OUR LIVING STONE

Lichens at Blenheim Palace

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BLENHEIM PALACE

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Part of Blenheim Palace's vision as a World Heritage Site is to understand, protect and enhance its ecological value. Recently, a team of researchers from the University of Oxford carried out lichen surveys on the palace walls to try and establish their ecological significance and role in the conservation of the site. We were delighted when this research led to the exciting discovery of a relatively rare British lichen called *Phaeospora parasitica*. The individual found was the first recorded for the county of Oxfordshire.

But to understand the significance of this work, it's important to set it in the context of not only our prior knowledge of the lichen flora of Oxfordshire, but also in relation to the immense contribution of lichens to our broader cultural heritage. Revered by poets like Elizabeth Bishop and artists like Leonardo da Vinci, used in embalming by the Ancient Egyptians and in committing acts of eco-forgery by Roman con-artists, lichens have played a significant role in our past, even influencing the outcome of wars. So, as you wander the palace grounds, keep your eyes peeled; for lichens have great stories to tell.

South walls, Blenheim Palace

'Art's finest pencil could but rudely mock The rich grey lichens broider'd on a rock'

Jane Taylor

View over the lichen covered wall to the Queen Pool, Blenheim Palace

What are lichens?

The great American poet Elizabeth Bishop called them ‘the still explosions on the rocks.’ The Victorian polymath John Ruskin repeatedly painted and wrote about them, lambasting the likes of J.M.W. Turner for having ‘absolutely stripped the [projecting] rock’ of them to ‘bare slate’ in his drawing Dunblane Abbey of 1816. And the British science fiction writer John Wyndham was inspired to write a novel that imagined them as a sort of elixir of life. I am, of course, talking about lichens, one of the most simple and widespread of all living things, the dominant biological species on 8% of the Earth’s land surface, able to tolerate both the icy wastes of the Antarctic and arid deserts, and found everywhere from rocky inter-tidal shores to the tops of mountains.

Stable self-supporting associations of a fungus (known as the mycobiont) and an alga or cyanobacterium (known as the photobiont), they are the result of a symbiotic relationship such that the fungus provides moisture and shelter for the algal cells allowing them to live in places that otherwise would be unsuitable for them. These algal cells, on the other hand, provide food for the fungi cells.
It should be noted, however, that some biologists consider this relationship to be an example of controlled parasitism, because the fungus seems to obtain most of the benefits. Like conventional plants, lichens join themselves to soil, bark and rock for stability and nutrients.

Lichens and our architectural heritage

Lichens that attach to rock and stone, such as those found on the walls and sculptures at Blenheim, are known as saxicolous lichens. The word saxicolous derives from the Latin ‘saxum’ (meaning stone) and ‘cola’ (meaning inhabitant). A building façade provides a number of different microclimates and so habitats in which environmental factors will operate and control lichen colonisation and growth. Factors such as stone type, roughness, porosity, substrate pH, the presence of mortars, building geometry and architecture are all of importance.

‘the still explosions on the rocks’

Elizabeth Bishop

Deteriorative or protective?

A question heritage professionals and researchers often face is whether the presence of lichens on historic buildings and monuments is detrimental to the stonework or not. The effectiveness of lichens as agents of rock weathering has been acknowledged since the late 19th and early 20th centuries, and saxicolous lichens are known to weather their substrate by both physical and chemical means. But different sorts of lichens act in different ways. This is illustrated by the lichens growing on one of the carved spherical sculptures in the gardens at Blenheim.

A carved spherical sculpture in the gardens at Blenheim Palace

Endolithic (buried e.g. *Verrucaria baldensis*) and epilithic (surface e.g. *Verrucaria nigrescens*) lichens on the sculpture.

Close up of lichen on a sculpture on the Water Terrace, Blenheim Palace

There are two types of lichen growing on this sculpture. Generally speaking, endolithic lichens grow below the surface and arguably contribute more to the weathering of the stone. When you run your finger over the *Verrucaria baldensis* on the sculpture, you feel the surface of the stone lower. On the other hand, epilithic lichens sit on top of the stone and, over time, can have a more protective role. The process of the bioprotection of rock or stone by lichens was acknowledged as far back as 1893 by the geologist Archibald Geikie.

