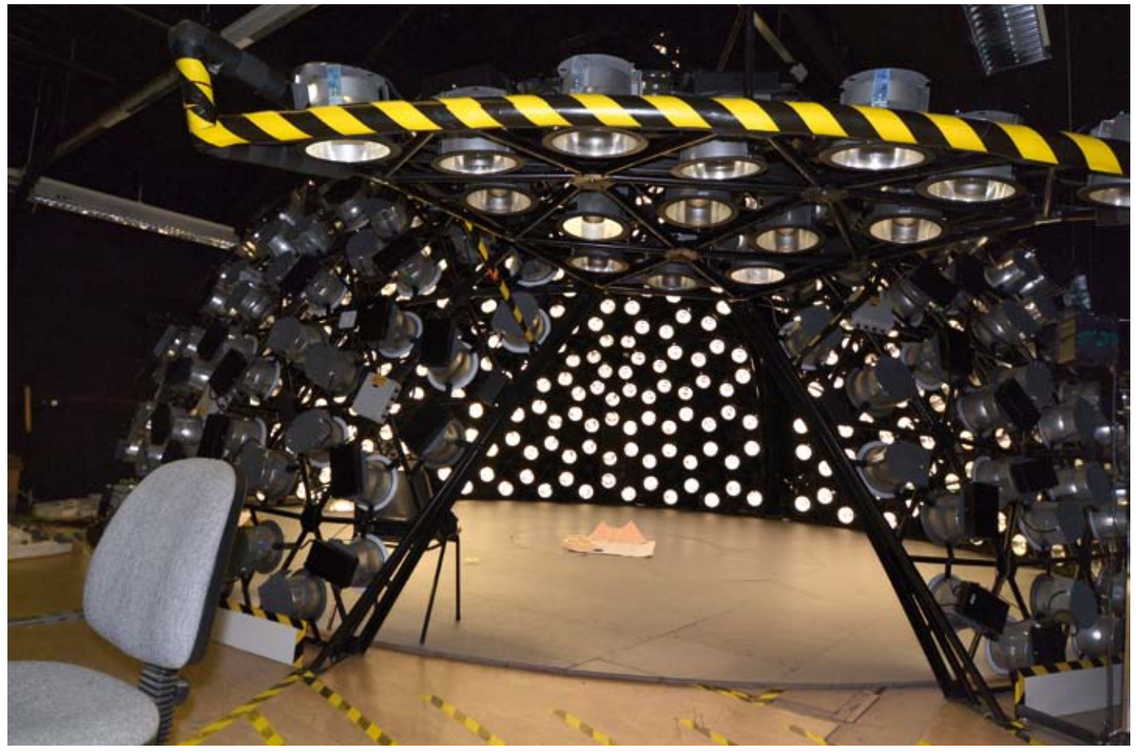
Tools and equipment

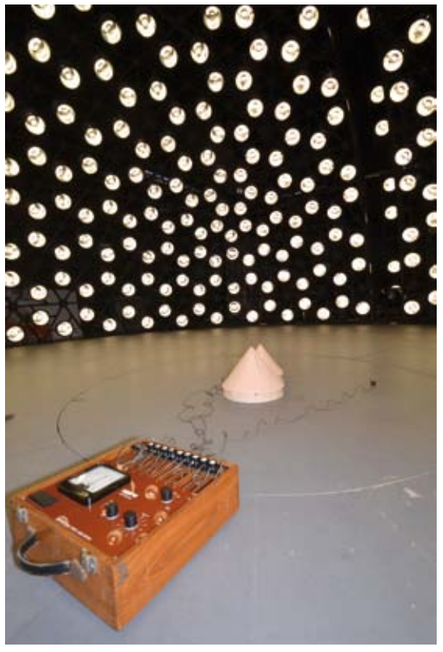
Testing was undertaken in the Artificial Sky facility at the Welsh School of Architecture with light levels set to simulate CIE standard overcast sky conditions.

A Hagner Architectural Model Light Meter was used to measure the light levels within the model. The photocells are 19mm high which translates to a scale height of 760mm, and an "external" cell was placed adjacent to the model at roof height, to provide reference light level values.

Photographic recording was undertaken using a Nikon D3100 with 10-24mm lens (necessary to convey the scale of the space at close distances).

Artificial Sky at the Welsh School of Architecture, Cardiff University.





Location of light sensors within model.

Hagner Architectural Model Light Meter.

Results

The equipment was used to test three different configurations of the Iron Age roundhouse design.

Config 1: Model as built including a series of 40cm square windows arranged around eaves of each house.

Config 2: Model as above but with eaves windows obscured.

Config 3: Model as config 2 but with door reveals cut away to the inside at around 45o on both houses.

Interior lux readings for 5,600 lux exterior sky condition (equivalent daylight factor% in brackets)

	Ref sensor	Sensor 1	Sensor 2	Sensor 3	Sensor 4
Config 1	5,600	0 (0)	8(0.14)	6(0.11)	4(0.07)
Config 2	5,600	0 (0)	6(0.11)	5(0.09)	3(0.06)
Config 3	5,600	2(0.04)	7(0.13)	8(0.14)	7(0.13)

Equivalent lux levels likely to be achieved under a 10,000 lux sky, (typical uniform overcast sky condition)

	External lux	Sensor 1	Sensor 2	Sensor 3	Sensor 4
Config 1	10,000	0	14	11	7
Config 2	10,000	0	11	9	5
Config 3	10,000	4	13	14	13

All of the internal measurements are close to the limit of the sensitivity of the instrument; consequently the absolute lux values must be treated with care. However differences between readings from the same cell, taken before and after interventions, will be more reliable.

Interpretation

The thickness of the wall construction and overhanging eaves results in very low light levels within each house, particularly away from the centre of the floor area.

New openings around the eaves designed to admit additional light did improve the daylight conditions but only slightly. However, "opening out" the reveals around the doors did have some impact on overall daylight performance; with the perimeter light levels being improved significantly.

Whether such an option is chosen in the final design will need careful consideration against the baseline provided by the archaeological evidence.

Consequences

The figures obtained from the model are similar to those from the existing, Peter Reynolds roundhouses. Since these roundhouses have functioned well for many years, it seems likely that during the summer months the Bryn Eryr roundhouses will have light levels which are high enough for most basic activities but, the figures produced in these tests reflect external light levels. Given that the houses will be open to the public on winter's afternoons, light levels may, at some times of the year, be much lower, and no amount of adjustment to doors or eaves gaps will compensate for this.

With this in mind it would be sensible to build discrete secondary electrical light sources into the structures so that light levels can be increased to facilitate visitor flow, but returned to normal when trying to convey the mood of a prehistoric house. This will reduce the potential for trip hazards in the interior as a result of poor visibility.

Working conditions for staff: Impact of fire lighting on building temperature

Goal

This survey was designed to test the potential of a thermal imaging camera as a tool for monitoring the ambient temperature of buildings.

Background

The Moel y Gerddi roundhouse at St Fagans was constructed by Peter Reynolds in 1992. It was built in a woodland clearing and, thanks in part to the shielding effect of the surrounding trees, its thatch has suffered from recurrent problems. In 2000 the decaying

outer layer of thatch was scrapped away and a new covering layer was put on; by 2010 this new thatch was also in a state of decay. At this time it was decided not to refurbish the roof as plans were already being developed for a new village to be built on a different site. This decision provided an opportunity to study the environment of a roundhouse at the end of its life cycle, and at a time when its thatch was essentially permanently saturated with rain water. This research objective is in line with that initially established for the site by Peter Reynolds who saw the monitoring of decline at Moel y Gerddi as a means of understanding the original excavation plan. But in the context of the current project, the main aim of the monitoring was to identify ways of improving site management, and to provide a base line for studying the environment of the replacement roundhouses.

A full suite of environmental monitoring equipment was installed in and around Moel y Gerddi, and this report focuses on the efficacy of using a thermal imaging camera in this context.

The survey consisted of repeatedly photographing the exterior of the roundhouse both before and after a fire was lit in the central open hearth. Photographs were taken at two minute intervals, with a selection of these photographs being shown below to indicate the general trend in the results.

Weather conditions

On the day of the survey the sky was overcast until 11:37AM when the sun broke through the clouds. Ambient temperature was around 9˚C and relative humidity was 100% at the start of the survey, rising to 12˚C and declining to 93% at the end. There was little or no wind throughout, and there had been no rain since the 27th February. All photographs were taken with the sun behind the camera.

Equipment and analysis

The thermal imaging camera used was a Testo 875-1, with emmissivity set to 0.95 and TRefl reset after every photograph using a tin foil marker. The Testo 875-1 has a rated accuracy of +/-2˚C, +/-2% of m.v, meaning that it is suitable for recording trends rather than precise values.

After the survey, data was analysed in Testo's IRSoft with all images being allocated the same max and min values (10 - 25˚C) and colour range. The temperature range of the thatched roof, excluding other parts of the image, were also analysed as bar charts showing the % of pixels exhibiting each temperature. Prior to the survey the principle recorder, Steve Burrow, had attended a training course at the Property Care Association. This course aimed to provide practical instruction in the basics of thermal imaging survey, but not detailed expertise in the interpretation of thermal imaging data. For this reason the interpretation of results presented here is likely to be the subject of review as more experience is gained in the use of the thermal imaging camera.

Inside the house were three TinyTag temperature and relative humidity data loggers, with additional TinyTags outside the village.

Summary

Recording began at 9:11AM. The previous day's fire had been extinguished 16 hours before with the hearth recording a core temperature of 24˚C at the start of the survey. Ambient temperature in the roof space of the house was 9˚C and relative humidity 100%.

At 9:47 the exterior surface of the thatch began to warm a few degrees above that of the external temperature, presumably a consequence of the diffused light falling on this face of the roundhouse.

The fire was lit at 10:05AM, at which time St Fagans opened to the public, and the effect on the external surface temperature of the thatch was rapid and pronounced. Temperatures at the top of the thatch cone rose to 25.5˚C within a few minutes. Internally, air temperature in the lower roof space stayed around 9˚C.

Over the course of the next 30 minutes, maximum surface temperature stayed at around 25˚C, but the area subject to this warming increased, spreading down the thatch. This is presumably a consequence of the interior of the roof space filling with warm air but, unfortunately, no temperature recording devices had been placed high enough in the roof cone to record this spread.

Surprisingly these raised temperatures were not maintained after this time, with both maximum and average temperatures declining thereafter, despite continued fuelling of the fire. Indeed by 11:19AM, just one hour after the fire was lit, the external surface temperature of the thatch had returned to the same temperature that was exhibited prior to the fire lighting. Internally the house was still heating at this time, with the highest TinyTag (c. 2m off the floor) only just beginning to record a temperature rise. It was a further hour before temperature in the lower levels of the house rose to around 20˚C – the same temperature as was recorded on the upper parts of the outer thatch surface. Relative humidity inside the house remained at 100% throughout the survey.

At first glance, these results suggest that the roundhouse thatch became more effective as an insulator during the course of this trial, trapping heat inside. But there is no reason to believe this is the case.

More likely, the saturated thatch exhibited evaporative cooling - effectively sweating. In the initial heating of the thatch the warm air escaped, heating the trapped water as it passed. Once the surface water had heated sufficiently it evaporated, leaving behind the cooler water and thatch surface.

This early temperature spike is an unexpected result and one which, if it has been interpreted correctly, should not be apparent

in a roof with a drier thatch. As a working hypothesis, it would be expected that a drier thatch would reach a standard temperature and maintain this unless the weather conditions changed or the fire was damped down.

Conclusion

While the interpretation presented above is only tentative, the survey was sufficient to demonstrate the value of a thermal imaging camera in monitoring building environments. The possibility that the camera could also be used to identify saturated thatch in other cases is an intriguing one.

However, this conclusion comes with caveats. The thermal imaging camera is a technical piece of equipment and requires a skilled and experienced operator. In addition, it is most useful when there is a significant temperature difference between the inside and outside of a house and when weather conditions are stable throughout the survey. The decision to hire or buy one, should therefore be weighed against the ability to use it, and the cost of the purchase.

Images

All bar charts show temperature range on the roof surface alone.

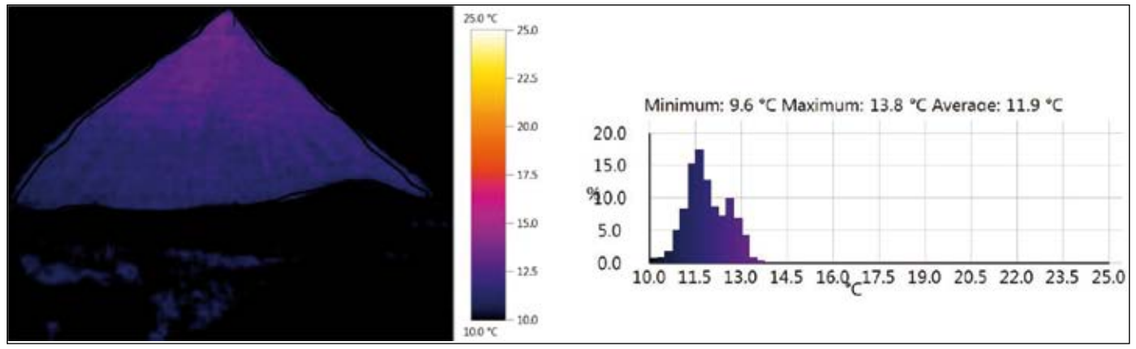


Fig 1. Thermal image taken 9:11AM.

