

FOCUS

2018
INFORMING THE CONSERVATION OF THE BUILT ENVIRONMENT
www.historicenvironment.scot



HISTORIC
ENVIRONMENT
SCOTLAND

ÀRAINNEACHD
EACHDRAIDHEIL
ALBA

BUILDING ON THE PAST

Focus on traditional skills

ENGINE SHED

Scotland's new building conservation centre exceeds expectations

CLIMATE CHANGE

At the vanguard of assessing risk and mitigating impact

CONSERVATION

Collaborative project gives Ross Fountain a new lease of life

CONTENTS

In brief	4
The big picture	8
2016-17: Our year in numbers	55

ENGINE SHED

Engine Shed is a sterling success	10
Volunteers provide a warm welcome	11
Building careers in conservation	12

CONSERVATION

Restoring the Ross Fountain	14
Conservation areas at 50	17
Clever chimney repairs	18
Structural monitoring	19

APPLIED CONSERVATION

Linlithgow's grand entrance	19
Conserving medieval wall paintings	20
Collaboration conserves Ritchie portrait	21
Replica Templeton bronze	22

COLLECTIONS

Melrose Abbey's medieval statues return	23
Good housekeeping	24
Cannon conservation is a team effort	25

TECHNICAL RESEARCH

Adapting to climate change together	26
Roman history comes to life	27

CLIMATE CHANGE

On the front line of environmental change	28
Green Champions' ambition	30

DIGITAL DOCUMENTATION

Capturing our properties in 3D	32
Documenting the Great Polish Map	34
The new face of digital innovation	35

SCIENCE

Future-proofing Glasgow's Fossil Grove	36
Secrets of the Skelmorlie mort helm	38

FOCUS ON TRADITIONAL SKILLS

The true value of craft	40
Mainstreaming traditional construction	42
Traditional railings make Stirling Castle safer	43
Firm foundations at Kinneil	44
Secure future for traditional materials	44
A gift from Scotland to Canada	45
An action plan for thatch	46
Five years of conservation training	48
Dublin's capital challenge	49
My year as an Earth Intern	50
Scottish brickwork fires the imagination	51
Stonemasons of the White House	52
Crafting conservation careers	53
Craft Fellowship connection	54

EDITORS

Jen Farquharson
Vanesa Gonzalez
Dorothy Hoskins
Ewan Hyslop

REGISTERED ADDRESS

Historic Environment Scotland
Longmore House
Salisbury Place
Edinburgh EH9 1SH

SCOTTISH CHARITY NO.
SC045925

PRODUCED FOR HISTORIC ENVIRONMENT SCOTLAND BY

Think Publishing Ltd
Suite 2.3
Red Tree Business Suites
33 Dalmarnock Road
Glasgow G40 4LA
Telephone 0141 375 0504
www.thinkpublishing.co.uk

EDITOR

Ida Maspero

DESIGNER

Felipe Perez

SUB-EDITORS

Kirsty Fortune

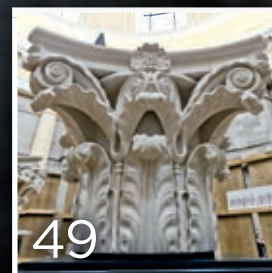
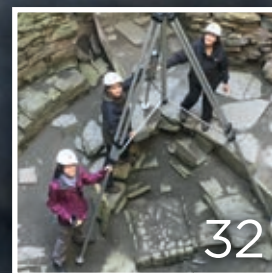
PUBLISHER

John Innes
john.innes@thinkpublishing.co.uk

While every care has been taken in the preparation and compilation of this publication, Historic Environment Scotland cannot be held responsible for any errors or omissions.

All images are Crown Copyright unless otherwise noted.

Front and back cover: Mixing wet clay and straw to make a traditional earth building material



WELCOME

This edition focuses on the skills we need to sustain over 450,000 traditional buildings in Scotland

Alex Paterson, Chief Executive



Welcome to the 2018 edition of *Focus* – our magazine showcasing technical conservation within Historic Environment Scotland (HES) and our partners.

2017 was a very busy year. Highlights included ongoing conservation work at many of our historic sites and the laying of strong foundations in our partnership work with the Palace Museum in China, and with counterparts in the Republic of Ireland. In addition, we celebrated becoming an accredited independent museum authority.

At the start of 2018, we presented our vision for the future management of the historic sites in our care with the publication of our Investment Plan. This plan sets out our programme of investment to enhance the condition of our sites and improve visitor experience.

It was announced alongside our Asset Management Plan, which details the steps we are taking to maintain not just the historic properties and structures in our care, but also the modern infrastructure such as car parks, public-facing facilities, mechanical and electrical installations, which are equally critical to our operations.

We have also recently published a ground-breaking climate change risk assessment report, which outlines the risk to Scotland's historic sites and our next steps for managing this through in-depth assessment and investment. This report places HES at the forefront of the global challenge to tackle climate change and enhance resilience against current and future changes to our climate, as we continue to work with partners to share expertise and guidance.

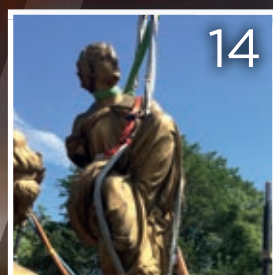
2018 will also see the first anniversary of the opening of the Engine Shed, Scotland's first dedicated conservation centre serving professionals and the public. It is a huge asset in ensuring we have the appropriate knowledge, skills and materials to care for the historic environment, and in engaging a new generation in traditional buildings, materials and skills. Already it has become a very popular venue, welcoming over 12,000 visitors within its first eight months.

It has been really pleasing to see the positive response to the Engine Shed from within the sector – not only for events, but for collaboration with our Science and Digital Documentation teams who are based there, including some ten new interns.

This edition focuses on the skills we need for the future to sustain more than 450,000 traditional buildings in Scotland, which are important cultural, economic and sustainable assets. Those who use these skills on a daily basis are assets too, and it is pleasing to recognise the good work being done in this area.

Our staff contact details are found throughout the magazine – please do in get in touch if there is something we can help you with.

Alex Paterson
Chief Executive





South wall of the Hall of Honour © Antonia Reeve Photography/ Trustees of the Scottish National War Memorial

A GILDED MEMORIAL

The beautifully maintained interior of the Scottish National War Memorial will be in pristine condition for events marking this year's centenary of the end of the Great War, thanks in part to non-invasive analysis carried out by Historic Environment Scotland's (HES) Conservation Science team.

Designed by architect Sir Robert Lorimer and opened in 1927, the Hall of Honour and Shrine at Edinburgh Castle commemorates the sacrifice of Scots in the Great War, Second World War and subsequent conflicts.

Ahead of cleaning and possible conservation work to the interior, the HES team was recently called in to help determine the materials used for

certain areas finished in gold and silver, including gold lettering and gold and silver decoration on regimental and service badges.

Portable X-ray fluorescence (XRF) equipment, which identifies the chemical elements present in a sample, enabled the team to perform analysis on site without the need for any invasive procedures. The work took place over three early morning visits, avoiding disruption to public opening hours.

Based on the results of this initial analysis, HES paintings conservators are now investigating the exact methods and materials used, and how these should be most appropriately conserved.



Using portable XRF equipment to analyse the composition of gilding on regimental badges

CLIMATE READY SCOTLAND HOSTS CONFERENCE

Scotland took centre stage in June 2017, when more than 850 international delegates attended the third European Climate Change Adaptation Conference in Glasgow. Historic Environment Scotland (HES) partnered with other Scottish public bodies to showcase a range of adaptation projects that are currently underway.

The HES contribution centred around the Climate Ready Scotland exhibition, which brought together case studies from around the country, including high-level projects such as Edinburgh Adapts, Dynamic Coast (National Coastal Change Assessment) and our own Climate Change Risk Assessment for the HES

estate. David Harkin, our Climate Change Scientist, gave a presentation on this project and delegates were able to see the adaptation work on our estate as part of the excursion programme.

We also partnered with Edinburgh World Heritage to take an international audience on a tour of Edinburgh's Old Town to highlight climate change

impacts, adaptation and mitigation. Our work on climate change adaptation in Scotland continues to grow and HES is dedicated to working with a range of partners to ensure it is propelled into the mainstream.

For more about Climate Ready Scotland, please visit www.bit.ly/ClimateReadyScotland

VISITING ANCIENT PAGODAS IN SOUTH KOREA

In mid-September 2017, Conservation Scientist Dr Maureen Young was invited to speak at a symposium on stone conservation in Daejeon, South Korea, and was fortunate enough to visit one of the country's great cultural treasures.

The conference was hosted by the National Research Institute of Cultural Heritage, the government agency responsible for research and conservation of South Korea's cultural heritage, which discussed its innovative research to repair damaged stone without damaging the original fabric. Maureen spoke about Historic Environment Scotland's interventions to control deterioration of the fabric of Skelmorlie Aisle, Largs.

Delegates visited restoration works at the 7th-century Mireuksa Buddhist temple near Iksan. This World Heritage site has two of Korea's oldest pagodas – stone structures that replicate earlier wooden building techniques. The



The 7th-century Mireuksa pagoda at the temple site

western pagoda was highly unstable, supported by concrete since the early 20th century until conservation began in 1999. When the pagoda was deconstructed, a great treasure of gold, pearls and other precious objects was discovered in the foundations, and these objects are now on display at the museum adjacent to the temple.

A LEAGUE OF PROFESSIONALS

The Technical Research team recently attained full professional status with the qualification of Dr Moses Jenkins as a Chartered Construction Manager (MCIQB) with the Chartered Institute of Building.

Moses joins Chartered Building Surveyors (MRICS) Roger Curtis and Jessica Hunnisett-Snow, and Carsten Hermann, who is a Chartered Architect (CAABC RIAS). The team is supporting its current intern, Gary Carvel, to gain associate membership of the Royal Institution of Chartered Surveyors, providing a route to professional membership.

Achieving chartered status all round demonstrates the team's breadth of knowledge and experience, and shows the importance of traditional buildings to the construction sector.

Roger Curtis, Technical Research Manager, notes: "Our professional qualifications demonstrate that each of us has been assessed by our peers in the wider sector on our knowledge, skills and understanding. They show that we are committed to adhering to professional standards, ethics and rules of conduct, as well as continued professional development."

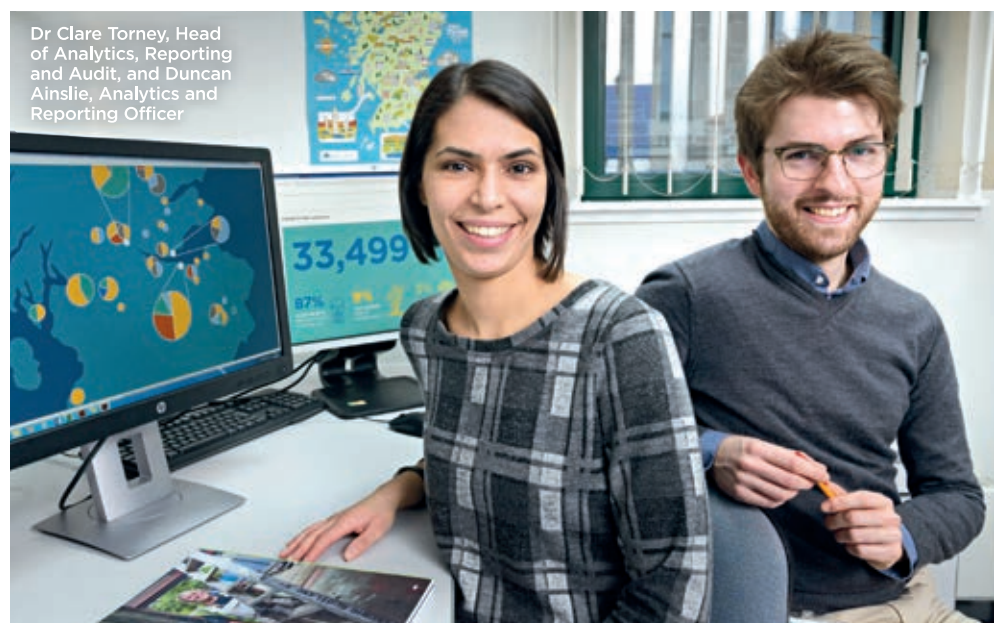
NEW ANALYTICAL APPROACH

Toward the end of 2017, the new Analytics, Reporting and Audit team delivered its first annual report on Historic Environment Scotland's Properties in Care. The report forms the baseline for setting targets and assessing performance in the future.

This new team in the Conservation Directorate was formed in October 2016 in response to new requirements associated with the Scottish Ministers' Schemes of Delegation.

"The Schemes of Delegation require us to report on our activities and demonstrate that we are transparent, accountable and effective. This brings an exciting opportunity to review how we do things and consider innovative initiatives," explains Dr Clare Torney, Head of Analytics, Reporting and Audit.

"Our new team is continually working to identify the needs of our historic assets, to improve national consistency and operational



Dr Clare Torney, Head of Analytics, Reporting and Audit, and Duncan Ainslie, Analytics and Reporting Officer

efficiency, and provide the analytical overview to inform decision-making and planning for the future," she continues. "In the year ahead, we will work closely with colleagues to put in place new data capture procedures,

ensuring we can report fully on our activities and their wider impacts in the years to come."

For more information about the team's work, email cd-analytics@hes.scot

HES HOSTS WORLDWIDE ENERGY REDUCTION PROJECT



In October 2017, construction professionals from around the world gathered in Edinburgh as Historic Environment Scotland (HES) hosted the inaugural meeting of a new international project to reduce energy use in historic buildings.

The four-year project for the International Energy Agency, called 'Deep renovation of historic buildings towards lowest possible energy demand and CO₂ emissions', brings together architects, conservationists, construction companies and engineers from 11 countries. It will collate and disseminate good-practice case studies demonstrating that low-energy standards can be achieved in historic buildings while retaining their special characteristics.

Historic and traditional construction account for a quarter of Europe's buildings, from iconic structures to simple homes. All of them need to play their part in reducing energy and helping to reduce global carbon emissions.

The project aims to lower the energy requirements of historic buildings by up to 75% through innovative insulation and ventilation, as well as the use of renewable energy. The solutions must be compatible with the existing building fabric, unobtrusive and reversible, and build on the inherent passive qualities of older buildings such as the natural use of daylight and solar energy.

HES is coordinating the project's dissemination and knowledge transfer, building on our existing expertise and published resources.



Learning about the properties of stone with the help of biscuits

STONE MADE TASTY

In September 2017, the first groups of local home-schooled children visited the Engine Shed to take part in our schools education workshop 'Science of Stone'. Many of the children had attended the Engine Shed during our summer programme and were keen to visit again to try more of our learning sessions.

The workshop focused on the variety of stone types used in Scotland's traditional buildings. We talked about their formation over millions of years and investigated how their differing natural properties make them suitable for different purposes in traditional buildings, from the roof to the foundations.

The children worked in pairs to analyse stone samples using

microscopes, magnifying glasses and tri-lenses, and matched each to a corresponding thin section. By watching the absorption of food colouring into a biscuit, they got to grips with the concepts of porosity and permeability. Food is not usually used to explain complex ideas, but at the Engine Shed we try to make learning fun.

To delve deeper into Scotland's underlying geology, the children explored our augmented reality map at the centre of the Engine Shed using tablets.

Our education sessions are free for schools and other interested groups.

For more information, see www.engineshed.scot

NEW TECHNICAL PAPERS

Several new Historic Environment Scotland (HES) Technical Papers will be published this year. The first, *Technical Paper 24: Review of technical research projects 2011-2016*, reports on a recent review of refurbishment case study projects by the Technical Conservation team between 2011 and 2016. It assesses the performance of the innovative fabric interventions in the years after completion and concludes that many of the measures trialed have delivered lasting improvements.

On the traditional materials side, there will be six new Technical

Papers covering specific themes around hot-mixed mortars (HMM). HES has recently supported several projects employing this traditional material, and is collaborating with other UK and Irish heritage agencies and a range of partners to develop knowledge and understanding of HMM.

The papers were written by independent experts in lime mortars and building conservation. Reports on the trial projects using HMM will be published in the Refurbishment Case Study series.

Visit www.engineshed.scot/publications

GLOBAL CHALLENGES IN STIRLING

In September 2017, as part of the Scottish Year of History, Heritage and Archaeology, a two-day conference in Stirling, entitled 'Global Challenges in Cultural Heritage', celebrated a new partnership between the University of Stirling, the Palace Museum in Beijing and Historic Environment Scotland.

The event provided a forum to explore and share approaches to challenges shared by the cultural heritage sector worldwide, and to highlight Scotland as an international centre for research and innovation in heritage and conservation.

On the first day, Feng Naien, Deputy Director of the Palace Museum, delivered the keynote presentation on digital technology in visitor engagement. There were also contributions from 22 other speakers exploring challenges and solutions, the role of international charters, and the need to build sustainable heritage economies. Specific workshops featured Scottish projects, including climate change risk assessments and



The delegates' visit to Stirling Castle included a scaffold tour

reconstruction following the Glasgow School of Art fire.

During the second day at the Engine Shed, delegates took part in hands-on workshops, including scientific analysis of heritage materials, digital scanning

technologies and stone masonry demonstrations. A visit to Stirling Castle looked at conservation practices and enhancing the visitor experience, and included a unique scaffold tour of conservation works.

GET SET FOR DIGIFEST!

DigiFest!, Historic Environment Scotland's first ever digital festival, will take place at the Engine Shed from 8 to 20 October. Combining workshops, events, an exhibition and an international conference, DigiFest! is set to be the largest digital heritage event in Scotland.

The first week will feature a digital showcase for schools and professionals, as well as the fifth DigiDoc, a two-day international conference with speakers from around the globe looking at the latest in digital innovation. Previous conferences had international speakers from high-profile

organisations such as Microsoft and Pixar, and this year's line-up promises to be just as impressive.

From Monday 15 October, during the school holidays, a range of daily workshops will focus on digital technology and how it is being used to record and interpret our heritage – it's the ultimate blend of tradition and technology.

Please note the Engine Shed will be closed to visitors on 11 and 12 October during DigiDoc. For more information about these events, email technicaleducation@hes.scot or see www.engineshed.scot

FORT CHARLOTTE PRISON MAKEOVER

The prison at Fort Charlotte in Lerwick, Shetland, is a small, single storey structure that, for many years, has been closed to the public and used mainly as storage.