Attractive or an eyesore?

Another question surrounds the aesthetics of our architectural heritage. Some argue that lichens add colour, texture and character to the objects on which they grow, often helping them to blend into the surrounding natural landscape. The artist Henry Moore quotes Leonardo da Vinci, saying, ‘in the lichen lines on a wall an artist should be able to discover a whole landscape.’ Because the distribution of lichens is controlled by a number of architectural as well as environmental factors, the lichen cover can often produce an aesthetically pleasing tapestry. Indeed, lichens respond to architectural detail by picking out and emphasising certain features, which can lead to them highlighting areas such as shaded arches and sloping surfaces, and window sills and slabs at the foot of arches, providing a new dimension to the architecture.

Renovation in the East Courtyard, Blenheim Palace

Others may argue that they are an eyesore, pointing out that, quite often, repairs or renovations support a dissimilar lichen cover to the original structure, due to their later date of construction, or use of a different stone. This sometimes accentuates these places, making them stand out more, rather than blend in.

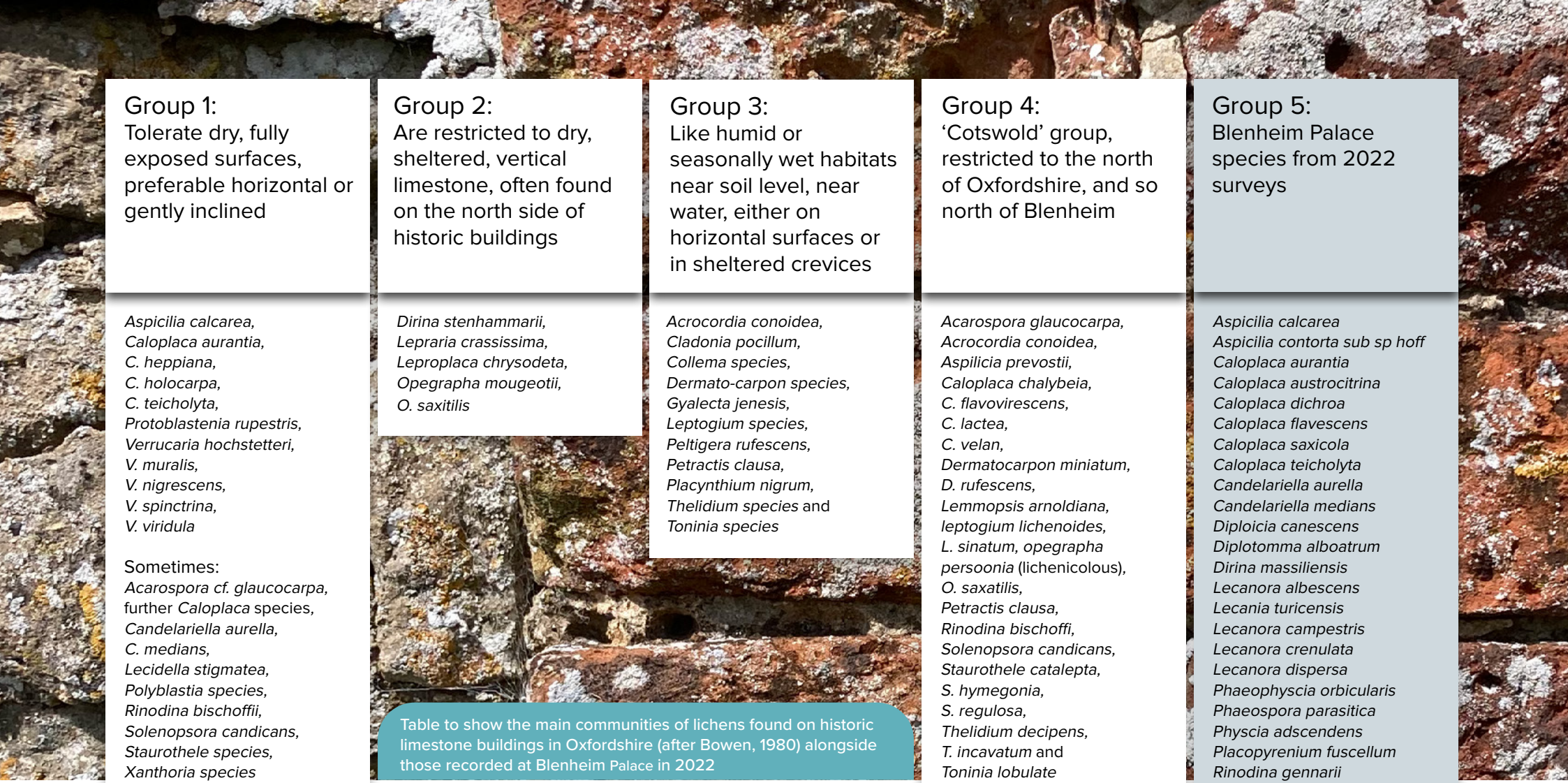
Statue in Oxfordshire’s Rousham Gardens

Lichens on historic buildings in Oxfordshire and the Cotswolds

Research into Oxfordshire lichens dates back to the Georgian era. The first list of Oxfordshire lichens was published by the Professor of Botany at Oxford University, John Sibthorp, in 1794. Sibthorp included records made by Jacob Bopart, who recorded the first lichen for the region, *Usnea articulata*, now extinct, and J.J. Dillenius, who held Sibthorp's position from 1734-47. The