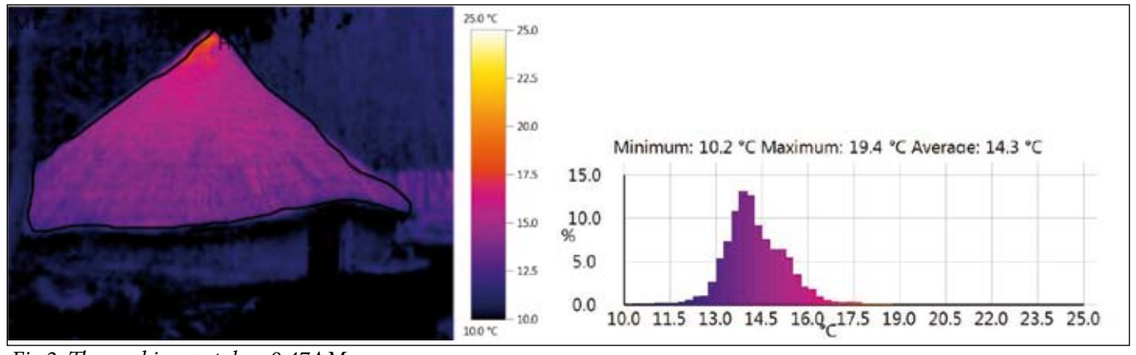


Fig 2. Thermal image taken 9:47AM.

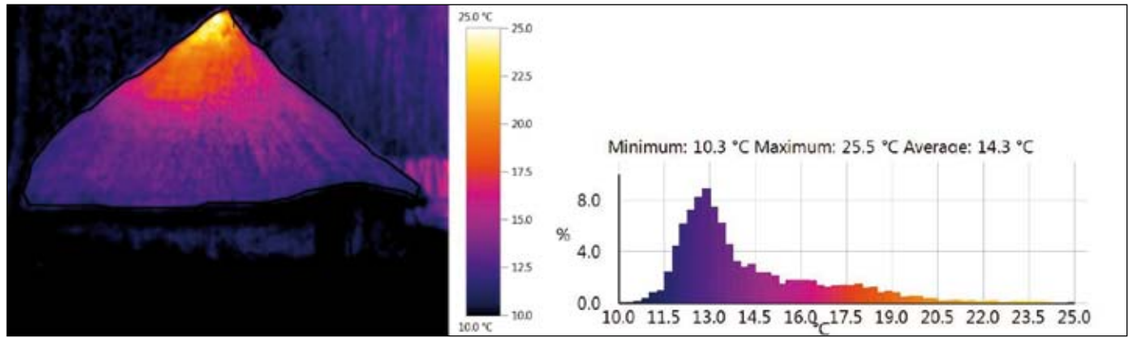


Fig 3. Thermal image taken 10:13AM.

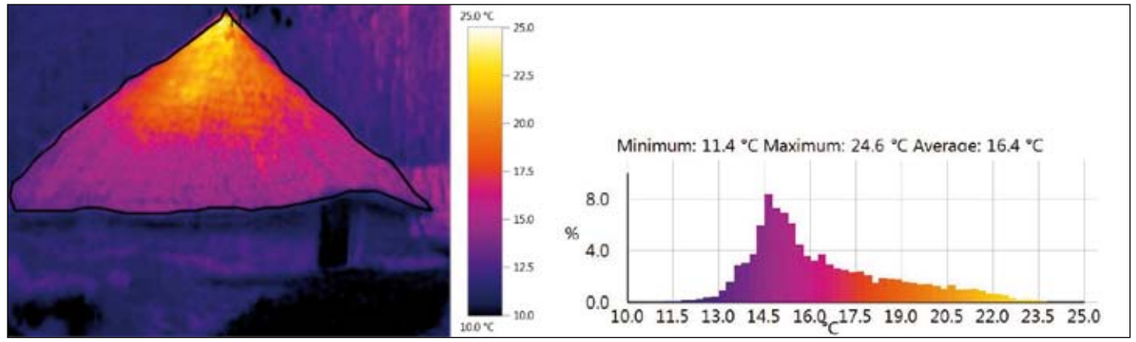


Fig 4. Thermal image taken 10:21AM.

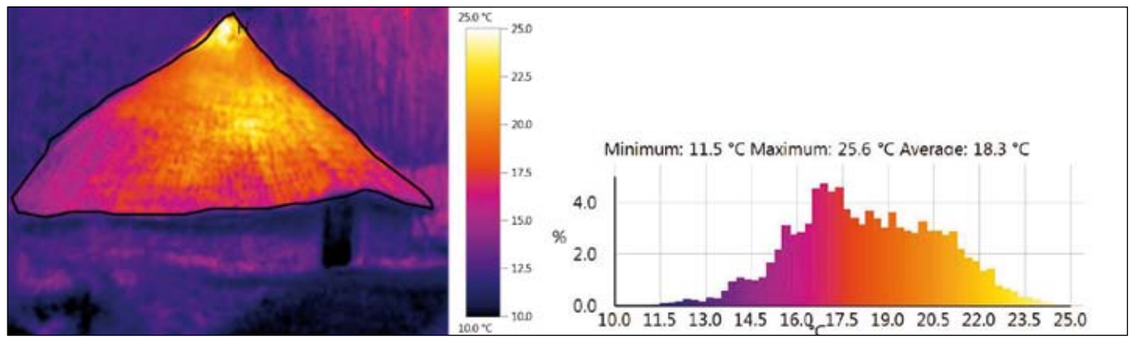


Fig 5. Thermal image taken 10:30AM.

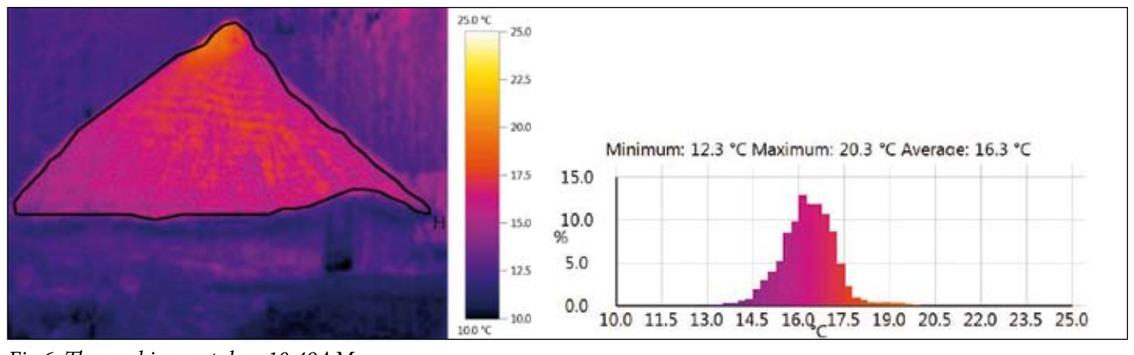


Fig 6. Thermal image taken 10:49AM.

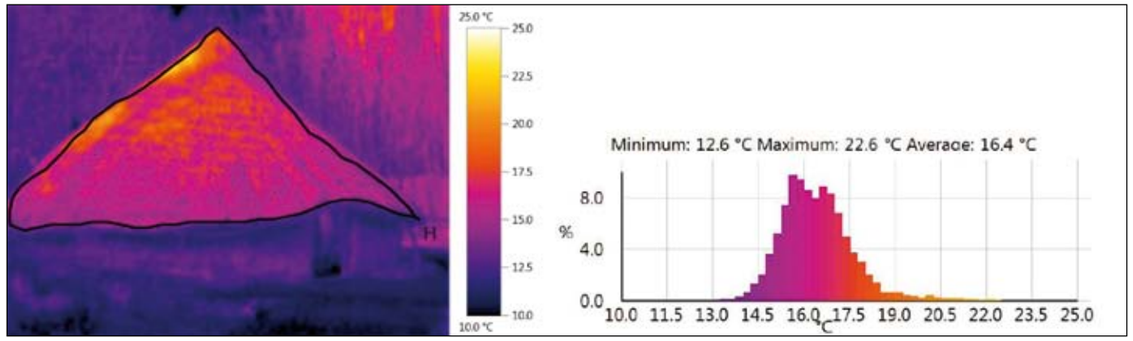


Fig 7. Thermal image taken 10:59AM.

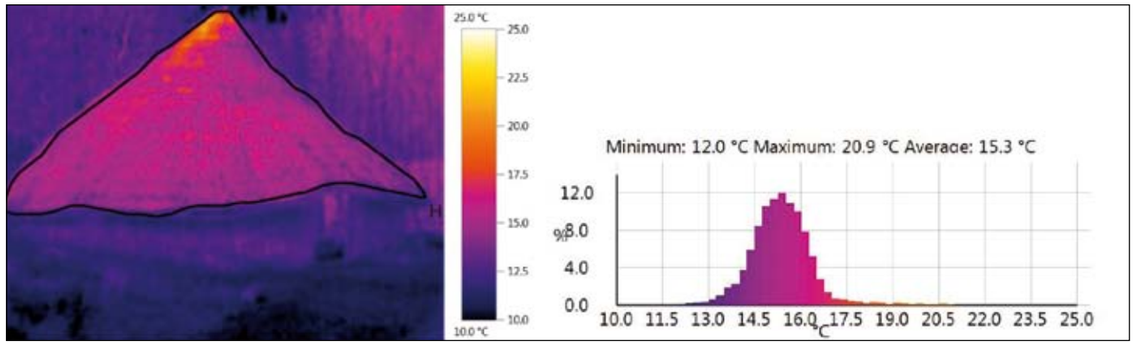


Fig 8. Thermal image taken 11:09AM.

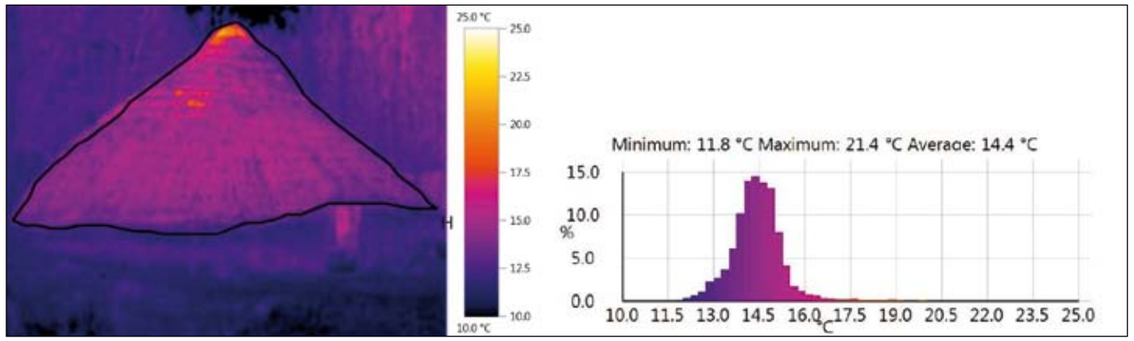


Fig 9. Thermal image taken 11:19AM.

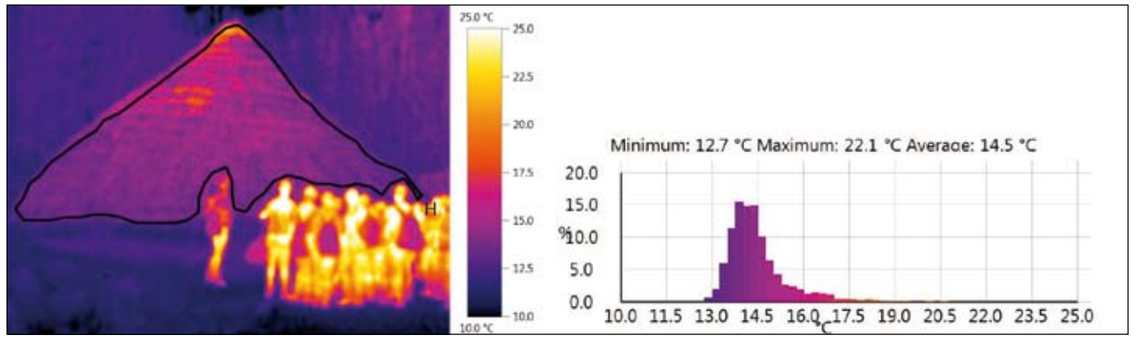


Fig 10. Thermal image taken 11:29AM.

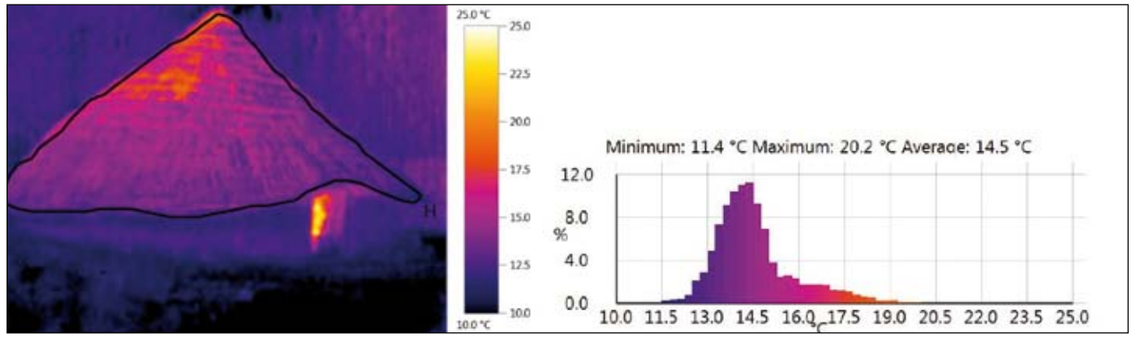


Fig 11. Thermal image taken 11:39AM.

