

The single-celled organism, physarum polycephalum

[Literature](#), [Russian Literature](#)



Physarum polycephalum is a brainless single-celled organism with many nuclei found in many different forms and environments where it is observed as a complex living creature. P. polycephalum is most commonly colored dark yellow and found located in dark, humid, and cool places such as forests and other plant life populated areas. It prefers to stay in dark or shaded places where it can avoid the sun. Because of its shape, color, and texture many believe P. polycephalum to be a type of fungus, but it actually belongs to the group categorized as taxonomic Amoebozoa which is a unicellular organism that can survive on its own or join together with other cells of the same species in order to enlarge their food foraging abilities.

The P. polycephalum takes on many different forms throughout its lifecycle based on its environment including haploid, diploid, and others forms to protect itself from harsh living conditions. The first stage in its lifecycle is its diploid, plasmodial form. An article written by science reporter Resnick (2018) explains this further as she says that slime molds can survive as single cells but they can also be found in two or more cell groups. When two or more cells interact they fuse together creating one membrane. These once individual cells now are two cells combined together living in one single-celled, multi-nucleate body called a plasmodium. This is the beauty of the single-celled organism for it is capable of being cut up into pieces and rearranged. Once the organism parts are put back together the slime mold becomes one giant organism with vein-like tubes connecting and fusing the pieces together. When it is in direct contact with sunlight the P. polycephalum will sporulate, acquiring little round black spores which cover its body and protect the organism from other harsh conditions. Finally, when

the organism is surrounded by a great deal of moisture it becomes a haploid and cell division begins.

Continual division of the P. Polycephalum amoeba can create two forms of similar amoebas which are flagellates or cysts that group together and are genetically the same in their sperate colonies. When amoeba becomes dry it forms cysts and under wet or damp conditions flagellate happens. The purpose of these forms is to allow the organism to survive and thrive in many types of conditions giving it the best chance at a long life. The next step in the P. polycephalum's life is sexual reproduction, which is how it is able to expand and diversify. This occurs when two haploid amoebas fuse together to form an organism with one diploid nucleus. The fusion of the cells allows for more cells to form into plasmodium and repeat the lifecycle of the P. polycephalum. P. polycephalum is a fascinating organism with many abilities but the most intriguing one is the fact that this brainless creature can formulate memories and has a learning process that is similar to animals with brains. P. polycephalum learns through habituation even though it has no brain or neurons. The process of how they learn and retain memory is different from animals with brains, but it is still able to complete functions that humans and other animals are capable of. Slime molds are without a neural network and brain, but this organism has its own way of retaining memory.

Paine (2017) describes this external memory in her article when she says that P. polycephalum is a unicellular organism with no neurological memory, but it is still able to use it to forage for food and land. It uses an external

memory system as it leaves a trail of slime everywhere it goes. This makes it so that it will remember where it has been and will purposely avoid the areas already crossed over with slime until it has been everywhere else in its area. This system allows the slime mold to find new food and areas of land where it has not been all through the use of its external memory. This process allows the *P. polycephalum* to be efficient when collecting food and navigating territory. A study done by a group of scientists introduces a topic and shows that the brainless slime mold *P. polycephalum* constructs a form of spatial memory by avoiding areas it has previously explored. After creating a study to test what the slime mold would do when put in a U-shaped trap problem their data showed that spatial memory is used by non-neural organisms so that they are capable of conquering rough or unknown environments.

Spatial memory is the part of the memory that records information about the environment something is in. This study concluded that although the *P. polycephalum* is a brainless creature it uses its ability to recognize and understand its surroundings to explore its area and search for food. This ability to know where it has been and hasn't been is evidence that the slime mold is able to retain and use memory to help itself survive.