However, at a Monument Conservation Unit (MCU) seminar discussion in 2015, the MCU decided to make the prison its next project. District Architect Mike Pendery and District Works Manager Alastair Christie came up with a plan to conserve the building and make it more attractive to visitors.

All cast rainwater goods and roof lights were removed, grit-blasted and redecorated, ready for reinstallation. Security bars and the masonry surrounding openings were replaced, the whole building needed repointing and redecorating, and the roof required refurbishment. Given the extent of the work, the building was covered in scaffolding and a temporary enclosure so the MCU could keep working during the winter.

Once the work is complete – hopefully by late spring – the internal space will be refurbished and ready to be interpreted for public access.



A 3D point cloud transitioning to 3D model of Edinburgh Castle

TRADITIONAL SKILLS, A PERSONAL PERSPECTIVE

Craftsmanship and provenance are thankfully now more valued by society than they were when he was a boy, observes **Professor David Mitchell**



**PROFESSOR
DAVID MITCHELL**
Director of Conservation
david.mitchell@hes.scot

When I was 12, I moved to a new school. For a number of reasons, my academic performance took a dip and I was summoned to see my guidance teacher when I was around 13. She suggested that I was not sufficiently 'smart' to pursue an academic future and I should think about "working with my hands".

I vividly remember being very annoyed with her and fairly vocal in my response (rather unusual for me at the time). Of course, I was frustrated by her lack of faith in me, but I was also angry at the clear inference that working with your hands was for those who were not 'bright' enough.

Many of the people in my life at that point worked with their hands – my father and most of his circle were mechanical engineers, and my grandfathers were a Water Board engineer and a cobbler respectively. I didn't view any of them as failures and certainly not as dumb.

That was the 1980s, but it has taken until recently for that view to start to shift. Several years ago at a conference, an attendee was bemoaning the fact that young people were not interested in traditional skills. I took some pleasure in pointing out that the reality was somewhat different to perception: just the month before, we had advertised for an apprentice stonemason at Edinburgh Castle and received 400 applications.

Things are different now, yet some things remain the



same. We have many people who want to work with their hands. The wellbeing and sustainability benefits are better understood, and there is greater appreciation of hand-crafted as opposed to

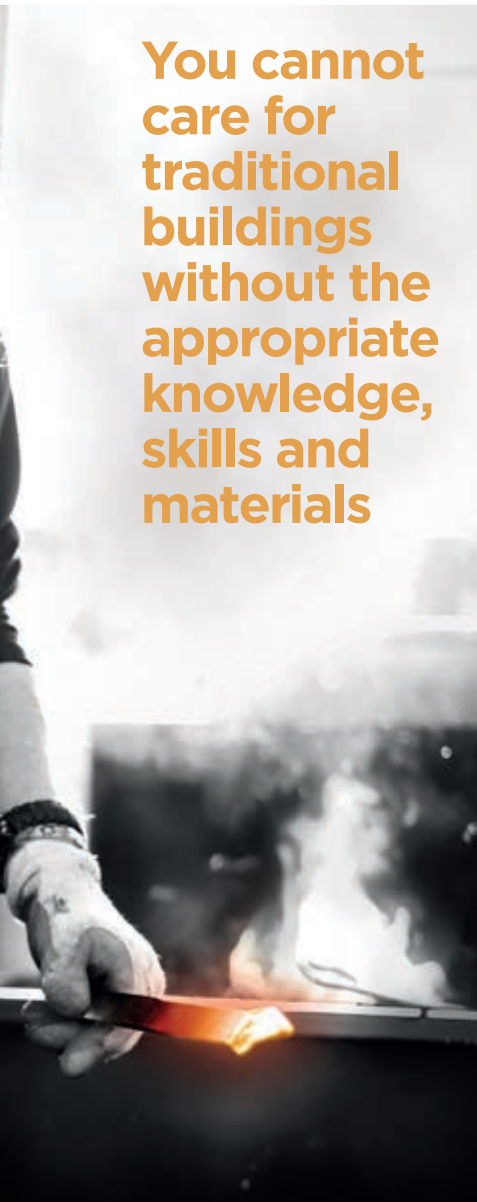
mass-produced items. Where things come from, who has made them and from what are increasingly part of our thinking.

The concepts of circular economy and material

Main: Historic Environment Scotland's blacksmith, Bert Pichlmayer, shares his skills with visitors



You cannot care for traditional buildings without the appropriate knowledge, skills and materials



provenance are gaining ground, but we are chipping away at a huge challenge. The way we procure and manage things does not help. The difficulties of being a small subcontractor

and investing in training and development of the next generation are well understood, and I greatly admire those who continue to push ahead – they deserve our support and patronage.

At Historic Environment Scotland, we have something of a mantra: you cannot care for traditional buildings without the appropriate knowledge, skills and materials. It's about creating both the demand and the supply. Our work on research, traditional skills and materials tries to take account of both.

Our approach to traditional skills combines training the trainers and qualification development for skills where demand is highest, as well as strategic interventions for specialist or at-risk skills through our Craft Fellowship programme. At the Engine Shed, we put a lot of resources into programmes to help young people appreciate traditional skills and materials, as well as helping kids of all ages get hands-on experience.

Our own apprenticeship scheme has grown from strength to strength. Some apprentices stay with us, while others move to the commercial sector. We don't like to lose them, but it's part of our role and many go on to establish new firms doing good work.

Our Masonry Training Centres in Stirling and Elgin deliver excellent training for



Above left: David Mitchell gets his hands dirty casting metal

Above: David's daughter encounters a DIY charcoal furnace for a chance to understand how things are made

both our own staff and for local firms. It's a big commitment for us as an organisation, but one in which we see much value as employers and as Scotland's lead public body for the historic environment.

And what about me? My friends know that a career of artisan endeavour would not have panned out well for me, but I do love making things and partaking in the tradition of 'footering' in the shed. I make paint from scratch and have a number of homemade furnaces for melting and casting metal. I like to understand how things are made and spent 20 years learning about traditional materials.

I think it's important that youngsters understand how things are made and to think about the consequences of that – much like they are taught about where food comes from at school. Recently, my little girl got very excited at the chance to work with the charcoal furnace – mostly to do with wearing safety specs, but you get the idea. Would I be happy for her to work with her hands one day? Of course I would... as long as she gave her dad good rates!

ENGINE SHED A STERLING SUCCESS

The Engine Shed in Stirling has been a hit since opening its doors on 3 July 2017, reports **Dorothy Hoskins**



DOROTHY HOSKINS
Technical Outreach and
Education Manager
dorothy.hoskins@hes.scot

The Engine Shed is Scotland's building conservation centre, established to help everyone – from homeowners and families to professionals, academics and everyone in between – learn more about the buildings and structures around them, and why it's important to look after them.

We offer an Advanced Professional Diploma in Building Conservation, continuing professional development modules on traditional building materials and technical seminars.

Our family-orientated workshops might find visitors emulating the process of metal casting with melted chocolate, getting creative with glass painting or building their own model structure with a 3D printing pen.

Among the centre's permanent features are interactive handling boxes, an augmented-reality app that explores Scotland's built heritage and a state-of-the-art auditorium with 3D 4K



Above right: The centrepiece of the public space is a giant map of Scotland, which visitors can explore using an augmented-reality app on the tablets provided

Below: Fiona Hyslop, Cabinet Secretary for Culture, Tourism and External Affairs, and local schoolchildren jump for joy at the official opening of the Engine Shed



capabilities. We have also hosted seven exhibitions on diverse topics, including the Glasgow School of Art and cast iron in Scotland, as well as an art installation with Forth Valley College.

Our annual target for visitor numbers – 10,000 – was reached just five months after the official opening by the Cabinet Secretary for Culture,

Tourism and External Affairs, Fiona Hyslop. We are delighted with the positive response to the Engine Shed from all who have been through its doors, and hope this is only the start of fostering people's interest in the built heritage, along with the materials and skills that created it and are required to look after it.

ENGINE SHED IN NUMBERS

10,000

visitors by
November 2017

900+

primary school
pupils on
facilitated visits

100+

outreach
workshops

2,000+

professional
visitors from the
heritage sector
and beyond

1,970+

Twitter followers

1,500+

Facebook
followers



VOLUNTEERS PROVIDE A WARM WELCOME

Wendy Malkin introduces passionate people who give their time to support the Engine Shed visitor experience



WENDY MALKIN
Events Officer
wendy.malkin@hes.scot

Early in 2017, we recruited a team of nine volunteers to support the outreach and education work at the Engine Shed. They are a great mix of passionate individuals, including retired scientists, health professionals, architecture graduates and history students.

The volunteers have different reasons for joining us: some contribute their time as a way of getting involved in the community, or to build confidence and take on a new challenge, while others are keen on heritage or are looking to gain experience in building conservation.

Their diversity reflects the main aim of our visitor offer at the Engine Shed: to provide a centre where visitors can learn about conservation, regardless of background, skill level or knowledge.

Volunteers spend most of their time dealing directly with visitors, delivering tours to the public, assisting with learning sessions and running small craft workshops at the weekends. Thanks to their efforts, we can offer our visitors one-to-one tours around the interpretation,

and be energetic and flexible with our programming so that we can deliver our objectives more successfully.

The initiative at the Engine Shed forms part of Historic Environment Scotland's volunteer programme, which sees volunteers engage creatively with our Properties in Care. All over Scotland, volunteers are doing amazing work in heritage. According to Volunteer Scotland, at least 17,000 were engaged in Scotland's historic environment in 2015.

For conservation specifically, hundreds of volunteers help to protect what we have – from rebuilding walls and paths in the natural landscape to traditional boat building or assessing the threats caused by coastal erosion.

In the coming years, we plan to expand our volunteer programme at the Engine Shed to offer even more exciting and unique opportunities for people to get involved in traditional building conservation.

MORE INFORMATION

Find out about opportunities at the Engine Shed at www.engineshed.scot or email engineshed@hes.scot.



ALEXIS MCEWAN
Volunteer at the Engine Shed

"I would sum up my experience as being like opening Pandora's box, but instead of the evils of the world, I have discovered passionate and dedicated individuals quietly working away to educate and develop techniques to help us appreciate the importance of our built environment. They are truly inspiring people who are open, friendly and willing to listen to new ideas and suggestions. Having opened the box, I feel refreshed and rejuvenated, and can't wait to tell the world about all the good things happening here. Volunteering has opened the door to new opportunities and experiences... and, best of all, amazing new friends."

Above right and left: Volunteers Val Crumley and Isobel Smith give visitors a personalised tour of the Engine Shed's interpretation

BUILDING CAREERS IN CONSERVATION

The first group of Engine Shed students enjoyed an action-packed first term, reports **Gordon Urquhart**



GORDON URQUHART
Postgraduate
Course Manager
gordon.urquhart@hes.scot

In August 2017, the Engine Shed opened its doors to its first students for Historic Environment Scotland's (HES)

Advanced Professional Diploma (APD) in technical building conservation.

This is a new qualification developed in association with Forth Valley College and certificated by the Scottish Qualifications Authority. The first cohort of students come from a range of backgrounds, including architecture, town planning, building surveying, engineering, Scottish history and archaeology. They have been joined on occasion by HES staff, local authority officers and conservators in private practice looking to update their skills on a continuing professional development basis.

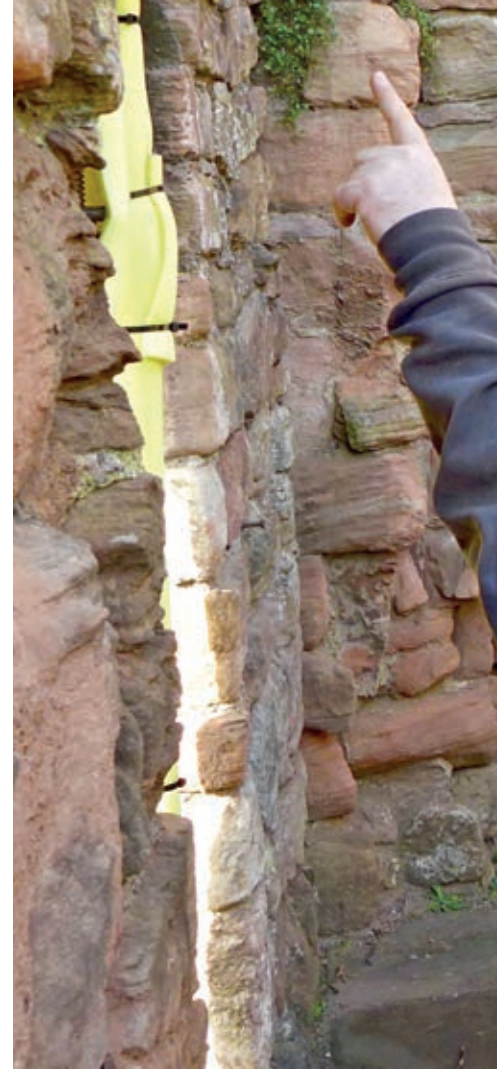
A defining aspect of the APD programme has been the combination of on-site and off-site learning. In addition to classroom and laboratory instruction at the Engine Shed, external sessions have been held at locations including

Linlithgow Palace, Stirling University and Glasgow City Heritage Trust.

The first term featured 30 site visits where HES district architects, regional works managers, stone conservators and masons conducted in-depth tours of current and past repair works, from local sites including Stirling Castle, Bannockburn House and Murrayshall Lime Kilns, to those further afield such as Glasgow Cathedral, Bothwell Castle and Dunkeld Cathedral.

The students have also enjoyed privileged access to HES assets not normally seen by the public, including the collections store at Croft-an-Righ in Edinburgh, the stone conservation workshops at South Gyle and the masonry conservation unit at the Lesmahagow depot, where they engaged in a stonecutting challenge under the watchful eye of Works Manager Chris Hamilton and his team.

There have also been hands-on sessions in limestone burning, lime slaking, mortar



Above right: The postgraduate students on a site visit to Bothwell Castle

Below: The students take part in a stonecutting challenge at the Lesmahagow depot



mixing and traditional plastering. Students visited a working sandstone quarry, a stone-processing facility and the Edinburgh headquarters of the British Geological Survey. However, the highlight of the first term was undoubtedly the day-long visit to the reconstruction works at the Glasgow School of Art, where the students enjoyed sessions with the consulting architect and GSA project management team prior to a tour of the fire-damaged site.

All the students have expressed enthusiasm about the course and the tutors have welcomed their participation in class, in the lab and on site. The success of the programme bodes well for the future, as the reputation of the HES postgraduate course, and that of the Engine Shed as a centre of excellence in conservation education, continues to grow.

MORE INFORMATION

For course details, see www.engineshed.scot/learning/diploma



WHAT THE STUDENTS SAY...

Four students reflect on their experience of the course so far

DANIËL POSTMA
ARCHAEOLOGIST, NETHERLANDS

I joined the course to learn more about applying ancient building traditions to modern sustainable architecture. I'm interested in eco-building and I realised that the early medieval longhouses I was reconstructing as an archaeologist shared many characteristics with eco-buildings.

This course is very different to conventional education. We benefit from the expertise and enthusiasm of people who are out in the field doing this work on a daily basis. When we visited the newly reopened Drumhead Quarry, we got a real impression of the challenges of promoting the use of Scottish stone.

I enjoyed learning about how ancient building traditions have been made relevant to new builds throughout history. Our first unit was full of examples of archaeo-based buildings and I was encouraged by the awareness that this isn't a new idea, which I can show people through my own work in the future.

ANDREA LEVIN
PRIVATE SECTOR HERITAGE CONSULTANT

I have been a heritage and conservation planner in the public, private and charity sectors for 10 years. My work has been

predominantly based in theory and policy, so I wanted to fill the gaps in my practical and technical knowledge. This course will arm me with a better understanding and the experience I've gained will help me to communicate more effectively with conservation contractors.

The course modules provide us with direct access to industry professionals in the conservation sector and to some of the country's best people within the field. This is completely unrivalled in any other of the courses on offer. The size of our classes also allows for an intimate learning experience. They are more of a discussion forum and we get much more out of it than you would in a lecture hall full of people.

TONY DUFF
ENGINEERING; MEDIEVAL HISTORY

I joined through a project that helps ex-servicemen get back into the jobs they want and I've thoroughly enjoyed it. I look forward to every day and conservation of traditional buildings has become a passion for me. The course can challenge the mindset of anyone involved in construction and architecture, and can even change how we move forward with new builds.

One of my favourite days was our visit to Linlithgow Palace. We stood

on a scaffold on the east wall and got a close-up look at the masonry. To think that building has been standing for 500 years, and in my lifetime parts of it might disappear, makes me passionate to conserve it and to get the knowledge needed to do so. That visit encapsulated the point of the course for me.

AMANDA TEVIT
ARCHITECTURAL DESIGNER

I felt I could relate the course content back to my own work and the small class sizes meant I could ask questions that were relevant to me. It expanded my knowledge and changed how I'll design in the future simply because I understand the materials better. This is how architecture should be taught in my opinion – for me, it has been a career-changing experience.

As an architectural designer, it's opened my mind to the fluidity of architectural history – I've stopped pigeonholing design by time periods. I was surprised to learn just how well early architects built things and how they thought about design. In some ways, I think their art, knowledge and skills outweigh those we have now. However, one of the biggest things I'll take away from this course is the social importance of heritage and how we can disseminate that.

RESTORING ROSS FOUNTAIN

Historic Environment Scotland specialists are part of a collaborative project to give an ornate Edinburgh landmark a new lease of life

The Ross Fountain in Edinburgh's Princes Street Gardens is probably the largest and most ornate cast-iron water fountain in the UK. Made by the world-famous Val d'Osne foundry of Antoine Durenne in France, it was exhibited at the London Exhibition of 1862 and bought by gunsmith Daniel Ross, who gifted it to the people of Edinburgh.

After arriving at Leith Docks in 1869 in 122 pieces, it languished for a few years until a site could be agreed for the controversial piece – the statues were condemned as “obscene and disgusting” by Dean Ramsay. However, it soon became a much-admired Edinburgh landmark.

Over the years, the fountain has been troubled by leakage and subsidence, and was taken out of use in 2010. A conservation report

by Industrial Heritage Consulting in 2013 emphasised that the fountain was in a dangerous condition and in need of repair after 145 years in situ.