Working conditions for staff: improving heating in Abernodwydd

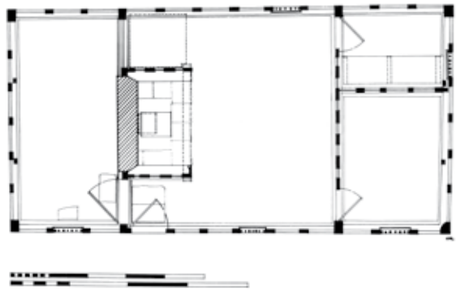
Abernodwydd farmhouse, as re-erected at St Fagans.

Goal

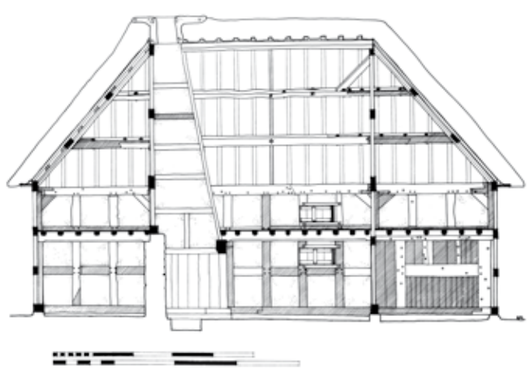
To improve the quality of the working environment in a 17th-century farmhouse which is open to the public throughout the winter.

Background

Abernodwydd is a typical timber-framed farmhouse from mid-Wales. Its walls are set on a stone sill to prevent the timber beams from rotting, and the walls are formed from hazel panels covered with clay. The floors are beaten earth and the roof is thatched.



Abernodwydd farmhouse. Ground floor plan showing position of central fireplace, windows and door.



Section through Abernodwydd showing the location of the central fireplace and chimney.

The open door at Abernodwydd.

The fireplace, as it was at the start of the project.

One of the open windows with shutters.

The building was moved to St Fagans in the 1950s and opened to the public in 1955. Its only heating source is a fireplace in the centre of the building, placed within a stone chimney breast and enclosed with built-in benches. A fire is lit in this hearth when needed and, until recently, this was fuelled by wood.

The building is presented to the public as it would have been around 1720. At this time the windows had no glass, although wooden shutters could be fixed in place to cut down on drafts and keep the heat in the building. Traditionally, buildings at St Fagans have been presented to the public with their front doors open, in order to welcome visitors inside. The building itself is always staffed by one person who stays in the main living room.

Spending a winter in a building with no window glazing, a large open chimney and an open door is inevitably very difficult for staff, even with the benefit of the open fire. Air temperature throughout the house can be low, and drafts through the building are uncomfortable. The option of closing the window shutters helped with this, but reduced light levels in the building considerably.

The project

As part of a general review of heating within the houses, it was decided to explore historically authentic improvements which could be made to the working environment for staff. This work focused on three areas:

- The door
- The windows
- The heat source

The work on this project was undertaken by Emyr Davies and Mared McAleavey, with supporting research from Steve Burrow.

The door

The open door policy at St Fagans inevitably leads to cold buildings. These are uncomfortable to work in, and also present a false image of how people lived in the past. The reason for the open door policy was concern that visitors, on meeting a closed door, would assume a building was closed to the public. Ways were therefore explored of overcoming this issue.

Benchmarking trips to other open-air museums showed that closing doors during winter was not uncommon. The Weald and Downland Museum in particular had a sign at its entrance encouraging visitors to try any closed door they came across.

It was decided to try a similar approach at St Fagans, with the following sentence being added to the daily information board and the daily sheet (a free hand-out given to visitors at the start of their visit).

Information provided to visitors.

This was implemented across the winter of 2014/15 and has proved very successful. Doors of historic buildings are closed to keep in the heat, and the public know that a building with its door closed is not necessarily closed to visitors.

The windows

Although a solution existed for cutting drafts from the unglazed windows – closing the wooden shutters – this meant cutting light levels in the house considerably. Alternative solutions available in 18th-century Wales were therefore explored.

Glazing is very unlikely in a rural location at this time, but two solutions presented themselves.

1. Parchment fenestrals. These consisted of hide sheets held within a wooden frame. The parchment was thin enough to let light through, but prevented drafts.

This solution has been used at Shakespeare's birthplace in Stratford-on-Avon. Since Shakespeare's father was himself a glove maker, the use of parchment fenestrals in this house is entirely in keeping with the story being told. However, it seemed less likely that high quality parchment was available to the owners of Abernodwydd.

2. Linen fenestrals. These consisted of linen sheets pasted with a translucent gum and held within a wooden frame. This solution has been used at the Weald and Downland Museum as a result of considerable research into 17th and 18th-century source material, including an 18th-century recipe for making fenestrals. It was decided to produce versions of these fenestrals at St Fagans.

These were installed at the beginning of winter 2014 / 2015 and were well-received by staff working in the building. They cut down on drafts, but also allowed a considerable amount of light through

Fenestrals at Shakespeare's birthplace.

Fenestrals at Weald and Downland Museum.

Fenestrals in Abernodwydd.

the linen sheet. As a result of this success, it has been decided to roll-out the fenestrals to other appropriate buildings at St Fagans.

The fireplace

The fireplace in Abernodwydd is the only source of heat for museum staff. Until this project began, wood had been the main fuel, with fires frequently being built quite large in order to provide necessary heat in a cold space.

Research into the environment of 18th-century Abernodwydd and other near-contemporary farmhouses indicated that peat was a more likely fuel, being supplemented by wood when needed.

As part of this project, a supply of peat was purchased in order to test how effective this was as a heat source. This part of the study is still ongoing, however, the use of an "unexpected" fuel source for the fire has certainly provided a talking point for staff and visitors.

The switch to peat has also meant the removal of the large quantity of firewood that was normally kept by the fire to dry out. This has provided more room for interpretation of the interior.

Summary

Minor changes to the running of a historic building have produced a working environment which has been greatly improved for staff. These changes have included more information to prime visitors on how to approach our buildings (the open door sentences in the daily sheet), and a reliance on historically appropriate means of insulating buildings (closing doors, covering windows).

The net result is a richer visitor experience, and improvements to the well-being of our staff.

Peat fire in Abernodwydd.

Environment and greening: sustainable thatching at St Fagans

Goal

To explore the potential for growing, harvesting and processing our own crop of thatch straw as a means to improving the sustainability of building maintenance at open-air museums.

Background

St Fagans, like many other open-air museums, has a large number of thatched buildings. In sheltered areas thatched roofs are recorded as lasting up to fifty years (Wiliam 2010, 149), but in recent years it has been noted that thatch needs patching or even replacing more often than this at St Fagans.

This places a considerable recurring cost on the museum as the work has to be undertaken by a specialist thatcher who supplies their own materials. This raises issues of sustainability, both in terms of the recurrent cost, and also in terms of the transport costs involved in bringing thatch material to the museum. It was decided to explore both of these elements in the context of work on the new Iron Age roundhouses.

There is no archaeological evidence to indicate what roofing techniques were used in the Iron Age, although it is likely that at Bryn Eryr (the site upon which our roundhouses were based), the roof was thatched with spelt.

It was therefore decided to attempt to grow our own crop of spelt for use as thatch material. This experiment had three main elements:

1. Rigour. The choice of thatch was based - as closely as possible - on that available to the builders of the original roundhouses.

2. Sustainability. The crop were planted and grown at St Fagans to ensure maximum control of the growing process and to minimise transportation costs.

3. Reporting and promotion. Growing sufficient straw to thatch two large roofs using an unfamiliar crop variety involved significant uncertainties. The progress of our project was reported to the other project partners at conferences so they could learn from the experience. In addition, as much of the process as possible was undertaken in front of the public, and with the support of our own volunteer community.

The project

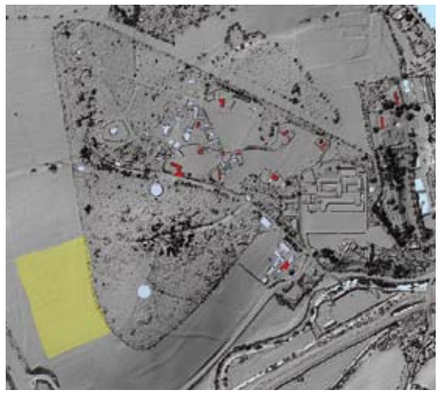
St Fagans leases a number of fields as part of its farming operation. One of these - a field called the '60 Acres' - was used for the crop experiment as it is immediately adjacent to the Bryn Eryr site, thereby minimising the project's carbon footprint.

The 60 Acre Field had been in pasture for over twenty years and prior to the decision to plough it, the following agencies were consulted.

- Welsh Assembly Government. A representative visited the site to assess whether the field could be ploughed, or whether it constituted historic pasture. (This was not the case and permission to proceed was given).
- Cadw (the Welsh historic monuments agency). The land is part of the essential setting to the adjacent Grade 1 Historic Landscape making the change of use to arable a matter for this heritage agency. (No objection was raised).
- Glamorgan-Gwent Archaeological Trust. Advice was given on the potential archaeological impact of ploughing the land. This led to the development of a programme of fieldwalking to follow ploughing (described below).
- Cooke and Arkwright (the agents of the land owners, Plymouth Estates). Permission was confirmed following the approval of the above agencies, as laid out in the Tenancy Agreement.

In addition, the project design was passed to partners in the OpenArch project to gather feedback and comment.

Following consultation, 3.2 hectares was fenced to prevent damage from sheep in neighbouring parts of the field. The area was then ploughed and fieldwalked in order to identify any archaeological remains which may have been present in the area. This work was undertaken by a volunteer group and the artefacts revealed were passed to the archaeology collections of National Museum Wales.



The area set aside for planting.

The field during ploughing - giving an indication of the size of the undertaking.

Metal detecting during the fieldwalking of the area.

Planting

The spelt seed was planted in late autumn 2013 and the crop grew with minimal interference. Pesticides were not used during the project as this can damage the wax coating that enhances the durability of the thatch crop. No nitrogen was added either, as excess nitrogen can lead to growth which is too rapid, resulting in weak stems that snap before harvest.

Weeds were not a significant problem, presumably because weed seeds had not had time to accumulate in a field that had not been ploughed for so long. Throughout the planting and growing of the crop, the museum was advised by historic thatch expert, John Letts, whose support was invaluable.

2 bags of grain, delivered in the husk, were sufficient to sow the full 3.2 hectares.

The field in spring 2014.

The crop ready for harvest in summer 2014.

Harvest

The labour involved in tending the crop prior to harvest had been minimal. This had been provided by our in-house Farming Team. The workload during and after harvest was considerable.

The reaper binder in operation.

Stacking the bundles to dry.

Collecting the bundles on to wagons.

In order to harvest the straw in lengths sufficient for thatching, a reaper binder had to be used rather than a standard combine harvester. As its name suggests, this cut the straw at its base and tied it into bundles which were left lying on the ground as the tractor moved on. These machines are no longer in common use and the museum's own machine required significant maintenance in order to make it functional. In the event it did not prove up to the task and a replacement had to be bought.

The bundles on the ground had to be picked up and stacked in groups in order to facilitate their drying. This had to be done quickly so that they did not have time to rot on the ground.

After a few days of dry weather the stacks were collected onto wagons and stored in the museum's barns and on trailers. The sheer volume of thatch material was almost overwhelming, as was the amount of labour involved in moving the stacks from field to wagon to storage location.

Processing

The straw, as gathered, still retained its heads of grain. These had to be removed prior to use of the material as thatch, in order to prevent the thatch sprouting, and becoming attractive to rodents, birds and other pests.

A number of different options were chosen for processing. In order of efficiency these were:

1. Flailing. Flails were used within one of the historic barns at St Fagans. It was rapidly determined that this was not an efficient enough means of processing the crop.

2. Heckling (effectively pulling bundles of straw through a large upturned comb). This was more efficient, and had the advantage that it kept the straw aligned for thatching, but with only one working heckle it was not sufficiently productive.

3. Trampling. In prehistoric times it would have been possible to get cattle or horses to walk over the crop to help break the heads from the corn. The modern equivalent of this was to lay the bundles on the path followed by the museum's land train, and wait for it to roll over them. A large amount of crop was processed in this way.

4. Threshing machine. A single afternoon with a threshing machine produced the same amount of threshed straw as had been produced with all the techniques tried previously. There was no comparison in terms of efficiency, and this proved to be only viable method for processing the amount of straw which we required.

Using the heckle.

Trampling the crop.

The threshing machine in use.

Promoting the thatch project at an open weekend attended by 12,000 people.

Wherever possible, volunteers and members of the public were encouraged to watch and take part in the threshing process which proved an effective means of communicating messages about farming practices in the past, food sources, and labour.

Results

The spelt thatch growing project proved that St Fagans could grow, harvest and process straw in sufficient quantity to thatch roofs. In the event, one of the two roundhouse roofs was thatched using the material we grew.

However, it was only possible because: we had the land on which to grow the crop, we owned the equipment with which to process

the crop, and we could marshal sufficient labour to manage the movement of the material.

