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Slime Molds
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Are Myxomycetes Living Fossils?

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Abstract: Myxomycetes are widespread and often common organisms, especially in the forests of the world. This may have been the case for a very long period of time, since the oldest known indisputable fossil of a myxomycete sporocarp dates back to the Cretaceous Period, about 100 million years ago. One could speculate that myxomycetes might well have been present in the coal swamp forests of the Carboniferous Period, but this may never be known. Since the oldest known fossils of myxomycetes do not appear to differ appreciably from still extant species, there seems to be justification for considering these organisms as living fossils.

Keywords: amber, fossils, slime molds

Introduction

Imagine walking into a nearby forest and encountering a dinosaur. Yes, that sounds highly implausible. Dinosaurs have been extinct for about sixty-six million years. However, there is an excellent chance you could encounter an organism that was a contemporary of the dinosaurs but has survived to the present day What is this organism? Why do so few people know about it?

Slime molds (referred to as myxomycetes by biologists) have an unattractive common name and are unknown to most people. However, during the summer months, after a period of rainy weather, examination of a decaying log often will yield one or more of the fruiting bodies of a myxomycete. Some of their fruiting bodies resemble those of certain mushrooms, but they are much smaller and structurally very different. Although there are a few larger examples (some can exceed a diameter of six inches), the vast majority of myxomycete fruiting bodies are no more than an eighth of an inch tall.

As all biologists know, the slime mold fruiting body is one of three stages in the life cycle of this organism. Fruiting bodies produce microscopic spores, and under favorable circumstances, the spores germinate to give rise to amoeboid cells. These increase in number and can be exceeding abundant in some situations. Ultimately, two amoeboid cells function as gametes and fuse together. The product of this fusion is a multinucleate structure called a plasmodium. The plasmodium itself is a remarkable structure. It is essentially a giant amoeba that creeps around in nature and feeds upon bacteria and other microorganisms. In some species of myxomycetes, the plasmodium can reach a size of several feet in total extent (Fig. 1). Plasmodia much smaller than this, when encountered by people who are totally unfamiliar with myxomycetes, can cause some excitement. The story of the “blob” that appeared in a backyard in Texas is widely known.

Figure 1. Plasmodium of a myxomycete in nature.

Plasmodia ultimately transform into fruiting bodies. These come in a wide range of shapes and colors, and some examples are among the most intricate and beautiful structures found in nature. Baldauf et al. (2000) indicated that the myxomycetes should be placed within the "crown" clade of eukaryotes, and this would suggest that they have a significant evolutionary history. However, because of the fragile nature of the fruiting body, fossil records of myxomycetes are exceedingly rare. What indisputable fossil evidence do we have?

Available Data

Dörfelt et al. (2003) reported a single sporocarp of a species of *Arcyria* preserved in Baltic amber dating from the Eocene (50 to 35 million years ago). This ancient *Arcyria* (Fig. 2) was described as a species (*A. sulcata*) new to science but based on what could be observed of its morphology, it was remarkably similar to the widespread and common *Arcyria denudata* (Fig. 3).

More recently, Rikkinen et al. (2019) reported that they had discovered a small cluster of six sporocarps of a fossil *Stemonitis* in a piece of amber from Myanmar. The age of this fossil was estimated to be 100 million years, placing back to the mid-Cretaceous. Like the *Arcyria*, this ancient *Stemonitis* (Fig. 4) was remarkably similar to some of the more widespread and common species that exist today. These would include such examples as *Stemonitis axifera* (Fig. 5).

Conclusion

Myxomycetes are thought to have been around for a very long time (Stephenson et al. 2009) but just how long will never be known because of the almost complete lack of fossil evidence. However, based on what little is known, it would appear that a collecting trip into a forest during the Cretaceous Period (likely to have been an extremely dangerous thing to do) would have yielded a nice collection of myxomycete sporocarps. It doesn't seem too much of a stretch of the imagination to think that a collecting trip into the coal swamp forests of the Carboniferous Period (more than 300 million years ago) also might have yielded myxomycetes. In any case, the two ancient myxomycetes now known from fossils are similar

enough to still extant species to consider the question posed in the title of this paper. In the opinion of the author, myxomycetes are indeed living fossils.

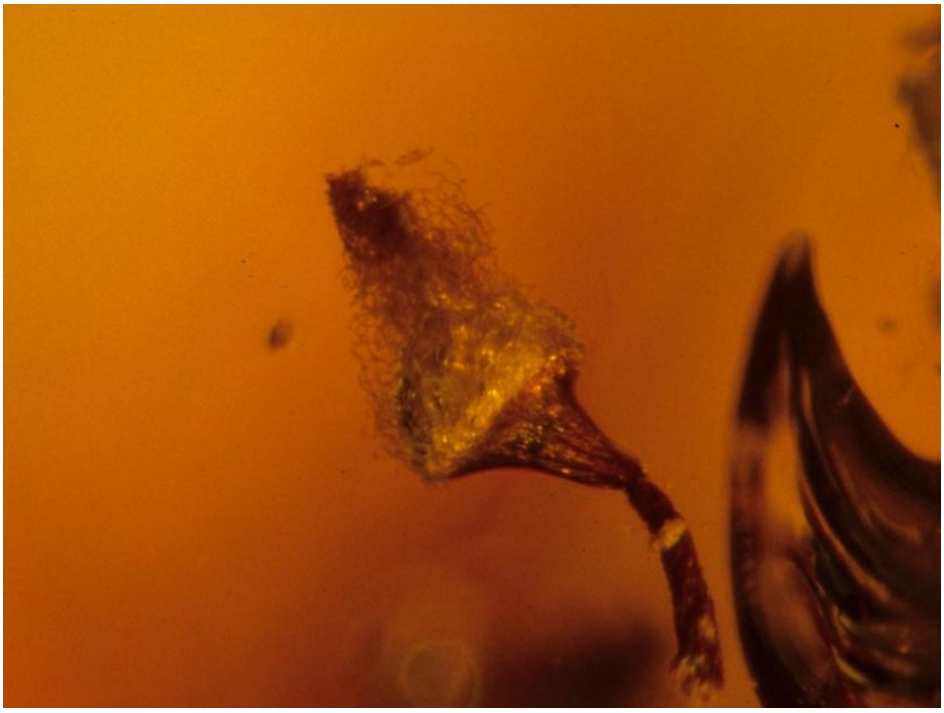

Figure 2. Sporocarp of an *Arcyria* in amber ca 40 million years old.

Figure 3. Sporocarps of the common *Arcyria denudata*.

Figure 4. Sporocarps of a *Stemonitis* in amber ca 100 million years old.

Figure 5. Sporocarps of the common *Stemonitis axifera*.

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