The Ross Development Trust stepped in to fund a £1.5m restoration project in partnership with City of Edinburgh Council. “The view of the Ross Fountain with the castle in the backdrop has become a postcard image of the city,” says David Ellis, Managing

Director of the Trust. “Therefore, we prioritised the restoration of this amazing and much-loved monument within the wider Princes Street Gardens revitalisation project.”

A multidisciplinary team began working on site in June 2017 and the fountain is expected to be reinstalled in early summer this year. Here, some of those involved talk about different aspects of this exciting project.





SCANNING AND 3D MODELLING

AL RAWLINSON

HES Head of Digital Innovation and Learning

In January 2017, the Historic Environment Scotland (HES) Digital Documentation team and partners at the Glasgow School of Art carried out a detailed 3D laser scan survey of the fountain. Over two days, the team captured 30 high-resolution laser images using scanners mounted on tall tripods from positions all around the fountain. More than 1,000 high-resolution photographs were also taken to generate an accurate photogrammetric record.

The laser scan and photogrammetry data were then combined to create a highly detailed, accurate 3D model of the fountain and its immediate surroundings. This model has since been used to help plan the dismantling of the fountain and will aid in its ongoing restoration.

Project architects have used the 3D data to help design a new lighting installation and redesign the adjacent gardens. The model was also used to create full-colour test images of the proposed paint schemes.

RECASTING, COATING AND NEW FOUNDATIONS

JIM MITCHELL

Consultant, Industrial Heritage Consulting

When work began in summer 2017, we found that an earlier refurbishment had masked serious problems. Many fastenings had failed, there was frost damage to many of the statue limbs, and missing iron sections had been replaced with expanding foam and epoxy fillers.

Many parts needed to be recast from purpose-made patterns, so all conservation work is being done off site at specialist restorers Lost Art's workshop in Wigan.

Paint sampling revealed no conclusive evidence of the original colour scheme, so a new scheme was designed. Echoing the French style of the time, it will give an impression of patinated bronze, with rich chestnuts, verdigris greens with bronze highlights, and gold detailing. Based on the techniques and materials we developed with Lost Art for the restoration of Paisley's Grand Fountain, cleaning and coating will have taken almost a year to complete.

Back on site, new foundations were set on piles reaching down to the bedrock beneath the old Nor' Loch, and a state-of-the-art water pumping and processing chamber is buried out of sight nearby.

This project is without doubt the most advanced piece of conservation work carried out on a cast-iron structure in the UK. We are now working on the conservation plan for the Saracen Fountain in Glasgow, meaning all three of the large A-listed fountains in Scotland will have been conserved.

DISMANTLING AND REMOVING

DAN LEA

Site Manager, Lost Art

From the outset, this restoration project has been both a challenge and an education for us. The condition of the fountain meant that it required complete disassembly, removal and transport to our workshop in Wigan, Greater Manchester.

Removing a large cast-iron structure of undetermined weight from a restricted location was by no means straightforward. We had to

The view of the Ross Fountain with the castle in the backdrop has become a postcard image of the city

Above, clockwise from left: The top statues, column and plinth arrive at the Lost Art workshop in Wigan © Lost Art; removal of the Art statue; painting in progress at the Lost Art workshop

Left: The iconic Ross Fountain in Edinburgh's Princes Street Gardens before it was taken out of use



consider different deconstruction methods, while keeping our options open on alternative means of access and lifting.

With the methods agreed, we began the dismantling – this is always the part of the project everyone wants to be involved in. There was the challenge of making sure the process ran smoothly, along with great interest in discovering how the fountain had been put together: what methods did they use and was it best practice? Where we had concerns about the methods used in previous interventions, it raised the question of whether we should follow suit when putting the fountain back together again after the components had been repaired.

Dismantling the fountain revealed a number of surprises, including the large size of the pieces, particularly where we had expected things to break down into subcomponents. Of course, this significantly affected the underlying logistics during this part of the project.

At the time of writing, the fountain was being repaired and restored in our workshop. Removal of the old paint has



shown that the iron is in worse condition than it appeared at the initial survey, so the amount and scope of work required is far greater than was expected. However, we relish the challenge!

DEVELOPING HES TECHNICAL EXPERTISE

ALI DAVEY
HES Project Manager

I was lucky enough to spend time on site with Lost Art during the dismantling of the fountain. My particular specialism is architectural ironwork, so this was a unique opportunity to learn more about the practicalities of taking apart a heavy, complex, cast-iron structure of this nature.

Joints and fixings are usually deliberately hidden, so a key task was working out where these were located to allow dismantling. Another problem was the weight of many of the components and the potential instability that the removal of one part could cause to the rest of the structure.

I learnt about stabilising the structure while slinging and craning out individual components, and even got to know some crane hand signals along the way! I've already been to visit the Lost Art workshop to see repairs and cleaning in progress, and look

forward to the restored fountain being reassembled in 2018.

ANALYSING THE PAINT LAYERS

AILSA MURRAY
HES Paintings Conservator

As part of the project, a number of paint samples were taken from various elements of the fountain to establish whether any evidence of the original paintwork survived on the surfaces. Each sample was mounted within polyester resin blocks to enable viewing at high magnification. We also performed a sodium sulphide test for the presence of lead.

The number of paint layers we found ranged from five to 19, although only one sample, taken from the mermaid, showed a full complement of early lead-based layers. Cross-section analysis revealed the earliest paint layer was a 'stone' tone over a red iron oxide preparation layer.

This type of structure was rarely one single colour and as there was so little surviving early paint on other parts of the fountain, it was impossible to build up a more accurate impression of what the overall original colour scheme might have been.

MORE INFORMATION

For more on the project, visit www.rdttrust.org/projects/fountain or email ali.davey@hes.scot

Above: Artist's impression of the restored fountain back in Princes Street Gardens and lit up at night © Lost Art

Above left: Mermaid statue in the Lost Art workshop prior to condition assessment

Left: The Quad Bowl mask with its new gold paint finish © Damian Liptrot/Lost Art

CONSERVATION AREAS AT 50

Mark Watson on how partnership work and investment support regeneration 50 years after the first conservation areas were designated



MARK WATSON
Deputy Head of
Industrial Heritage
mark.watson@hes.scot

The Civic Amenities Act 1967 created the concept of the conservation area as “areas of special architectural or historic interest, the character of which it is desirable to preserve or enhance”.

The designating local authority has an active role in managing the conservation area, promoting change that preserves or enhances its special character. In many former industrial locations that are struggling economically, designation has been a catalyst for regeneration. Some conservation areas need more active intervention than others. These partnership mechanisms are available to help:

- Townscape Heritage (TH): Launched by Heritage Lottery Fund (HLF) in 1998, its key objective is skills training to embed good practice long after funding has ended.
- Conservation Area Regeneration Scheme (CARS): HES funding to support regeneration and conservation initiatives run by local authorities and other groups.

Relatively isolated towns are well placed to assess the impact of CARS. Wick’s Pulteneytown conservation area replaced three much smaller conservation areas in 2000 as part of regeneration of a precinct of former cooperages and fish-curing yards.

TH funding, succeeded by CARS, has transformed Pulteneytown. Not all projects were strictly ‘minimum intervention’ and few were to listed buildings, yet the positive impact of repair, re-use and



CONSERVATION AREAS IN NUMBERS

0.3%
of Scotland’s land area is a conservation area

9.6%
of Scottish households are within conservation areas

Source: Scotland’s Historic Environment Audit 2016

accompanying public art is undeniable.

HES and HLF fund skills training to support CARS and TH, as the demand for skills such as slating, window and door joinery, lime pointing and traditional streetscaping should persist long after the initial investment has ended.

Open-day workshops enable public participation and allow traditional contractors to market their skills. Listed buildings, almost half of which are in conservation areas, benefit from conservation approaches becoming the norm in the neighbourhood, as contractors have more work to justify retaining apprentices and gaining skills certification.

Crucial to any conservation area is local authority management through appraisal, employment of project officers, giving small



grants to a range of householders and businesses, public realm work, and resolution for buildings at risk. Maintenance guides set standards for repair and character appraisals set parameters for future change once funding ends.

Fifty years on, the core concept behind conservation areas endures: to preserve and enhance character. There is a human character, too: TH or CARS officers’ hard-won people skills and technical knowledge see a project through to completion, from initial owner hesitation to a last rush for grants before the drawbridge goes up.

MORE INFORMATION

More about CARS at www.bit.ly/hescars and about Townscape Heritage at www.bit.ly/townscape

SCOTLAND’S FIRST CONSERVATION AREAS

were designated in this order in 1968:

- Carlops & Skirling
- Eaglesham
- Aberdeen (7)
- Ayr (3)
- Dunfermline (4)
- Eyemouth
- Houston

Source: Edinburgh Gazette

Above right: Telford Street in Wick’s Pulteneytown conservation area in 1994 and 2005, before and after Townscape Heritage investment. Thomas Telford laid out the harbour and streets of this new settlement in 1786. The dressings, quoins and lintels of the corner building are concrete, implying it was added to the streetscape in the 19th century

Below: Plaques mark conservation areas in South Lanarkshire, legacies from Clydesdale District Council designation in the 1970s





DUNCAN AINSLIE
Analytics and
Reporting Officer
duncan.ainslie@hes.scot

CLEVER CHIMNEY REPAIRS

Duncan Ainslie reports on work to stabilise chimneys at Dumbarton Castle

In early 2017, a lengthy programme of works was finally completed at the Governor's House, Dumbarton Castle. Inspection of a leaky roof had revealed a range of hidden issues, including decayed chimney flues.

Weak sulphuric acid produced by coal burning had, over time, eroded the bridging stones that anchor the outside face of the gable wall to the internal structure. As a result, large expanses of the external wall face were poorly connected to the main structure of the building.

The decayed bridge stones made it difficult to accurately trace the path of the flues. Anything sent down the chimney to track them would

'change lanes' into the neighbouring flues.

A specialist camera was inserted on a semi-flexible push rod, with a remote display enabling it to be tracked from the outside. From this, we could determine where reinforcing internal tie-bars were necessary and where to drill in the external wall joints.

Having re-anchored the wall, large rubber tubes were then inflated in each flue to serve as 'formers'. Approximately 10 tonnes of lightweight, permeable lime concrete was pumped in around them. This bonded to the existing masonry and new stainless steel ties to re-line the upper sections of the flues where the decay



was most severe. Once the concrete had set, the tubes were deflated and removed, leaving the flues and gables in a much more stable condition.

Above: South elevation of the Governor's House, Dumbarton Castle, with scaffolding in place for the chimney repair work

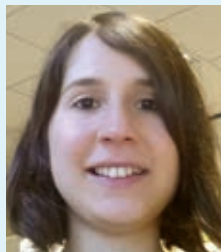
Right: The eroded bridging stones and newly installed anchor bars in the flues of the south-west chimney

SOUND STRUCTURES

Structural monitoring is a fundamental part of conserving our heritage, explain **Kashif Ashraf** and **Frantzeska Nanopoulou**



DR KASHIF ASHRAF
Senior Civil Engineer
kashif.ashraf@hes.scot



FRANTZESKA NANOPOULOU
Assistant Civil Engineer
frantzeska.nanopoulou@hes.scot

Historic Environment Scotland's team of civil and structural engineers carry out structural monitoring of the HES estate, among many other tasks. They observe and record any movement in our buildings, assess the significance and severity of what is being assessed, and decide on the urgency of any remedial works.

Monitoring methods range from the traditional to the high tech, and include:

Crack monitoring This uses steel studs fixed with resin at either side of a crack in stonework. Distance measurements are made between the studs using a digital calliper and then recorded. Monitoring takes place over a period of time to determine if the movement is ongoing or dormant.

Lean on walls or pillars

Traditionally, this is done with a 'plumb bob', but it's now common to use modern equipment such as a digital inclinometer, laser, tape or total station.

General deterioration Visual inspection is a simple but important monitoring tool. For example, regular visual inspections of the concrete pier at Inchcolm Island has determined the rate of deterioration and the need for intervention.

Structural monitoring is an important tool, often relied on to determine if and when intervention is required. Without this, it would be difficult to predict ongoing movement and the level of investment needed for repairs to ensure that the monuments are conserved for future generations.

Above left: Steel studs to monitor a stonework crack at Edinburgh Castle

Above right: The leaning perimeter wall at Duffus Castle



IT'S A GRAND ENTRANCE

Christa Gerdwilker on the care and attention given to the carvings above the east entrance of Linlithgow Palace



CHRISTA GERDWILKER
Stone Conservator
christa.gerdwilker@hes.scot

The intricate 15th-century east entrance to Linlithgow Palace boasts some of the finest carved details of its time

– it would have proclaimed the building's importance to visitors and passers-by. Over the summer and autumn of 2017, stone conservators from the Applied Conservation team spent time ensuring that the elaborate detailing is well preserved.

Scaffolding provided access for a rare close look at the rich detail of the ornament, and enabled conservators to install copper alloy banding and support brackets to a number of protruding elements to keep them securely fixed in situ. The conservators were assisted by the Melrose Monument Conservation Unit (MCU) in consolidating and pointing the fragile stonework.

Dr Sally Rush from Glasgow University took advantage of the high-level access to try to answer questions about the building sequence of the palace, and students on the Advanced Professional Diploma in Technical Building Conservation course were shown the work during their visit.

The project was a true collaborative effort involving the MCU, Science and Digital Documentation teams, with support from the Heritage and Interpretation teams, the Photography Unit and Visitor Services. Further work on the external east entrance is being planned.

Above: Stone Conservator Christa Gerdwilker injects unstable stonework with a resin during work to consolidate the elaborately carved ornament above the east entrance of Linlithgow Palace



CONSERVING MEDIEVAL WALL PAINTINGS

Ailsa Murray had the chance to help conserve an important painting scheme in Oxfordshire



AILSA MURRAY

Paintings Conservator
ailsa.murray@hes.scot

St Mary's, an early 14th-century church nestled in the small Oxfordshire village of Chalgrove, is home to one of the most complete surviving medieval wall painting schemes in England. I was invited to get involved in their conservation by fellow paintings conservator Madeleine Katkov, a specialist in medieval wall paintings. Historic Environment Scotland (HES) supported me in taking up this rare CPD opportunity to work on such an extensive site project.

The paintings at Chalgrove depict stories from the life of Christ and the Virgin Mary, in roughly 20 individual scenes arranged across three tiers. Fine incision lines are used in the main compositional elements, and scenes and figures are outlined in finely painted red ochre on a smooth, white lime plaster.

Medieval paintings are subtle and modest, but the quality and delicacy of the artists' skills at Chalgrove are unmistakable. The use of symbolism and colour helps viewers interpret each image, and the architectural space is used in interesting ways. Many of the images, particularly on the north wall, survive as fragments of colour and line like scattered pieces of a jigsaw.

Like many medieval painting schemes in England, the paintings were covered in layers of white limewash during the Reformation and weren't uncovered until 1858 by enthusiastic Victorian 'restorers'. Since then, they have been 'restored' several times, the most recent being in 1993. Key interventions included applying a wax over the painted surfaces to consolidate detached paint flakes and securing friable



areas of the plaster support.

The present conservation treatment focuses on condition recording, surface cleaning, grouting voids to stabilise the plaster and reintegrating previous surface repairs to unify the surface appearance. Some detailed line drawings were also made of selected images to help understand and interpret them better.

Above: General view of the painting scheme on the south wall with conservation work in progress

Inset: Detail of The Resurrection

COLLABORATING TO RESTORE RITCHIE

Damiana Magris explains how joint effort and innovative science helped restore a piece of maritime history



DAMIANA MAGRIS
Paintings Conservator
damiana.magris@hes.scot

The conservation of the 19th-century Portrait of Captain Archibald Ritchie is part of a major programme by Historic Environment Scotland (HES) to preserve and promote the maritime heritage of Leith, Edinburgh. The three-quarter-length portrait painted by Thomas L. Ritchie in 1865 is part of an exquisite collection of paintings at Trinity House in Leith. The graceful Georgian building was once the headquarters of the Incorporation of Mariners and Shipmasters, set up to support the welfare of local seafarers. The charity also collected and looked after paintings, ship models and other memorabilia for more than two centuries until 2001, when the building and its contents entered into the care of HES.

The Ritchie portrait was coated in discoloured oxidised varnish. In order to determine a suitable method for removing it, we carried out a series of preliminary investigations and analyses to document the artist's original technique and materials.

Removing the oil-resin varnish proved to be quite challenging. It is mainly comprised of linseed oil and pine resin, and was applied onto a 19th-century paint medium of similar composition. Tested and controlled methods such as resin soaps and solvent gels were only a partial solution.

The Centre for Colloid and Surface Science (GSCI), based



at the University of Florence, developed an innovative hydrogel cleaning agent specifically for this project. They adjusted one of the hydrogels from the Nanorestore Gel® brand formulation, capturing all the best qualities of traditional gels and other thickened liquids, such as their viscosity, to reduce the rate of penetration and evaporation of the volatile components.

The gel was modelled and cut to fit the area being

treated. It was applied onto the surface, then peeled off once the varnish had dissolved and migrated inside the gel. The gel's transparency and lack of colour enabled us to monitor the cleaning action directly.

Due to the intrinsic character of the oil-resin varnish, the gel peeled off only some of the components, so we used swabs imbibed with white spirit to remove the remaining residue.

Experts from various institutions shared their experience and expertise to secure the protection of this painting for future generations. We wish to thank Dr Brian Singer at the University of Northumbria, Newcastle, for help with the analysis, and Dr Emiliano Carretti, Professor Rodorico Giorgi and Professor Piero Baglioni at GSCI for their collaboration and development of the formulation.

Above right: Portrait of Captain Archibald Ritchie after conservation

Right: The hydrogel is clear before application (left) and lightly amber-toned after use



REPLICA TEMPLETON BRONZE

Stephen Gordon on creating a replica to safeguard a large bronze memorial



STEPHEN GORDON
Head of Applied
Conservation
stephen.gordon@hes.scot



This project was an opportunity to introduce stonemasonry apprentices to moulding and casting

The grand memorial to textile entrepreneur James Templeton (1802–1885), located on the southeast side of Glasgow Necropolis, comprises a large granite memorial with a bronze covering. The bronze, weighing around half a ton and measuring 2.5m x 1.7m x 0.15m, had been stolen and recovered from scrap dealers on several occasions.