The number of person hours involved in the project is shown below. Even with the scale of St Fagans it would not be possible to divert this amount of staff time from regular tasks every year in order to assist in the harvest. Two alternatives therefore exist for future experiments in sustainable thatching:

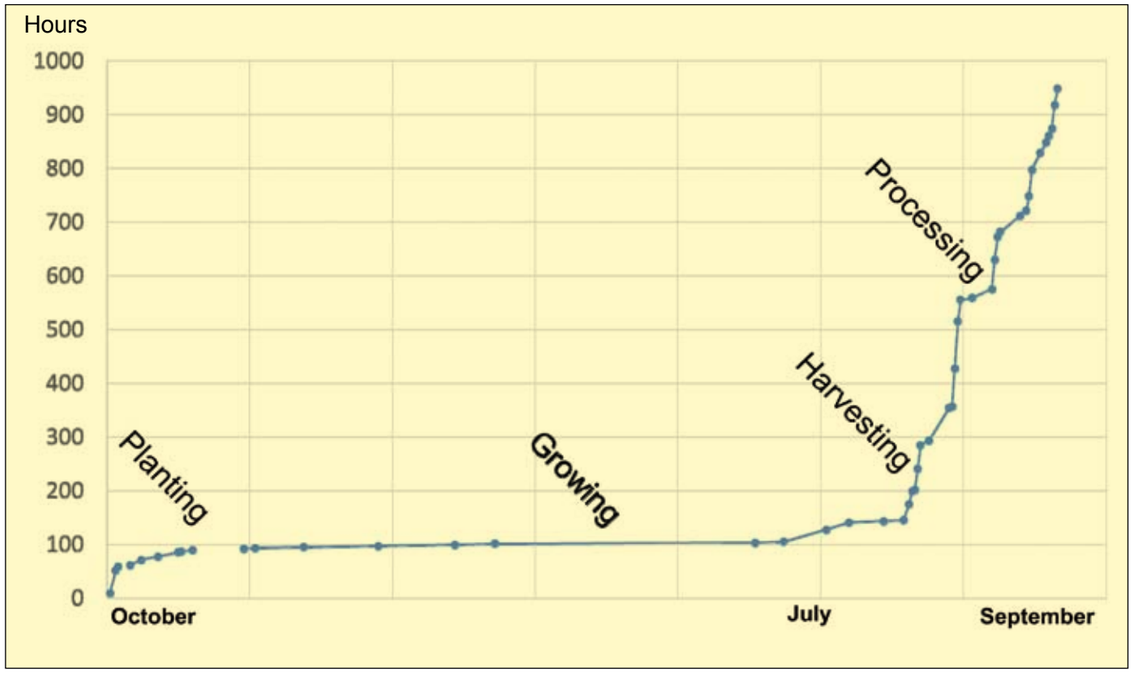
1. Improve labour efficiency by reducing the double handling of the crop and by machine threshing from the outset: ie, threshing it by machine in the field so that it is not moved repeatedly into barns, then out for processing, and on to the building to be thatched.

2. Employ additional labour. This would reduce the financial saving of growing our own crop and is unlikely therefore to be beneficial to the project's goals.

Conclusion

The experiment was successful in demonstrating that our museum could become sustainable in the growing and processing of thatch material, but this would involve the diversion of significant resources on an annual basis.

The benefits of doing so would have to be weighed against the opportunity cost of other projects not being completed.



The labour cost of the project.

Volunteering: a case study from the new Iron Age farmhouses at St Fagans

Goal

To trial methods of encouraging non-traditional museum volunteers to take part in a project to build two Iron Age roundhouses at St Fagans.

Background

In 2012 the old Celtic Village at St Fagans was dismantled and plans were put in place to replace it with new roundhouses. As a large part of the building process involved non-specialist work, eg, preparing timbers and building clay walls, it was decided to use the project as a case study for volunteering at St Fagans.

Our project partners

Traditional our museum volunteers are: white, female, 18-24 (students), or 55+ (retired). This demographic doesn't reflect society at large and we wanted to change this in order to benefit a greater spectrum of people.

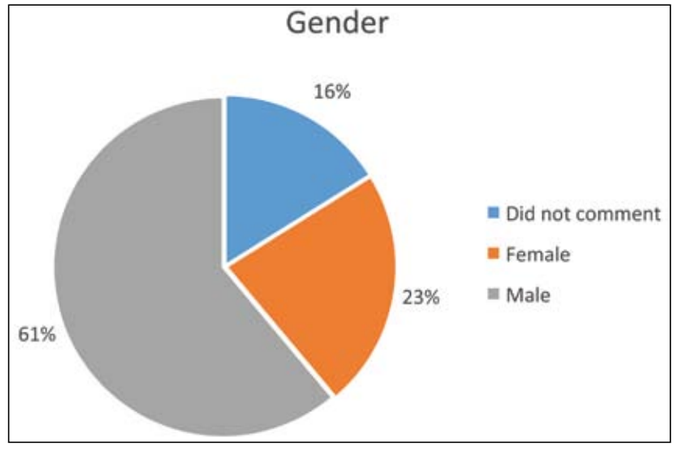
Fortunately, the work on the roundhouses coincided with our involvement with another project, Our Museum, which encouraged us to enter into partnership with a range of community organisations who already worked with the audiences we wanted to reach, for example:

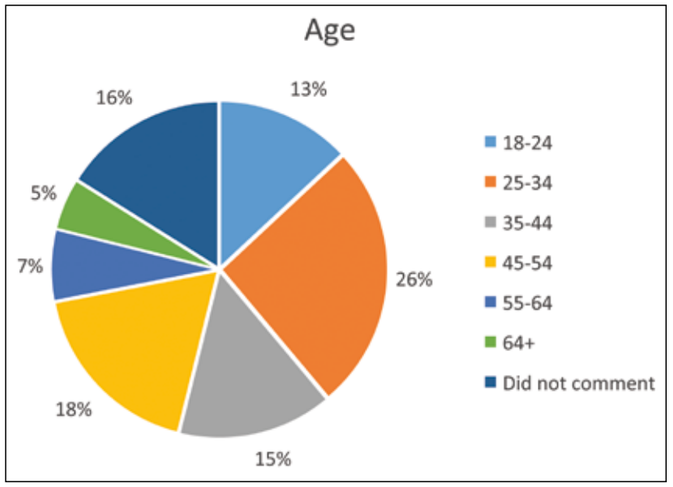
- The Wallich (a homeless support organisation)
- DrugAid (helping people tackle drug and alcohol problems)
- Diverse Cymru (an innovative equalities organisation)
- Job CentrePlus (serving the unemployed)
- Wales Council for Voluntary Action

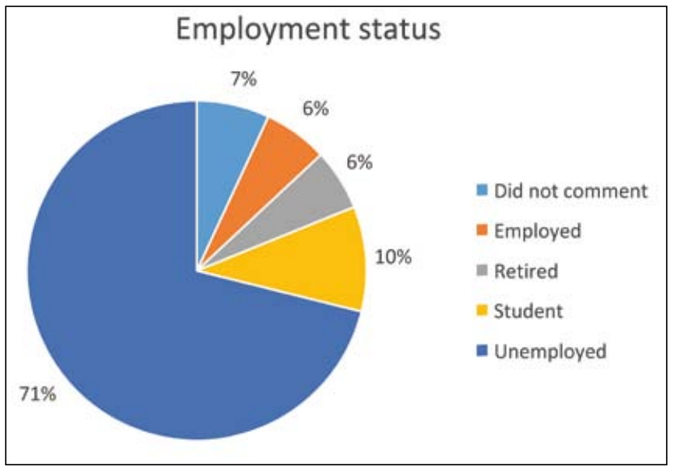
Recruitment

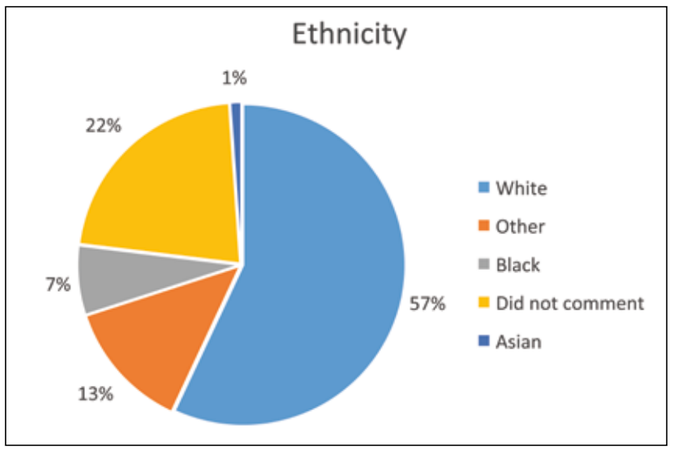
We began preparations for recruitment in 2013 but delays to the building work on the roundhouses meant that recruitment didn't commence until spring 2014, at which time Taster Days were organised. Groups were encouraged to come to these days with staff from their community organisation in order to see whether volunteering with the museum was for them.

Interim figures for the project showed the following demographic.









As these figures show, by working through community partners, the project successfully diversified the range of volunteers who came to work with us.

What they did

Our group of volunteers worked one day a week, on 5 day a week rota to help build Bryn Eryr (a total of 60 days). They built clom walls using traditional skills and clay from the original area, as well as debark wood for the roof and walls. Later in the project, volunteers also helped with the thatching of the smaller of the two roundhouses. For some, this involved preparing straw at ground level. Others were trained to work at heights, and contributed to the thatching process itself. Our volunteers have truly contributed in building Bryn Eryr from the bottom up.

Crucial to the success of the project was compliance with Health and Safety and Building Regulations in order to ensure that all work was undertaken safely. This involved a careful review at each stage of the project to ensure that the working environment had been made safe and that all volunteers were aware of the potential hazards on site. In addition, volunteers were only allowed to carry out tasks which they were trained for.

Alternative volunteering opportunities: Teulu'r Eryr

The roundhouse building project gained a lot of interest from staff and volunteers beyond the community partners noted above. It was therefore decided to create a group for people interested in helping with the roundhouses, which we named Teulu'r Eryr (Eagle's Family). This support group was made open to all existing volunteers and staff across Amgueddfa Cymru – National Museum Wales. Teulu'r Eryr has and will be creating objects, rope and landscaping the area around the farm, etc. and we hope will continue to participate in the maintenance and upkeep of Bryn Eryr in the future.

So far we have had five days of Teulu'r Eryr activities at St Fagans where volunteers and staff:

- Made rope out of nettles to hang and bind objects, and to help tie the roof. This activity was open to public to view during Volunteers' Week (1-7 of June 2014) and was an opportunity to showcase a traditional natural skill to children and adults. The volunteers and staff found these sessions rewarding as they gained a new skill, contributed towards the project, but could also pass this information on to others.

- Helped us lay the floor in the round-houses. This was also an opportunity for those who do not volunteer on Bryn Eryr every week to 'have a go' and make a difference to the project.

We had 15 volunteers and 13 members of staff from St Fagans and National Museum Cardiff contributing 179 hours towards the project on these 5 days.

Volunteers removing bark from roof timbers.

Volunteers working on the walls of the roundhouses.

Alternative volunteering opportunities: Staff carpentry project

As part of the project to build the roundhouses, objects for the interior were needed for decoration and interpretation purposes. A number of members of staff who were not directly involved with work on the roundhouses, expressed an interest in helping to make items.

Their work focused on the creation of a wooden loom, made using Iron Age tools which had been replicated by the blacksmith at St Fagans. The project has involved 9 members of staff over 8 days (over a span of 8 weeks) to produce a loom and bowls for Bryn Eryr. These staff have shared skills and in turned up-skill themselves in carpentry and Iron Age history. They have run this project themselves as a team working through risk assessment, health and safety and product design. Everything has been created and developed by them.

Volunteers involved in making string from nettle fibres.

Staff working to make the loom for the roundhouses.

Conclusions

At the end of the work on the Iron Age roundhouses, 59 volunteers had worked in-depth on the project, 106 participated in Teulu'r Eryr sessions, 24 assisted with open days, and over 1,250 visitors donated their time to help with the rope making sessions. In total the project benefited by 4,158 hours of work.

There is no doubt that volunteers made a substantial contribution to the project, but just as importantly, the volunteers also benefited through their work with us. A few quotes will illustrate this:

"My volunteer said he hadn't expected it to be so engaging. He expected just to do some manual labour and not much else. He said he feels excited at the prospect of being involved in the re-build of the Celtic Village. He smiled and said how he hopes that one day, his children and their children will visit Bryn Eryr and feel proud that their father/grandfather had been part of something so amazing."

"St Fagans wasn't somewhere they [the volunteers] would have expected to be welcomed nor to become involved in. However, those individuals who've volunteered so far have absolutely loved the experience &, most importantly, have been made to feel welcome & part of the project."

"I spoke with [his] social worker yesterday and he shared with me that [he]… feels that the volunteering he's doing at St Fagans is the most important thing he's ever done: working with like-minded people, actually creating something, and using ancient methods to create things anew. He also said he wishes he'd done this when he was younger so that he could have spent more of his life doing it…!"

Results like this make clear the potential of all of our organisations to achieve a social impact that goes beyond a simple presentation of the past. We offer safe environments in which people can try different skills, socialise and build confidence. These are important and valuable assets at a time when all public sector organisations have to justify their value in a climate of shrinking funds. Viewed from this perspective, the creation of two new roundhouses is almost a by-product.

Maintenance of structures: Lessons learnt from twenty years of building, maintaining and presenting Iron Age roundhouses at St Fagans National History Museum.

Goal

To learn from the experience of maintaining a group of Iron Age roundhouses (the Old Celtic Village) and to apply this lessons in the creation of a new Iron Age farmstead.

Introduction

In February 2013 St Fagans National History Museum closed its Celtic Village after over twenty years of continual use as a popular visitor attraction. This pioneering development was built for the museum by Peter Reynolds of Butser fame and consisted of three Iron Age roundhouses set within a palisaded enclosure. From the outset its remit was primarily educational, providing a resource for schools which were teaching the Iron Age Celts component of the Welsh National Curriculum, although several experiments were conducted within its environs over the course of its life. Most notable of these were the excavation of the original Moel y Gaer house by Professor Martin Bell, Reading University (2009), the excavation of the Moel y Gerddi house by Dr Oliver Davies, Cardiff University, and the present author (2012), and smelting and brazing experiments by Tim Young, Cardiff University (1998 - 2004).