early part of the nineteenth century found two active lichenologists working in Oxfordshire: William Baxter (1787-1871), curator of the Oxford Botanic Garden, who collected extensively in Bagley Wood and elsewhere near Oxford, and George Gulliver (1804-82), a surgeon who collected around Banbury in his youth and went on to publish a list of his finds. With regards to Blenheim, we have to come forward to the work of the lichenologist Francis Rose in the second half of the twentieth century, whose list was restricted mainly to tree species.

Until now, the distribution of lichens in the region has been influenced more by air pollution than rainfall or temperature, and by the 1980s Oxfordshire air pollution was relatively low compared to East Berkshire and Buckinghamshire which are more urbanised and have higher sulphur dioxide emissions. Oxfordshire walls are known for their colourful flora with *Aspicilia calcarea* and *Verrucaria* species dominant, grading into *Caloplacetum heppianae* near villages. The area is notable for its ancient limestone churches, well colonised by lichens. Flat slabs of limestone called 'Stonesfield slates' were quarried locally, and old roofs made up of this, especially with a reduced angle of slope near the gutter, usually have a rich lichen community. In north Oxfordshire, a deep yellow limestone containing much iron and silica, known as ironstone, is extensively used for walls and houses; the species *Rinodina subexigua* and *R. teichophila* like its rough texture, as does *Sarcogyne regularis*.

Broadly speaking, the wall lichens of Oxfordshire can be divided into four main groups. These are shown in the following table, with the species recorded during the recent surveys at Blenheim in the fifth column.



