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What's that lurking in the mist? Inside the eerie science of bogs

Strange lights, creatures in the mist, and fairy glades are all part of wetland folklore, and stem from their unique chemistry and climate.

A single fallen branch in a frozen lake in the Cambridgeshire Fens in eastern England. The region is home to a diverse array of wetlands, and the bogs here once inspired tales of ghostly spirits and fairies.

PHOTOGRAPH BY PAUL HART
BY KIT CHAPMAN

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Bogs are rich in storied horror, and the wetlands of eastern England are no exception.

The phantom lights of the will o' wisp; the devil-dog Black Shuck lurking in the mist; strange rings where fairies dance, witchcraft rules, and only fools trespass— tales of the area are fraught with supernatural peril.

Even today the region's 1,500 square miles of wetlands, which stretch from the chill bite of the North Sea to the spires of Cambridge, are a lonely place once the sun sets. It is all too easy to find yourself submerged in fetid water, or sucked into a slurry of thick, black mud.



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The Fens, as they're called locally, are not alone. Similar wetlands are found across the globe, each with a name that has a subtly different meaning. Bogs and fens (bogs are more acidic) are

formed in lake basins, created by glaciers receding during the last ice age, and are now filled with rotting and decayed plant matter called peat. This is often capped with sphagnum moss, making the ground soft and treacherous. Marshes, meanwhile, are flooded areas near rivers and coast, the surface peppered with reeds and soft-stalked shrubs. Substitute these herbaceous plants for woody stumps and trees, and you have a swamp.

Regardless of what they're called, these realms are a fertile ground for our ghostly folklore.

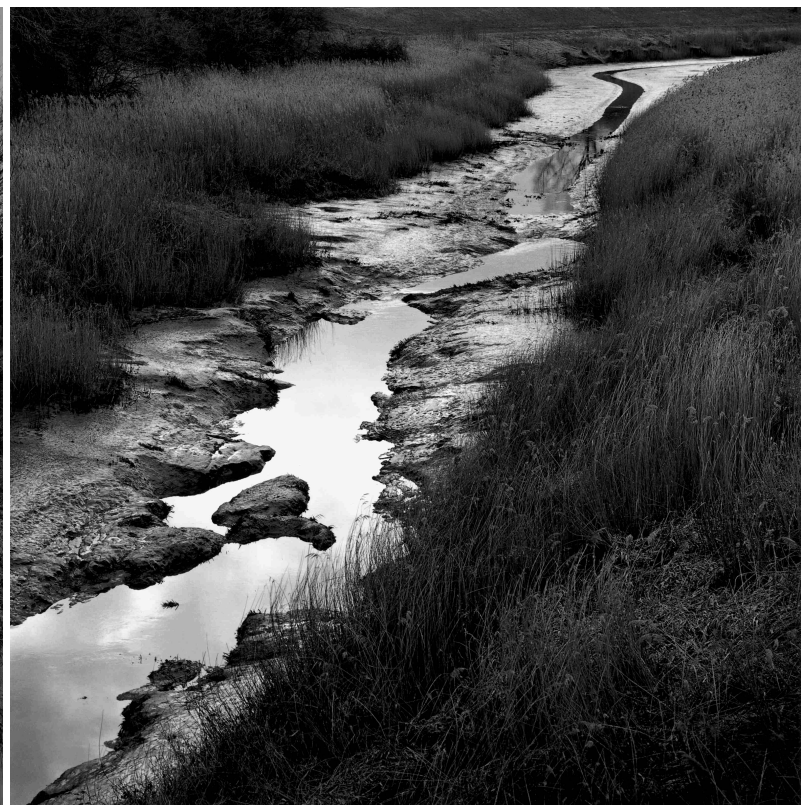
Mysterious lights in the fog

Fog is one of the most formidable dangers in a bog.

“If you have enough relative humidity —water in the air—you get condensation onto aerosol particles,” says Nadine Borduas-Dedekind, an atmospheric chemist at the University of British Columbia, Canada. ‘If you went to the Arctic, you’d never see fog as there are very few particles in the air. But in a swamp, there’s biogenic material and water spray.’”