The three houses that made up the Village were based on excavated evidence from Moel y Gaer in northeast Wales (Guilbert 1976; 1982), Moel y Gerddi in northwest Wales (Kelly 1988) and Conderton in the English Borders (Thomas 2005), with the palisade being a construct designed to provide physical coherency to the Village rather than reflecting a specific site.

St Fagans is best known for the display of "real" buildings, moved and re-erected stone-by-stone and brick-by-brick, a service it has performed for over 60 years. The Celtic Village was therefore something of a departure being based, as it was, on archaeological evidence and engineering principles and being built using wood, stone and straw bought for the purpose rather than derived from an original building. Nonetheless, over its twenty year life span it proved enormously popular with visitors and was the setting for many re-enactment and craft events. Indeed, at the time of its closure, it was welcoming 13,000 school children and perhaps as

many as 250,000 visitors throughout the 361 days each year that St Fagans is open.

As with all reconstructed roundhouses, the structures at St Fagans were all repaired and altered over the course of their history. The thatch on all of the houses had to be patched after just eight years. At the same time, the roof structure of the Conderton house had to be reworked since the original design allowed water into the stone walls. Nine years later, the Moel y Gaer house had to be taken down due to structural failure being completely rebuilt the following year following excavation by Professor Martin Bell of Reading University. The Moel y Gerddi house lasted three years longer but was finally closed to the public for safety reasons in 2012.

In summary, as the houses grew older the resources needed to maintain them increased and eventually exceeded what was available, hence the decision to close the Village to take stock of what we had learnt from the previous twenty years and to plan for a new series of Iron Age structures. This article details the results of these reflections and outlines our plans for the redevelopment of the Iron Age roundhouses at St Fagans.

The Celtic Village in 2004, showing the Moel y Gerddi house in the background.

Lessons from the Celtic Village: water run-off and ventilation

One of the dominant themes that runs through the maintenance records for the Celtic Village is the consequence of its build location, set as it was at towards the base of a hill, surrounded by tall trees. This meant that the site was plagued by water run-off from the hill, and also failed to benefit from drying breezes, resulting in very damp conditions. Several attempts had been made to mitigate these problems over the years. The ditch of the palisade was intended to catch the run-off with drainage pipes beneath the houses carrying water away but, over time, the ditch filled-in and the pipes clogged.

The choice of hillside location had one additional consequence for water ingress in the Celtic Village. In order to produce flat ground upon which to build, Peter Reynolds followed a practice common in prehistory and cut a level platform into the hillside which extended about 30cm beyond the south wall of the Moel y Gerddi house with the palisade bank rising beyond this. Over the years the vertical edge of this platform eroded and soil washed down slope until it butted against the outer wall of the house, leaving its floor effectively underground by some 30cm. Attempts were made to cut back the hill wash in the early years of the Village but, over the course of its life span, the extent of the original platform was forgotten and efforts to cut it back ceased. As well as putting pressure on the wall of the Moel y Gerddi house, this meant that the internal environment was cold and damp resulting in more rapid deterioration of the house contents. Presumably many Iron Age roundhouses built onto hillsides would have encountered similar problems if the edges of their platforms were not set far enough back, or if any resulting hill wash was not routinely cut back.

Still image taken from a video recorded when Peter Reynolds built the Celtic Village in 1992. The platform onto which the Moel y Gerddi house was built can be seen along with the cut into the hillside, the latter being visible in the lower right hand corner.

Photograph taken during the 2013 excavation of the Moel y Gerddi house. The white line marks the lime coating on the inner-face of the house wall; stakeholes show the centreline of the wall. The height of the hillwash can be seen against the rear of the house, while the ranging rod rests on the much lower level of the house's floor.

The woodland location provided the final dimension to the water-based problems faced at the Celtic Village. The shading of the site by trees further exacerbated the problem of damp since it meant that the thatch didn't dry out, causing it to rot at a faster rate than anticipated and leading to greatly increased maintenance costs, as noted above. The lighting of fires within the house, helped to dry the thatch a little, but the fires were allowed to die back when the museum was closed. The effect of this heating regime on the environment within the Moel y Gerddi house were recorded in its last years using TinyTag Dataloggers to monitor heat and humidity both inside and outside, supported by a thermocouple placed within the central fire. These devices allowed the relationship between the fire, the internal environment and the ambient conditions to be monitored and analysed. This programme indicated that

the house had returned to an ambient temperature by the early hours of the morning. Further experimental work using a thermal imaging camera showed that the fire regime inside the Moel y Gerddi house did elevate the temperature of the thatch, but one only had to push one's hand into the roof to determine that it was not sufficient to dry the sodden straw.

The conclusion reached from our attempts to control water flow, damp and humidity levels in the Celtic Village is an obvious one: that the choice of location is critical to the long-term integrity of the structure and the environment of its interior. It is rare that archaeological open-air museums have a completely free-hand in the choice of location for their buildings, but our own experience indicates the importance of considering these factors.

Lessons from the Celtic Village: coping with success

Perhaps the greatest single factor affecting the visitor experience in the Celtic Village was simply the sheer success of the structures. Visitor numbers have already been quoted and on a peak summer day it was possible for 6-7,000 people to visit the Village as part of their trip to St Fagans. This placed great demands on the individual buildings. Both Moel y Gaer and Conderton only had single low doors and had maximum occupancy levels for fire regulations of 12 people each, Moel y Gerddi had two opposing doorways and was rated for 35 people. On a busy day, the doorways were often log-jammed with visitors attempting to get in and out, while simultaneously blocking the light for those already inside. Staffing levels in the Village exacerbated the problem.

When it was first built the Celtic Village was only open to the public for six months of the year and it was staffed by two people equivalent to a single annual salary. This model allowed one person to speak to the public, while the other looked after the Village; however, after a few years, demand for access to the Village reached such a level that the decision was made to open it all year round. At this point the staffing model had to change; employing two people for the whole year rather than for half of it would have doubled the running costs for the Village and there are many other buildings at St Fagans which need to be staffed. The post of Celtic Village facilitator therefore became a single full-time position. The quality of experience offered by the individuals who occupied this post over the years is well-documented in visitor feedback, but the sheer volume of visitors coming to the Village meant that they couldn't provide the same high quality experience to everyone. Furthermore, it was only possible for them to occupy a single house at a time, particularly on busy days, and the other two houses were therefore left unmanned. For safety reasons, no fires could be lit in these unmanned houses, and their contents had to be removed to prevent damage or theft. They were sad and empty structures which offered little to visitors and were a constant frustration to staff.

Beyond the Celtic Village

The closure of the Celtic Village provided an important opportunity to reflect on these varied issues. Fortunately, concurrent with the decision to close, came the decision to build a new Iron Age experience at St Fagans, thereby providing an opportunity to turn reflection into an improved visitor experience. Site location, water management, visitor flow, building design and staffing all became variables which could be altered. At the time of writing we are about half way through the building of our new Iron Age reconstructions and so what follows in this article is an overview of a work-in-progress, complete with our current thoughts on solutions to specific design problems. It is possible that these will alter as the reconstruction continues.

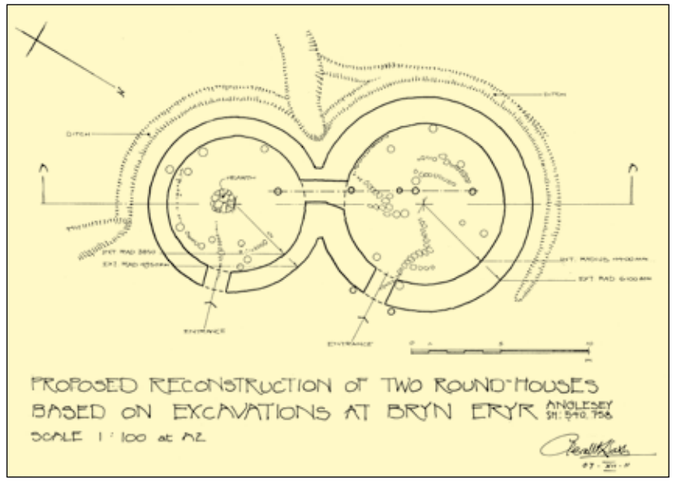
Beyond the Celtic Village: location

In developing our plans for the new buildings the first issue we addressed was their location taking the opportunity to build on a new site at the top of a hill where the woodland is thinner and the available clearing larger. This position will, we hope, be less affected by water run-off and will benefit more from a drying wind.

The chosen location is set further away from the main visitor routes at St Fagans than the old Celtic Village, a point which has both positive and negative sides. On the one hand, it is likely that the new Iron Age structures will receive fewer visitors than did the Celtic Village, although the number of school groups on visits linked directly to the History Curriculum is unlikely to change. On the other hand, the number of visitors is likely to be more in keeping with the scale of the structures, thereby allowing us to provide a better visitor experience for those who do make their way up the hill.

Beyond the Celtic Village: the basis of the reconstruction

The second issue we faced was what we should build. In 1992, Iron Age roundhouse reconstructions were relatively rare. Today there are over 126 roundhouses in Britain and Ireland (source: www.britishroundhouses.com). The majority of these are based, to a greater or lesser extent, on the work of Peter Reynolds who provided an architectural template for wattle-walled roundhouses and also explored the design of stone-walled roundhouses. One form he did not attempt to reconstruct was the earth-walled roundhouse. In recent years there has been a growing recognition that in western Britain roundhouses were often built with thick earth walls, sometimes with a stone cladding, and sometimes



Ground plan of the Iron Age farmstead as used during the building work.

Reconstruction drawing produced at the start of work on the Iron Age farmstead. The details of the roof design have changed since this was produced.

with internal rings of posts (eg, Bryn Eryr, Anglesey, Longley 1998; Cefn Du, Anglesey, Cuttler et al 2012; Poldowrian, Cornwall, Smith and Harris 1982). Since Wales has provided several examples of this type it seemed particularly appropriate that St Fagans National History Museum should attempt a reconstruction.

It was decided to base our reconstruction on evidence from Bryn Eryr, an Iron Age farmstead on Anglesey, an Island off the north coast of Wales. In its second phase, Bryn Eryr consisted of two clay-walled roundhouses built abutting one another with conjoined drainage gullies around their circumference suggesting they were in use contemporaneously. Each house had a doorway opening to the east, and looking out onto a cobbled yard, while behind were drainage ditches and clay quarry pits. The houses were set within a large rectangular enclosure which, due to pressures of space, it will not be possible to build at St Fagans.

A number of different design possibilities exist for clay-walled roundhouses, with the wall height being a crucial variable. Peter Reynolds noted that wall height was a particularly problematic area in some of his own reconstructions. In his publication of the Pimperne reconstruction he noted that, in the absence of archaeological evidence or structural necessity, this was the only variable that he decided arbitrarily (Harding et al 1993, 95), the decision being to build the walls to 1.52m in order to allow headroom when stood close to them.

In part the ability to build to any height depends on the strength of the raw material. If roundhouses were built with pure clay then the wall height would, of necessity, have been low, corresponding to the natural angle of repose of the clay when dry. Given that this angle of repose is around 30 degrees, the 1.7m thick walls at Bryn Eryr could only have been raised to around 0.5m high before they became unstable, but this need not have been the case, as the strength of clay can be significantly increased by mixing it with coarse aggregates, straw and stone dust to make a building material known as clom in Wales (cob in England). This material can be very strong, allowing walls of around 0.6m thick to be raised to over 2.4m tall, as evidenced by the clom-built Nantwallter house at St Fagans which was built around 1770, and moved to the museum in 1990

No detailed description of the composition of the material used to make the walls at Bryn Eryr could be found in the excavation archive. Consideration was given to the possibility of returning to re-excavate the site in pursuit of this information, but the excavation report is clear that only the lower few centimetres of the walls survived at this time, making it unlikely that significant material would survive to the present. Nonetheless, the excavation archive makes clear that the area is rich in clays and well-supplied with coarse and fine aggregates - the raw materials of clom buildings. It was therefore decided to build our roundhouses with walls around 1.5m high. This is an arbitrary measurement - as any other choice of height would have been - but it has the advantage of maximising headroom, and usable floor space, within our buildings. The clay for our houses was procured from Pembrokeshire whereas that used at Bryn Eryr could easily have been provided from the immediate environs of the site. Sufficient could have been obtained from the excavation of the enclosure ditch which surrounded the original site, with the quarry pits set within the interior of the enclosure potentially supplying patching material for ongoing maintenance.

The method by which two prehistoric houses could be built abutting one another, as was the case at Bryn Eryr, was particularly vexing, although it is known from other sites such as Tre'r Ceiri, a hillfort in Gwynedd, north Wales and Chysauster in Cornwall. Reconstruction drawings of both sites show the roofs of the roundhouses as separate cones, which touch where their walls butt (eg, http://www.peoplescollectionwales.co.uk/items/25575, and Cunliffe 1995, pl 6). Such a design would lead to water run-off from the roofs meeting at the join between the two buildings, leading to water penetration into the walls, and subsequent erosion.

To reduce the risk of this occurring at our houses, we decided to join our two roundhouse roof cones using a linking ridge, thereby pushing the water away from the tops of the walls. One consequence of this design is that a disproportionate amount of water would be funnelled from the roofs to the ground where the two houses join - potentially creating a waterlogged patch of ground. Referring back to the archaeological evidence from Bryn Eryr, a large drainage gully had been dug behind the buildings, from the point where their walls joined, thereby channelling water away. No such drainage ditch existed at the front of the buildings, but one possible solution to the problem of excess water flow is to place a water barrel below the eaves, thereby obviating a drainage problem and providing a ready supply of water for the inhabitants of the houses.