Group 1: Tolerate dry, fully exposed surfaces, preferable horizontal or gently inclined	Group 2: Are restricted to dry, sheltered, vertical limestone, often found on the north side of historic buildings	Group 3: Like humid or seasonally wet habitats near soil level, near water, either on horizontal surfaces or in sheltered crevices	Group 4: 'Cotswold' group, restricted to the north of Oxfordshire, and so north of Blenheim	Group 5: Blenheim Palace species from 2022 surveys
Aspicilia calcarea, *Caloplaca aurantia,* *C. heppiana,* *C. holocarpa,* *C. teicholyta,* *Protoblastenia rupestris,* *Verrucaria hochstetteri,* *V. muralis,* *V. nigrescens,* *V. spinctrina,* *V. viridula* Sometimes: *Acarospora cf. glaucocarpa,* further *Caloplaca* species, *Candelariella aurella,* *C. medians,* *Lecidella stigmatea,* *Polyblastia species,* *Rinodina bischoffii,* *Solenopsora candicans,* *Staurothele species,* *Xanthoria species*	*Dirina stenhammarii,* *Lepraria crassissima,* *Leproplaca chrysodeta,* *Opegrapha mougeotii,* *O. saxitilis*	*Acrocordia conoidea,* *Cladonia pocillum,* *Collema species,* *Dermato-carpon species,* *Gyalecta jenesis,* *Leptogium species,* *Peltigera rufescens,* *Petractis clausa,* *Placynthium nigrum,* *Thelidium species* and *Toninia species*	*Acarospora glaucocarpa,* *Acrocordia conoidea,* *Aspilicia prevostii,* *Caloplaca chalybeia,* *C. flavovirescens,* *C. lactea,* *C. velan,* *Dermatocarpon miniatum,* *D. rufescens,* *Lemmopsis arnoldiana,* *leptogium lichenoides,* *L. sinatum, opegrapha persoonia* (lichenicolous), *O. saxatilis,* *Petractis clausa,* *Rinodina bischoffi,* *Solenopsora candicans,* *Staurothele catalepta,* *S. hymegonia,* *S. regulosa,* *Thelidium decipens,* *T. incavatum* and *Toninia lobulate*	*Aspicilia calcarea* *Aspicilia contorta sub sp hoff* *Caloplaca aurantia* *Caloplaca austrocitrina* *Caloplaca dichroa* *Caloplaca flavescens* *Caloplaca saxicola* *Caloplaca teicholyta* *Candelariella aurella* *Candelariella medians* *Diploicia canescens* *Diplotomma alboatrum* *Dirina massiliensis* *Lecanora albescens* *Lecania turicensis* *Lecanora campestris* *Lecanora crenulata* *Lecanora dispersa* *Phaeophyscia orbicularis* *Phaeospora parasitica* *Physcia adscendens* *Placopyrenium fuscellum* *Rinodina gennarii* *Toninia aromatica* *Verrucaria baldensis* *Verrucaria hochstetteri* *Verrucaria macrastoma* *Verrucaria nigrescens* *Verrucaria viridula* *Xanthoria calcicola* *Xanthoria candelaria*

Table to show the main communities of lichens found on historic limestone buildings in Oxfordshire (after Bowen, 1980) alongside those recorded at Blenheim Palace in 2022

The first group includes lichens that tolerate dry, fully exposed surfaces, and prefer those to be horizontal or gently inclined e.g. *Aspicilia calcarea, Caloplaca teicholyta* and *Verrucaria nigrescens*, all three of which were discovered during the recent surveys and are prominent at Blenheim Palace. The majority of these, along with the ubiquitous *Physcia* species are known as being anthropophilic, preferring the extra nutrients available near farms and villages. A quite distinct community is restricted to dry, sheltered, vertical limestone and often occurs on the north side of old churches. A third community like humid or seasonally wet habitats near soil level and especially near water, either on horizontal surfaces or in sheltered crevices. Again, most of these prefer the nitrogen-rich environments of farms and villages. Finally, it should be noted that in 1980 there was a well-marked 'Cotswold' group of limestone species whose distribution was restricted to the north of Oxfordshire, and so north of Blenheim Palace.

Lichens at Blenheim

The aim of the lichen surveys at Blenheim was to build as full a species list as possible for four locations of varying aspect: North-East, North, West and South-East. The species recorded were, on the whole, very commonly found on limestone buildings and mortars in Oxfordshire and the Cotswolds, and are listed for the different locations below.

North-East

Aspicilia contorta sub sp hoff, Caloplaca austrocitrina, Caloplaca dichroa, Caloplaca flavescens, Caloplaca Saxicola, Caloplaca teicholyta, Diploicia canescens, Diplotomma alboatrum, Lecanora crenulate, Lecanora albescens, Placopyrenium fuscellum, Toninia aromatica, Verrucaria hochstetteri, Verrucaria macrastoma, Verrucaria nigrescens, Verrucaria viridula, Xanthoria candelaria