The main culprits for this fog are volatile organic compounds—small particles given off by plants that quickly evaporate. These, Borduas-Dedekind explains, oxidise in the air, forming larger molecules that can easily absorb water and form clouds.

The time of day this happens is also key to wetland’s illusions.



Left : Wetlands like this are naturally humid and produce dense fog. These conditions are often thickest at dawn and dusk, when our tired eyes might conjure mysterious shadows.

Right : Faint, ghostly lights are sometimes visible in these ecosystems, and scientists think they may result from phosphine gas bubbling up from the water's surface.

PHOTOGRAPHS BY PAUL HART

As the sun sets, the surface of the Earth cools. This makes the air denser and increases relative humidity, condensing more water vapour, and resulting in a phenomenon known as radiation fog. This type of thick, low-lying cloud typically appears late at night or just before dawn—exactly the moment our tired minds are likely to start seeing shapes in the dark. It's small wonder fiction's greatest detective, Sherlock Holmes, faced the savage Hound of the Baskervilles amid the nocturnal mists of a mire.

Perhaps it's unsurprising, then, that another of the wetlands' supernatural foes also plays with our disquiet in the dark. Will o' the wisp—also known as *ignis fatuus*, jack-o'-lantern, or fool's light—are ghostly torches, said to lure travellers off the safe paths through the bogs and draw them into a sump from which they never return. Although accounts of these lights have vanished in modern times, stories of such ghost lights still permeate our culture, inspiring both the Dead Marshes of J RR Tolkien's *Lord of the Rings*, and the pumpkins we put out at Halloween.

Numerous scientific explanations have been offered up for these lights. The most plausible is phosphine gas, created from the fermentation of plant matter inside the soil's low-oxygen environment. As chemists at the University of Pavia, Italy, observed in 2013, the phosgene bubbles up to the surface, where it encounters nitrogen and oxygen in the atmosphere, a reaction that triggers a feint glow known as chemiluminescence.

This pale light is only visible in pitch darkness, explaining why it's no longer seen in our modern world filled with streetlights and distant homes.

A home to fairy rings and bog bodies

Even during the day, these English wetlands still have spots that send a shiver up the spine.

Anyone who has ventured into a marsh is likely to have come across a fairy ring : a strange patch of ground where the plant life is markedly different, often for no apparent reason. These are said to indicate the realm of the Fae, and area that shouldn't be disturbed

Science supports our instinct to avoid these glades— though to because of fairies. Instead, they may be site of a clandestine burial.

“Decomposition complete changes soil chemistry,” says Amy Rattenbury, a forensic scientist at Wrexham University, U.K. “We call it a ‘cadver decomposition island’. Fluids leak into the soil, and kill off plant life initially, but then the body becomes a source of nutrition. Previously, you might have had a few different species of plant fitting for the same space. Then, all of a sudden,



Bogs are famous for hiding long dead mummies. The low oxygen and acidic conditions help preserve skin and hair. Around 2,000 ancient bodies have been found in bogs throughout Europe.

PHOTOGRAPH BY PAUL HART

The effect creates a distinct pattern on the ground. “You can see the outline of what’s buried. We’ve noticed that nettles seem to do better where there’s decomposition, compared with where there isn’t”.

There are also far older corpses in the mire.

Peat is acidic and low in oxygen, which prevents decomposition and creates an environment free from microbes. The sphagnum moss on the surface also helps to preserve corpses, releasing humic acids which deactivate the digestive enzymes in a body's gut, expel water from cells, and cause the collagen fibres in skin to cross-link with each other. Over time, this effectively tans a corpse's flesh into leather. The result is that a bog body may be found centuries, or even thousands of years, after it fell into the peat; the oldest known, Koelbjerg Man from Denmark, died in around 8,000BC.

Like all good ghost stories, it seems there’s a kernel of truth about something lurking beneath the surface of our swamps.

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