The Friends of the Necropolis in conjunction with Glasgow City Council have been arranging for other smaller bronze memorials to be replaced with replicas, and asked Historic Environment Scotland (HES) whether its Applied Conservation team could tackle this large example.

Work began in winter 2016 after the bronze had arrived at

the HES conservation studios in South Gyle, Edinburgh. This project was an opportunity to introduce stonemasonry apprentices to moulding and casting, which is a technique widely used for documenting and protecting culturally significant artefacts.

We examined the bronze and set it on a specially fabricated timber frame before making preparations to commence moulding. This process involved brushing on multiple layers of modified silicone rubber over several days, taking great care to avoid air bubbles and other imperfections.

We built a glass fibre sectional 'mother' mould to support the rubber and reinforced it with a substantial timber frame – all designed to be easily removed from the original bronze.

After numerous trials with bronze powder, pigments and resin, we settled on a suitable finish for the replica. The cast was made from a specially prepared styrene resin mixed with real bronze powder and bronze pigments, and reinforced with two grades of glass fibre matting.

We built up the resin coats in numerous layers in the silicone mould, allowing each one to cure over several weeks to avoid distortion. Further aluminium and stainless steel reinforcing was bedded in a lightweight concrete to fill the inside of the replica. Its finished weight turned out to be slightly heavier than the original bronze.

The replica has been placed on the granite memorial in the Necropolis, while the original bronze is destined for a secure display indoors.

Clockwise from top left: The silicone mould being made; casting in progress; the replica bronze cover being lowered into position; the finished replica in position on the Templeton memorial



MELROSE STATUES RETURN

After more than 30 years in storage, four medieval statues are back on display at the Abbey, reports **Jill Van Millingen**



JILL VAN MILLINGEN
Collections Manager
jill.vanmillingen@hes.scot

Four medieval niche statues representing the Virgin Mary and the saints Peter, Paul and Andrew once adorned the walls of Melrose Abbey. Dated to the early 15th century and the rebuilding of the Abbey after its destruction by the armies of Richard II, the statues have suffered significant damage throughout their lives.

During the Scottish Reformation in the mid-16th century, they were defaced by angry Protestant mobs who considered them 'Popish' idols with no place in the Reformed Church. By the early 1980s, they were removed to prevent further weathering, which was eroding the sandstone and blurring the beautiful carved details.

After their removal, the statues underwent cleaning and conservation work. According to Head of Applied

Conservation Stephen Gordon, who worked on the statues in the 1980s, this consisted of removing old cement-based repairs using small hand tools. Unstable areas were consolidated with lime-based repair mortars and acrylic resin mortars were all colour matched to the stone. Fissuring and other areas of decay were treated by injecting weak acrylic resin to stabilise the surface.

Once the repairs were complete, moulds of the statues were taken so that resin replicas could be made for the empty niches in the Abbey.

The polyester resin copies were formed from these moulds using pigments throughout the resin to replicate the colour of the originals. These replicas can still be seen today in the niches high up on the Abbey walls.

Meanwhile, the originals were carefully stored to

preserve them until they could be returned to Melrose. Finally, in May 2017, as part of a re-display project involving different Historic Environment Scotland teams – Collections, Interpretation, the Monument Conservation Unit, Cultural Resources and Applied Conservation – the statues were installed in the Commendator's House Museum at the Abbey.

The project team, working with a design consultant, decided to display the statues high up on modern plinths so that visitors would look up at the figures as medieval pilgrims would have done centuries ago. The ecclesiastical purple chosen for the background offers a striking contrast to the statues' warm sandstone and the display makes a prominent scene as visitors enter the museum. It has drawn many positive comments from both visitors and staff.

Clockwise from top left: The original statues form a striking display at the museum; one of the replicas in a niche on the Abbey wall; a view of the Commendator's House Museum at Melrose Abbey

GOOD HOUSEKEEPING

The homely atmosphere comes at a price for objects at Arnol, while three other properties have enjoyed preventative conservation work, says **Lynsey Haworth**



LYNSEY HAWORTH
Regional
Collections Manager
lynsey.haworth@hes.scot

Arnol Blackhouse on the Isle of Lewis was inhabited until 1965, when it was taken into care. Today, time stands still in this traditional Hebridean property, presented as if the family still lived there.

The coastal location and atmospheric peat fire may be idyllic for visitors, but it presents a number of challenges for the Collections team, who manage the items on display inside the house. We undertook a review of these challenges to produce a collections care plan.

Peat smoke contains gases that can lead to the formation of acids in damp environments such as the blackhouse. The effects of this are particularly visible on the metalwork, which is often heavily corroded. We have previously used Kurust rust paint to treat some ironwork, but a more regular programme is required.



We found relative humidity in the house to be more than 80%, with many organic surfaces damp to the touch. Although biological growth does not appear to be an issue, this moisture causes dust and soot to stick to surfaces, making it difficult to remove. We also found salt deposits in several areas.

The review will be used to inform better planning and allocation of resources for the care of collections at this property, and ensure an

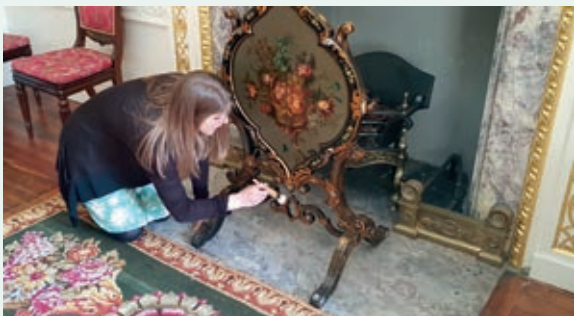


appropriate balance between providing a meaningful experience for visitors while maintaining the long-term conservation of the objects and materials.

Above right: The living room at Arnol Blackhouse

Inset: A heavily corroded iron kettle on display in the house

BEETLES, BLINDS AND BRUSHES



Lynsey Haworth on preventative conservation at three properties

The Collections Unit runs an annual preventive conservation programme to slow down and halt deterioration to the objects in care. It focuses on

recording and managing the environmental influences that can cause harm to historic artefacts.

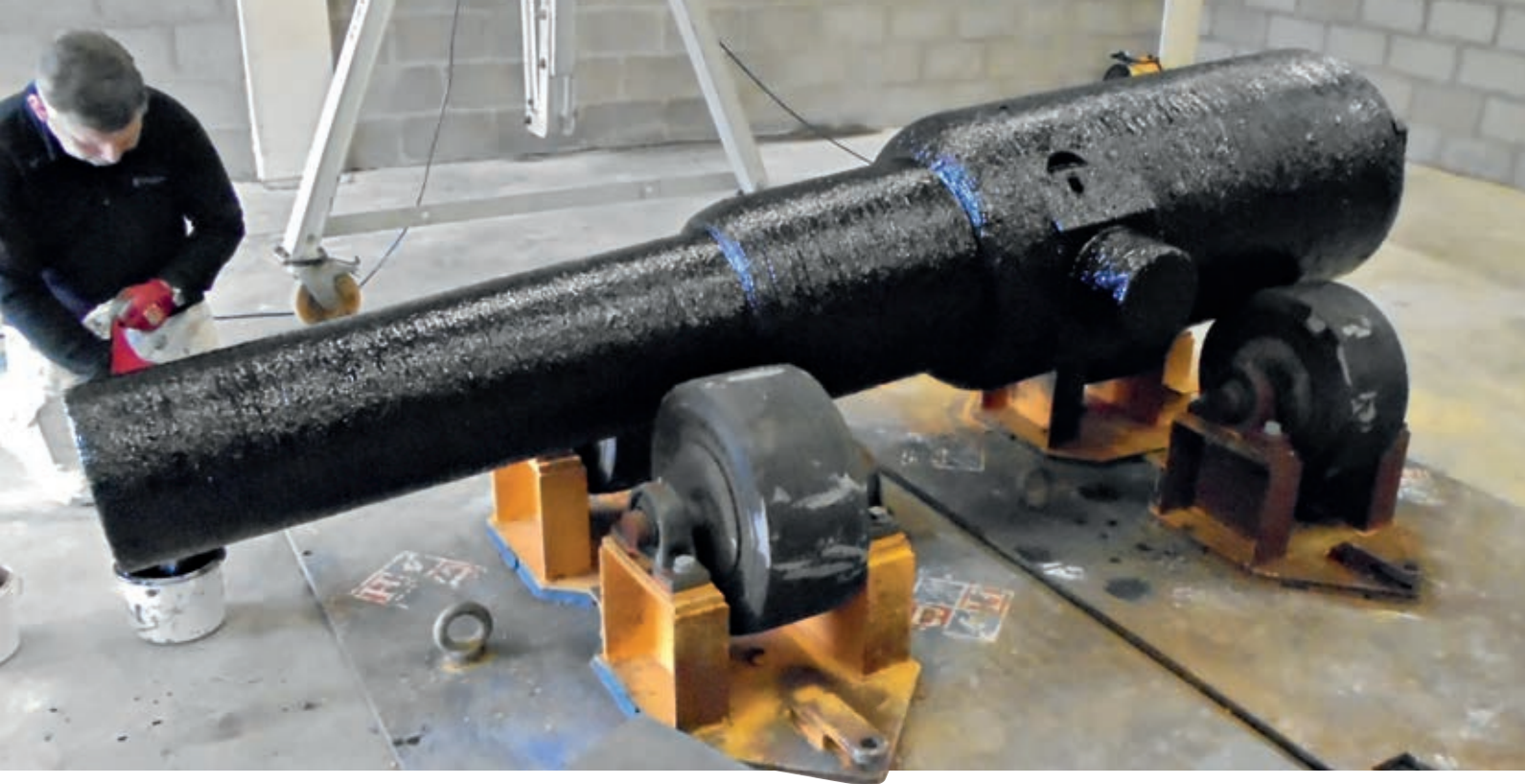
In February, the entire contents of the Fort George barracks were removed to be treated for an active furniture beetle problem. The items were placed in a freezer unit at -30°C for two weeks to kill off all stages of the beetle's life cycle. The room was also treated with a water-based insecticide called Constrain, which is commonly used in the museum sector.

Blackout blinds were installed in the Abbot's House at Arbroath Abbey to

preserve the sculpture and artworks on display. The double blind system uses Vision Fabric, which enables visitors to continue enjoying the view while limiting harmful light. Secondary blackout blinds are drawn after closing time.

Early in the summer, members of the team visited Duff House to assess the collection's housekeeping needs. The property boasts nearly 4,000 objects, all with different cleaning and maintenance requirements. A housekeeping plan and staff training are currently being developed.

Above: Collections staff carry out some light dusting during the visit to Duff House



CANNON CONSERVATION IS A TEAM EFFORT

Hoy's Hackness Cannon is looking spick and span, thanks to an interdepartmental project team, as **Rona Walker** explains



RONA WALKER
National
Collections Manager
rona.walker@hes.scot

A three-year adventure for the Hackness Cannon came to an end in July 2017 when it was hoisted back to its position on top of the Hackness Martello Tower on the island of Hoy, Orkney.

The cannon, not original to the tower, is a 64-pounder Armstrong gun from the late 19th century. It was found in the Caledonian Canal and installed at Hackness in 1996 on a wooden carriage (made by the then Historic Scotland joiners) on the original 1886 circular floor track. Increased corrosion of the metal elements of the carriage had become a safety risk, so a conservation project team was formed to strip back, conserve and repaint both the cannon and the carriage.

The Collections Unit, with the help of site colleagues, regularly monitor the condition of all the artillery in their care across the Historic Environment Scotland (HES) estate. This is the third of



three large artillery conservation projects the Collections Unit has managed recently, but all credit sits with the tremendous interdepartmental project team.

To use and further develop our in-house skills, we moved the cannon and carriage to Fort George - no mean feat - with the carriage subsequently spending time in Edinburgh. The project could not have succeeded without the expert input from members of the Monument Conservation Units at Orkney, Fort George, Elgin and Edinburgh, and the work of external conservators from AOC Archaeology.

The conservation of the cannon was challenging due

to its poor condition, partly resulting from its chequered past. Initial paint stripping trials discovered a historic filler material embedded in the cannon's ridged iron surface, identified by analysis as linseed oil, clay and rosin putty. Removing the filler to ensure future stability of the cannon required the development of a specific conservation methodology.

A Doff low-pressure superheated steam-cleaning system successfully removed the paint layers and historic filler without causing damage to the cannon's surface. The cannon was then dried out and the surface chemically stabilised prior to painting with a robust three-tiered paint system that HES, in conjunction with the Royal Armouries, developed specifically for cannons.

With regular monitoring and maintenance, the intention is that the cannon will not need another such adventure for a long time to come, even with the notorious Orkney weather!

Above: Finishing touches are made to the final paint layer

Inset: The cannon before conservation, showing corrosion and flaking paint layers

WORKING TOGETHER TO ADAPT TO CLIMATE CHANGE

Carsten Hermann introduces a new international project, led by Historic Environment Scotland (HES), to prepare for the impacts of climate change on heritage in northern Europe



CARSTEN HERMANN
Senior Technical Officer
carsten.hermann@hes.scot

Climate change is threatening our historic environment. A drastic example was the swelling of the river Dee in 2016. The swift-flowing water destroyed the historic masonry bridge to Abergeldie Castle, Aberdeenshire. The castle only narrowly escaped collapsing into the deluge of water, which had washed away large chunks of the embankment. Both the bridge and the castle are listed.

Natural hazards such as fluvial flooding are not new, but their frequency and intensity is increasing due to climate change. We are already assessing the risks of such hazards to our own estate of historic places, as David Harkin reports on page 28. To complement this, in June 2017, we started a three-year project, Adapt Northern Heritage, with partners from across northern Europe.

Working with our counterparts in Iceland and Norway – Minjastofnun Íslands and Riksantikvaren – and the Norwegian Institute for Cultural Heritage Research, we are developing tools and guidance to better understand the likely impacts of climate change on historic places, and to help protect them from these impacts.

THE PROJECT IN NUMBERS

3 years
June 2017 to May 2020

€1 million budget
including €360,000 for HES

4 project partners
led by HES

11 associated partners
two from Scotland

6 countries
including three EU states

10 case study sites
two in Scotland



In addition to natural hazards, the project will also investigate the more subtle impacts of a changing climate. A rise in mean temperature could bring more beetle attacks on historic materials, a growing problem at the 18th-century farmstead of Otternes in Norway.

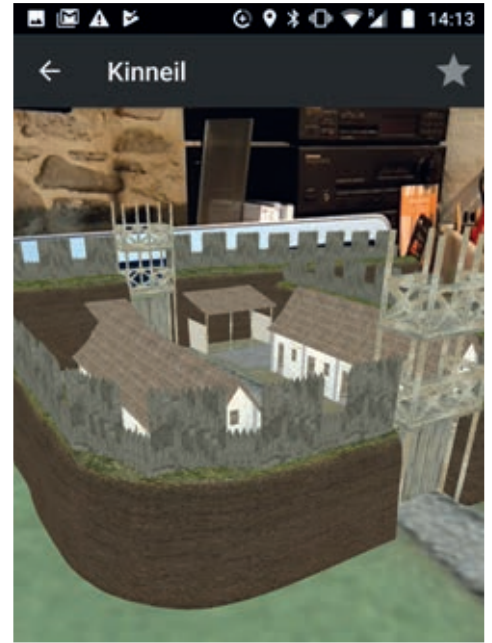
Increased precipitation combined with strong winds is causing lime mortar to be washed out of the walls of Threave Castle in Dumfries and Galloway. The loss of permafrost is destabilising the historic wooden cableways near Longyearbyen, Svalbard, once used to transport coal

from the mines of Spitsbergen to the coast.

With the support of 11 associated partners, we will use, as case studies, these three sites and another seven historic places in Iceland, Ireland, Norway, Russia, Scotland and Sweden to help develop, test and demonstrate our new tools and guidance.

With funding from the European Union, Iceland and Norway (through the Interreg programme for the Northern Periphery and Arctic), as well as from the four project partners, we can enhance our expertise in climate change adaptation. Unlike the hazard mapping of our own estate, Adapt Northern Heritage focuses on working with the communities involved in looking after historic places. We will start in late 2018 a series of round-table events to provide an easy way for interested communities to engage with climate change and its impacts on their historic places. Working together, we will plan how to protect them against climate change for future generations to enjoy.

Below: The historic Otternes farmstead in Norway is suffering increasing beetle attacks, possibly due to rising temperatures
© Riksantikvaren/
Marte Boro



ROMAN HISTORY COMES TO LIFE

Patricia Weeks and **Carsten Hermann** explain how a new augmented-reality app for smartphones will enhance visitors' experience of the Antonine Wall



PATRICIA WEEKS
Antonine Wall World
Heritage Coordinator
patricia.weeks@hes.scot



CARSTEN HERMANN
Senior Technical Officer
carsten.hermann@hes.scot

Imagine standing on a hillside looking across the ruins of the Roman fort at Bar Hill. A series of low stone walls are all that remain today of this once magnificent fortification on the Antonine Wall, the Roman Empire's north-western border. As a visitor to the site, you might decide to use your smartphone to search for information about Roman life on the frontier. Imagine seeing a virtual reconstruction of the fort, overlaid on the existing physical remains, appear on your mobile phone's camera.

Creating such advanced visualisation is the aim of Advanced Limes Applications, a three-year project supported by the European Union's Creative Europe programme. Since 2016, Historic Environment Scotland has been leading a partnership involving Austrian, German and Scottish specialists to improve on a smartphone platform that was originally developed for Roman frontier sites in Bavaria.

Although simple text, photo and video content is already available in the

Android and iOS versions of the Antonine Wall app, we are now working on integrating augmented and virtual realities. After downloading the app, visitors can view a 360° reconstruction while standing at the site, or try 'handling' virtual 3D models of artefacts discovered along the Antonine Wall and now on display in Glasgow's Hunterian Museum.

Our next step is augmented reality. We are working on overlaying building reconstructions onto the camera image so that visitors can experience Roman sites as never before.

Working with a reconstruction of the fortlet at Kinneil, we are using target images, such as illustrations on interpretation boards, to trigger the display of virtual reconstructions as augmented reality. However, our longer-term aim is to develop the smartphone app so that it recognises landscape elements, such as the masonry in the ground of Bar Hill, to trigger the models automatically.