The solution we've chosen for the problem of how to combine two roundhouse roofs means that our structures will inevitably look different from single-roofed roundhouses of the types explored by Peter Reynolds and we hope that this will generate debate.

Beyond the Celtic Village: experiment or experience?

So far, this article has focused on the practical issues affecting the development of the Iron Age farmstead, not least because this is an area that is little explored in most articles which deal with roundhouse reconstructions. Indeed, the practicalities involved in catering for visitors are sometimes presented as a negative, leading as they do to deviation from an archaeological ideal (Harding 2009). I hope therefore that the discussion above has helped to illustrate why such compromises are made, particularly at venues which receive a high volume of visitors. A roundhouse which can't be opened for reasons of fire safety, can't be entered because of poor access routes, and can't be seen because the interior is too dark will not teach many visitors about the Iron Age; whereas the compromises we have made are all ones which can be explained to the public while they are sat enjoying the ambience inside the houses.

This raises the question of what we are reconstructing at St Fagans. Is it Bryn Eryr itself? Clearly not, given the compromises noted above, and the availability of other solutions to the design problems posed by the archaeological evidence. For this reason, once open, the houses will be presented to the public as an "Iron Age farmstead, based on Bryn Eryr, Anglesey" rather than simply "Bryn Eryr". This will help to distinguish them from other buildings at St Fagans which have been moved to the museum and which are known by their original names, for example "Nantwallter cottage", "Llainfadyn cottage", "Cilewent farmhouse". Such distinctions are a means of helping the public grasp the many different types of authenticity that exist at St Fagans ranging as they do from: original in situ building, to original building moved to the site, original building recreated from plans, and archaeological reconstruction.

A further question exists as to how much these structures can be regarded as experimental. From the outset, Peter Reynolds distinguished the educational structures that made up the old Celtic Village from the experimental structures which he maintained at Butser, observing the impossibility of running one structure for both ends. The new Iron Age farmstead is also decisively an educational resource. The roundhouses explore themes not previously addressed on a large scale - such as clay-walled building - but they have not been designed explicitly as an experiment in a strictly scientific sense. Instead, we hope that they will become a venue and a backdrop for experiments, thereby helping the public to understand how archaeological knowledge is obtained, while also encouraging the skills with which visitors can critique the reconstructed buildings themselves.

The success of the Iron Age farmstead as a teaching resource, both for schools and the general public, will depend to a great extent on the richness of the narrative that is generated around each aspect of the site. The grounding of the site in the archaeology of Bryn Eryr provides one example of this, allowing staff to introduce a specific Iron Age site and explain how it has influenced our design. The story of the clay walls is another example, introducing visitors to a building technique which is now unfamiliar but was once widespread. Even light levels and water flow will be the subject of discussion with visitors, encouraging conversations which will, no doubt, range across modern issues of sustainability and accessibility as often as they do through life in the Iron Age past.

Conclusion

Through the experience we have obtained from running the old Celtic Village, and the many lessons learnt, we hope that from 2015 visitors to St Fagans will enjoy an introduction to the Iron Age which is of a high and consistent quality. It will be an experience which disabled visitors will find easier to engage with due to the adjustments we have made to the site and which our staff will find easier to manage. With good fortune the Iron Age farmstead will also be a structure which is easier to maintain as a result of the revised building location and construction techniques.

Although the formal opening of the farmstead is still some way off, for many the visitor experience has already begun. Throughout the construction of the site we have drawn on the help of a large number of volunteers from very different backgrounds. Groups from the Probation Service, Hafal (a mental health rehabilitation charity), and corporate volunteer groups have all lent a hand in the harvest of the spelt, the building of the walls, preparing timbers, and thatching the roof. As a result, there is a considerable sense of shared ownership about the project, with many hands contributing

to a product which will be enjoyed by hundreds of thousands of people for years to come.

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Accessibility for visitors: learning from access issues in the Old Celtic Village

Goal

To identify issues which were affecting accessibility for disabled visitors in our Old Celtic Village and to learn from them in the creation of our new Iron Age roundhouses.

Background

In 2011, St Fagans National History Museum commissioned a series of reports from Visionsense, a company specialising in access and inclusive design, to identify areas in which access for our visitors can be improved. This survey found a number of issues relating to our Old Celtic Village. These issues are likely to be applicable at other archaeological open-air museums in the UK and are important for three reasons:

- Ethical duty. Accredited museums in the UK have a responsibility to act in accordance with the Museum Association's Code of Ethics, section 3.5 of which states "All those who work for or govern museums should ensure that they: respond to the needs and wishes of people with disabilities. Have in place effective systems to ensure that buildings, displays and other services are increasingly accessible to people with physical, sensory or learning disabilities." Not all AOAMs in the UK are accredited museums, but if they aspire to be accredited in future, this duty will apply to them.

- Legal duty. The Equality Act 2010 requires organisations which provide services to the public, or which act as employers, to make reasonable adjustments to its facilities to ensure that a disabled person is not put at a substantial disadvantage when accessing visitors, compared to a non-disabled person.

- Serving visitors. Research at St Fagans has shown that disabled visitors make up more than 15% of our on-site audience, in contrast to an anticipated level of disability Wales-wide of 4%. Clearly therefore, disabled visitors were an important visitor group at St Fagans. It is possible that this result is applicable at other sites.

Issues in the old Celtic Village

The Old Celtic Village was opened to the public in 1992. It occupied the site of a natural clearing adjacent to a tarmac-surfaced roadway. Work by VisionSense identified a number of issues.

Clearly there were significant barriers preventing disabled visitors enjoying the facilities as could non-disabled visitors. Issues like these are likely to affect many roundhouse reconstructions, making it particularly important that the Celtic Village experience is shared in this way.

The access route to the Village was via a bare earth pass on an uneven gradient, leading to a slip and trip hazard. The recommendation was to resurface and regrade the route in order to provide a suitable accessible surface.

Within the Village a number of drainage gullies had been cut and filled with aggregate. These produced an uneven surface.
A short term recommendation was made to change this aggregate to a finer-grade.

The information board from the village was located on a particularly steeply sloping section of path, making it difficult for disabled visitors to stop and read.

The low doors and high thresholds into the roundhouses also presented a barrier to access. In addition, dishing of the ground surface in front of the door also lead to puddling which exacerbated the trip hazard. These barriers meant that some disabled visitors had difficulty accessing the interpretation within the building, and no alternative was provided.

Circulation space within the building was also noted as a problem, due to the dispersal of objects within the interior. This led to trip hazards. In addition, there was insufficient space for recommended wheelchair turning.

Responses to the issues

The recommendations made by VisionSense included:

- Adjusting the gradients of access paths
- Resurfacing paths
- Placing interpretation at accessible points
- Altering the thresholds into the roundhouses
- Clearing the interior to improve accessibility

In the short term, improvements could be made such as:

- Training staff to improve their disability awareness.
- Offering additional interpretation outside the buildings.
- Clearing the interior to aid mobility.

All these changes could have been made without significantly altering the buildings, however, in order to properly address these issues, more substantial change was needed. This could only be achieved by building new roundhouses in a new location. Improve-

ments to accessibility for disabled visitors was therefore, one of the motivations behind the building of the new Iron Age roundhouses

Location

A new location was selected for the replacement Iron Age farmstead. This came with both advantages and disadvantages for disabled visitors.

In its finished form the site will be accessed by a tarmacked path that will conform to disabled access slope requirements.

The new location is about 320m from the other buildings on site. For this reason, a shuttle bus service will be offered to those that require additional help with the distance.

The location of the roundhouses, prior to construction.

Surfacing

The new buildings are on a level site with lots of clear ground around them. Surfacing around much of the buildings is in compacted chippings, making movement easy. The original pathways into the building are demarcated in larger stones, but these are arranged flush with the surrounding ground in order to prevent trip hazards.

Solutions to visitor access issues in the new Iron Age farmstead

The new roundhouses with attention being paid to the needs of disabled users. This consideration influenced the choice of specific archaeological site upon which our reconstruction was based. For example, sites were discarded from the selection process if they would have resulted in buildings which were inaccessible to visitors whether because of flooring obstacles or threshold issues.

In the event, we selected an archaeological site called Bryn Eryr on Anglesey which featured a group of two roundhouses of sufficient size and form to suit our needs. Having made this decision, the needs of disabled visitors informed our thinking at several stages, as noted below.

Doorways

The available archaeological evidence dictates the form of a doorway in a reconstructed house. In the case of Bryn Eryr, the site upon which the new roundhouses were built, the doorways were wide enough to accommodate a wheelchair (1m wide) and there was no evidence of threshold obstacles.

The interior layout

The display within the smaller roundhouse is arranged in order to allow for level turning space for a wheelchair, with all potential trip hazards kept on the far side of a rope barrier.

The larger roundhouse has no furniture within it, with all seating accommodated as benching set into the walls.

There is a joining doorway between the two buildings to allow visitors to move between the spaces easily, without having to step outside.

Conclusions

Disabled visitors form an important user group at museums, as demonstrated by survey evidence from St Fagans. Within the UK there is a legal and ethical obligation to ensure that the services they receive allow for their disabilities so that they are not disadvantaged during their visit.

This case study used our Old Celtic Village to show the challenges that disabled visitors can face in exploring an archaeological reconstruction. Some of these challenges can be resolved through training, or minor adjustments to facilities, others require a more fundamental reworking of the buildings and the visitor offer.

We hope that our work in building the new Iron Age roundhouses at St Fagans presents some ways in which archaeological structures can be made more accessible to all visitors, while at the same time highlighting the need to consider accessibility from the outset, in terms of site location, access routes, doorways and the organisation of internal space.

Sleepovers: developing a facility at St Fagans National History Museum

Goal

To develop a venue at St Fagans that will allow school groups to stay overnight, thereby broadening and deepening the learning experience that is available.

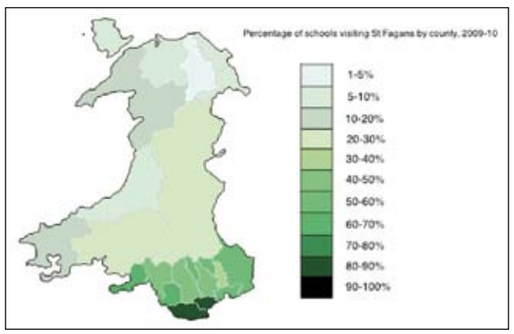
Background

Amgueddfa Cymru – National Museum Wales has a duty to serve the whole of Wales. It does this through its seven venues, located across the country, and also through an active presence on the internet and on social media.

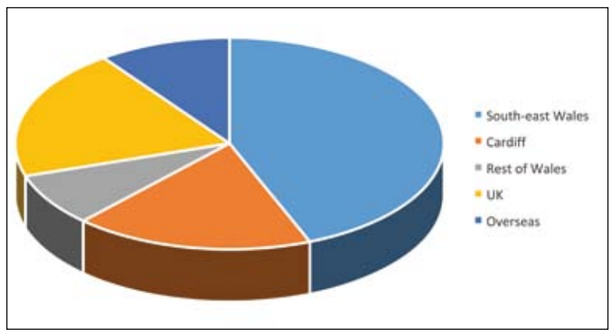
Several of the Amgueddfa Cymru museums have a site-specific or industry-specific focus that means they tell the story of a specific region of Wales. St Fagans National History Museum is different in that it is expected to reflect all parts of the nation, a role that it delivers through its geographically-varied building and artefact collections. It is often described as "Wales in miniature".

Nonetheless, geographical distance prevents many potential users from accessing its facilities. This is particularly noticeable when one looks at the distribution of schools visiting St Fagans. In order for a school to visit from Anglesey (the large island in the north of Wales), they must undertake a 5 hour coach trip in each direction. Clearly this isn't possible in the course of a single day.

One option available to schools is to stay overnight at the Urdd City Sleepover in Cardiff. This facility, run by Urdd Gobaith Cymru (one of Europe's largest youth organisations), offers 153 en-suite bedrooms at an affordable price. But, as the chart below indicates, few schools from north Wales are making use of this facility to visit St Fagans.



Percentage of schools visiting St Fagans, by county, in 2009-10.



Origin of visitors to St Fagans in 2010, excluding formal education groups.

To help overcome the barriers to access that exist for North Wales schools, St Fagans decided to explore the potential for setting up its own sleepover facility. What follows is a summary of the process that St Fagans has gone through in order to develop this facility.

The project

It was decided from the outset that whatever was built at St Fagans had to have some historical merit, and be large enough to provide space and facilities for a whole school class to stay overnight. A wide range of archaeological sites in Wales were examined, and one in particular met this criteria: Llys Rhosyr on Anglesey.

Llys Rhosyr is a medieval court used as an administrative centre by the Princes of Gwynedd in the 12th and 13th-centuries. It consists of a large enclosure containing a suite of buildings, including large halls, kitchens, stables, a smithy and so on. Thanks to archaeological excavation in the 1990s, its ground plan is very well-understood. Practically therefore, a recreation of a medieval court, based on Llys Rhosyr, would provide sufficient large and varied buildings to be used as a sleepover facility. A few other factors also recommended it:

- St Fagans has no buildings from Anglesey, recreating a medieval court based on Llys Rhosyr would help to plug this gap.

- For many people, the Princes of Gwynedd remain an important part of their national identity, recreating a medieval court would allow St Fagans to explore this topic.

- The Princes of Gwynedd ran an itinerant court, moving from llys to llys throughout the year. Our recreation of a medieval court would be used in exactly this way – being occupied by a changing group of school children every week.

