

Journal of Interdisciplinary Science Topics

How Eternal is the Bog of Eternal Stench?

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14/02/2025

Abstract

The Bog of Eternal Stench exists within the Goblin King's labyrinth in the movie *Labyrinth*. The Bog is famous within the *Labyrinth* due to its horrific stench and legend that if you touch the bog, you will smell bad for eternity. This paper suggests the chemistry and microbiology occurring within the Bog of Eternal Stench and how the Bog may seal the fate of eternal stench for anyone who dares to enter.

Keywords: Film; Chemistry; Methanogenesis; Labyrinth; Bog of Eternal Stench

Introduction

The Bog of Eternal Stench, shown in figure 1, can be found in the Goblin King's labyrinth, in Jim Henson's movie *Labyrinth* [1]. The Bog is renowned for the repulsive smell that penetrates the air surrounding it, with Hoggle the dwarf recounting a legend that if you dip "so much as one toe" into the Bog, you will smell bad forever [2].

This paper will explore the chemistry of the Bog to determine the molecules causing the foul smell and suggest a reason to how the Bog can cause the fate of eternal stench.



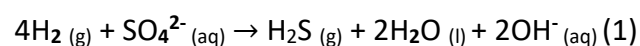
Figure 1 – Screenshot from the movie *Labyrinth* (1986) showing Ludo crossing the Bog of Eternal Stench via stepping stones [2].

The Environment of a Bog

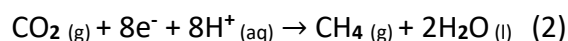
Bogs are wetland ecosystems with high acidity and low oxygen levels [3]. They contain high levels of peat, formed in the partial decomposition of organic material [4]. Chemical reactions such as sulfur reduction, methanogenesis, and the nitrogen cycle

rely on microorganisms, high acidity, and often aerobic conditions for these reactions to occur [9].

Sulfur reduction carried out by micro-organisms reduces sulfate ions to hydrogen sulfide, as shown in equation (1). Hydrogen sulfide is known for its odour of rotten eggs. The presence of hydrogen sulfide in real-world bogs does not give them a foul smell. However, when the surface of a bog is disturbed, and hydrogen sulfide gas is allowed to escape, the sulfurous smell is detectable. The following equation shows the reduction of organic sulfate anions to hydrogen sulfide gas [9]:



Methanogenesis is the reduction of CO_2 gas into methane as shown in equation (2). This process is carried out by methanogens [9]. Methane is a colourless and odourless gas [10]. It is referred to as 'marsh gas' when produced in wetlands. The presence of methanogenesis within bogs may present an explanation to the large quantity of bubbles that are seen within the Bog of Eternal Stench.



Naturally Occurring Stenches

Foul smelling molecules in nature are not limited to decomposition reactions. *Amorphophallus titanum*, also known the Corpse flower and shown in figure 2a, is famous for the odour it emits during bloom which is reported to smell of rotten animals and egg [6]. The

odour is emitted during female flowering and can be attributed majorly to organic molecules such as trimethylamine ($N(CH_3)_3$) [6], dimethyl sulfide ($S(CH_3)_2$), 3-methylbutanal ($(CH_3)_2CHCH_2CHO$), and methyl thioacetate (CH_3COSCH_3) [7].

Another example of high odour molecules within nature can be found within *Mephitis mephitis*, known as skunks, shown in figure 2b. This spray is secreted from the anal-glands to warn nearby skunks of danger and ward away predators [11]. The pheromones released in this skunk spray are sulfur containing compounds including: crotyl, 3-methyl-1-butaneethiol, and methyl-crotyl sulfide [11].



Figure 2 – Left (a): *Amorphophallus titanum* during the bloom period [8].
Right (b): *Mephitis mephitis*, in a defensive position to ward away predators [12].

What Does the Bog Smell Like?

The smell of the Bog of Eternal Stench likely comes from organic matter decomposition similarly to other real-world bogs. Assuming the molecules causing the stench are similar to those found in existing bogs and other high odour natural occurrences, such as corpse flowers and skunks, allows us to determine what the Bog may smell like. Table 1 summarises the molecules from previous sections and the odour they would contribute towards the overall odour. It can be concluded that the Bog of Eternal Stench would have a strong smell of sulfur, rotting vegetables and fish.

Despite methane being an odourless gas, excessive methanogenesis occurring within the Bog may be the cause of the stench. As previously mentioned, methanogenesis leads to the formation of methane. Excessive methanogenesis leading to methane build-up below the Bog's surface may explain the large quantity of bubbles seen in the Bog of Eternal Stench. As bogs do not have an overpowering smell unless the surface is agitated, the large volume of bubbles

seen in the Bog of Eternal Stench may be an explanation as to why the stench is continuous.

Molecule	Smell Description
Methane	Odourless
Hydrogen sulfide	Strong rotten eggs
Trimethylamine	Fishy, ammonia
Dimethyl sulfide	Decaying vegetables
3-methyl butanal	Apple
Methyl thioacetate	Sulfurous
Crotyl	Skunk
3-methyl-1-butaneethiol	Skunk
Methyl-crotyl sulfide	Skunk

Table 1 – High-odour molecules that may be found within the Bog of Eternal Stench [13]. Those highlighted are sulfur-containing. "Skunk" smell is described as sulfurous.

Cause of the eternal smell

One suggestion as to why a dip in the Bog of Eternal Stench would result in a person smelling bad forever may be the presence of geophilic dermatophytes. Dermatophytes are a classification of fungi that cause skin infections through degradation of keratin [14]. It is likely that a fungal species living in the Bog of Eternal Stench would be geophilic, as these organisms are found within soil but have the ability to infect both man and animal [14].

Infections such as athlete's foot and ringworm are caused by these fungi [15]. One symptom of athlete's foot is a bad smell at the fungal infected area if left untreated [16]. The production of this odour occurs within fungal infections in a similar way to bacterial infections. Fungi react with the skin, causing decay and the release of foul-smelling odours, similar to that of the Bog [17]. Hence, an all-over body infection caused by these fungi may result in a similar symptom. Whilst these fungal infections can be treated by antifungal and steroid creams in the real-world, these may be difficult to acquire within the Labyrinth, resulting in an eternity of fungal infection.

Conclusion

Whilst never described in detail from those who have witnessed it, the Bog of Eternal Stench likely has a strong sulfurous smell mixed with rotten vegetables and fish. The presence of a new strain of fungi may provide an explanation as to how the Bog ensures a fate of eternal stench for those unlucky enough to breach the surface. Not only would the unfortunate person who touched the Bog smell for eternity, they may also be suffering with a full body fungal infection!

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