

MICROSCOPICAL EXPLORATION

FORTY TWO (ME42)

OBSERVATIONS OF GRAVEYARD LICHENS ON DIFFERENT SUBSTRATES

Since boyhood I, the author of this brief microscopical exploration, have been a keen amateur naturalist. I also spent my whole working life employed in occupations directly or closely linked to the sciences, but mainly chemistry and physics.

Over those many years I have acquired no specialist knowledge of lichens or lichenology and, now in retirement, I am perfectly happy to embrace 21st century technology to assist me with my on-going fascination with the natural world. That technology, for the purposes of ME42, comes in the form of a smart phone app [here](#), which was used to identify those specimens observed in one of the pleasant green spaces close to my home. That pleasant green space happens to be a cemetery and, as such, has trees and stone structures in abundance, any of which can be populated by lichens of various types.

Before I illustrate and describe my observations, I will define some of the terms used in ME42.

Lichen: An organism comprising a symbiotic partnership between an alga (or cyanobacteria) and a fungus.

Thallus: The 'body' or vegetative tissue of the lichen.

Soredia: Reproductive structures of lichens composed of fungal hyphae wrapped around algae or cyanobacteria.

Apothecia: Small cup or disc shaped structures for the sexual reproduction of the lichen's fungal partner.

The Observations

Candelaria concolor on a large fallen tree branch



Name: *Xanthoria parietina* (Common Yellow Wall Lichen)

Description: *Candelaria concolor* is a crustose lichen, characterized by its intricate, small, and branching lobes that form a thin, almost powdery layer on the substrate. The lobes are closely adherent to the substrate, creating a smooth to slightly textured surface. The colouration is a key identifier, typically a pale yellowish-green to greyish-green, often with scattered, bright yellow soredia, which contribute to a speckled appearance. The overall effect is a delicate and subtly beautiful colony that covers the substrate in patches. The thallus is largely composed of densely packed hyphae that adhere firmly to the substrate, and the soredia are easily distributed by the wind or rain.

Thallus Form: Crustose

Colour: Pale yellowish-green to greyish-green with scattered bright yellow soredia, creating a speckled effect. The yellow is often more intense in areas exposed to higher levels of sunlight. Some areas might show a very slight darkening, indicating older sections.

Texture: Smooth to slightly granular surface, the lobes are closely situated giving a more or less even surface, yet the presence of the soredia creates a subtly uneven texture resembling fine sand.

Spore Producing Structures: Apothecia are rarely observed in *C. concolor*. Reproduction is primarily asexual via the production of abundant soredia which are small, powdery granules that contain both fungal hyphae and algal cells. These soredia are easily dispersed and are responsible for the lichen's widespread distribution.

Habitat: Typically found on acidic substrates such as rocks, especially siliceous rocks, and also on bark of deciduous trees. It particularly favours shaded or partially shaded conditions, in damp environments and is often seen in crevices or along cracks where some moisture is retained.

Growth: *C. concolor* exhibits slow growth, often taking many years to form extensive colonies. The growth pattern is expansive, spreading slowly through soredia dispersal rather than forming distinct lobes.

Symbiotic Relationship: *Candelaria concolor* is a typical lichenized fungus, exhibiting a mutualistic symbiotic relationship with a green alga, likely a species of *Trebouxia*. The fungus provides structure and protection to the alga, while the alga provides the fungus with carbohydrates produced through photosynthesis.

Reproduction Method: Primarily asexual reproduction through the dispersal of soredia. Sexual reproduction via apothecia is infrequent, if not exceedingly rare in this species.

Ecological Role: *C. concolor*, as a pioneer species, plays an important role in initiating soil formation and succession on bare rock surfaces. It contributes to weathering of the substrate and increases organic matter content. It also serves as a food source for some invertebrates and is an indicator species for specific air quality conditions.

Xanthoria parietina on a Hawthorn branch



Name: *Xanthoria parietina* (Common Yellow Wall Lichen)

Description: *Xanthoria parietina*, also known as the common yellow wall lichen or yellow scale lichen, is a foliose lichen characterized by its bright yellow-orange colour and leafy,

lobed thallus. It often displays a range of colours, from a pale yellowish green to a deep golden orange, depending on moisture levels and light exposure. The upper surface is smooth to slightly wrinkled, while the lower surface is typically paler and displays rhizines for attachment to the substrate.

