Euglena: The Amazing Plant-Animals

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Euglena are unique, interesting single-celled organisms of the Kingdom Protista that posses characteristics of both plants and animals. For example, euglena have chloroplasts, which they can use to generate food through photosynthesis, like plants. However, they are also mobile and have the ability to catch and ingest food, which is an ability possessed by animals. For this reason, these perpetually puzzling protozoa previously posed a perplexing and peculiar problem to classification scientists, who were not sure whether they ought to be considered plants or animals. However, euglena are classified as protozoa today. But mitochondria and chloroplasts are not the only features of euglena, as they also have many other organelles. Each of these organelles is vital to the functioning of the euglena and include some that are common to most cells, such as a nucleus, Golgi apparatus, and endoplasmic reticulum. Euglena also have some unusual features among their organelles, such as possessing both chloroplasts and mitochondria, as well as an eyespot and flagellum. These organelles provide the euglena with the abilities it need in order to survive and reproduce.

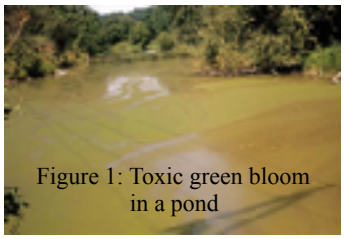

Figure 1: Toxic green bloom in a pond

The distinctive features of euglena allow them to survive all over the world. They are often found in fresh and somewhat salty water that is full of organic materials. Euglena commonly appear in ponds and lakes that are full of algae, because they like to eat the algae. Although most euglena are harmless to humans, some

species can get together in large numbers to form toxic blooms in bodies of water with high nitrogen content.

Euglena move by using a flagellum, a long filament in the front of the euglena that functions as a rotary motor. The flagellum is held in front of the cell, and its tip is rotated to propel the euglena through the water. In addition to a useful flagellum, each euglena has at its disposal another form of movement, one unique to its kind. Euglenoid movement, as this special form of locomotion is called, consists of the body of the euglena itself changing shape. As one biology textbook reads, "The posterior end is drawn forward, giving the body a round shape. Then the anterior end is stretched forward, moving the organism and returning it to its original shape" (Graham 446). The euglena is able to change its body shape in this way because, in the place of a cell wall, it has been endowed with a thickened membrane called a pellicle. This pellicle is more flexible than a cell wall, and can change shape when the euglena needs to perform euglenoid movement.

In addition to chloroplasts, euglena also have another wonderfully designed organelle that is required for them to be able to carry out photosynthesis. The euglena's red eyespot, located near its front end, resembles an eye, but is less than eye, for it can only detect light. The eyespot allows the euglena to move towards light, which enables it to obtain the light it needs for photosynthesis. Although euglena are able to obtain the energy they need for the processes of life this way, they can also catch and digest food. However, this ability is rarely needed, as euglena can usually get enough light to carry out photosynthesis.

The primary method of reproduction in euglena is an asexual process known as binary fission. In this method, which is a form of mitosis, the nucleus splits in two, then the cytoplasm

divides in two. In the first phase of mitosis, prophase, each chromosome splits into two chromatids. In the second phase, mitosis, chromatids line up along the equator of the cell. In euglena, no spindle apparatus if formed. The third phase is called anaphase, in which the chromatids are separated and move towards opposite ends of the cell. In the final phase, telophase, the nuclear membrane constricts, causing the nucleus to spilt in two. Afterwards, all the euglena's other organelles are duplicated. When the cell splits into two, resulting in the birth of a new euglena, the daughter cell usually keeps the flagellum and the parent cell grows a new one. However, the flagellum sometimes disappears entirely during the division process, and each cell has to construct a new one.

When exposed to unfavorable conditions, euglena can form cysts to protect themselves. Some factors that can provoke euglena to encyst themselves include lack of food, lack of oxygen and lack of water. Euglena range from 15 to 500 micrometers in length, and each one of their cysts is usually about the same size as the euglena that formed it, but they have been known to be a little bit larger. The cyst helps the euglena within it to withstand unfavorable conditions for extended periods of time. When conditions become favorable once more, the euglena emerges from the cyst to resume normal life.

Figure 2: Model of a euglena

Euglena have many organelles that they share with most other cells. Among these are the nucleus, the Golgi apparatus, and the endoplasmic reticulum, both rough and smooth. The nucleus, an organelle possessed by most eukaryotic cells at some point in their lifetime, is a large organelle that stores the cell's genetic material in the form of deoxyribonucleic acid, or DNA.

Inside the nucleus is a distinct region called the nucleolus, where ribosomes are assembled (Rana 39). These ribosomes, which are about 23 nanometers in diameter, leave the nucleolus and many of them attach to the rough endoplasmic reticulum, which gives it its rough appearance. The ribosomes make proteins and insert them into the rough endoplasmic reticulum's internal cavity, the ER lumen. Smooth endoplasmic reticulum has no ER attached to it. It makes vesicles, containers that carry proteins around the cell (Rana 39-40). The vesicles go to the Golgi apparatus, an organelle resembling a stack of hollow pancakes. The Golgi apparatus makes chemical modifications to the contents of the vesicles and then ships the vesicles wherever they need to go (Graham 459).The energy generating organelles of a euglena, mitochondria and chloroplasts, are unique because they possess their own genetic material in the form of a small circular piece of DNA. Unlike most other organelles, the cells cannot make mitochondria from scratch. Instead, these organelles must come from preexisting mitochondria through a replication and division process controlled by the cell. The same goes for chloroplasts. Chloroplasts also contain chlorophyll, a green pigment that gives euglena their color (Rana 41). All these organelles perform the same function in euglena as they do in other cells.

In conclusion, euglena are unique and ubiquitous unicellular organisms with multiple methods of movement. Their most unusual feature is the fascinating fact that they possess both colorful chloroplasts, which make them similar to plants, and mighty mitochondria, which make them alike to animals. The former enable them to obtain energy from sunlight, while the latter bestow upon them the ability to get energy from catching and digesting food. They reproduce through binary fission and can encyst themselves when necessary. Like other cells, each euglena has a nucleus, rough and smooth ER, and a Golgi apparatus. All these organelles work together

to allow the euglena to live, as well as making it an interesting species of microscopic organism to study.

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