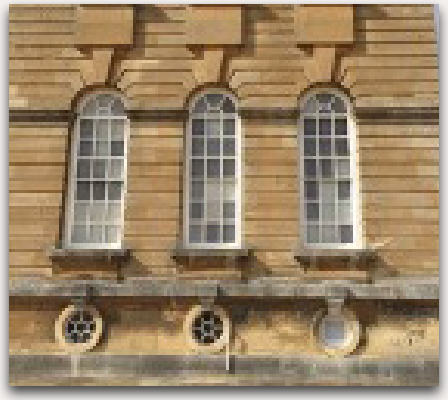
North

Caloplaca dichroa, Caloplaca flavescens, Caloplaca teicholyta, Candelariella medians, Diploicia canescens, Dirina massiliensis, Lecanora albescens, Lecanora campestris, Verrucaria nigrescens, Xanthoria calcicola

West

Aspicilia calcarea, Caloplaca austrocitrina, Caloplaca flavescens, Caloplaca teicholyta, Diplotomma alboatrum, Lecanora albescens, Lecanora crenulate, Lecanora dispersa, Rinodina gennarii, Verrucaria macrostoma, Verrucaria nigrescens, Xanthoria calcicola

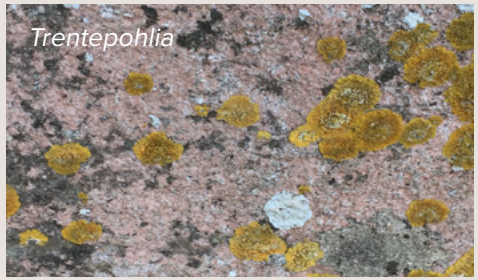
South-East



Aspicilia calcarea, Caloplaca austrocitrina, Caloplaca flavescens, Caloplaca teicholyta, Diplotomma alboatrum, Lecanora albescens, Lecanora crenulate, Lecanora dispersa, Rinodina gennarii, Verrucaria macrostoma, Verrucaria nigrescens, Xanthoria calcicola

As you can see from the table, the Blenheim list in column five matches the ‘Group 1’ list from the 1980s the most, but with some variations. One species, *Phaeospora parasitica*, is relatively rare, and was found at the South-East site. This is the first recorded individual for Oxfordshire and the British Lichen Society were informed of its discovery.

Another common occurrence at the palace, seen at other sites in Oxfordshire also, is that different communities were found on the sills and ledges compared to the walls. Lichens require moisture, and so appear fuller and healthier on surfaces that remain damp for longer. This is certainly true for the South-East site compared to the others. Nutrient-enrichment thanks to the presence of bird droppings, especially on sloping and horizontal surfaces, has also influenced the lichens present there.



At Blenheim, one of the dominant photobionts is a pink-coloured algae called *Trentepohlia*, which can be commonly seen on the walls. Many of the lichens on the palace walls will include it in their makeup.

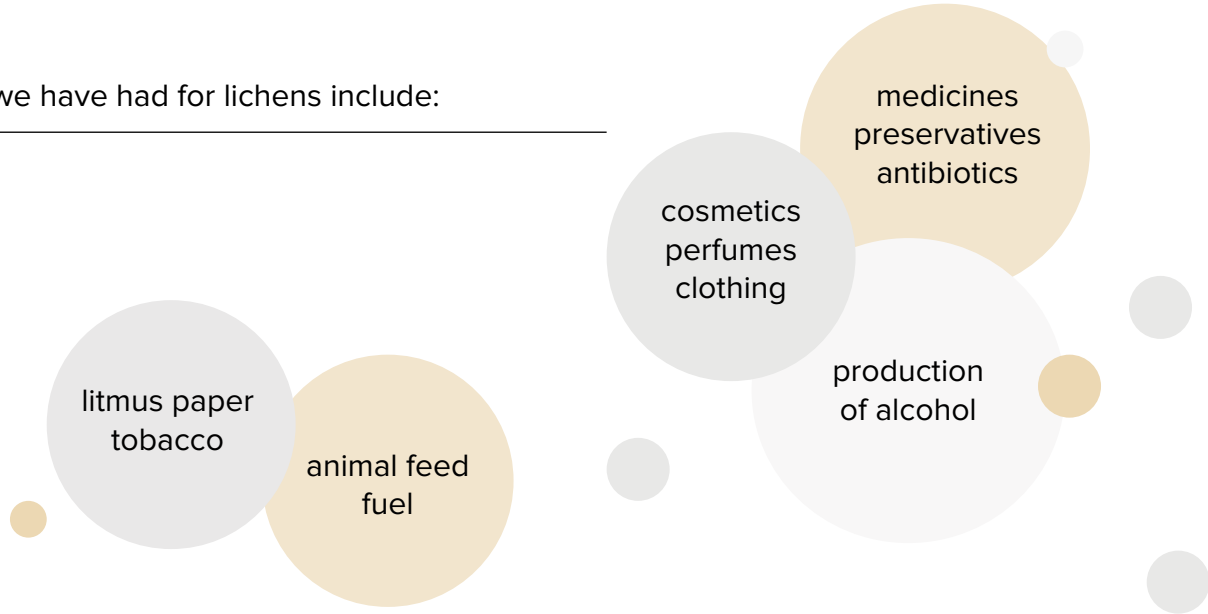
What else?