Thallus Form: Foliose (leaf-like), with lobes that are somewhat irregular and overlapping.

Colour: Primarily bright yellow-orange, ranging from a pale yellowish-green in shaded areas to a deep golden orange in areas with direct sunlight. May exhibit some gre-green tones in less exposed areas or on older parts of the thallus. The apothecia are a distinctive bright orange-yellow.

Surface Texture: Smooth to slightly wrinkled or undulated upper surface. The lobes are flat to slightly convex, and the edges of the lobes can be somewhat crisped or wavy. The lower surface is smoother and paler, with noticeable rhizines that adhere to the substrate.

Spore Producing Structures: Apothecia are abundant, disk-shaped, and bright orange-yellow, often numerous and clustered on the upper surface of the thallus. They can be relatively large compared to the thallus lobes. Asci contain numerous ascospores.

Habitat: *Xanthoria parietina* is a common lichen found on bark, particularly of deciduous trees, rocks, walls, and other exposed surfaces in a variety of habitats including woodlands, urban areas, and coastal regions. It thrives in well-lit, somewhat humid environments, but is remarkably tolerant of air pollution.

Growth: It exhibits moderate growth rates, readily colonizing suitable substrates. Its growth is influenced by available moisture and light conditions; during periods of drought it can appear duller and less vibrant.

Symbiotic Relationship: It forms a mutualistic symbiotic relationship with green algae (*Trebouxia*) that provides carbohydrates through photosynthesis, and fungal hyphae that provide protection, moisture, and inorganic nutrients.

Reproduction Method: It reproduces both sexually (via ascospores produced in apothecia) and asexually (via soredia and isidia).

Ecological Role: *Xanthoria parietina* acts as a bioindicator of air quality, being more abundant in less polluted areas. It contributes to nutrient cycling and provides habitat for small invertebrates. It is a pioneer species, often one of the first lichens to colonize a new substrate.

Physcia adscendens on the trunk of a Small Leaf Lime Tree



Name: *Physcia adscendens*, common name: Shingle Lichen.

Description: *Physcia adscendens*, also known as the Shingle Lichen, is a foliose lichen characterized by its broadly lobed thallus that adheres closely to the substrate. The lobes are relatively broad and often overlap, creating a somewhat shingle-like appearance, hence the common name. The upper surface displays a distinct combination of colours and textures, and the undersurface is characterized by a network of rhizines that aid in attachment.

Thallus Form: Foliose

Colour: The primary colour is a muted olive-green to greyish-green, often with areas exhibiting a brownish hue, especially on older parts of the lichen. Some lobes show a lighter yellowish-green in areas of high light exposure.

Surface Texture: The upper surface appears slightly wrinkled and somewhat uneven, not entirely smooth, with a minutely granular or slightly rough texture. The edges of the lobes are typically crisped or somewhat wavy.

Spore Producing Structures: Spores are produced in apothecia, which are disc-shaped structures typically found on the lobe tips and upper surface of the thallus. The apothecia of *P. adscendens* are generally small, and a pale brownish or beige colour compared to the darker thallus. They are often scattered but can appear clustered in some areas. The ascospores themselves are typically simple, colourless and elliptical.

Habitat: *Physcia adscendens* is a common species found on tree bark, particularly in wooded areas, and also occurs on rocks and other substrates in shaded or partially shaded environments. It prefers acidic bark substrates in temperate to boreal zones. This specimen is growing on a tree trunk.

Growth: The growth pattern is generally outward-expanding, with new lobes forming at the edges of the existing thallus. Growth rates are typically slow to moderate for foliose lichens of this kind.

Symbiotic Relationship: The symbiotic relationship in *P. adscendens* is a mutualistic one between a fungal mycobiont and a green alga, likely a species of *Trebouxia*, which provides the lichen with carbohydrates through photosynthesis. The fungus provides the alga with structure, water, and protection.

Reproduction Method: Reproduction occurs both sexually via ascospores produced in apothecia and asexually through soredia or isidia, enabling dispersal and colonization of new substrates.

Ecological Role: *Physcia adscendens* plays a role in nutrient cycling in its ecosystem, helping to break down organic matter and enriching the soil. It also provides habitat for small invertebrates and may serve as a food source for some animals.