The augmented-reality feature will be fully available in the app in late spring 2018, along with a gallery tour of objects in the Hunterian Museum.

ABOUT THE PROJECT

Lead partner: Historic Environment Scotland

Project partners: Bavarian State Office for Monument Care (Germany), Centre for Digital Documentation and Visualisation (UK), edufilm und medien GmbH (Austria)

Principal funder: European Union's Creative Europe programme

Project period: 2016–2019

Websites and app download: www.alapp.eu and www.antoninewall.org

Above left: Viewing a reconstruction of Bar Hill fort via the new smartphone app during a visit to the Antonine Wall

Above right: Augmented-reality reconstruction of the Roman fortlet at Kinneil

ON THE FRONTLINE OF ENVIRONMENTAL CHANGE

David Harkin introduces the results of an initial climate change risk assessment and what it reveals about properties such as Kilchurn Castle



DAVID HARKIN

Climate Change Scientist
david.harkin@hes.scot

Below: Kilchurn Castle is a fixture of the Loch Awe landscape

Over the past two years, Historic Environment Scotland (HES) has been working towards completing an initial assessment of climate change risk to its Properties in Care (PiCs). Results of this initial assessment, conducted in partnership with the British Geological Survey and the Scottish Environment Protection Agency, will be published very soon and our focus now shifts towards more detailed, site-by-site

analysis of climate change related risk.

This process not only involves considering future changes to our climate, but also investigating what environmental changes our sites have experienced in the past. Many of the properties HES cares for have been enduring fixtures in their settings for millennia and can provide clues to what the impacts of future climate change may be.

Kilchurn Castle has been a fixture of the Loch Awe landscape since the mid-15th century. Various phases of expansion occurred until the end of the 17th century, and

by the end of the 18th century the castle was abandoned, unroofed and left exposed to the unforgiving climate of the west of Scotland.

Once only accessible by boat, the castle was originally constructed on a rocky knoll surrounded by the waters of Loch Awe. However, visitors to the site today can reach the castle ruins on foot. This change in access was a result of a drainage project on Loch Awe in 1817 to clear the main outflow of the loch, which lowered the water level.

This connected the mound on which the castle stands to the mainland. Today, the ground around the castle is predominantly marshy and, as identified in our climate



change risk assessment, highly susceptible to flooding.

The risk posed to sites such as Kilchurn Castle from flooding is reduced by their historic design and position in the landscape. They are inherently resilient to this

RISK ASSESSMENT IN NUMBERS

352

sites assessed for natural hazard risk from six different hazards: flooding (fluvial, pluvial, coastal and groundwater), coastal erosion and slope instability

53%

of sites at 'high' or 'very high' risk from one or more of the six hazards investigated

28

sites record 'very high' levels of risk in one or more of the six hazards investigated

45%

of HES's Properties in Care located within 100 metres of a river/stream course

15%

of HES's Properties in Care located within 50 metres of the coastline; 8% within 10 metres

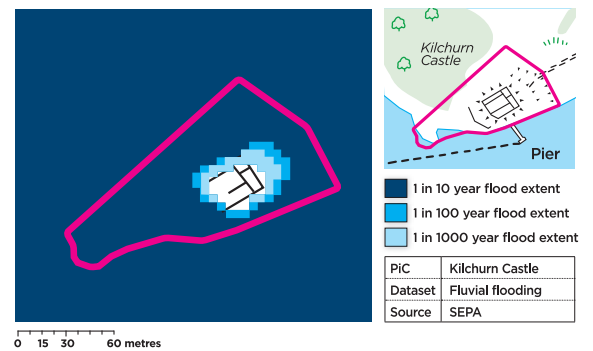
hazard. Our ancestors would have selected this particular site for constructing Kilchurn for many reasons, such as its advantageous natural defence capabilities and transport links. In a wider context, this demonstrates the acute ability of our ancestors to select sensible locations to build on. The legacy of this is that Kilchurn should always remain high and dry, out of reach of potentially damaging flood waters.

Climate change is increasing the amount of rainfall in Scotland. Since the 1960s, average annual rainfall has increased by approximately 20%. Looking ahead, seasonal variations in rainfall are predicted to become increasingly distinct, with winters becoming wetter and summers drier, but with more intense, shorter periods of rainfall.

This will alter the occurrence rates and severity of flooding at sites such as Kilchurn Castle and throughout Scotland. While Kilchurn Castle itself should remain safe from floodwater, access to the site for visitors will become increasingly disrupted and the way in which we manage visitors and their expectations will have to be addressed.

Aside from large-scale environmental impacts of climate change, smaller-scale changes will affect properties, regardless of their position

KILCHURN CASTLE FLUVIAL FLOODING RISK



OUR CHANGING CLIMATE SINCE THE 1960s



21% more rain a year on average



1°C rise in temperature



3mm sea level rise per year*

*and speeding up

in the landscape. For example, increasing amounts of rainfall will result in the accelerated deterioration of exposed stonework, with rates of decay expected to increase exponentially, particularly at sites such as Kilchurn, where the lack of roof has reduced the protection offered to masonry.

Understanding the way our PiCs interact with all these different scales of change associated with climate change will be crucial to the ongoing conservation and preservation of Scotland's historically and culturally significant monuments.

Top: Kilchurn Castle's inherent resilience to flooding is a testament to our ancestors' ability to select sensible locations to build on

Above: Fluvial flooding risk map for Kilchurn Castle. Note how the castle remains unaffected by the predicted extent of flood waters during a 1 in 10, 1 in 100 and 1 in 1000 year flood

© NERC



GREEN AMBITION

Green Champions are helping to turn Historic Environment Scotland into a truly sustainable organisation, as **Katie Carter** explains



KATIE CARTER
Sustainability Officer
katherine.carter@hes.scot

Sustainability and a commitment to addressing the impacts of climate change are at the heart of the Historic Environment Scotland (HES) ethos. The Scottish Government has set some of the most ambitious carbon emissions reduction targets in the world and, as a lead public body, HES is striving to be just as ambitious.

To this end, we have been re-evaluating working practices to save energy, reduce waste and improve biodiversity across our estate. We launched a new Carbon Management Plan in 2017, and created a new Circular Economy Project Officer position to help drive reduction of our emissions, reduce costs and improve resource efficiency.

Our internal network of more than 100 Green Champions is integral to harnessing the potential for improvement and supporting changes across our operations. They are leading some superb initiatives to transform our organisation from within so that we are fit for the future.

Top: View of Inchcolm island and its abbey





ISLAND LIFE

Catriona Patience, Inchcolm Residential Custodian

Set in the Firth of Forth, Inchcolm is home to a 12th-century abbey, wartime fortifications and many thousands of birds. I have been one of its Residential Custodians for two years, living on the island from March to October surrounded by rich biodiversity. The experience has opened my eyes to environmental issues and motivated me to become an HES Green Champion.

Our days here are dictated by natural rhythms: the changing tides, weather, seasons and wildlife. In spring, the island is teeming with eider ducks and greylag geese. Then come the gulls and oystercatchers, with shags and puffins nesting on the west end of the island and seals on the rocky outcrops.

Swallows build their nests in the old gun batteries, the well-house, the garden shed and even the hatch to the Bell Tower. On summer evenings, young swallows can be seen

sitting on ledges in the cloister practising their flying while bats swoop in the garden.

Working on an island site such as Inchcolm brings particular challenges when it comes to dealing with waste and implementing recycling. However, being a member of the HES Green Champions network gives me the opportunity to share my experiences with others and influence HES's approach to dealing with this difficult issue.

Last year, the Engine Shed hosted the Green Champions Conference, at which 120 Green Champions met to discuss current issues, not only at HES properties but also across the country. The line-up of speakers represented a range of organisations, from the Scottish Government and the British Geological Survey to Changeworks and Home Energy Scotland. All this will help improve our approach and working practices across the HES estate.

BORDERS BIODIVERSITY

Scott Barden, Steward, Smailholm Tower

Down here in the Borders, HES has been busy creating wildlife havens for the many plants, insects and other animals that live at its sites. One highlight is Dryburgh Abbey, where a wildflower area is taking shape, helped along by a cracking team, including Head Gardener Mark Gillie, Grounds Maintenance staff Colin Angus, Gary Thorburn and Davie Ormiston, helper Alan Miller and myself.

With at least 23 species being planted, including field poppy, wild carrot, corn cockle, cornflower, musk mallow, bluebell, common vetch and ragged robin, we hope to have very colourful abbey grounds in 2018. The flowering plants will hopefully attract bees and other insects and wildlife that will benefit the site and its surroundings. Creating a poppy area at Dryburgh has been more of a challenge. Two past attempts didn't go well, but we hope to try for a third time this year.

At Melrose Abbey, Mark Gillie and others have been working on a sensory garden and 'wild' area. Here, we are also germinating seeds in greenhouses that, when ready, are taken to be planted in the herb garden at Jedburgh and also sold in the shop.

A new compost area at Dryburgh Abbey, inspired by the 'eco oasis' created by Lesley Peebles-Brown at Seton Collegiate Church, has already helped HES save in costs, labour and travel emissions, and we hope soon every HES site will have access to a compost area.

I have been working on surveying the wildlife at Dryburgh over the last two years. With the help of Andrew Burnett and the Interpretation team, advice from Ranger Matt McCabe and my own artistic skills, I have recently translated this into a visitors' wildlife-spotting activity new for 2017. A three-year wildlife survey and wildlife spotting activity is also underway at Smailholm Tower.

I hope to expand these projects in the coming years.

Above: Head Gardener Mark Gillie plants wildflower seeds at Dryburgh Abbey

Left: Catriona Patience took this picture of young swallows stretching their wings at Inchcolm Abbey

Left inset: Scott Barden's wildlife spotter for Smailholm Tower

Top right: Wildflower meadow in the making at Dryburgh Abbey

CAPTURING OUR PROPERTIES IN 3D

The Rae Project to digitally document properties and collections is making impressive progress, says **Dr Lyn Wilson**



DR LYN WILSON
Digital Documentation
Manager
lyn.wilson@hes.scot

The Rae Project is working to digitally document all 336 properties and their associated collections that Historic Environment Scotland (HES) cares for across the country. These range from mighty Edinburgh Castle to tiny, traditionally built Sunnybrae Cottage in Pitlochry, and from the expanse of Holyrood Park to the elegantly carved Kildalton Cross on Islay.

There are also some 40,000 collections items including the Crown Jewels and the Stone of Destiny.

This year, we have made great progress. We have been digitally documenting well-known sites, including Bothwell Castle, Links of Noltland's Neolithic and Bronze Age settlements on Westray in Orkney, and some lesser-known gems such as Tealing Dovecot in Angus. To date, we have almost 30% of our properties documented in 3D.

We named our project after Dr John Rae, the Orkney-born doctor and surveyor who discovered the Northwest Passage in Canada and reported on the fate of the Franklin Expedition. In doing so, we hope to raise awareness of this pioneer and his incredible achievements in exploration. Our techniques include laser scanning, digital photogrammetry and other appropriate digital capture methods to provide accurate 3D geometric data for each site, building or object.

The data contributes to a range of conservation initiatives to help us better protect and manage the historic environment. For example, we can measure the impact of coastal erosion at a range of sites – at Skara Brae in Orkney we use the data we collect to proactively monitor the coastline.

While conservation is the primary purpose, the Rae Project data is also being used for many other applications. We can develop the data for educational use, such as creating 3D-printed handling kits of sculptured stones that are too delicate to hold, and explaining the complex history of a castle through 3D visualisations of each period in its history.

The data can also help improve accessibility and provide access to remote sites. We recently released a free app for Maeshowe chambered cairn in Orkney.

Accessing this tomb via the long, low passageway can be difficult for some of our visitors, and we often have so many at the same time that they can't all safely enter the tomb.

The app, developed from accurate laser scan data and high-resolution photography, offers a virtual tour of this amazing place from anywhere in the world and is available for free on Apple and Google Play stores. We're also increasing accessibility to our collections and sites by sharing our 3D models online through the Sketchfab website – think of it as 'YouTube for 3D data'.

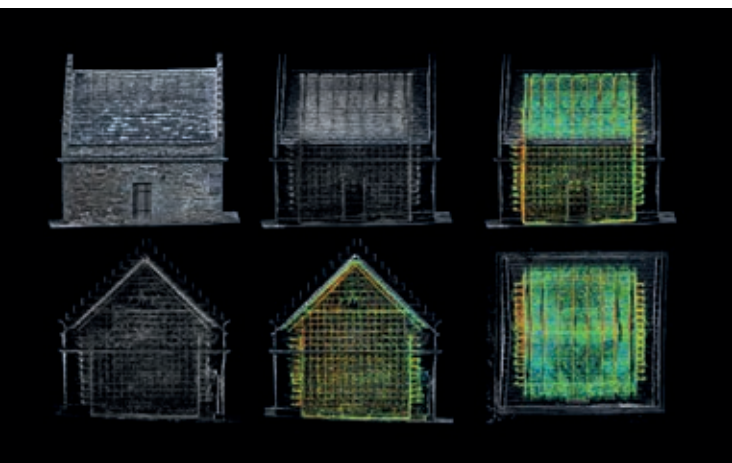
The Rae Project data provides a rich resource for research. We have spent time in Shetland digitally documenting Mousa Broch with our PhD student, Li Sou, based at the University of Bradford. Mousa is the best-preserved Iron Age dwelling of its kind anywhere in the world, and Li's research will examine the power of 3D data to better understand its conservation history and investigate new interpretations of Iron Age sites across Shetland.

The digital technologies and software used in the Rae Project are constantly evolving. Staying at the cutting edge is critical to maximising the potential of the data, and we are now exploring digital innovations such as 360° sound to create

Below: Point cloud image blend from Bothwell Castle with one of the laser scanners



We have recorded almost 30% of HES properties and a large number of collections objects, but we have a busy few years ahead



immersive virtual reality and mixed-reality experiences.

In 2017, we moved into our new home at the Engine Shed, which we use as a testbed for research and development, and to explore the best ways to apply digital technologies for conservation and learning.

We have recorded almost 30% of HES properties and a large number of collections objects, but we have a busy few years ahead. Delivering the Rae Project is undoubtedly an enormous challenge, but we are lucky to have a talented and passionate team who are dedicated to making it a success.

MORE INFORMATION

Follow progress on Twitter @Scottish3D, #RaeProject, and for more about the Digital Documentation team, visit www.engineshed.scot

Top: Laser scanning inside Mousa Broch, Shetland, for both the Rae Project and Li Sou's PhD research
© Dr Andrew Wilson, University of Bradford

Above: Different point cloud views of Tealing Dovecot showing the interior and exterior of the building – one of the first laser scanning projects processed by our Digital Documentation Intern, Marta Pilarska

Above right: Rosie Brigham captures images during a field trip to Machrie Moor. Her information sign can be seen in front of her



CROWDSOURCING CONSERVATION

Dr Lyn Wilson explains how citizen science can be used to monitor heritage sites

Research is at the heart of our digital documentation programme and heritage science underpins our approach to the Rae Project. We recently undertook pilot research with Rosie Brigham, MRes SEAHA student at the University College London Institute for Sustainable Heritage, to investigate the potential of crowdsourcing to help us monitor the condition of heritage sites.

Crowdsourcing is an increasingly popular and successful method of collecting and analysing large quantities of data for 'citizen science' projects, whereby members of the public can voluntarily participate in scientific research and contribute data for analysis.

In the heritage sector, crowdsourcing has been used to collect photographs

to digitally reconstruct lost heritage – the international project called Rekrei (www.rekrei.org) is a great example of this. Our aim was to scope out the potential of crowdsourced photographs to provide reliable measurements and information to help us in our conservation efforts.

We trialled the technique at two very different heritage sites: the fountain at Holyrood Palace in Edinburgh and the remote standing stones at Machrie Moor on Arran. The data collected helped with tracking qualitative changes at the sites, and social media was effective in encouraging public participation. With plans for further research in this area, we hope that crowdsourcing will directly help to conserve our historic environment.



DOCUMENTING THE GREAT POLISH MAP

Marta Pilarska discovers Scotland's links to her homeland while documenting an unusual site



MARTA PILARSKA
Digital
Documentation Intern
marta.pilarska@hes.scot

Twenty miles south of Edinburgh, just outside the village of Eddleston in the Scottish Borders, sits an unusual landmark: a large-scale concrete model of the Scottish mainland and the Western Isles. This 40m x 50m outdoor structure was created in the 1970s by Poles living in Scotland as a tribute to the Scots' hospitality after the Second World War. It has become a symbol of an enduring relationship between Scotland and Poland.

When the Scottish Government asked the Historic Environment Scotland (HES) Digital Documentation team to scan the Great Polish Map, I was very excited, as I am from Poland myself. I didn't expect to work on a project celebrating my homeland's heritage, not to mention how it relates to the heritage of Scotland, the country I call home.

The aim of the project was to document the map in 3D and use this to create an

interactive application for the centenary of Polish independence in 2018. The generated data will serve as a record for conservation and monitoring purposes of this B-listed heritage site.

A dense point cloud, obtained through laser scanning and photogrammetry, was used to create a photorealistic 3D model, which then served as a backdrop for annotations representing Scottish-Polish links, some of which included oral histories and archival footage and imagery.

HES worked closely with Mapa Scotland, a group of volunteers who have been restoring the physical model, and Polish Scottish Heritage, which has been raising awareness of the historical and cultural links between the two nations. Together, we were able to gather an outstanding amount of information.

Being involved in this project gave me new insights into my nation's heritage. I found out that the last king

of Poland had Stuart blood in his veins and, similarly, the Scottish royal bloodline had Polish links. The relationship between Scotland and Poland has lasted for hundreds of years, and was first established in the 1400s when more than 40,000 Scottish families moved to Poland to seize promising business opportunities. 'Scotland's America' is how Poland was described by affluent 17th-century Scottish merchants.

Most importantly, I had a chance to hear heart-warming stories from the Second World War and later, when the two nations supported each other and connected through historical and cultural links.

These links, many shown in the final animation, are rooted in both nations' identities and I am glad that this project enabled me to explore how much we have in common.