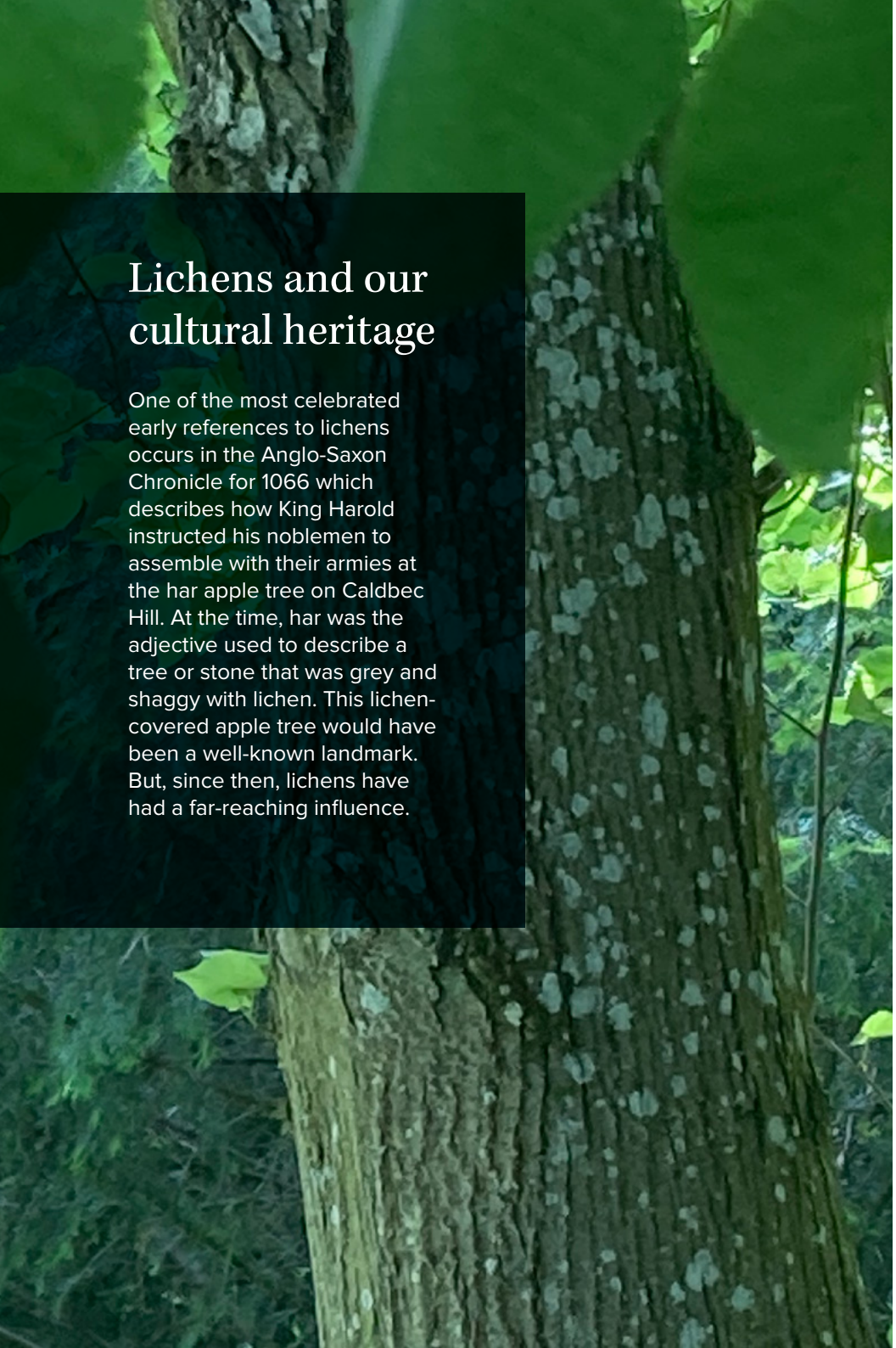
We've already seen that lichens play an important role in the conservation of our architectural heritage, but it doesn't end there. Due to their widespread presence, lichens contribute significantly to carbon and nitrogen cycling and energy flow at the global scale, as well as ecosystem hydrology and biomass production. They are also important to certain animals; birds use them to build their nests, they provide camouflage for moths and food for their larvae, and also provide food for reindeer, slugs and snails and mites. What's evident is that lichens play a huge role in the health of our ecosystems.