Ramalina menziesii on a Sandstone Grave Marker



Name: *Ramalina menziesii* (Menzies' Ramalina)

Description: *Ramalina menziesii* is a fruticose lichen characterized by its intricately branched, pendulous thallus. The branches are cylindrical to slightly flattened, with a distinctly greyish-green to bluish-green colouration. The surface appears somewhat smooth to slightly rough, with subtle longitudinal striations visible upon closer examination. It often grows in dense clumps or patches, creating a visually striking display.

Thallus Form: Fruticose

Colour: Greyish-green to bluish-green, with subtle variations in shading depending on light exposure and hydration. Can appear somewhat glaucous in appearance due to surface texture.

Surface Texture: Smooth to slightly rough, with fine longitudinal striations and a slightly granular or powdery appearance in some areas. Can appear somewhat matte rather than shiny.

Spore Producing Structures: Apothecia are rare but present as small, disc-shaped structures that develop along the margins of the branches, and are a pale, almost whitish colour when mature. They contain asci and ascospores responsible for sexual reproduction. The apothecia often are partially or fully immersed within the branches themselves.

Habitat: Typically found growing on the bark of trees, particularly in coastal areas or environments with higher humidity. It exhibits a preference for exposed, well-lit surfaces and often colonizes the branches of hardwood trees. It is also sometimes seen on rocks in similar habitats.

Growth: *Ramalina menziesii* exhibits a moderate to slow growth rate, adding a few centimetres in length each year depending on conditions. Growth patterns are often elongated and irregular, resulting in the characteristic tangled masses.

Symbiotic Relationship: It is a symbiotic organism comprising a fungal mycobiont (likely belonging to the genus *Ramalina*) and a photobiont, usually a green alga (likely from the genus *Trebouxia*). The fungus provides protection and structure, while the algae conduct photosynthesis and provides carbohydrates to the fungal partner.

Reproduction Method: Reproduction is achieved primarily through both sexual and asexual means. Sexual reproduction involves the production of ascospores in apothecia, while asexual reproduction occurs through the fragmentation of the thallus and the formation of soredia (small powdery propagules).

Ecological Role: *Ramalina menziesii*, like other lichens, plays a significant role in nutrient cycling within its ecosystem. It contributes to soil formation through weathering of the substrate, and also acts as a food source for invertebrates in some ecosystems. It can be a sensitive indicator of air quality, as it is susceptible to air pollutants.

Parmelia saxatilis on a Sandstone Grave Marker



Name: *Parmelia saxatilis* (Common Name: Rock Lichen)

Description: The image shows a specimen of *Parmelia saxatilis*, exhibiting its characteristic foliose thallus with lobes that are irregularly shaped and relatively broad. The lobes are closely appressed to the substrate but have slightly raised margins and are distinctly crenate or scalloped. The surface displays a granular texture with slight wrinkling around the lobes' margins, indicating a degree of age and exposure to environmental conditions. Colouration varies, with a dominant greyish-green that lightens towards the lobe margins, where a pale bluish-grey or even whitish tint can be observed. Some darker areas suggest possible discoloration due to environmental factors or localized accumulation of substances.

Thallus Form: Foliose

Colour: Predominantly greyish-green, with a pale bluish-grey to whitish hue at the margins of the lobes. Some areas show a darker greenish-grey discoloration.

Surface Texture: Granular surface texture, with slightly wrinkled and uneven margins on the lobes. The lobes themselves are relatively flat against the substrate.

Spore Producing Structures: Apothecia are present, appearing as small, round to oval, brown discs, typically located on the upper surface of the lobes. The number and distribution of apothecia are relatively sparse in this specific image but their presence suggests the lichen is mature and capable of sexual reproduction.

Habitat: This lichen thrives in exposed, rocky habitats, often found growing on various rock types including sandstones, granites and other exposed siliceous substrates, particularly in

well-lit environments. It demonstrates a preference for well-drained, acidic environments, avoiding areas with excessive moisture.

Growth: Growth is relatively slow, with the lichen extending and developing new lobes gradually over several years. The rate of growth is influenced by environmental conditions like light availability, temperature, moisture availability and the availability of nutrients.

