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Conversation Report

I chose to conduct a conversation with several of my close friends about some of the topics that we have recently been discussing in class. The setting of our conversation was my living-room. We were simply socializing when I had brought up this assignment; they were all eager to participate and discuss some scientific principles. There were two people that I had this conversation with. Both of them are currently taking IB Physics HL (second year); so they had a fundamental understanding of the principles that we discussed. As well, last year, we all took IB Physics SL (first year) together, so it was quite interesting to catch up and discuss some of the physics principles that they had learned in their new class and see how they related to our astronomy understanding.

Our discussion began with discussing Newton’s laws of motion. The first law is that an object in motion will stay in motion unless acted upon by an unbalanced force. The second law is that a force is proportional to a bodies mass and acceleration; or, in equation form, F = **m***a*. The third law is that for every force there is an equal but opposite force. After reviewing these laws, we discussed how we were impressed that these laws of motion are so good at explaining many of the observable phenomena in the universe. As well, one person involved with the discussion said a joke about Newton’s third law of *emotion*. He said that is states, “for every male action, there is a female overreaction!” We all had a good laugh about this one, since all of us were guys and were having girl trouble! After discussing these laws, the discussion moved towards the nebula theory.

We all were familiar with the nebula theory, but this was never discussed in our previous class together. We talked about how many of the laws of physics were involved with the cold nebula cloud collapsing and eventually becoming dense enough to form a star. Namely, we discussed the conservation of energy and momentum that is involved with this type of system. We discussed how the collapse of the cloud of gas is a decrease in the gravitational potential energy and that this is transformed into kinetic and thermal energy. I then asked the question, “why does the cloud begin to uniformly rotate on a singular plane when it collapses?” Both of them knew the answer right of the top of their head; they explained that the angular momentum must be conserved and averages out overtime, which leads to the uniform rotation. I was able to explain something that they had not thought about before though. I told them that the sun’s mass was about 99.9% of the solar system’s total mass. I explained to them that this is because a majority of the original nebula cloud has lost its initial velocity in the orbiting cloud, and as such gravity was able to pull a majority of the mass towards the center to create our mother star. They were both interested in this idea and thought that it had made sense. The discussion of the nebula theory led to the discussion of its applications in other solar systems.

This segment of the conversation was begun by discussing how we are able to detect other solar systems and their planetary systems. The methods of doing this discussed at length were primarily the Doppler shift and direct imaging. I did not have to explain what the Doppler shift was because this was common knowledge that we had learned in our IB Physics SL class together. They did forget what a red and blue shift were though; so I was able to explain that a blue shift occurs when the waves become compressed and vice versa for a red shift. Regardless, the discussion lead to the fact that this method only works for very massive, but very close planets; and as an extreme, that some planets as massive as Jupiter have been found within the Mercury’s orbit. I then posed this problem as part of the discussion, that is that the nebula theory states that these types of planets, Jovian planets, are predicted to form outside of the frost line. They both guessed that these were where the Jovian planets had originally formed, and that they had simply moved into their current orbits over time. I was quite impressed that they were able to speculate this concept of planetary migration in such a quick manner. It is quite similar to the to the modification that was made to the accepted nebula theory.

In the end, I learned many things in this discussion. For example, in our segment in which we discussed Newton’s laws, both of them briefly explained special and general relativity. I am fascinated with the idea that both time and space effect each other. I plan to learn more about this concept in my free time. Another thing that I learned was how much a general understanding of physics, especially higher levels of physics, helps in one’s ability to understand astronomical concepts.

I thoroughly enjoyed this assignment and the discussion that I was able to have with some of my close friends.