MORE INFORMATION

The app is at www.sketchfab.com/HistoricEnvironmentScotland soon

Above: The Digital Documentation team on site at the Great Polish Map of Scotland

NEW FACE OF DIGITAL INNOVATION

Al Rawlinson explains how his new role at Historic Environment Scotland supports a cutting-edge approach to digital technology



AL RAWLINSON
Head of Digital
Innovation and Learning
al.rawlinson@hes.scot

Based at the Engine Shed, my new role at Historic Environment Scotland (HES) started in summer 2017, when the centre opened. The presence of familiar faces made me feel right at home: I came from Glasgow School of Art, where I'd worked closely with HES for eight years on a partnership venture, the Centre for Digital Documentation and Visualisation (CDDV).

This new post, Head of Digital Innovation and Learning, is wide ranging and brings together many different strands. Although my focus is on working with the Digital Documentation and Science teams, it's also important that I liaise with the Technical Outreach and Education teams to generate content for the public. This could include anything from traditional online offerings, mobile apps and tablet-based content to mixed and augmented reality applications.

More broadly, I work alongside different areas within HES to develop digital

delivery for a range of projects. I'm also keeping an eye on the rise of new technologies and investigating how the organisation can put these to use, whether that be on the public outreach side or in staff development, training, and health and safety. There is often a crossover between these areas, so I look at how we can join the dots and maximise the opportunities that new digital technologies can bring.

This year, we have a number of exciting initiatives on the go. We're undertaking visualisation at the Heart of Neolithic Orkney World Heritage Site, from which we'll develop virtual reality and online 3D models of the Ring of Brodgar and Stones of Stenness, which will enhance the visitor experience both at the site and online.

Other significant ongoing projects for 2018 include scanning and 3D visualisation of Edinburgh Castle, and visualisation work at Stirling Castle. The latter is really exciting, and will deliver cutting-edge, explorable models to assist in the

conservation and management of the castle.

Together, HES and CDDV have been scanning the three Forth bridges to develop innovative, interactive resource packs for primary schools. There will be educational computer games and lesson plans around programming and 3D modelling suitable for primary school children. This year will see the culmination of this two-year project.

There's no such thing as a typical working day for me. I could be in front of my computer manipulating datasets, in the lab doing 3D printing, or out and about helping the Digital Documentation team with survey fieldwork. I often sit down with teams across the organisation to discuss the possibilities that digital technology offers for their projects.

Within the heritage sector internationally, HES is seen as a leader in implementing new technology for conservation, science and asset management. I'm proud to be part of that.

Above left: Al Rawlinson undertaking 3D scanning of the Forth Bridge as a member of the CDDV team in 2013

Above right: Demonstrating 3D scanning technology to school children at Claypotts Castle

FUTURE-PROOFING FOSSIL GROVE

A joint scientific investigation is supporting the conservation of Glasgow's hidden geological gem, explain **Sarah Hamilton**, **Dr Lyn Wilson** and **James Hepher**



SARAH HAMILTON
Conservation Scientist
sarah.hamilton@hes.scot



DR LYN WILSON
Digital Documentation
Manager
lyn.wilson@hes.scot



JAMES HEPHER
Surveyor and
Spatial Analyst
james.hepber@hes.scot

Above: Lyn Wilson
laser scanning the
fossilised tree stumps

Tucked away in a quiet corner of Glasgow's Victoria Park lies a hidden geological gem, Fossil Grove. Discovered during landscaping of the park in 1887, the site contains the beautifully preserved casts of 325-million-year-old Carboniferous lycopod tree stumps and their stigmarian root systems.

Recognised at the time as a site of great interest and importance, the Victorian city fathers chose to encapsulate the site within a building as a visitor attraction rather than send the fossils to a museum. Thanks to this foresight, Fossil Grove is the only site in the world where these trees have been preserved in their growth positions and is considered one of the first examples of geoconservation.

However, in recent years, the much modified Victorian building has started to suffer from water penetration, leading to the discolouration and decay of some areas of the fossil exhibits. Working in



partnership with Scottish Natural Heritage and Fossil Grove Trust, Historic Environment Scotland (HES) offered the services and expertise of its Digital Documentation and Conservation Science teams to undertake a 3D laser scan and mineralogical analysis at the site.

We hope our work will help inform recommendations for

improving both the fabric of the building and its environmental conditions to ensure the continued preservation of this fascinating site for future generations.

MORE INFORMATION

Find out more about the Conservation Science and Digital Documentation teams at www.engineshed.scot/about-us/teams

NOW FOR THE SCIENCE BIT

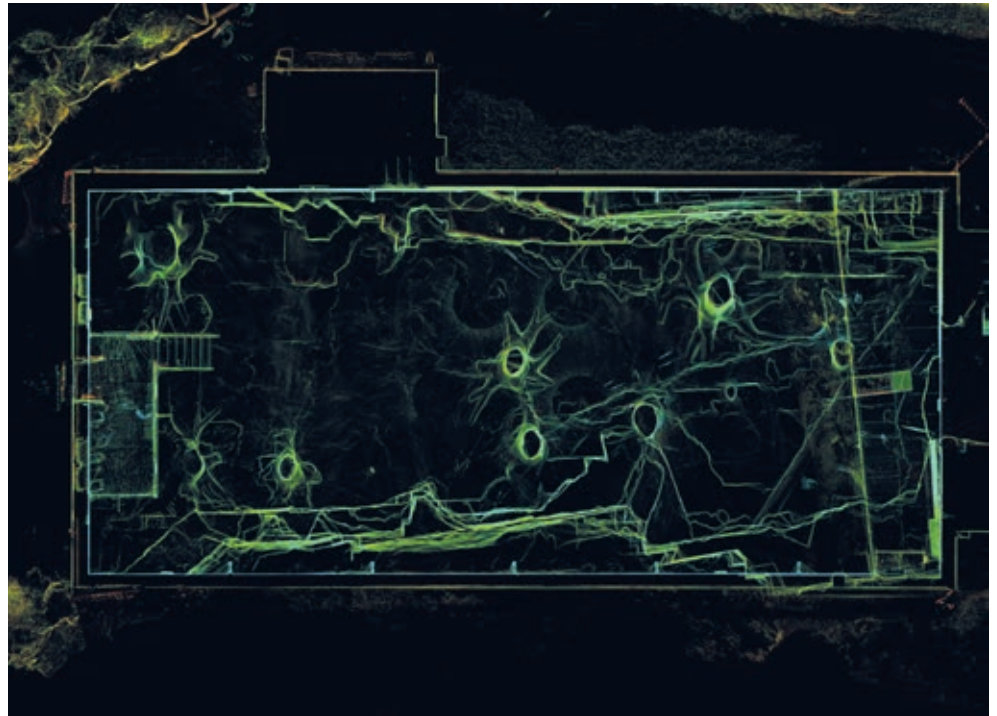
The Conservation Science team used X-ray diffraction to analyse the mineralogical composition of the main rock types found at Fossil Grove and identify the salt growths causing discolouration of some of the rock surfaces.

Only tiny quantities of material are required for this type of analysis – loose fragments of rock were used, which meant that there was no further damage to the fossil exhibits.

Our work is ongoing, but by identifying the salts present at the site, we hope to assess where they may have come from, their damage potential and suitable methods for their removal from the rock surface.

Fossil Grove Trust has also started permanent monitoring of temperature and relative humidity conditions within the fossil house.

Armed with this data plus some supplementary sampling and analysis, our next step will be to undertake



computer modelling of the salt mixtures present.

This will help us to understand the range of salts that could form under varying environmental conditions and will ultimately enable us to determine the optimal environmental conditions required to best manage future salt growth.

Above: A point cloud plan view of the fossilised tree stumps inside the Victorian building

Below: James Hepher laser scanning around the exterior of the Victorian building

Left: A perspective point cloud view through the building across the fossilised tree stump area

THE DIGITAL PICTURE

The HES Digital Documentation team visited Fossil Grove armed with two laser scanners: a survey-grade Leica Geosystems ScanStation P40 scanner to undertake a traverse around the outside of the building, and a lightweight Faro X350 scanner for the interior and for scanning the fossils up close. The two scanners had overlapping areas at the building's doorways, allowing the exterior and interior scans to be joined together to give us one overall 3D point cloud.

Part of our team's role is to support HES partners, so we were delighted to help with the gem that is Fossil Grove.

We hope the scientific analysis and 3D records will be of practical use in the conservation process, as well as supporting future management and interpretation.



SECRETS OF THE SKELMORLIE MORT HELM

The Conservation Science team has analysed a mort helm from Skelmorlie Aisle to help determine its origin, explain **Colin Muir** and **Dr Maureen Young**



COLIN MUIR
Stone Conservator
colin.muir@hes.scot



DR MAUREEN YOUNG
Conservation Scientist
maureen.young@hes.scot

Skelmorlie Aisle, in Largs on Scotland's west coast, is a mid-17th century burial aisle

containing a Renaissance-style monument built by Sir Robert Montgomerie in 1636 in memory of his wife, Dame Margaret Douglas. The mort helm (funerary helmet) associated with the monument is quite an unusual artefact and its history is unclear.

An 1886 illustration in *Castellated and Domestic Architecture of Scotland, Vol III* shows a helmet hanging high on the left wall, although it does not exactly resemble the current helm. A Ministry of Works photograph from 1954 shows the present helmet placed on the Montgomerie tomb.

Recently, the mort helm, currently in the care of the Collections team, was 3D imaged as part of the Rae Project (see page 32). To record its current condition and aid analysis of its structure, the helm was scanned with a structured light scanner, providing a true colour 3D model with a resolution of approximately 0.5mm.

The Skelmorlie helm is a decorative rather than functional object: the hinged visor does not open and the small neck diameter would have made it impossible to wear. It also lacks the overlapping plates and riveting typical of traditional European armour.

It is constructed of 18 parts, some held together at rolled edges, others soldered. The metal is only about 0.8mm thick – much thinner than typical armour. There are four

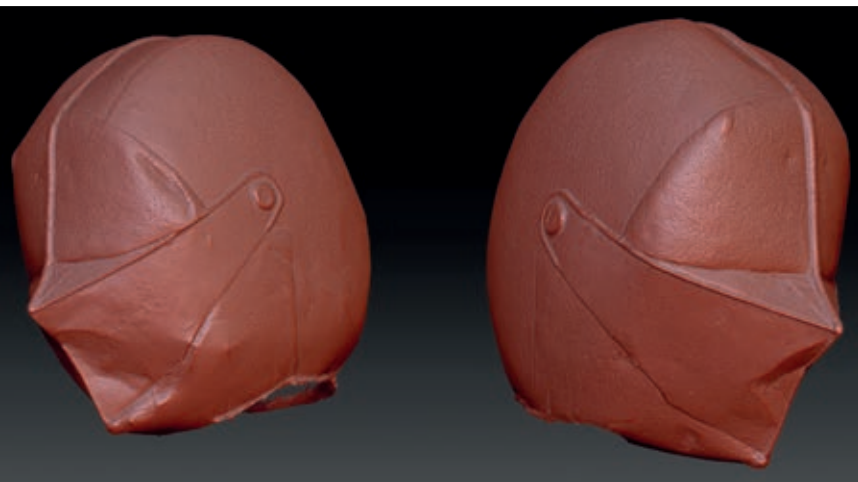


holes through the top of the helmet, which may have been used to hang it for display or perhaps to attach a crest.

Records show that in 1985, the helm underwent extensive

restoration involving removing corrosion, filling areas of damage with polyester resin, chemical surface protection, coating and complete repainting. This degree of

Main image:
The Renaissance tomb of Sir Robert Montgomerie in the Skelmorlie Aisle of Largs Old Kirk, photographed in the 1980s with the mort helm on top



restoration and the materials used may not be considered best practice now, but they were carried out with the best intentions and using technology available at the time.



Our Science team conducted X-ray fluorescence analysis to investigate the composition of the metal, solder and paint, as the chemical elements present can provide evidence to help date the object. Analysis shows that the helm is iron with remnants of a tin coating. It may have been tinned to protect it or to give a 'silver' appearance, but the detection of a small amount of molybdenum in the metal indicates that the helm is made of steel no older than the late 19th century.

The red 'visor' of the helm is known to have been restored in 1985 and two different red paint compositions were found. The (presumed) original paint was coloured bright red with mercury sulphide (cinnabar), and the second paint type contains cadmium and selenium (cadmium red), which was not commercially available until 1910.

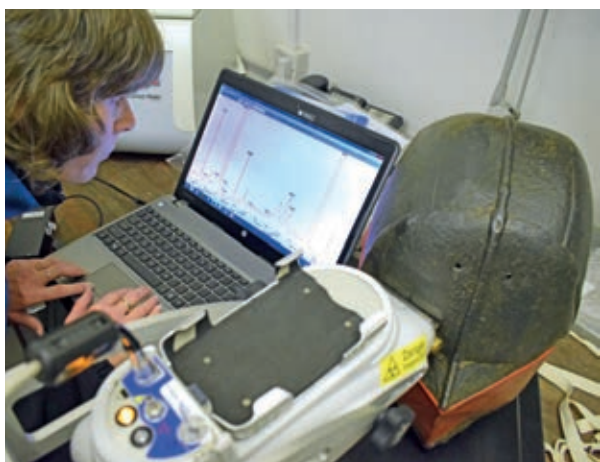
Earlier records had dated the helm to the 17th century, but current investigations imply a late 19th- or early 20th-century origin. Whether

ABOUT MORT HELMS

Funerary helmets, also called mortuary or mort helms, have a long history. One of the earliest surviving examples is that of the Black Prince in Canterbury Cathedral, dating from 1376. The tradition of suspending or mounting a helmet above a carved knightly effigy continued until the late 17th century.

Funerary helms could either be actual relics or decorative objects. Some later examples used a contemporary helmet modified to look more medieval, and some were painted for additional sombre effect (black and red being particularly favoured, as with the Skelmorlie helm).

Painting also minimised the regular maintenance that armour required to stave off corrosion. Mort helms can be seen in situ in a number of rural churches in England, particularly in the south west and Cornwall, but they are rare in Scotland.



the helmet portrayed in the 1886 drawing is the same one is difficult to say. However, an 1879 reference to "a rusting helmet and sword" hints at a potential reason for creating a replacement.

Was an earlier helmet removed to altruistically conserve the original or was it removed to exploit its newly acquired value as 19th-century collectors sought out such rarities? Where did it end up, or was it simply discarded as being too corroded?

Although it is short of historical authenticity, the Skelmorlie helm has survived more or less intact for some 100 years or more. Its original painted surface has now been lost or obscured and it has 20th-century repairs, but it nonetheless remains aesthetically and historically significant to the site.

Above: X-ray fluorescence analysis of chemical elements in the metal and paintwork

Above left: Close-up of the Skelmorlie Aisle mort helm, highlighting its black and red paint scheme

Top left: 3D scan images of the helmet

THE TRUE VALUE OF CRAFT

Traditional skills play a vital role in the conservation of our historic environment, but can also play a far greater role in improving our society, believes **Colin Tennant**



COLIN TENNANT
Head of Technical
Education and Training
colin.tennant@hes.scot

Being creative is something most people have a need for in some shape or form. Yet often there seems to be no room for it in construction or building conservation. In the rush to implement a specification, use a new technology, adhere to a principle or stick to a budget, we often lose sight of the creativity that a craftsman can bring.

At the Engine Shed and through all the work we do on traditional skills – whether that be qualification development, short training courses or Craft Fellowships – I am determined that we highlight and include the added value of a craftsman's creativity: the problem-solving, the application of old techniques to new situations, the ability to make something beautiful out of nothing.

Too often, craftspeople have told me they feel that their knowledge has been ignored because it doesn't have an academic basis, or that their creativity is not valued because they are there to 'do' and not to 'think'.

We at Historic Environment Scotland (HES) have been guilty of this ourselves in the past. Now, as part of our revised Skills Strategy, we are aiming to build qualifications and training programmes across at least 13 traditional



skills. We want to create pathways for young people to get into traditional skills and for current crafts and tradespeople to up-skill or have their existing skills recognised.

It is vital that everything we do relates to the Scottish Credit and Qualification Framework (SCQF). This maps all training and qualifications, whether academic or vocational, onto the one system of grading, from school through to PhD.

I think this is an incredibly powerful tool. It will help our sector articulate the level of knowledge, skill and training someone has achieved, whether that be through a vocational or academic route. It will help us map pathways between those routes, to broaden our skills base and to enable people to change direction in their education or career while building on their achievements.

Using the SCQF will enable us to reinforce the concept of parity of esteem between those who have taken an



academic route and those who have taken a vocational pathway.

We need to increase understanding of the levels and content of vocational qualifications. It is also important that we explain how they can be used as the foundations of a successful and rewarding career.

Only then will we attract the next generation of craftspeople needed to conserve our built heritage. Parity of esteem enables us to recognise the creative input and experience of our craftspeople, and restore them to the place in our society they deserve.

It is seldom mentioned that two of Scotland's greatest designers, Thomas Telford and Robert Adam, both started their careers as masons. With appropriate training and career pathways, mapped to the SCQF and with parity of esteem, there is no reason why the designers of the future should not come from the same starting point.

Main image: Stone letter carving is one of many traditional skills being secured for the future, thanks to HES training programmes

Above left and right: The enduring value of traditional building materials such as wood and clay is highlighted through short training courses and events

Parity of esteem enables us to recognise the creative input and experience of our craftspeople

BY THE REGIMENTAL TRUSTEES

(SCOTLAND)





LET'S MAINSTREAM TRADITIONAL CONSTRUCTION KNOWLEDGE

Joann Russell on why the Engine Shed has a key part to play in mainstreaming knowledge of traditional materials and construction in the building sector



JOANN RUSSELL
Head of Estates
joann.russell@hes.scot

As a newly qualified architect, I left university with scant knowledge of traditional construction and materials. Scottish vernacular architecture and the technical traditions on which so much of our built heritage is constructed was often considered to be beneath the course's design aspirations.

Conservation was delivered as a one-term, elective module with sustainability as the alternative. While sustainability is now embedded in architectural education and practice thanks to government legislation, the same cannot be said for conservation.

Most of my learning around traditional construction was gleaned from on-the-job experiences in private practice. Later, I developed a passion for the potential to breathe new life into existing buildings by juxtaposing modern interventions with traditional fabric.

I was fortunate to have knowledgeable mentors who allowed me to explore how a holistic understanding of the

traditional can inform good design in existing buildings.

