Natalie Mueller

PHYS-1010-501-Su20

Reflection Essay

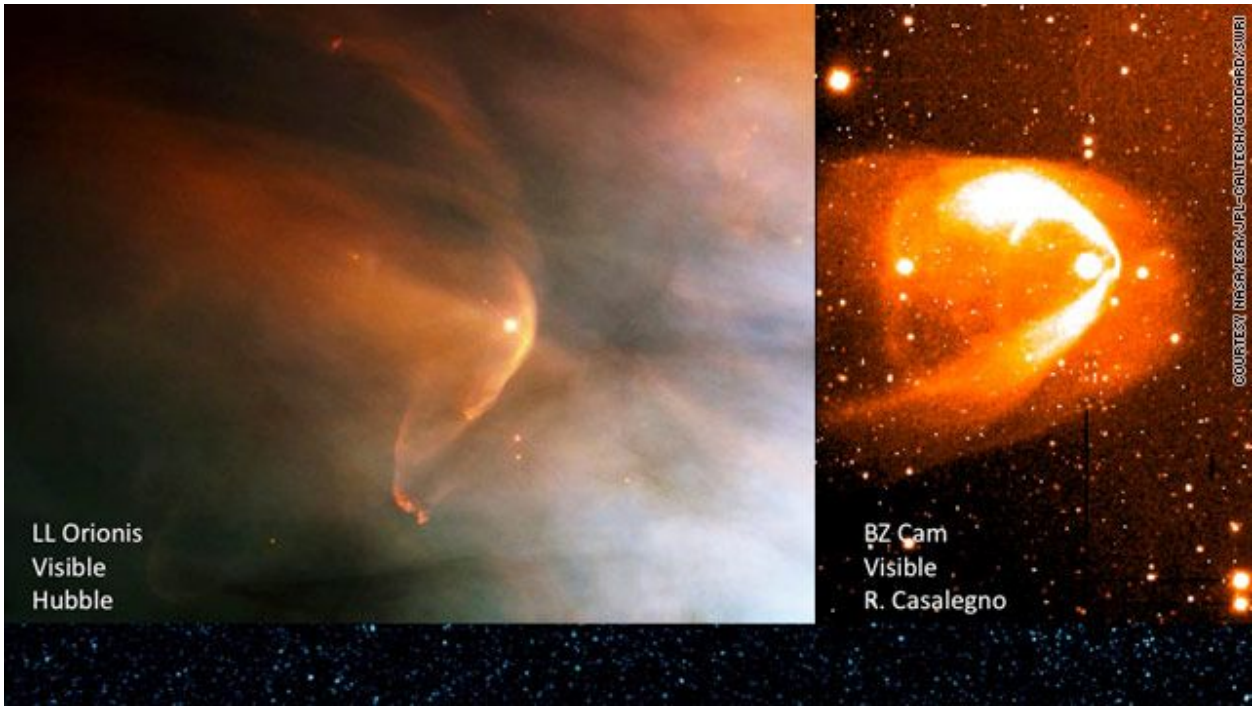
When beginning the Signature Assignment, I decided to start with the Equation Analysis section since I figured numbers are objective and it would be easy for me to complete this section. I soon discovered that when trying to write and solve equations on my own, I ended up needing to look at about five different sources to verify I was making my calculations correctly. And even though I thought I could provide a succinct explanation of the reasoning behind these equations, I still ended up cross-referencing several different places because I was second-guessing myself.

I think there are different levels of understanding a subject matter: The first level is being only familiar with something and having a rough idea of how it works, but maybe still having misconceptions. The second level is understanding it well enough to be able to answer specific questions about it, like when you take a test. But it takes having to explain or teach this subject to another person to really know it inside and out, since you might have to make comparisons or metaphors to other subjects to really convey the details accurately.

That said, I really only understood these physics equations on a superficial level until I was required to provide an analysis of what each part meant and then draw conclusions from this information. As an aside, I struggle with visualizing numbers written in scientific notation, so I wrote out all the 0s in each of the equations to begin with so that I could get a better mental picture of exactly how enormous the conversion of mass to energy would be.