Demand

The cost of recreating a medieval court would be substantial, making it imperative that it was established early on that there was a demand for such a project. The potential demand for a sleepover facility was explored through a number of focus group meetings. These meetings looked at a range of different ways in which St Fagans could broaden its appeal.

- Of all the options explored by the Young People's Forum, the most popular suggestion was the "residential stay"

Painting activity while trialling a sleepover activity at St Fagans in 2011.

Testing the potential of a sleepover facility at St Fagans, with an Anglesey school group, summer 2014.

- Members of an Informal Learning Forum were also keen on the proposal, noting in particular the need for the facility to be accessible for disabled children.

- Primary School Teachers in northwest Wales were interviewed in two meetings held in 2011 and were extremely positive about the potential of the medieval court as a base for sleepovers. Nobody was uncomfortable with the idea of "roughing-it", nor did they perceive the health and safety issues involved as insurmountable. The potential of the court for poetry, singing and storytelling was immediately grasped. Given the importance of this stakeholder group to the success of the sleepovers, every opportunity has been taken to verify this finding since the recreation project began.

  An example of the reactions from teachers is given below:
  Having the sleepover in Llys Rhosyr would be amazing it would make a real difference to schools in north Wales. It would really make us visit. I think you would be overwhelmed with offers by schools. It would be really special and would really bring a part of our heritage to St Fagans.

As a means of trialling the practicalities involved in running sleepovers, a group of 15 schoolchildren from Anglesey and their teachers stayed overnight using one of the modern buildings at St Fagans. Throughout the afternoon and evening of the visit, a range of activities were trialled, including: a painting workshop, a bat walk, and a Tudor session,

The experience was very positively received.

Academic consensus

St Fagans is known for its history buildings, moved stone-by-stone to the site, they gain their authenticity in the museum from their physicality. Archaeological structures are different in that they do not reuse the original building material, and the bulk of their superstructure is based on inference from other sources. For this reason, it was important to gauge the reaction of the academic community to the proposal to recreate a medieval court based on Llys Rhosyr. This was done in two seminars held at St Fagans, the first at the start of the project in 2011, the second in 2013.

Professor Huw Pryce, speaking at the 2011 seminar.

The audience and speakers at the 2011 conference included leading figures in Welsh medieval literature, poetry, archaeology, architecture and history, as well as representatives from other heritage organisations in Wales. The day consisted of a series of talks in which the museum set out its ideas, and external colleagues presented papers outlining the historical context from the perspective of their own subjects. The discussion that followed demonstrated two main findings:

- There was widespread interest in the recreation project. It was seen as a means of providing a "laboratory" for the study of medieval Wales.

- The museum had to be careful in how it presented the project. To claim that it was recreating Llys Rhosyr itself would lead it open to critique that such an undertaking was impossible, given the available evidence surviving on the site.

This second point led to a change of approach, reflected in this document. At the beginning of the project, the museum referred to its work as a recreation of Llys Rhosyr, subsequently we refocused ourselves on "recreating a medieval court of the princes, based on Llys Rhosyr". This is an important distinction when considering the authenticity of the project, however, it is a very difficult one to maintain informally within the museum – put simply, it is much easier to say we are rebuilding Llys Rhosyr.

The 2013 seminar was used as an opportunity to reengage with this group of stakeholders and present an update on progress with the project. A key finding from this seminar was the enthusiasm of all for community engagement with the project, even if this led to delays in progress, and compromises to the quality of elements of the finished project. This participatory ethos was especially welcome.

Mark Redknap and staff from Oriel Ynys Mon, reviewing the artefact collections from Llys Rhosyr.

Historical accuracy

The credibility of the finished reconstruction would inevitably be decided by the care with which the architectural plan was conceived. For this reason, considerable effort was made to ensure that all parts of the plan were evidence-based. This began with a review of the published reports for the site and was followed by extensive discussions with its author, Neil Johnstone. Additional elements included a review of the artefactual collection from the site and also of the site paper archive (much of which was duplicated and brought to St Fagans for ready reference).

This work led to the museum archaeologist, Mark Redknap, proposing an architectural model for the site which was radically different from that which had been believed before. Because of the care with which Mark

Neil Johnstone, the excavator of Llys Rhosyr, and Mark Redknap, museum archaeologist, discussing the site.

Previous reconstruction drawing of Llys Rhosyr, showing the main hall as a cruck-framed structure.

Model for Llys Rhosyr that followed from Mark Redknap's reinterpretation of the evidence. This is the illustration now used at the original site.

had researched this model, he was able to present it to academic audiences with conviction, thereby reinforcing the credibility of the work that St Fagans was undertaking.

This work was translated into a series of architectural plans by the museum's Curator of Historic Buildings, Gerallt Nash, and these were submitted to Cardiff Council Planning Authority for approval.

Benchmarking

Running sleepovers at St Fagans is a departure from our existing visitor model, and it throws up lots of questions relating to areas as varied as: site security, washing, storage, provision for disabled visitors, heat, light and food. In order to learn from the experience of others, staff met with colleagues from other organisations which already provide sleepovers, or who offer "feasts" to people visiting their museums. This included discussion with:

- Stiklastadir medieval farm, Norway,
- Lofotr Viking Museum, Norway.

And benchmarking trips to:

- Archeon (Netherlands),
- Foteviken (Sweden),
- Middelaldercentret (Denmark),
- Eindhoven Museum (Netherlands),
- The Irish National Heritage Park (Republic of Ireland),
- Viminacium (Serbia),
- The Ancient Technology Centre (UK).

The central conclusion from these visits and conversations was that every organisation that offers feasts and sleepovers uses a different model. These models are chosen to suit their own organisational needs and resources, and involve a local interpretation of relevant health and safety legislation. In each case, an element of the sleepover model was relevant to St Fagans, and influenced the development of our own thinking, but no single business model could be transferred to St Fagans without adaptation.

In particular, the sleepover model used by the Ancient Technology Centre was very influential, and initial phone conversations on the subject lead subsequently to benchmarking visits, both to the ATC and in return by them to visit the building work at St Fagans. The ATC also gave a paper on this subject at the St Fagans OpenArch conference in May 2015.

Issues raised

Throughout the research and benchmarking phase of the project a range of issues were identified, linked to the holding of sleepovers at St Fagans or indeed at any other venue. These are noted below.

Sleepover groups

The type of groups that organisations were willing to accommodate for feasts and sleepovers varied considerably, with all accepting youth groups, some accepting corporate groups and others wedding parties. The types of groups that an organisation allows to stay on its premises varies according to their values. In the case of St Fagans it was decided that groups of adults would be allowed on the site, as well as children, but that the motivation of the group would also be an important consideration – for example, we would accept a re-enactment group interested in exploring life in medieval Wales, but reject a stag party that was looking for an unusual location for a celebration.

Turning to schools, the average class size in the UK is around 30 children. To this has to be added the number of supervising adults, with the general recommendation being a ratio of 1:5. To be viable for a full class, the sleepover venue has to be large enough to provide sleeping space for around 35 people. In addition, from age 11, the need to separate boys and girls also becomes an important factor. For this reason we decided to limit our facility to accommodating primary school children.

Facilities

Sleepovers require support facilities that extend beyond the provision of floor space. Depending on the facility being offered, additional space requirements come from:

- Kitchen facilities for cooking of evening meals and provision of breakfasts to a required hygiene standard.

- Storage space for items brought by guests, for example modern bags containing changes of clothes, sleeping bags and pillows (when not in use).
- Storage for equipment used during activities linked to the sleepovers (most notably costumes).
- Storage for items belonging to the hall when not in use for sleepovers (eg, cups, bowls, candlesticks etc)
- Toilets within reasonable distance of the sleeping facility, including facilities for guests with disabilities.
- Breakout spaces, which could be used for adults to relax, or to move children into during the night if needed.
- Facilities for washing linen and costumes used by one group in preparation for the next.
- Space for cleaners to store equipment.

A few of these areas do not need to be covered by facilities close to the sleepover venue, eg, storage for guests' luggage or activity equipment, although it obviously helps if everything is close to hand. In addition, some requirements are mutually exclusive, eg, toilet facilities in close proximity to a kitchen is not to be recommended.

In addressing these issues, two decisions were made at St Fagans. First, all replica items in the main hall, eg, the chests and armoires, would be available as lockable storage spaces for small items that were not needed for display when a sleepover was in progress. Second, three buildings would be needed:

- The main hall (used for display, activities, sleepovers and the storage of smaller items)
- The smaller hall (used for storage, cooking, cleaner's cupboard and breakout spaces).
- The toilet block (used as its name suggests).

Finally, a septic tank would be need to service the toilets, and a unit to power the underfloor heating which would serve the first two buildings (see below).

The main hall would be presented as a 13th-century building inside and out. The smaller hall would look authentic from the outside but would be fitted out to a modern standard on the inside (this would be reversible if at a future date it was decided to abandon the sleepover plan). The toilet block would also appear medieval from the outside, but would have modern fittings inside, linked to the septic tank.

Heating

Discussions about how to heat a venue safely was a recurrent issue in all our benchmarking visits since authentic open fires present challenges in terms of health and potential fire risk.

One organisation noted that they do not allow a fire in a house for 24 hours prior to it being used for a sleepover, in order to remove the potential for latent sparks igniting thatch. Another reported that they no longer used an open fire as the smoke was felt to be distracting to the guests during meals. Yet another, used an open fire but covered it with a cloche when the evening drew to a close. To these notes of caution should be added the case study of the Ancient Technology Centre who have a raised open fire in their hall which is allowed to burn down naturally during the night. In their case, the safety of the guests is managed by prior training, and they have an exemplary safety record.

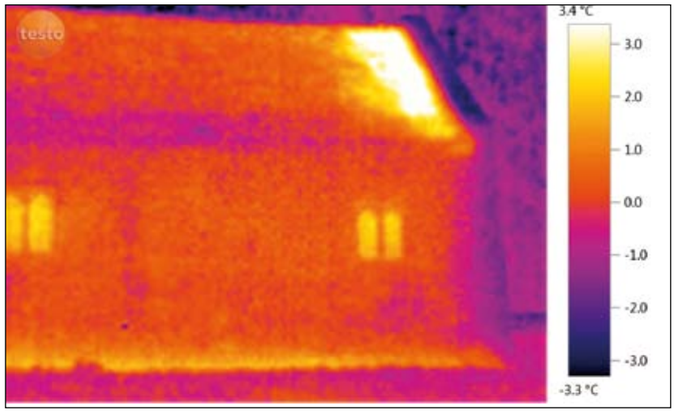
At St Fagans it was decided to install underfloor heating as a means of taking the chill off of the building and reducing damp at floor level. This is a technique which has been used successfully at other buildings at our museum, however, it was felt by all involved with the project, that the provision of a real fire was an important part of the atmosphere of a visit to St Fagans. In consequence the hearth found at Llys Rhosyr will be reinstated in position in our medieval court. The extent to which this will be used during sleepover nights has yet to be decided.

Regardless of the heat source, both buildings in our medieval court will be equipped with two exits. The first being the main exit from the original hall, and the second a "modern" insert in order to ensure that visitors can leave the halls from either end, in case of emergency.

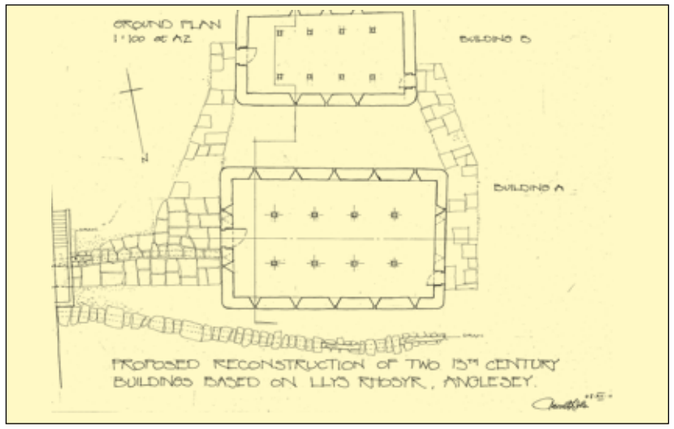
In addition to heat sources within the hall, consideration has also been given to the means by which heat will be kept in. Thatch is a good insulator, and the thick walls will also help to reduce heat loss, but the window openings present a particular challenge when trying to maintain a comfortable temperature for the interior of the hall.

The windows likely to have been present at Llys Rhosyr are relatively small, a fact which assists with heat retention, however, no glass was found on the site, leading to the conclusion that they were covered by other means. A range of ideas were considered. At an early stage perspex sheet was considered as a means to cover the

St Teilo's church in which underfloor heating has been installed.



Thermal imaging showing the extent to which the underfloor heating lifts the temperature of floor level.



The medieval court showing the exits at both ends of the buildings.

The windows at the recreated medieval court.

holes but, following research into parchment or linen fenestrals, it was decided to explore this option as a more sympathetic method for covering the windows. The windows would also be provided with wooden shutters to provide an additional insulating layer.

Regardless of the heat source used and the effectiveness of the building's natural insulating properties, it is inevitable that the interior of the hall will reflect exterior temperatures. A review of the temperature range experienced at St Fagans in previous years was therefore conducted. This showed that it would only be viable to run sleepovers from April to October during which time it was extremely unlikely that the night time temperature would fall below freezing.

Having explored the potential methods of heating and insulating the building, and the appropriate time of year for the sleepovers, the only other means of ensuring a warm night's sleep for the guests was to make recommendations regarding bedding. Since guests would be expected to sleep on the floor, it was decided that sheep skins would be provided to offer insulation from the cold, as well as a measure of comfort. Guests would also be expected to bring their own sleeping bags so that they had to take some responsibility for ensuring that they were warm enough at night. This could, of course, lead to an inauthentic riot of purples, greens and blues every time a sleepover was held, therefore the museum will provide linen sleeping bag covers.