Most of an architect's or building professional's training in conservation is picked up on the job. This is totally dependent on the knowledge, experience and willingness of a mentor or contractor.

Such ad hoc delivery of traditional construction and conservation philosophy in a commercial environment does not constitute a holistic training programme.

Our historic environment is an asset with the potential to generate economic, social and environmental benefits. It often gives our towns, cities, villages and landscapes their unique identity and sense of place. Some of the best recent Scottish architecture uses traditional, local materials in a modern way to promote a unique and fresh Scottish design language that draws on the traditions of our past.

The winners of the Royal Incorporation of Architects in Scotland (RIAS) Awards 2017 include some exciting examples of this.

However, conservation is often perceived as a specialism rather than a

mainstream knowledge base. This has to change if we hope to drive up standards of repair and appropriate interventions in our historic environment. Personally, I find the title conservation architect problematic, perhaps due to the 'beard and sandals' image.

The majority of architects working in small and medium sized practices deal with existing buildings on a regular basis. Is it too much to expect that, in the future, all professionals working on existing buildings understand what they are made of and how they are put together?

How can we create new architecture or protect existing buildings if we do not properly understand and value their traditions, crafts, materials and construction methods?

I hope that the Engine Shed will provide a forum to embed this understanding among all building professionals, not just those with beards and sandals!

MORE INFORMATION

The Engine Shed offers a range of CPD modules and courses. See www.engineshed.scot

Above: Fernaig Cottage in Wester Ross by Scampton and Barnett Architects shows how contemporary Scottish design can draw on the traditions and materials of the past. It was a winner of the RIAS Awards 2017

TRADITIONAL RAILINGS MAKE STIRLING CASTLE SAFER

Tom Gaze explains how installing new, hand-forged railings has allowed the reopening of gardens and wall walks at this flagship property



TOM GAZE
National Investment Plan
Co-ordinator
tom.gaze@hes.scot



Over the last 18 months, a series of visitor safety improvements have been made at Stirling Castle after potential risks were identified to certain wall walks and stairs in the castle's garden areas. The height of the walkways, their uneven surfaces and the lack of railings to prevent falls from height onto hard surfaces in difficult-to-access areas were all identified as potential risks during regular visitor safety reviews.

Historic Environment Scotland's (HES) Conservation team collaborated with Visitor Operations colleagues based on site and the Cultural Heritage team to ensure that these regular visitor safety reviews consider significant issues. These include historic setting, numbers and types of visitors, their activity and behaviour, and any accident and incident history to inform decision-making.

We recognised that installing railings could impact

the setting of the wall walk and could set a precedent for other sites across HES's estate. As such, comparator sites were visited and reviewed, and peer-review workshops were held at the castle to discuss the suitability of proposed solutions.

P. Johnson & Company of Ratho Byres Forge, Edinburgh, was commissioned to make railings using only traditional techniques in the assembly. The detailing was inspired by the design of railings introduced to the castle in the 1920s by the

Ministry of Works. All of the new components were traditionally hand-forged and joined with mortice and tenons peened together to form a rivet connection.

The finished railing components were assembled with a paste (red lead or non-lead based, depending on the contractor's health and safety procedures) for additional weather protection to vulnerable junctions. Being of mild steel, the railings were galvanised and painted with a micaceous iron oxide to provide a good weatherproof, abrasion-resistant finish that also provides a key for future painting coats.

Our Conservation team had the opportunity to visit the forge and assist in hand-forging the railings to fully understand the traditional processes involved.

Stonemasons from the Monument Conservation Unit assisted the blacksmiths in fitting the railings by helping identify and open up the existing joints in the rubble masonry of the wall walk.

Since the railings were installed, we have hosted a number of Insight and Summer School tours to showcase this traditional workmanship, while visitors now have more of Stirling Castle to explore and enjoy.



Above: The completed railings along Douglas Gardens wall walk show the detailing

Right: The project showcased traditional blacksmith techniques such as hand-forging

FIRM FOUNDATIONS AT KINNEIL



DUNCAN AINSLIE
Analytics and
Reporting Officer
duncan.ainslie@hes.scot

Above left:
Deconstructing the
original orchard wall,
with banked earth on
the right

Above right:
Reconstruction work
in progress

Kinneil House near Bo'ness is an impressive historic house with grounds. Last year, Historic Environment Scotland (HES) stepped in to help when the stone wall enclosing the site of the old orchard was in desperate need of repair.

The wall had been cordoned off, as it was unstable and in need of consolidation work. The ground level on the driveway side stood over a metre higher than that on the orchard side, meaning the

wall was serving as a retaining wall. This, along with nearby tree growth, subjected the wall to a range of stresses.

Investigation found it had been constructed with no foundations. To ensure its stability, HES experts decided to rebuild the wall with a new, purpose-built foundation. The wall was carefully taken down and as many stones as possible were saved and set aside for reuse. Where stones were not suitable for recycling, the team sourced closely matched stones.

The original wall had probably been constructed

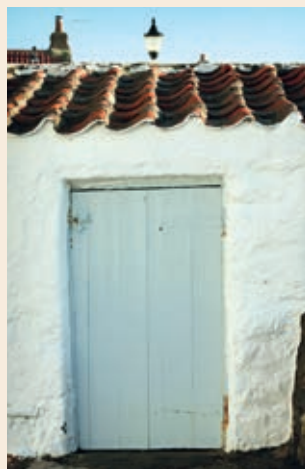
using a hot-mixed lime mortar and a like-for-like replacement was planned. The project was one of several HES pilots looking at the practicality, durability and, above all, authenticity of using quicklime-based mortars.

The rebuild provided a training opportunity for a number of HES masons and apprentices in the principles and practices of hot-mixed lime mortar. Between spring and autumn last year, more than 30 metres of wall were taken down and rebuilt during this project.

SECURE FUTURE FOR TRADITIONAL MATERIALS

Historic Environment Scotland (HES) has started developing a multi-pronged action plan to secure the supply of several key traditional building materials such as thatch, earth, slate and timber.

“This is a long-term commitment that builds on the strategy document, *Scotland's Traditional Building Materials*, published online in April last year,” explains Ali Davey, HES Project Manager for Traditional Skills and Materials. “That document set out the key challenges for a range of



A traditional clay pantile roof in Crail in the East Neuk of Fife

traditional materials. From that starting point, I'm developing a

framework for action, setting out short- and long-term priorities.

“To look after our traditional buildings, we need a secure supply of materials. Inappropriate modern alternatives can be damaging to older buildings.

“Sourcing materials locally not only ensures that sympathetic materials are being used for repair, but also supports local economies and helps reduce our carbon footprint.

“This framework will bring a new focus to our work securing the long-

term supply and use of Scottish traditional building materials.”

HES will work with a range of producers, suppliers and craftspeople with a view to ensuring a secure local supply of materials for anyone commissioning or carrying out repairs to traditional buildings in Scotland.

MORE INFORMATION

Email ali.davey@hes.scot for more information. *Scotland's Traditional Building Materials* is available at www.bit.ly/tradbuild



A GIFT FROM SCOTLAND TO CANADA

Historic ties between the two countries provided inspiration for a unique stone piece handmade by Historic Environment Scotland craftsmen, as **David Storrar** explains



DAVID STORRAR
Head of Conservation
david.storrar@hes.scot

To mark Canada's 150th anniversary in 2017, the Scottish Government commissioned Historic Environment Scotland (HES) to design and craft a gift celebrating the strong historic and cultural links between Scotland and Canada.

Enterprising Scots moved to Canada in large waves of immigration between 1760 and 1860. One ship, the *Hector*, sailed in 1773 from Loch Broom to Pictou, Nova Scotia, with 189 settlers on board, and this ship was the focal point of the gift.

The design combined Highland Clashach sandstone with a central roundel of polished stone bearing an

etched motif. To link a tangible piece of Scotland with the heritage of the *Hector*, a rock from the shores of Loch Broom was hand-selected, polished and etched with an image of the *Hector*, before being inset into the design.

The rope carved around the edge references both the ship's rigging and the ties between the two countries, while the bronze plaque bears the Gaelic for 'forever friends'. The timber base is made from a piece of elm from the garden of the Palace of Holyroodhouse in Edinburgh. The tree had been planted under the direction of Prince Albert around 150 years ago.

David Storrar designed the stone and Architectural Technician Ian Cargill

produced the technical drawings. Stonemason Mark MacArthur carved the stone at the Elgin Conservation Centre and Training Manager Graeme Campbell gilded the carved letters. HES joiners Adrian Ferguson and John Nicol made the timber base at St Anne's Malting's workshops in Edinburgh.

On 16 October 2017, the completed gift was shipped to Ottawa. Keith Brown, Cabinet Secretary for Jobs, Economy and Fair Work, presented it to Sean Casey MP, Parliamentary Secretary to the Minister for Canadian Heritage. It is expected to go on temporary display at the Hector Heritage Quay in Pictou before going to the Canadian Museum of History in Ottawa.

Clockwise from top left: Stonemason and Training Manager Graeme Campbell applies gilding to carved lettering; the completed stone mounted on its timber base; stonemason Mark MacArthur carves the rope edge detail

AN ACTION PLAN FOR

Jessica Hunnisett-Snow explains how Historic Environment Scotland is leading a strategy to secure the future of Scottish thatch



JESSICA HUNNISETT-SNOW
Senior Technical Officer
jessica.snow@hes.scot

It has been over a year since the publication of *A Survey of Thatched Buildings in Scotland*, which generated much media coverage and local interest. The survey, published by the Society for the Protection of Ancient Buildings (SPAB), found that of the 300 or so existing buildings thought to be thatched, only around 200 remained in anything like their original form.

Thatched buildings are now rare in most parts of Scotland. Responding to this, Historic Environment Scotland (HES) held a conference in May 2017 in association with the National Trust for Scotland, SPAB and the Scottish Vernacular Buildings Working Group. The event was a great success, attracting a wide range of participants, including thatched building owners and curators, estate managers, planning officers, local history groups and heritage organisations, and, crucially, many thatchers currently active in the craft.

During the event, attendees were given a demonstration of heather thatching and were encouraged to voice their thoughts, experiences and



concerns about the factors affecting the survival of thatched buildings and what might be needed to help conserve them for the future.

From this, HES has committed to developing an action plan for thatched buildings in Scotland, and is focusing on ways in which thatched buildings and other vernacular structures can be better recognised, assessed and protected.

As a crucial first step in reassessing significance, the Designations team is undertaking a comprehensive review of listed and unlisted thatched buildings, starting in the Western Isles, where a large number of thatched buildings survive.

Initial assessment suggests it is likely that the listing category of a number of thatched buildings may change, and the listed building records will be updated to recognise their rarity and importance. As with all designation reviews, owners and local authorities are being

consulted on any proposed legal change to the listing.

A recent engagement event on Benbecula in the Outer Hebrides attracted a steady stream of local people who were keen to talk about their buildings and find out more about the designations review. They also had the opportunity to seek advice on technical matters and grants. Fiona Hill of HES Archives and Collections was on hand to show how people from anywhere in Scotland can contribute information about their buildings to MyCanmore, an online resource for the historic environment.

HES has also supported the re-thatching of the Hebridean Blackhouse at the Highland Folk Museum in Newtonmore. This provided a training opportunity for in-house Monuments Conservation Unit staff to learn traditional marram thatching. The open-air museum is home to a significant group of thatched buildings,

Above left and right: Thatched cottages on Berneray, North Uist, and at Swanston village on the outskirts of Edinburgh

Above, far right: HES and museum staff learn marram thatching from Uist-based thatcher Neil Nicholson at the Highland Folk Museum

Below: Shetland crofthouse



THATCH



roofed with heather, reed, bracken and marram grass, and demonstrating a range of different techniques. HES hopes to work more closely with regional organisations in the future to support training and up-skilling in traditional thatching techniques, so helping to bridge the skills gap and provide focal points for the provision of advice.

In November 2017, HES held a practitioners' working group meeting facilitated by Rural Skills Scotland and aimed at practitioners within the field. The objective is to develop a more formal training programme for thatchers and to formally recognise the skills that currently exist.

The reasons for the decline of thatched buildings in Scotland are numerous and complex, linked to changes in land use, housing and rural populations, and the availability of skills and materials. By their very nature, thatched buildings decay rapidly and disappear if they're not maintained, making them a particularly ephemeral form of vernacular building.

By implementing a comprehensive action plan to address the key factors in the conservation of these buildings, we hope future generations can continue to enjoy the rich heritage of thatching in Scotland and understand how best to maintain and protect thatched buildings.



THATCH IS BACK IN FIFE

Our Conservation team has been raising local awareness of thatched buildings through live demonstrations and supporting thatched buildings projects, such as that at the Falkland Craft Symposium, held at Falkland Estate in August last year.

Thatched buildings, once common in Fife, are now rare, but enjoyed a high profile once again at this weekend event. Visitors were able to observe the thatching process, discuss methods and issues with thatcher Jonathan Botterell, and even have a go themselves.

With grant funding and oversight from HES, an estate orientation point was

given a new thatched roof. The unassuming pitched roof structure was stripped of its deteriorating wood shingle and thatched with locally sourced Tay reed from a supplier in Errol, with a ridge of turf cut from the estate.

Hopefully, the orientation point, with its display of information about thatched buildings and where to go for advice, will encourage homeowners to better care for and maintain their thatched buildings. The project also inspired the estate's Trustees to discuss how thatch might be used for the roofing of other ancillary buildings.





CHARLES JONES
Training Manager
charles.jones@hes.scot

FIVE YEARS OF CONSERVATION TRAINING

Charles Jones reflects on the achievements of Historic Environment Scotland's Conservation Training Centre at Forth Valley College

Since its establishment in 2012, the Conservation Training Centre has been a hive of activity. We continue to deliver the Professional Development Award and SVQ 3 in Stonemasonry to apprentices from both Historic Environment Scotland (HES) and the private sector. So far, we have had nearly 40 students undertake the award. All of those who have completed it have progressed on to either work in the construction industry or into further education – an excellent result.

We continue to offer additional training, including SQA awards in masonry repair and advanced craft stonemasonry, and craft

courses in letter cutting and architectural carving, which have always generated a lot of interest.

The Conservation Training Centre has had some talented and committed students who have been highly successful, securing top places in the Stone Federation Masonry Skills Challenge, winning medals at UK Skillbuild finals, and winning the Intercollege Apprentice Masonry Competition and the Construction Industry Training Board UK Apprentice of the Year.

There are not many awards and competitions we have not won or done well at, a fact that not only credits the staff at Forth Valley College, but also the support and training offered by employers along the way.

This year looks to be just as busy. Significant changes to the SVQ evidence requirements will present challenges, with collated training evidence from the student's workplace becoming a mandatory element of all Craft level 3 qualifications. This will require even greater collaboration between employer, centre and trainee to ensure that all the relevant skills required can be demonstrated.

This, combined with additional training delivery in partnership with the Office for Public Works in Ireland and St Mary's Cathedral Workshops Edinburgh, plus the development of new Heritage Skills SVQs, will ensure that 2018 will be another action-packed year at Forth Valley College.

Above left: HES apprentice stonemason Megan Crawford cuts letters on the Cleland grave marker for Dunkeld Cathedral during its creation at the Conservation Training Centre in 2015

Above right: Apprentices Ross Kennedy and Megan Crawford celebrate success in the 2017 Construction Industry Training Board awards

DUBLIN'S CAPITAL CHALLENGE

At the Engine Shed, stonemasons from Historic Environment Scotland are carving a new stone capital for Dublin's Four Courts, reports **Ian Walker**



IAN WALKER
Building Crafts
Development Manager
ian.walker@hes.scot



The capital will require about 700 man hours to cut using chisels and mells

Built in the late 1700s, the Four Courts is Ireland's main court building. It features an impressive dome supported by 24 columns with carved Corinthian capitals. After suffering extensive fire damage in the 1922 civil war, the Four Courts was restored and rebuilt, reopening in 1932.

In 2011, investigations by Ireland's Office of Public Works (OPW), responsible for the fabric of the building, revealed that several capitals had eroded and degraded over time, so needed to be repaired or replaced.

This ongoing conservation project has provided the first opportunity for collaboration under the Memorandum of Understanding, signed in March 2017 by Historic Environment Scotland (HES) and the OPW Heritage Service for the sharing of experiences and expertise. It was agreed that one of the replacement capitals would be carved by HES stonemasons at the Engine Shed, providing an opportunity for skills-sharing and training for both organisations.

In preparation for the project, the HES Digital Documentation team scanned



the original capital, as well as a replacement already completed. They used the resulting 3D digital scan to create a resin model for the stonemasons to work from.

Towards the end of last year, HES held an internal competition to select the stonemasons who would tackle this challenging task: with the capital measuring 1.2m x 1m and comprising two parts, the scale of the job would be substantial.

What's more, creating detailed freehand carvings true to the original would require flair and skill from our stonemasons, who are mainly trained as architectural masons.

The candidates eventually awarded the honour were Craft Fellow Lara Townsend and a selection of HES stonemasons.

They started work on the capital at the Engine Shed earlier this year under the guidance of Training Manager Charles Jones and Technical Conservation Training Manager Stephen Townsend. The capital will require about 700 man hours to cut using chisels and mells (or mallets) – the same traditional tools employed 120 years ago to create the original capitals.

While the stonemasons are working on the early stages, only one of them will tackle the finer detailing to ensure consistency. The new capital will hopefully be complete in July 2018.

In the meantime, visitors can watch the work in progress at the Engine Shed, which is open to the public free of charge from Monday to Saturday, 10am to 4pm.

Top: One of the completed replacement capitals on display in the court building

Inset: The Four Courts building with its dome on the banks of the River Liffey in Dublin



MY YEAR AS AN EARTH INTERN

Maria Saez-Martinez reflects on her year as Earth Building Intern with the Conservation Science team



MARIA SAEZ-MARTINEZ
Earth Building Intern

Earth in some shape or form is probably the oldest and most widespread building material in the world. A wide range of earth materials and techniques can be found around the globe, such as adobe, rammed earth, sod or turf, cob, mud bricks, and wattle and daub. The techniques reflect the raw materials available locally, the local climate and conditions, and how much time is available to erect a structure.