Symbiotic Relationship: The lichen exhibits a mutualistic symbiotic relationship between a mycobiont (fungal partner) and a photobiont (algal partner). The algal partner is usually a species of green algae, providing the lichen with organic compounds via photosynthesis. The fungal partner provides protection and absorbs moisture and minerals from the substrate.

Reproduction Method: Reproduction occurs through both sexual and asexual means. Sexual reproduction is via the release of ascospores from apothecia, while asexual reproduction is achieved through the fragmentation of the thallus, allowing detached lobes to establish new colonies.

Ecological Role: *Parmelia saxatilis* serves as a pioneer species in various ecosystems and contributes to weathering of rocks, enriching soil through its decomposition. It plays a significant role in providing habitat for a range of small invertebrates and may also act as an indicator of air quality. Its presence or absence can indicate the relative level of air pollution in the surrounding environment.

Lepraria incana (Ash-grey Lepraria) on Sandstone Wall



Name: *Lepraria incana* (Ash-grey Lepraria)

Description: *Lepraria incana* is a crustose lichen, appearing as a granular to farinose

(powdery) coating on its substrate. It lacks distinct lobes or other structural features typical of many other lichens. Its colour is quite variable, ranging from whitish-grey to pale greyish-brown, often with a subtle, dusty appearance. The image shows a patch that is predominately off-white, with slight variations in tone. The overall effect is a finely textured, almost chalky surface.

Thallus Form: Crustose

Colour: Primarily off-white to pale greyish-brown; subtle variations in tone across the patch create a mottled, dusty effect. There's a lack of any strongly contrasting colours.

Surface Texture: Granular to farinose (powdery); fine-textured, almost chalky; lacks a smooth, continuous surface, instead appearing as an aggregation of tiny granules that give it a slightly uneven look. The image suggests a slightly raised appearance.

Spore Producing Structures: *Lepraria* lacks apothecia (typical spore-producing structures in many lichens). It primarily reproduces through soredia, small dust-like particles containing both fungal hyphae and algal cells, which are visible in the image as fine granular texture. The image does not show any clearly defined structures that might point towards other reproductive mechanisms.

Habitat: *Lepraria incana* is a common species found on various substrates, including rocks, bark of trees, and even soil. It prefers areas with moderate moisture and can tolerate a wide range of light conditions, though it is often found in shaded or partially shaded habitats. The image shows that this specimen likely resides on rock, based on the substrate's texture.

Growth: *Lepraria incana* is a slow-growing lichen, expanding slowly outward from its initial point of attachment. The growth is predominantly through the dispersal and colonization of soredia; hence it is difficult to quantify a precise growth rate. The irregular shape of the patch in the image supports the notion of slow and somewhat unpredictable expansion.

Symbiotic Relationship: *Lepraria incana* represents a symbiotic relationship between a fungus and a green alga (*Trebouxia*). The fungus provides structure and protection, while the alga photosynthesizes, providing nutrients to the lichen.

Reproduction Method: Primarily asexual reproduction through the dispersal of soredia. Sexual reproduction, if it occurs, is less common and more difficult to observe.

Ecological Role: *Lepraria incana*, like other lichens, plays a significant role in soil formation through weathering of rock surfaces and contributes to nutrient cycling in its environment. It also serves as a habitat for small invertebrates and provides a food source for some animals. In the case of the image, the species likely contributes to the weathering of the specific rock formation it is attached to.

Lepraria incana (Grey Dust Lichen) on a Granite Grave Marker



Name: *Lepraria incana* (Gray Dust Lichen)

Description: *Lepraria incana*, also known as the Gray Dust Lichen, is a crustose lichen that lacks distinct thallus lobes. It forms a granular to powdery coating on its substrate. The image shows a characteristic fine-grained, almost dust-like texture spread across the surface of the substrate. There is a lack of defined structures such as apothecia, which are typical fruiting bodies in other lichens. It is a very common lichen often overlooked due to its subtle appearance.

Thallus Form: Crustose

Colour: The primary colour is a pale greyish-green, appearing almost dusty or powdery. Variations in shade exist, with some areas slightly darker, showing hints of olive-green and off-white.

[Surface Texture]: The surface is extremely fine-grained, appearing almost powdery or granular to the naked eye. It has a slightly uneven texture, lacking any prominent ridges or furrows, creating an overall matte appearance.