Reading about the four different stars in section 1 was the most interesting to me because there are so many different types of stars with different traits. Betelgeuse is a fast-moving red supergiant that has several interesting phenomena involved with it including a four-light-year-wide bow shock, which is when the magnetosphere of an object in space interacts with nearby plasma, and

rapid loss of mass which has created an envelope (mass that is not gravitationally-bound to the star but still surrounds it). Betelgeuse is also potentially close to the end of its evolution cycle where it could become a supernova sometime within the next 100,000 years.



(Examples of bow shocks)

Honestly, I might have been the most interested in learning about different stars because all of the cool pictures you can find. I think astrophotography is really pretty and it's really interesting learning what different objects in space are actually made of, like how that cool rainbow-looking cloud thing (nebula) is actually where new stars are born.

I decided to use Boyle's Law that describes how the pressure and volume of a gas are inversely related for my equation analysis section because it uses a straightforward mathematical formula and is easy to understand with logic alone. It's a simple calculation, where $k = PV$, or $P_1V_1 = P_2V_2$, so I could give an example and say that, at the same temperature, if I take a $1m^3$ box of air and squish it down to half its height (so instead of being 1m x 1m x 1m, the area is

now 0.5m x 1m x 1m), the pressure of the air inside the box would become twice as much as when you started.

Boyle's Law applies to ideal gasses at same temperatures, but when temperatures change and if gasses behave differently than ideal gasses (basically, an ideal gas is a theoretical gas that does not have to deal with interparticle interactions that affect its behavior), at that point you need to use different calculations to figure out changes in pressure and volume.

You normally don't associate physicists with a sense of humor, but when looking into information about Fermi's Paradox, I stumbled onto a great quote with subtle humor. When discussing potential intelligent lifeforms on other planets and trying to define what "intelligence" means, Charles Lineweaver stated, "Dolphins have had ~20 million years to build a radio telescope and have not done so." And dolphins are normally considered the 2nd most intelligent species on earth!

The most important principles of physics to my assignment were related to Newton's first law of motion: momentum (an object's tendency to resist change in motion relative to its mass) and gravity, especially the constant gravity acting upon everything on Earth's surface.

The most difficult parts of the project for me were the star identification and equation analysis sections, since they were so dense with figures. I would spend five to ten minutes of research just to be able to fill in one blank for each section. It was much easier completing the explanations for Fermi's Paradox since I was able to explain the logic behind the solutions in my own words. But with determination and a lot of time, I was able to complete all of the sections successfully.

I have to say that this project definitely piqued my interest in Physics more than answering multiple-choice questions has. I don't do very well with theoretical concepts, so being able to put some actual numbers on paper has been a lot more interesting to me than seeing equations full of variables.

In order to complete this assignment, I had to use a lot of critical thinking and research to be able to arrive at satisfactory conclusions. I think that part of secondary education should be a focus on "learning how to learn," so to speak,

and I think this assignment is a great example of learning how to search for information and practicing distilling useful data from different sources.

I wouldn't be able to say whether or not this assignment has had a connection to my other gen-ed courses because I'm a returning student after last attending classes ten years ago, so it's been so long since my other classes that I've forgotten quite a bit! I'd like to think that I was able to demonstrate success with SLCC's learning outcomes, but I'm not quite sure how to illustrate that in an objective manner.

I think the biggest improvement I've had in this class and was able to show through this assignment was understanding equations, including the order of operations for calculations, and paying special attention to units (like how a Newton is equivalent to 1 kilogram times meters per second squared.) I never thought I'd be improving my arithmetic in a physics class, but here we are.

In conclusion, this assignment was very research-intense and numbers-heavy, and while the finished product is only a few pages long, it took me about 12 hours of research and work to complete, but I can confidently say that due to this time and effort, I understand the content in the assignment much better than I would have without the amount of research I did.