Adaptability

The medieval court is a major project at St Fagans which is bound to attract considerable attention when it opens. At present St Fagans receives around 550,000 visitors a year, and it isn't reasonable to limit entrance to the court just to the few thousand who will be coming to take part in a sleepover. For this reason, the interior of the court will have to be capable of being repurposed to accommodate other functions. Through the benchmarking trips undertaken as part of this project, three main functions were identified for the buildings:

- Sleepover facility,
- Venue for evening performances,
- Venue for the general public.

The requirements of sleepovers has been covered above. As a venue for evening performance a number of other factors had to be considered, not least because evening performances are likely to be very different in character, ranging from poetry readings, to wedding ceremonies, to musical recitals and plays. Each one will place different demands on the structure, but consideration of the subject narrowed the issues down to the following areas:

- Seating plans (including flexible plans depending on whether the event required bench seating, or seating at round tables),
- Staging (fortunately, the design of the hall already includes a dais),
- Stage lighting (which can be concealed within the roof timbers of the hall).

In every case it is likely that the evening performance will be planned far in advance, allowing any complications which are unique to a specific event to be identified and resolved in good time.

The question of how to make the halls available to the general public is more challenging, as this will recur at the start and end of every day in which sleepovers are held.

Requirements for daytime visitors	Transition	Requirements for sleepovers
Presentation of the hall as it would have looked in the 13th-century, including trestle tables, benches, and high table.	Movement of furniture to the smaller hall for storage. Laying out of the sleeping space.	Trestle tables and benches at which an evening meal can be eaten. Sufficient floor space for 40 people to sleep.
Small items on display as talking points for the public.	Storage of small items in furniture in the main hall. Bringing of activity equipment from the smaller hall.	Plates and cutlery for the evening meal. Items for running evening activities.
Hearth in use for a real fire.	Effective means of dampening the fire, or making it safe (see above).	Fire not in use (pending more detailed review)
Duration: 10:00 – 17:00 (museum opening times)		Duration: 17:00 – 10:00 (when museum closed)

The transition between these two modes of use would require the moving of furniture from the main hall to the smaller hall for storage at night, and the reverse in the morning. For this reason, all the furniture will need to be made light-weight and easily dismountable. This is in keeping with the needs of an itinerant medieval court, and need not be seen as a compromise with authenticity. This

task could form part of the activities for some of the sleepover groups – although it is unlikely that all would manage it well. The laying out of sleeping mats to demarcate the space is something that other organisations can be planned by the teachers, with the aid of a "sleepover manual".

In addition, the hall would need to be cleaned during the morning when the sleepover group has left, and before the building opens to the public. Initially it was hoped that this could form part of the tasks set for the sleepover group themselves however, again, it is unlikely that all groups would manage it with sufficient care. As a result, it will inevitably take time to transition the building from a sleepover space to a public venue. Fortunately, the medieval court is located at the far end of the museum site from the main entrance, for this reason, it is unlikely that many visitors will arrive at its doors before 10:30.

Inevitably the effectiveness with which a large building can be converted between sleepover and visitor functions on a daily basis will only become apparent as a result of experience.

Conclusion

The exploration of the potential of running sleepovers at St Fagans has raised a large number of issues, relating to the choice of structure, the use of that structure, and the necessity of support facilities. None of these problems are insurmountable, as the benchmarking trips to other organisations has shown, however, they all require serious thought in order to produce an experience which is both safe, and enjoyable.

Status of the project

At the time of writing, building work at St Fagans has proceeded to full height on the smaller of the two main halls and it is anticipated that the roof timbers will be set in place in the autumn. The plan of the larger hall has also been completed and the walls are currently being raised. Designs for the toilet block have been produced and are currently awaiting costing.

It is anticipated that the buildings will be completed in the winter of 2018 with the first sleepovers taking up residence in the spring of 2019. This will be an important moment at St Fagans, representing as it does, a very significant change in the way that visitors can experience the site. It is inevitable that not all parts of the sleepover project will function perfectly first time – indeed it was heartening to hear during the benchmarking phase of the project, how many organisations had evolved their plans for sleepovers in the light of experience. However, there can be little doubt that the thrill of staying over in a recreation of a medieval hall at one of Europe's leading open-air museums will stay in the mind of many young people who visit us, regardless of how much sleep they get.

The ground plan of the larger of the two buildings at any early stage in the construction.

Cutting the timbers for the roof of the smaller of the two halls.

The height of the walls of the two halls in June 2015.

Results of the final WP2 seminar

St. Fagans event.

At the end of the OpenArch project we conducted a seminar to explore areas in which our shared partnership had led to improvements in the management of our organisations.

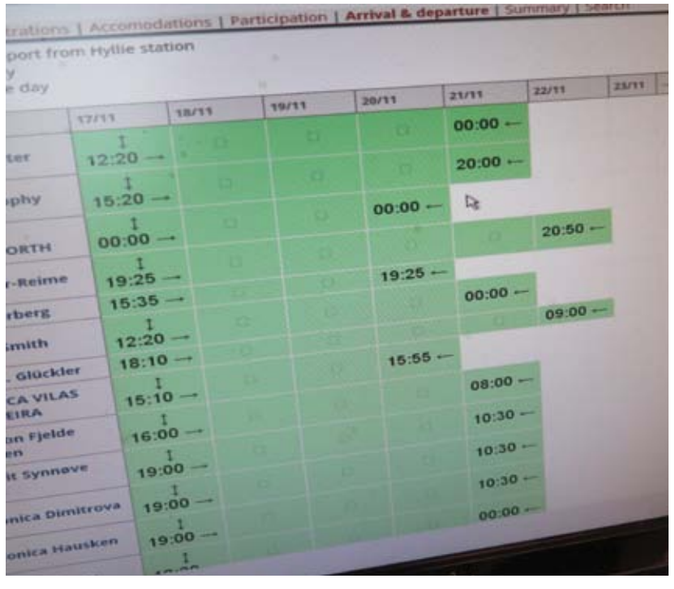
The results were very encouraging and demonstrate clearly the benefits of such international partnerships as a means of exposing organisations to alternative business models and examples of best practice. As one partner observed: "The experience in OpenArch project taught us that to copy is not forbidden and on the contrary is a source!".

Discussions in the seminar and through follow up interviews revealed four main areas in which business practices had improved across the partnerships during the OpenArch project. The management of public interactions; working conditions for staff; the maintenance of buildings, and lastly public relations and the promotion of activities.

The management of public interaction

Throughout the many conferences and staff exchanges in OpenArch, partners were exposed to a great variety of different types of visitor engagements from large scale public events organised at St Fagans to school sessions run by Montale and the daily management of the general public at Archeon. Improvements in the management of large scale events was a common thread in the feedback from partners, in particular, the use of databases to coordinate activities across sites, as exemplified by Foteviken. Other partners also identified clear benefits derived from the introduction of visitor surveys during the project. For example, Viminacium noted that the use of such tools had given them a great understanding of the needs of their visitors, which had in turn led managers to alter their offer to the public. Specifically, their survey work identified a need for more interpretive material for the visually-impaired, such as audio-guides. That such subjects should be identified as

Fotevikens databas for Event.



management issues is of interest in itself, a point which was elaborated on by Archeon who observed that the visitor experience needed to be managed and professionalised in order to ensure the sustainability of high standards across a site.

School visits are an important income stream at some sites and here too we see that the partners improved their management systems. Two examples in particular were highlighted. At Modena, partners saw a well-developed approach to the treatment of schools in which children were prepared for their visit with activities that helped to engage both mind and body, prior to their full entrance into the park. Such staged approaches have since been explored by other partners Turning from the micro-scale of managing individual schools to the macro-scale of managing multiple schools across a whole site, the trip to Archeon on a day when many school groups were present was also noted by some partners as a source of inspiration.

Educational concept in Modena, Italy

The management of scientific engagements as part of the visitor experience was noted as an area of improvement by several partners. This feedback came in two forms. First, our university partner, Exeter, indicated how they had become more aware of the needs of the host museum when planning their involvement, noting specifically the importance of the scientific project being planned so that it fitted with the ethos and values of the organisation. For example, if the museum required front-of-house staff to be in costume, then this had to form part of the planning by the academic group. Conversely, two museum partners noted that they had made the management of scientific projects a clearer role within their own management structures, both as a means of preserving quality but also to ensure that the results of the science fed back into the work of other parts of the organisation.

One clear piece of advice stemming from this dialogue was the need for agreement at the outset about the products of the scientific engagement and what they could be used for. Management attention on these issues is a way of ensuring that work produced is useful to the museum, and that issues of intellectual copyright, where they exist, are clearly understood.

Exeter experimental arkeologi – St. Fagans

The working conditions of staff

Damp condition in reconstructed house - the result may be build up of fungus.

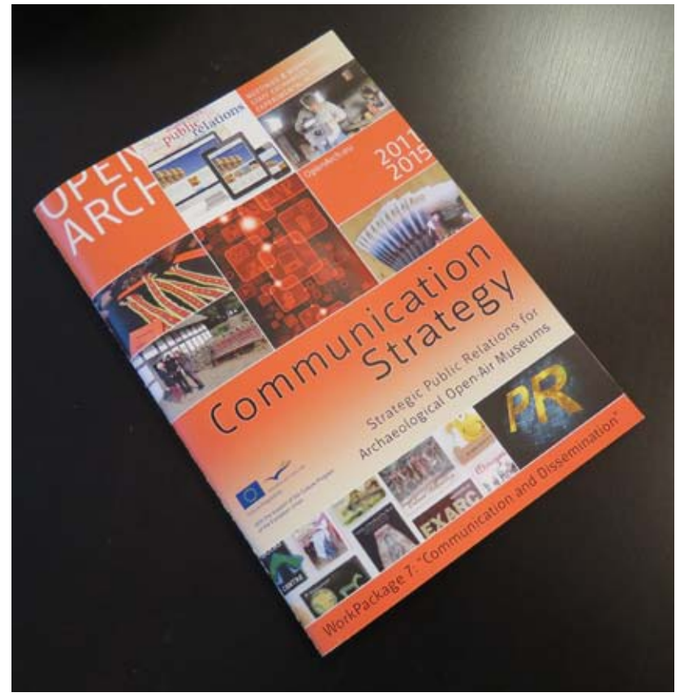
During the OpenArch project, Exeter University undertook pioneering work on air quality in house reconstructions and the issues that this raises for the use of buildings by both public and staff. This work fed into management discussions at several organisations, with the Hunebedcentrum in particular noting it as having become an important consideration in the development of their own buildings. But the most widely cited area in which partners had improved their management techniques in relation to staff came about as a result of the staff exchange programme run by OpenArch. During the course of the project over 50 staff exchanges were run, and many more individuals attended conferences – indeed, over twenty staff benefited from these opportunities at St Fagans alone. These opportunities led several partners to improve their staff training programmes, thereby integrating the best practice they had seen elsewhere into their own sites. For example, Archeon noted that the project's staff exchanges had brought fresh ideas into their museum. This has fed into staff training programmes that had been expanded and improved to include a guidebook and film. Calafell also observed that staff training was an area in which they now invested more energy.

The maintenance of buildings

Several partners built new structures, or renewed existing ones as part of the OpenArch project. Different business models were adopted in managing such work, depending on the nature of the museum. The high quality of repair work at Montale illustrated the benefit of having a member of staff responsible for maintenance over an extended period, while the Hunebedcentrum demonstrated the logistical benefits of employing contractors to develop their buildings. In contrast, St Fagans kept construction and maintenance in-house, except where specialist services were needed, such as thatching. There is, of course, no single method that is correct, but discussion in the final OpenArch seminar showed that partners had incorporated elements of different management models into their own thinking as a result of visits to one another's museums. For example, the roundhouses built at St Fagans during the project were designed using principles noted at the Hunebedcentrum, particularly in relation to ways of mitigating damp issues derived from high local water tables. The Hunebedcentrum in turn, had learnt from St Fagans the importance of paying proper attention to local building regulations and planning processes in order to ensure that the finished structures were capable of serving their intended need. In both cases the partners noted the very great amount of time that was required in order to plan a construction project prior to the build actually taking place. Through such professionalization of building processes, and the incorporation of more management oversight, it is to be hoped that the end results will be more durable structures that are better suited to their intended purposes.

Managing communication

One of the main successes of the management thread in OpenArch has been the broadening of perspectives on what constitutes "management" at several partner organisations. Examples have been given above of how participants in the final seminar had come to consider the visitor experience, school engagements and staff training as all being areas which were benefiting from a clearer management overview. The final area, and the one flagged most strongly, was the management of communication.



PR book

During the course of the project, several partners had moved from seeing the delivery of visitor engagements as the beginning and end of the work, to seeing the promotion of their work as being a subject of equal value. The need to achieve impact and recognition was a key driver in this development. For example, Calafell observed that they now saw communication as being an important role to be assigned to a specific member of staff within their projects. Montale also highlighted PR and communication as something that they now "managed". Looking at the wider AOAM community, EXARC also noted that they had seen tangible benefits among their members as a result of the PR booklet that they distributed early in the life of the project.

Despite these positive observations, significant challenges were also identified by managers working in this area. The Hunebedcentrum commented that the speed at which social media changed meant that communication strategies had to be updated continually, leading to some platforms being downgraded as others achieved more prominence. EXARC also identified the amount of time it

took to extend professional networks into new areas as being a particular issue. Such observations reinforce the need for such work to be managed and for dedicated resources to be allocated to the task, if an organisation is to achieve impact outside of their immediate peer group.

The final meeting in Tarragona, Spain.

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