[Spore Producing Structures]: Spore-producing structures, such as apothecia, are absent in *Lepraria incana*. Reproduction is primarily through the dispersal of soredia, which are small dust-like particles containing both fungal and algal components.

[Habitat]: *Lepraria incana* is a ubiquitous species, thriving on a wide range of substrates. It's commonly found on rocks, particularly acidic rocks, bark of various trees (especially deciduous species), and even on weathered wood surfaces. It is often found in relatively

undisturbed habitats, preferring moderately shaded or exposed conditions.

[Growth]: The growth pattern is mostly evenly distributed across the substrate. The growth rate is slow, often taking years to create a noticeable patch. It spreads by the proliferation and dispersal of its soredia.

[Symbiotic Relationship]: *Lepraria incana* has a symbiotic relationship with a green alga, specifically *Trebouxia*, which is responsible for photosynthesis. The fungus provides protection and absorbs nutrients and moisture for both organisms.

[Reproduction Method]: Reproduction is primarily asexual, accomplished through the production and dispersal of soredia. Sexual reproduction is rare and poorly understood in this genus.

[Ecological Role]: *Lepraria incana* plays a significant role in early stages of soil formation on rocks and can contribute to nutrient cycling in the ecosystem. It is also a pioneer species, colonizing exposed surfaces and acting as a substrate for other organisms to establish themselves. It serves as a food source for some invertebrates. The lack of significant fruiting bodies means its contribution to spore dispersal within the wider community is minimal.

Lecanora muralis (Common Wall Lichen)



Name: *Lecanora muralis* (Common Wall Lichen)

Description: This image shows a specimen of *Lecanora muralis*, a common crustose lichen. It displays a characteristically smooth to slightly granular, pale greyish-white to whitish-grey thallus. The thallus is relatively extensive in the image, covering a significant portion of the

substrate, suggesting mature growth. The edges are somewhat irregular and diffuse, showing no distinct demarcation from the surrounding substrate. There appears to be some fine cracking or reticulation on the thallus surface, characteristic of this species.

Thallus Form: Crustose

Colour: Primarily a pale greyish-white to whitish-grey, with subtle variations in tone across the thallus. Slight darkening is present in some areas, possibly due to environmental factors or age.

Surface Texture: Smooth to slightly granular with a fine network of cracks or reticulations giving it a slightly textured appearance, almost like fine wrinkles in a thin layer of paint. There is no apparent hairiness or other significant texture.

Spore Producing Structures: Apothecia are likely present (though not clearly visible in this image at this resolution) and would be small, disc-shaped, and typically a pale orange to light brownish-orange colour when mature, sitting somewhat flat upon the thallus surface. They're a key identifying feature for this lichen.

[Habitat]: This lichen thrives in various environments, but most commonly on rocks and walls, particularly in well-lit, often slightly shaded, areas. It tolerates high levels of air pollution and is frequently found in urban and disturbed habitats, growing on man-made structures like stone walls and concrete.

[Growth]: *Lecanora muralis* exhibits relatively slow growth, adding small amounts of thallus material each year. The image suggests a colony that has had a period of consistent growth in place. Colonization happens as spores settle in favourable places and gradually expand.

[Symbiotic Relationship]: It has a mutualistic symbiotic relationship with green algae (trebouxoid algae), specifically within the genus *Trebouxia*. The fungal partner provides the structure and protection, while the algae photosynthesize, providing carbohydrates to the lichen.

[Reproduction Method]: *Lecanora muralis* reproduces both sexually (via ascospores produced in the apothecia) and asexually (through soredia or isidia). The image does not provide enough resolution for positive identification of either soredia or isidia.

[Ecological Role]: As a pioneer species, *Lecanora muralis* plays a vital role in the early stages of rock and wall colonization, helping to break down the substrate and create conditions suitable for other organisms. It also contributes to nutrient cycling in its environment.

In Conclusion

Two of the above specimens above are described as having the same taxonomic name. However, due to the complexity of lichen taxonomy, their differences in appearance could possibly be attributable to differences in substrate, geographical position and environmental conditions pertaining, although differing genetic lineages are not beyond the bounds of possibility.

**As we say here in Cumbria:
'Ave a go yersel'!**

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