Their sensitivity to environmental change also makes them excellent bioindicators of air quality. For example, high levels of pollution, particularly sulphur dioxide, damages the lichen thallus, and the number of species tends to decrease drastically from the edge to the centre of urbanised areas. You'll be pleased to hear that the lichens at Blenheim indicate good local air quality.

Other uses we have had for lichens include the production of alcohol, cosmetics, perfumes, clothing, animal feed, fuel, litmus paper, medicines, antibiotics, tobacco and preservatives, but to truly understand the significance of lichens to our society we need to delve deeper into our cultural past.

Uses we have had for lichens include:





Lichens and our cultural heritage

One of the most celebrated early references to lichens occurs in the Anglo-Saxon Chronicle for 1066 which describes how King Harold instructed his noblemen to assemble with their armies at the har apple tree on Caldbec Hill. At the time, har was the adjective used to describe a tree or stone that was grey and shaggy with lichen. This lichen-covered apple tree would have been a well-known landmark. But, since then, lichens have had a far-reaching influence.

Dyes

Arguably the most important use of lichens in Britain has been for dyeing, first as a cottage industry and later on a commercial scale. Vivid descriptions of the process have been identified in the writings of travellers in both Wales and the Scottish Islands. Communities in the west of Britain and Ireland were chiefly involved in the production of yellow-brown or red-brown lichen dyes known as crottle or crotal, made from *Parmelia saxatilis* scraped off rocks. Many of the traditional dyes of the Scottish Highlands were made from lichens including red dyes from the cudbear lichen, *Lecanora tartarea*, the common orange lichen, *Xanthoria parietina*, and several species of leafy *Parmelia* lichens.

Purple dyes from lichens were historically very important throughout Europe from the 15th to 17th centuries. They were generally extracted from *Roccella* species imported from the Canary Islands, Cape Verde Islands, Madagascar, or India. These lichens, and the dye extracted from them, are called orchil (variants archil, orchilla). It should be pointed out here that orchil lichen dyes have the longest recorded history and were used by the Ancient Egyptians too, as well as being mentioned in the Old Testament. Lichen dye is usually extracted by either boiling water or by letting the lichen steep in ammonia (traditionally urine) for at least two to three weeks.

There are a number of stories of note that relate to the use of lichens as dyes. During Roman times, in an act of eco-forgery, con-artists would pass off togas dyed using lichens as the prestigious and sought after ones dyed using a particular kind of shellfish. Also, in Pembrokeshire, dye lichens were indirectly responsible for a famous military victory. In February, 1797, at the height of the Napoleonic Wars, a French Army landed at Fishguard intent on wreaking havoc and destruction. This surprise attack went almost unopposed, but the French army mistook the red, lichen-dyed cloaks of a number of distant Welsh women mounted on hill ponies for the uniforms of advancing battalions of regular soldiers. This error led to the decision to surrender to Lord Cawdor without a shot being fired.

