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When the rules are broken: A look at Gremlin reproduction

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Abstract
In the film titled Gremlins, it depicts small, menacing creatures with notably large ears causing chaos and destruction in humorous and horrific ways. In order to avoid creating a Gremlin, one must follow a set of rules that are laid out in the film. This paper is inspired by one of these rules, which states that a Gremlin will reproduce when it comes into contact with water. This article will look at various methods of comparable reproduction and draw comparisons to real-world examples with the aim to discern how Gremlins are able to reproduce in this manner.

Keywords: *Film; Biology; Budding; Fragmentation; Cryptobiosis; Gremlins*

Introduction
In the Gremlins films, the Gremlins originate from a creature called a Mogwai, with one of the main characters being a Mogwai called Gizmo (see Figure 1) [1]. During the film, Gizmo comes into contact with water, which causes it to produce other Mogwai who aren't quite as friendly. These new Mogwai trick the main protagonist, Billy, into feeding them after midnight, which causes them to go into a pupal stage and emerge sometime later as Gremlins [1]. This paper examines the process of Gremlin reproduction when in contact with water and draws upon real-world examples to make comparisons and suggest a possible mechanism for this process.

Figure 1 – Image of Gizmo from Gremlins when it is first revealed [1].

Overview of observed Gremlin reproduction
In the films, once a Gremlin comes into contact with water, it starts to produce more Gremlins from its back [1]. Their reproduction is exponential, with each Gremlin producing about four each. Their reproduction also seems to be continuous as long as they are wet. All the offspring produced are identical to each other and their parent. This suggests that the Gremlins produced are genetically identical and therefore reproduce asexually. Given this fact, it is worth examining real-world examples of asexual reproduction to better understand this process.

Examination of real-world reproduction
One possible way in which the Gremlins may reproduce is via a process called budding. Budding is a form of asexual reproduction wherein the offspring develops from a part of the parent's body and may remain attached, forming colonies, or detach to develop into a separate organism [2]. Comparisons have already been made between Gremlins and an organism called a Hydra, which is a freshwater coelenterate [3, 4]. Whilst this comparison is very apt, as visually the process of budding is very similar to what is depicted in the films, there are some discrepancies. The budding process observed in Hydra may take about 3 days to fully form and separate from the parent, whereas Gremlin offspring grow and detach in a matter of minutes [5]. Additionally, Gremlins can be seen to produce multiple offspring at a time, whereas Hydra typically only produce one. Therefore, it may be beneficial to

observe other real-world methods to better understand Gremlin reproduction.

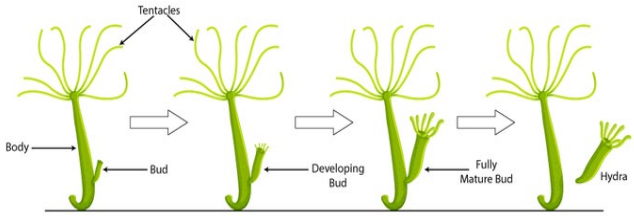

Figure 2 – A visualisation of the process of asexual reproduction (budding) in a Hydra [6].

Another example to consider would be the process of fragmentation. Like budding, fragmentation is also a form of asexual reproduction where an organism or part of an organism breaks into smaller parts or fragments, which can develop into fully grown organisms [7]. This process occurs in some flatworms and starfish. Fragmentation is a good comparison for Gremlin reproduction, as it can produce multiple organisms at a time. Furthermore, it is considered to be a chain process whereby one organism can produce multiple organisms exponentially, which is very similar to scenes portrayed in the film. However, fragmentation requires the separation of an organism, whereas Gremlins sprout from the body of the parent.

An additional asexual process worth considering is the way in which fungi utilise spores (mitospores) to propagate [8]. For asexual reproduction, the spores are produced mitotically from the parent mycelium and, once released, are spread over great distances where they eventually settle and develop into new organisms. Spore discharge can be triggered by either passive or active methods [9]. Passive methods involve the triggering of spores to release by disturbances in airflow, vibrations, or raindrops. This is similar to Gremlins, as their reproduction is triggered by an external factor and is not a consistent natural occurrence. Like fragmentation, this process can produce many offspring at one time and is also considered to be a chain process but on a much larger scale. However, when comparing the fungal spores to Gremlins, there are some issues. Spores are minuscule single-celled particles, whereas Gremlins emerged fully formed as multicellular organisms. Also, the idea that fungal spores are released via raindrops is not necessarily due to the contact with water; it's more so the impact itself releasing the spores.

After looking at multiple real-world examples of asexual reproduction, there is no one example that is fully comparable, as they all have their respective dissimilarities. It is likely that Gremlin reproduction is a combination of all of these processes. However, in order to explain the fact that reproduction is triggered by water, other real-world examples need to be looked at outside of asexual reproduction.

Extremophiles and Lichens

As no organism can reproduce asexually via the addition of water, considerations need to be made into how other organisms, and their respective processes can be activated by water. Some organisms, like tardigrades, can undergo a process called cryptobiosis when conditions are harsh (absence of water) [10]. Their bodies cease all metabolic processes and survive in a state of suspended animation for extended periods of time. However, when they become rehydrated, they reanimate and resume all natural processes in a relatively small amount of time. Another organism that experiences a similar process is lichen. Lichens are hybrid colonies of cyanobacteria, fungi, and green algae that take in water from the surroundings for photosynthesis [11]. Similarly to tardigrades, lichens can become inactive in dry conditions and are reactivated when they are rehydrated [12]. I am suggesting that the Gremlins may have a similar mechanism whereby when they become hydrated, it triggers a mechanism that causes rapid mitotic cell division and growth, producing offspring.

Conclusion

In conclusion, this examination into the reproductive methods of Gremlins has revealed many fascinating insights into an otherwise fantastical concept. By drawing upon real-world examples, it has enabled the comparison with multiple examples of asexual reproduction and allowed for the examination of their suitability for comparison. It was concluded that a combination of budding, fragmentation, and fungal spores would be the most likely explanation. However, there is no real-world instance of asexual reproduction being triggered by water. In order to explain this, a comparison to extremophiles and lichens is made, who undergo a process of suspended animation that is reactivated by rehydration. It can be implied that the Gremlins experience a similar process that causes rapid cell division and produces offspring.

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