Introduction

What is a Dinoflagellate exactly. [Dinoflagellates](http://docs.google.com/Pictures/dinoctn.jpg) are mostly unicellular, microscopic, flagellated, photosynthetic protists, commonly regarded as algae. Dinoflagellates have two flagellum that work together to make a swirling action to propellel them through the water. Dinoflagellates are classified by their unusual and very rare nucleus along with their [outer armor](http://docs.google.com/Pictures/gony.jpg) feature. Dinokaryotic nucleus is a nucleus in which the chromosomes remain condensed(never unwind). The cells of this protist are made of divided cellouse that acts as a extremely tough armor.

There are two main types of Dinflagellates heterotrophic (eats others) and autotrophic (photosynthetic). In the past years both have puzzled scientists especially the hererotrophs. These guys are responsible for red tides which most oftenly occur in summer when ideal conditions are met. The Dinoflagellates then bloom and release their neurotoxins killing most of the life in that area. These Dinos have a special feature the penduncle which is projected to eat the organisms. This phenomena of algae eating fish has been referred to as "grass eating the sheep" or a "Dr. Jekyll and Hyde personality"(killer algae article). The hertrotrophs have a very different attacking plan. When no fish are present in the water the Dino is a armored cyst that looks docile. Once fish are present the Dino sheds it's cyst within minutes and emerges as the known Dino a flagellated cell. After they've killed the organism the penducle takes over and they can double in size while feeding. If no fish are present it will go to the cyst stage if there is still fish it transforms into another stage in which it becomes an amoebae. They shed the flagella, lose some of the toxicity, stop photosynthesizing, and become more animal-like. No where is a fish immune to the toxin. Dinos life cycle is amazing it consists of 15 stages one as an amoebae that can grow to be 20 times the size of the original. Ironically the only time they can reproduce is during a feeding frenzy.

Autotrophs are a lot less deadly, and complex as their brothers. However, these guys have a bizarre feature like the hetertrophs, its bioluminescence (some hertertrophs could have it). [Bioluminescence](http://docs.google.com/Pictures/how1.jpg) is light produced from a living organism produced by a chemical reaction. The two chemicals involved in this are luciferin which produces the light, and luciferate which acts as the catalyzer of the reaction. In Dinos this reaction takes place when one of two things happens: something disturbs the dinoflagellate or the environment around it becomes more acidic. Three common bioluminescent Dinos used in experiments are the *Pyrocystsis lunula*, [*fusiformis*](http://docs.google.com/Pictures/bluebl1.jpg) and [*noctiluca*](http://docs.google.com/Pictures/nocti.jpeg). The noctiluca is a little easier to deal with because of it's large size 2 mm diameter. The [bioluminescence chemical structure](http://docs.google.com/Pictures/dino.luciferin.gif) that is produced closely resembles the structure of chlorophyll and many feel it derived from this. Once the Dinos are agitated they put on a spectacular show giving off bursts of light. One place that demonstrates this year round is [Bioluminescent Bay](http://docs.google.com/Pictures/air2.JPG) in Vieques Island, Puerto Rico.

The media is an important factor here because it will play an ecological role. Since Dinoflagellates are classified in the algae group they will depend upon the same types of elements as they do. In algae the nitrogen cycle is important any drastic increase in nitrogen will cause blooms of algae as algae can reproduce faster than any other producer in the water. Phosphates will also did the same and when the two come together it meets ideally with the algae but poorly with the other inhabitants. The main question of this experiment is to test that theory but instead of a freshwater river or pond what happens in our ocean. Where algae doesn't exist the Dinoflagellate does and many scientists have seen through media tests whether they have adapted and evolved to high levels of nitrogen and phosphates and now grow ideally in them would suggest our ocean is in poor condition. The bloom of Dinos can cause massive killings of organisms and can overgrow and make inhabitants scarce or extinct. Bottom-dwellers, and fish would be no more.

One of the steps that took me towards this subject was my excitement in glowing objects and the ocean. After reading an article about these guys I became fascinated with their bioluminescence and the fact that they are the most bizarre creatures. I decided to go for the media after I was researching them a bit and found a article in National Geographic about a place called Bioluminescent Bay. This and the projects that are going on at Scripps gave me the key idea to this project. I hope through this experiment I can see how these guys react to the various environments without driving to the coast.

The types of media used in this experiment varied in phosphate and nitrogen content. The ideal environment was possible by the media erdschreiber. The others consisted of Miracle-Gro, Algae-Gro, Freshwater Plant Nutrients, Enriched saltwater mix, and Del Valle Creek water. All have something the other doesn't have or is neutral. Many of these particular medians have differing levels of nitrogen, phosphates, and other minerals. For the complete list of ingredients look in Procedure.

  Dinoflagellates are being tested at the Latz Laboratory of Scripps Oceanography on bioluminescence and behavior in other organisms. For physical and philosophical reasons on if the bioluminescence produced by the dinos react as a warning to hide, camouflage, or to attack for species of fish and shrimp. Since dinos give off the light when something passes by it could produce a signal to others that is important to their survival. In this way they learned to evolve and adapt to another organisms presence. Many other things besides Dinoflagellates give off bioluminescence like species of fish, plankton, squid, and jellyfish. To few the movies of these creatures manufactoring bioluminescence [click here](http://docs.google.com/movies.htm).

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