Medicines

Lichens have been and continue to be used medicinally across the world. A lichen's worth as a medicine is often related to the secondary compounds that are present in most lichen thalli. Different lichens produce a range of these compounds that are often unique to lichens and many of which are antibiotic. It has been estimated that half of all lichen species have antibiotic properties, and many lichen extracts have been found to be effective in killing bacteria that cause boils, scarlet fever, and pneumonia.

Much contemporary use of lichens in medicine stems from the use in the past recorded in the folklore of different cultures. Lichens were used as wound disinfectants, as anti-bleeding agents and for treating other skin problems such as soreness and mouth infections. *Usnea*, common in Dartmoor, for example, has a host of folk names, such as 'witches' whiskers', 'apothecary's beard' and 'Merlin's beard', and there have been many medicinal uses for it in the past. The usnic acid it produces has antibiotic and antifungal properties, so lengths of it were used as bandages before sterile gauze was available. The *Parmelia* genus, also used in dying, takes a leafy shape and has the common name of crottle or skull lichen. According to folklore, it was thought to be an effective treatment for epilepsy if found growing on an old skull, especially that of an executed criminal. Other lichens commonly featured in folk medicines include Iceland moss and Lungwort.

So much more

Lichens have had a wide-ranging influence on other aspects of human society too. During famine, they have been used to feed humans and animals. In antiquity, they were commonly used in cosmetics; the extracts of some species, like *Evernia prunastri*, are contents of perfumes and oils. Species of *Letharia* and *Vulpicida* have been used in poisons, and lichens were used by the Ancient Egyptians for embalming too: the lichen *Pseudevernia furfuracea* was pushed into the body cavity together with sawdust, cassia and other spices, because it was highly absorbent and had antibacterial properties. They've even been used to frighten off elves, and in the limestone district of Derbyshire it is traditional to dress the village wells, which are springs, by creating floral pictures using lichens on large screens which are erected nearby to honour the springs and prevail upon them to keep flowing. One of the most frequently used species is *Xanthoria parietina*, referred to as golden lichen in some villages and bronze moss in others.

The future

The lichens living on the façade of Blenheim Palace have a fascinating history and play an important role in its conservation, contributing to Blenheim's status as a World Heritage Site as well as the wider ecosystem. The more time we spend with lichens, the more they reveal their artistry, their uniqueness and their tales. But it's important we do notice them. As the writer Vincent Zonca wrote recently, the humble lichen 'is the idealism of survival, the epiphany of having little, the hope and belief in modesty.' They are great examples to us, especially of resilience, in an age of uncertainty and rapid change. An unknown Anglo-Saxon elegise meditating among Roman ruins in the city of Bath presented the durability of lichens and stone as a model of stoicism in the face of changing fortune, and the reddish hues of the lichen assemblage described are compared with the bloodstains left by passing battles.

So, what does the future hold? To be able to implement conservation polices, and so to protect endangered species for example, more information is needed regarding the taxonomy, abundance, habitat requirements and distribution of lichens in many ecosystems worldwide. Key current research ranges from examining what climate change means for the distribution of lichens and so their role in ecosystem hydrology, and carbon and nitrogen cycling, to work like that being carried out at Blenheim that seeks to develop ways of monitoring lichens to support built heritage teams and move towards a clearer understanding of nature-based solutions for our living stone.

'Time and again this wall endured,
Lichen grey and red stained,
as kingdom followed kingdom.'

Blenheim Palace Water Terrace statue

BLENHEIM PALACE

Further reading

If you would like to find out more about lichens, here is a brief selection of resources:

Lichens by Oliver Gilbert
A great starting point for any budding lichenologist, this book deals with the biology, ecology and cultural history of lichens.

Lichens by Vincent Zoncha
A far-reaching book offering a fresh take on lichens that draws from biology, ecology, philosophy, literature, poetry and graphic art.

The Secret World of Lichens: A Young Naturalist's Guide by Troy McMullin
This book for younger readers introduces lichens before concentrating on forty of the most interesting and unique species of lichen in the world.

https://britishlichensociety.org.uk
This is the website of the British Lichen Society and it contains a wealth of information promoting the teaching and study of lichens, their conservation and their beauty and importance.

Blenheim Palace Estate