



# Ghost Fungi

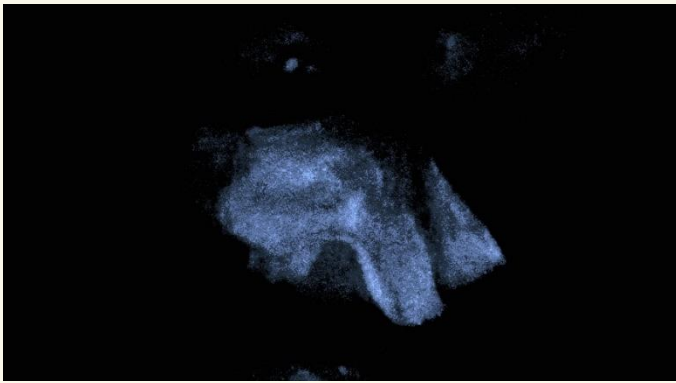
## Bioluminescence

### *Omphalotus nidiformis*

In suburban Sydney, we don't expect to wake up on a dark night, look out the window and see glowing white lights in the garden - not solar lights, rather Ghost Fungi, illuminated by the phenomenon of bioluminescence.

This Sydney summer has been one of the wettest on record, and fungi are appearing everywhere. What we observe, the mushroom caps and bracket fungi, are the above-ground fruiting bodies of vast, but mostly unseen subterranean networks of microscopic fungal filaments (hyphae). Our unparalleled rainfall this year has unlocked these underground resources resulting in the proliferation of fungal fruiting bodies.



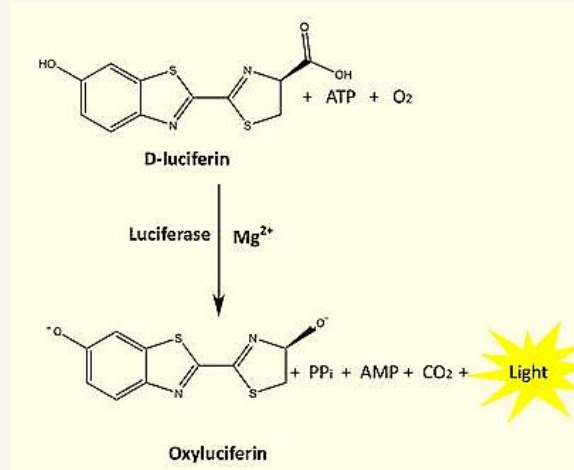


The Ghost Fungus, *Omphalotus nidiformis*, growing on the stump and exposed roots of a *Banksia integrifolia* caught our attention recently. This fungus occurs in two widely separated regions of Australia (*disjunct* distribution): firstly, the south-west of Western Australia; secondly, from eastern South Australia, all the way through to coastal Queensland. It has also been recorded from Norfolk Island and southern India. It grows on both living trees (where it is parasitic) and also on dead wood (saprophytic). It glows white in the dark although most images on the internet are green.



How, and why, does the fungus glow in the dark? Bioluminescence is the production and emission of light from a living organism. Probably the best-known is the sparkling phosphorescence produced by dinoflagellates (a type of marine algae) in sea water, but fireflies, glow worms and fungi are other examples of organisms illuminated by bioluminescence.

Bioluminescent light is referred to as *cold* light as it can be generated in the dark. Light emission is generated in a biochemical reaction catalysed by an enzyme, luciferase, that facilitates the oxidation of compounds called *luciferins*.



Bioluminescence developed early in the evolution of the group of fungi (Agaricales) to which *Omphalotus nidiformis* belongs. All bioluminescent fungi are *white rot* fungi, given this name because they break down wood, leaving a decaying, fibrous white residue that microbes can attack. White rot fungi play an essential role in global carbon cycling by breaking down recalcitrant complex carbohydrates and releasing nutrients that would otherwise be locked up forever.





*Omphalotus nidiformis* in the light (upper) in the dark (lower)  
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The evolutionary role of bioluminescence in fungi is seemingly not yet fully understood, but it has been suggested that the oxygen-consuming process of bioluminescence may reduce the damaging effects of highly reactive chemicals (known as Reactive Oxygen Species, or ROS). It has also been suggested that in dark forests, bioluminescent fungi may attract invertebrates that facilitate the dispersal of spores, or even that bioluminescence

deters potential predators. Maybe bioluminescence is simply an incidental by-product of metabolism, with no selective advantage.

Distribution map modified from Atlas of Living Australia: <https://bie.ala.org.au/species/880abd7a-b60f-44b6-8c08-ea72f832d2e0>

Fungimap: <https://fungimap.org.au/omphalotus-nidiformis-ghost-fungus/>

Kaskova Z M, Dörr F A, Petushkov VN et al. 2017. Mechanism and color modulation of fungal bioluminescence. *Science Advances*. 26;3(4):e1602847. doi: 10.1126/sciadv.1602847

Ke H-M, Tsai I J. 2022. Understanding and using fungal bioluminescence – Recent progress and future perspectives. *Current Opinion in Green and Sustainable Chemistry* 33: 2452-2236, <https://doi.org/10.1016/j.cogsc.2021.100570>

Weinstein P, Delean S, Wood T, Austin AD. 2016. Bioluminescence in the ghost fungus *Omphalotus nidiformis* does not attract potential spore dispersing insects. *IMA Fungus*.7(2):229-234.

Wikipedia: [https://en.wikipedia.org/wiki/Omphalotus\\_nidiformis](https://en.wikipedia.org/wiki/Omphalotus_nidiformis)

Wikipedia: [https://en.wikipedia.org/wiki/List\\_of\\_bioluminescent\\_fungus\\_species](https://en.wikipedia.org/wiki/List_of_bioluminescent_fungus_species)

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