

The strange case of the ice-making fungus

by John Tyler

Walking through Moor Copse near Frieth on a cold, still December morning last year I was intrigued to come across what looked like a tuft of pure white wool lying on the ground (Fig.1 below). Looking more closely I realised that it was in fact made up of hundreds of ice crystals about an inch long, springing like a curled Victorian moustache from the underside of a beech twig where the bark had peeled away to expose the wood beneath. This was the first time that I had ever come across this odd phenomenon and despite much searching this was the only example that I could find anywhere in the wood. So I was even more surprised when, an hour later and several miles away, I came across a second, larger specimen, this time on a fallen beech bough in a wood near Lacey Green (Fig 2 below). Like the first one it was sprouting not from the bark but from the surface of the wood, though it was hard to say whether the crystals had actually forced the bark off or had just been restricted to an existing patch of bare wood.

Now you may be wondering what all this has got to do with fungi. Well, after a brief search on the internet it transpires that this 'hair ice' as it's known has been the subject of study and speculation for many years and that in 1918 Alfred Wegener suggested that it was created by a fungus. More recently, Gerhart Wagner and Christian Mätzler of Bern University have studied the idea in more detail and found some evidence to support it. Hair ice seems to be found only on wood supporting fungi, either ascomycetes or basidiomycetes (the second specimen that I found was accompanied by *Ascocoryne sarcoides* and what appeared to be a *Hypoxylon* species). This observation in itself means very little - after all, almost any piece of dead wood chosen at random has a good chance of containing fungi - but perhaps more significant is the fact that killing the fungus, by treating pieces of the iced wood with alcohol or a fungicide or by boiling, stops the hair-ice from forming as it does on untreated control pieces kept under the same conditions. The researchers suggest that as the



Fig. 1 Hair ice on a Beech stick in Moor Copse, December 2012 © J. Tyler

the fungus breaks down the wood, particularly the nutrient-rich medullary rays that radiate through it from the centre to the surface, its metabolism generates carbon dioxide, the pressure of which drives water outwards along these rays. Once the water reaches the surface of the wood it freezes to form the tip of a

hair-like ice crystal which then continues to grow from the base as more water is expelled. This association with the rays of the wood might explain why hair ice is normally confined to bark-free parts of the twig or branch.



Fig. 2 Hair ice on a fallen Beech bough in woodland near Lacey Green, December 2012 © J. Tyler

What I find particularly remarkable is how rare and localised hair ice is, with just these two specimens to show for my countless years of wandering about in woods. It presumably requires an equally rare combination of quite precise factors to occur: for example the right species of fungus at the right stage of development; perhaps the right species of tree (some, like beech and oak have more pronounced medullary rays than others); patches of bark-free wood; the right temperature conditions to form ice crystals without inhibiting the growth of the fungus; and perhaps perfectly still air to allow the crystals to develop undamaged. I don't think that even the researchers would claim that the theory has been proven beyond all doubt, but I do find it a charming thought that such beautiful ice-sculptures could be created quite unintentionally by a fungus just going about its day-job. And before we are tempted to dismiss the idea out of hand it is perhaps worth noting that this was not Wegener's only unorthodox suggestion. His other claim to fame is that just a few years earlier he had come up with the equally outlandish theory of Continental Drift, in which the Earth's surface is constantly on the move: and he was absolutely right about that one!

References

Wagner, G. & Mätzler, C. (2008) Haareis auf morschem Laubholz als biophysikalisches Phänomen [*Hair Ice on Rotten Wood of Broadleaf Trees – a Biophysical Phenomenon*]. An online publication in German but with an English abstract and some beautiful photographs.
<http://www.iap.unibe.ch/publications/download/3152/de/>

Wegener, A. (1918) Haareis auf morschem Holz. *Die Naturwissenschaften* 6/1, 598-601.