As a building engineer from Spain, I've been interested in earth buildings – both contemporary and traditional – for a long time, so when I came to Edinburgh University to do a Master's degree in building conservation, I chose Scotland's traditional earth buildings as the topic of my dissertation. There aren't many people working in the field, so Historic Environment Scotland (HES) offered me a one-year internship after my Master's, which started in September 2016.

My first step was to bring together all the information and records available. I started by examining the archives of

the late Bruce Walker, who worked with HES before joining the School of Architecture at Duncan of Jordanstone and was one of Scotland's leading lights on the subject.

I was surprised by the variety of techniques used across Scotland, from clay dabbins in the south west to the turf blackhouses of the Hebridean islands and Moray's clay and bool (clay mixed with stones). There is evidence that these techniques were shared across Europe via trading routes. Walker's records mentioned a location in Italy where clay and bool was used, having been introduced by traders. Similarly, on Madeira, clay and bool buildings can be found near the harbour, where ships would have called in.

After a year, I came to the conclusion that many more earth buildings remain in Scotland than previously thought, and that collaboration between home owners and agencies or institutions is essential to their protection and conservation. My internship hopefully provides a foundation upon which HES can build further research and support for

Scotland's traditional earth buildings.

During my internship, I started to develop a gazetteer – a collated list of all earth buildings from across the sources – and a framework of recommendations for the next steps. These include scientific investigation of the properties of earth building materials to shed light on why they were selected.

Although the use of earth in traditional buildings has often been regarded as an inferior substitute to other materials, evidence shows that it is an effective, inexpensive, locally available and sustainable option for building work. Furthermore, it is eco-friendly and has excellent thermal properties.

I believe we can learn a lot from the past. I hope my work as intern helps to inform not only conservation of existing buildings, but also underlines the value of applying earth building techniques in contemporary construction.

MORE INFORMATION

For more on the topic, see the *Inform Guide Earth and Clay Construction* at www.bit.ly/earthclay

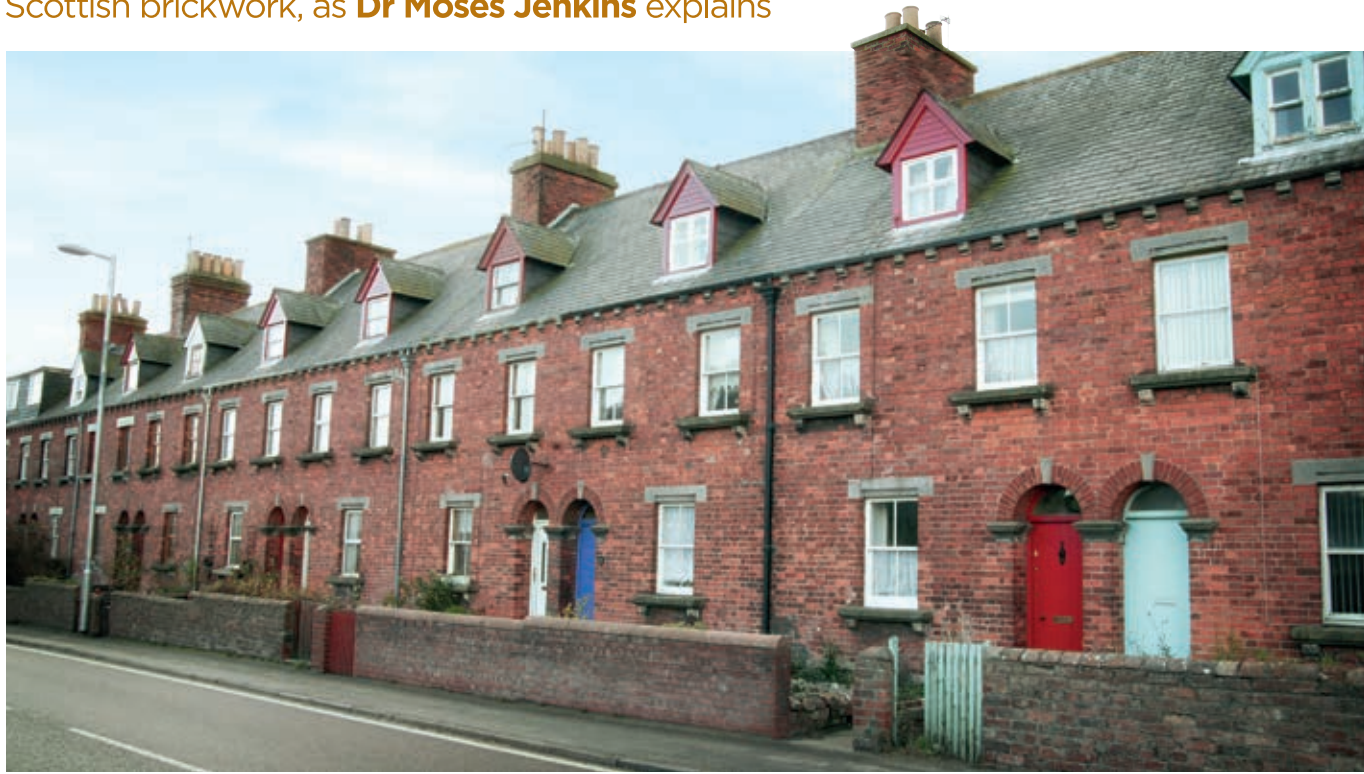
Above left: Clay mixed with straw is a common earth building material with good insulating properties

Above right: Cottown Schoolhouse in St Madoes, Perthshire, is a clay-walled and thatched building from the 18th century now cared for by the National Trust for Scotland

Inset: The Grey House in Errol, Perthshire, undergoing repairs. It is another rare example of a surviving clay-walled building from the first half of the 18th century

SCOTTISH BRICKWORK FIRES THE IMAGINATION

Recent research sheds light on the distinct character of Scottish brickwork, as **Dr Moses Jenkins** explains



DR MOSES JENKINS
Senior Technical Officer
moses.jenkins@hes.scot

A recently completed research project has made significant advances in the understanding of traditional Scottish brickwork. Entitled 'The Technical Development of Scottish Brickwork, 1700–1900', the work, leading to a PhD from Dundee University, took place between 2009 and 2016. The study analysed 301 buildings: 167 surviving brick buildings were surveyed, while information for the rest came from documentary and printed sources.

The research project revealed the significant differences between Scottish craft practice and that elsewhere in Britain – most importantly, in the bond and gauge in which brickwork was constructed.

Bond is the way bricks are laid in a wall. It is defined by the relationship between stretchers (bricks laid lengthwise) and headers (laid

crosswise with their ends exposed on the external face of the wall). Craft practice in Scotland is dominated by the aptly named Scottish bond, which was found in more than 60% of brickwork surveyed. It is formed by laying three, four or five courses of stretchers between each course of headers.

The term 'gauge' refers to the height to which a given number of bricks and mortar joints are built, most commonly four courses of brick and the joints between them. From 1800 to 1860, the height of four courses of brickwork in Scottish practice was commonly found to be an inch higher than elsewhere in Britain.

From 1860 to 1900, this divergence was even more pronounced, with 67% of examples between two to three inches above the height specified in contemporary technical works. This indicates that Scottish bricklayers were working to a specifically

Scottish gauge, as well as using a specific Scottish bond.

The research also demonstrated the diversity of brick buildings in Scotland, from lighthouses to tenements, bridges to fortifications, and from North Uist and Shetland to Galloway. Also recorded were a number of uses for brick that may easily go unnoticed, such as backing material for ashlar stonework, the construction of vaulting, internal partitions and its use in conjunction with earth building techniques. These findings help expand the appreciation of brick and its place in Scottish construction.

The research project has advanced our knowledge of the uses of brick in Scotland and the associated craft practices. This, in turn, will inform the conservation needs of brick buildings and help ensure this integral but often overlooked part of Scotland's built heritage is better understood and appropriately repaired and maintained.

Above: Among the buildings surveyed were terraced brick cottages in Brora showing a Flemish bond



STONEMASONS OF THE WHITE HOUSE

Ian Walker on how the little-known link between Scottish stonemasonry and the American presidential residence will be celebrated this year



IAN WALKER

Building Crafts
Development Manager
ian.walker@hes.scot

In 1793, seven Scottish stonemasons left Edinburgh for Washington DC to help build a new official residence for the President of the United States, which later became known as the White House. The sandstone for the new building – from the Aquia Creek quarry 45 miles to the south – was very similar to that used in Edinburgh, so the expertise of Scottish stonemasons was sought to bring the neoclassical design of Irish-born architect James Hoban to life.

The willing men were recruited through Lodge of Edinburgh Number One, the world's oldest Masonic Lodge. At the time, construction work in Edinburgh's New Town had slowed due to the Anglo-French War, so many stonemasons were out of work. This assignment would have been a welcome one.

The Scottish stonemasons who worked on the White House left behind distinctive calling cards on its sandstone exterior, including several 2ft-wide carvings of the

iconic Scottish double rose, which was first cultivated at Royal Botanic Garden Edinburgh in the mid-1700s.

Being of sandstone, the double rose designs were fairly crudely cut, and over the years they were coated and obscured by layers of whitewash and, later, paint. However, when around 40 layers of old paint were stripped off during renovations begun in the 1980s, the Scottish stone roses were rediscovered.

The remarkable story of the Scottish connection with the construction of the presidential residence is told in *The White House of Stone* by William Seale, a book published in summer 2017 by the White House Historical Association (WHHA).

Founded by First Lady Jacqueline Kennedy in 1961, the WHHA funds restoration efforts for the White House State Floor and assists in acquiring and preserving the art and decorative objects of the White House collection.

A WHHA symposium in Washington in May will celebrate this little-known link with Scottish stonemasonry and Historic Environment Scotland is a key partner in the celebrations. Our stonemasons are busy cutting a couple of double roses – replicas of those on the White House walls.

One of our stonemasons will travel to the US to cut another rose on site, which will be presented to the WHHA at the symposium. Stone for the roses will be sourced from the original Aquia Creek quarry.

We are delighted to be taking part in celebrating this historic connection between Scottish craftsmanship and the White House. From September 2018 to January 2019, a free exhibition at the Engine Shed, entitled *The Stonemasons of the White House*, will showcase the influence of Scotland's skilled workforce and celebrate traditional building skills, materials and conservation.

Above: The intricately carved garland above the North Door of the White House features Scottish double roses, leaves, acorns and fruit

Inset: The earliest known published illustration of the White House appeared in 1807 in a travel book, *The Stranger in America*

CRAFTING CAREERS

Stephen Townsend and **Karyn McGhee** report on the progress of Craft Fellows and unveil Historic Environment Scotland's new Conservation Internship Programme



STEPHEN TOWNSEND
Technical Conservation
Training Manager
stephen.townsend@hes.scot



KARYN MCGHEE
Technical Conservation
Training Officer
karyn.mcghee@hes.scot

The Technical Conservation Training team works with industry specialists across Scotland's heritage sector to develop opportunities for learning traditional skills, achieving qualifications and gaining work experience in built heritage. These include Craft Fellowships, which provide individuals with a one-year work placement to develop their knowledge of and experience in a particular traditional skill.

Current placements include stone carving, boat building, blacksmithing and milling, although we also recently offered placements in traditional signwriting,



VICTORIA MARTIN
Craft Fellow in blacksmithing, P. Johnson & Company

"Since the age of six, I've been obsessed with how metal is forged and transformed into either something elegant and beautiful, or functional and practical. During a basic blacksmithing course at Oatridge College, Broxburn, I was introduced to artist blacksmiths P. Johnson & Company and was lucky enough to be offered an HES Craft Fellowship at the forge in early 2017. It has given me the opportunity to work and learn among other blacksmiths, building the skills I need to progress further in my chosen career. I hope to do a BA (Hons) in Artist Blacksmithing and then steadily build up my own forging business."



TOBY TOTTLE
Craft Fellow in milling, Knockando Woolmill

"There are very few experts left in Britain with a working understanding of Victorian woollen mills and I would never have had the chance to work with the ones at Knockando had it not been for the HES Craft Fellowship. I've learned on the job, observing my mentor, Hugh Jones, and then gradually taking over the operation, just as he and his predecessor did, and on the same machines! After 18 months, I am now a full-time carding and spinning engineer, handling the transformation of piles of wool into knitting and weaving yarns. Becoming the next link in a chain of craftsmen at Knockando has been an extraordinary journey."

heritage engineering and traditional tweed cloth production. The placements are hosted by individuals, companies and organisations, which provide on-site training and are monitored by Technical Conservation Training Manager Stephen Townsend.

We recently recruited the first 11 participants in our new Conservation Internship Programme. Similar to the successful Craft Fellowship Programme, this provides work placement opportunities in a variety of fields across Historic Environment Scotland's (HES) Conservation Directorate. These include Climate Change, Collections, Architecture, Conservation Science, Digital Innovation, Traditional Materials, Technical Research, as well as Outreach and Education. Each intern will work with

their mentor to develop their skills and engage with a variety of projects across the organisation.

Both these programmes aim to provide people with opportunities to learn more about the sector, and to gain real, valuable work experience as well as develop new skills and insights. A key aspect is supporting the continued development of the individual's chosen craft or professional area by enabling access to appropriate external training, as well as relevant modules from our Advanced Professional Diploma in Technical Building Conservation at the Engine Shed (see page 12).

MORE INFORMATION

See www.engineshed.scot for regular updates from the Craft Fellows and Interns



PHILIPPA SOODEEN
Fellowship Officer, SPAB
philippa@spab.org.uk

CRAFT FELLOWSHIP CONNECTION

An enduring relationship between two organisations is helping to nurture craft skills for the future, as **Philippa Soodeen** explains

In 2017, the Society for the Protection of Ancient Buildings (SPAB) celebrated its 140th year and the 30th anniversary of its William Morris Craft Fellowship. The programme is dedicated to developing outstanding craftspeople to pass on the SPAB approach to building conservation.

The recipients will be among those who, as employees, employers and consultants, will provide the advice and expertise to protect heritage throughout their careers. The Fellowships equip them with the skills and experience required to participate in research, develop their practice, provide technical advice, and lead projects to manage and protect heritage at risk.

The Fellowship programme has enjoyed the support of Historic Environment Scotland (HES) from its early years. Since the first Fellow from Historic Scotland, Allan Smith, embarked on the programme in 1993, 108 Fellows have

passed through the programme, of which 14 have been employed by HES. Four others have been employed by Steven Laing, a former Historic Scotland Fellow now running Laing Traditional Masonry Ltd.

As part of the programme, Fellows are able to deepen their knowledge of their own and associated trades. They are placed in different workplaces across the country, are given the opportunity to meet with architects, surveyors and engineers, and do practical work under expert guidance.

Fellows learn from and support one another during their eight weeks travelling together, and are encouraged to pass on their newfound knowledge to others.

It is heartening to see Fellows further their careers within HES and they are always keen to encourage those coming after. Previous Fellows Charles Jones and Innes Drummond have hosted groups at Forth Valley College

(Stirling), as have Erik Ramsay, Johnnie Clark and Heather Griffith at Glasgow Cathedral.

SPAB Lethaby Scholar Peter Buchanan has introduced Fellows and Scholars to Stirling Castle, and later the Engine Shed Project. Stephen Gordon and his team at South Gyle Conservation Centre have also been long-standing hosts. SPAB Lethaby Scholar Jessica Hunnisett-Snow and Roger Curtis of the Technical Research team have welcomed Fellows and Scholars, and supported their training through the Scottish Conservation Working Parties and other site visits and events.

The relationship between SPAB and HES has developed over many years, strengthened by invaluable financial support, for which we are extremely grateful. We look forward to meeting new applicants for the 2018 Fellowship programme and beyond.

MORE INFORMATION

Visit www.spab.org.uk/learning/fellowship

Above: The SPAB Craft Fellows of 2017 were Jack Clare, Paul Walters, Dale Perrin and Gregor Alcorn

Above right: Craft Fellows and Scholars on a visit to Hampton Court Palace

2016-17: OUR YEAR IN NUMBERS

The new Analytics, Reporting and Audit team gives an overview of spending and project activity at our Properties in Care (PiCs) and beyond

OUR PROPERTIES IN CARE



336
Properties in Care

280,000+ hours of care and maintenance work by Monument Conservation Unit staff

CLIMATE CHANGE

35 climate change projects across **24** PiCs, with a total spend of **£382,000** on these projects

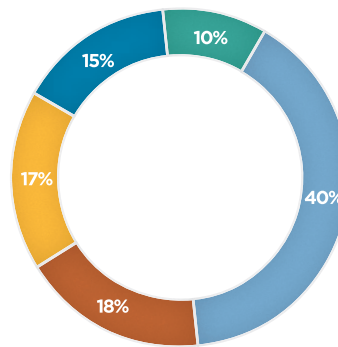
SPENDING*

£7.6m spent on conservation and maintenance

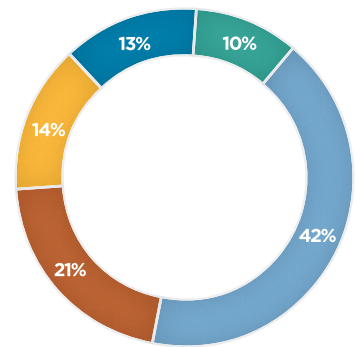
PROJECTS

134 active projects at **65** PiCs

PROJECTS AT PiCs BY CATEGORY



SPENDING AT PiCs BY CATEGORY



- Conservation
- Mechanical & Electrical
- Non-PiC property**
- Visitor facing
- Infrastructure

WIDER IMPACT



£430m

in tourism spend contributed by our sites, **£260m** of this in areas considered to be deprived



OUR COLLECTIONS

33,499 objects in our collections

Nearly **£250,000** spent on projects related to the management and care of the associated collections

12,163 object records updated

1,636 object records added to catalogue, increasing our collection by **5%**

BEYOND OUR PROPERTIES



36
HES apprentices

18 private-sector apprentices supported at our training centres

15 Interns

11 Craft Fellows

40 active research projects in science, digital documentation, technical research, climate change and skills

* Excluding staff costs ** Depots, HQ buildings, storage etc

Historic Environment Scotland

Longmore House, Salisbury Place, Edinburgh EH9 1SH • Telephone +44 (0)131 668 8600
www.historicenvironment.scot • Scottish Charity No. SCO45925



HISTORIC
ENVIRONMENT
SCOTLAND

ÀRAINNEACHD
EACHDRAIDHEIL
ALBA

