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Comins AST 109

December 15, 2012

One of the most interesting topics that really interested me in AST 109 had to be the subject of black holes. They are such a mysterious phenomenon that sparks so many questions in my mind. It is so hard to wrap my mind around such an unexplained occurrence that we can't completely explain or research. I decided to take it upon myself to learn more about them by researching them on the web. In this paper I hope to learn more about them and hopefully answer some of the questions I have in regards to them.

I started by looking into how black holes are created and formed. Turning to my first obvious source, my *Discovering the Universe* textbook, I found just how they are formed. "When the gravitational force of an object is so great that it overcomes all opposing repulsive forces or pressures (like neutron degeneracy pressure), the object collapses in on itself. Its gravitational attraction then becomes so strong that nothing- not even light- can escape from it. When this happens, the matter and the apace around it become a black hole." (Neil Comins, 444). Since the time I can remember I have always thought that black holes were a giant suction mechanism that things get vacuumed into like they do in cartoons; however reading on in the book, it becomes clear that black holes do not.

There have been many theories upon what black holes really are, starting with Stephen Hawkings theory which has changed over time originally states that black holes absorb and disintegrate all particles that fall into them, but he later re-made his theory. Then there is Einsteins theory of special relativity, which according to the text was developed upon two ideas, "Your description of physical reality is the same regardless of the constant velocisty at which you move"

(Comins, 444) as well as “Regardless of your speed of direction, you always measure the speed of light to be the same.” (Comins, 444) Relative to this upcoming week (December 21, 2012) I thought to look into the Mayans theory of the world ending because of a black hole, the 2012 black hole theory. According to Wikipedia, the Mayans had their own theory that once we become in galactic alignment, we are going to become closer to a black hole and the weather on our planet will become very extreme with various natural disasters occurring all over the planet. They theorized that we will either be thrown our of orbit either nearing the sun or distancing from it causing either a global freeze or burn. Their other theory is that we will be captured by the black hole and that our planet will be disintegrated into it. Their second theory seems a little off to me after remember what we learned in class.. I specifically remember that it takes a long time for an object to be completely swallowed by a black hole. Professor Comins told us that time slows down when you're viewing an object entering a black hole, so if that were really the case, then we have plenty of time left on this planet. I also question the 'end of the world' because why is it such a coincidence that Earth, the only planet with life is the first planet to encounter this black hole or even be thrown out of orbit... something just isn't matching up in my mind when I think about it like that. This so called black hole must be rather large if it is going to take on the whole planet Earth, and I feel that we would have been able to detect something of that mass coming towards us a lot time ago.

There is an endless debate to be had about the Apocalypse, so I am just going to leave that topic where I stand now after making my point clear with its relation to black holes. Moving onto some deeper details about that actual structure of a black hole, I think that it is important to recognize what the actual black hole consists of. What is inside a black hole? Do we know they actually exist? While I was reading on in the textbook, a simple sentence broke down black holes in a very easy way, “It contains matter at its center or in a ring, it has a boundary shaped like a

sphere, it either has a net electric charge or not, and it either rotates or does not rotate." (Comins, 448) This puts all of the complex defining features into a simple explanation of all the possibilities that could possibly make a black hole. After considering the different features I was reminded of some pictures I drew in my notes from class which demonstrated singularity in different types of black holes. For example, the singularity in a Schwarzschild black hole is essentially a dot right in the center, where as in a Kerr black hole the singularity is a horseshoe shape in the center of the black hole. In my notes I defined the term of singularity as, "We have no explanation to where the matter in black holes go to and that is defined as singularity." (Rowan, AstroNotes) Just to contrast that with a more technical definition I turned to my textbook once again where singularity is defined as, "A place of infinite curvature of spacetime in a black hole." (Comins, G-11) I think that singularity is a key component that should always be incorporated in lessons on black holes. It sums up the mystery factor and questioning that we all have possess when it comes to wrapping our minds around the concept of black holes. The term singularity essentially just closes all open-ended questions regarding where the matter goes, it clears it up by simply saying that we just don't know and we have no answer. When the idea of wormholes is suggested, singularity just knocks the idea out of the park because if something has a singularity then there is no reversing it and that matter is gone forever, so we think.

So now that we know what makes a black hole and what they do, I want to know more about what happens to them over time. "In exploring the fate of black holes, astrophysicists find that, once again, these objects confound common sense- they evaporate!" (Comins, 459) It seems as though the mass of the black holes collapses in on itself. The process of virtual particle production was fascinating to read about; it is where the black hole converts its mass into energy. It seems like another magical process that just cant be explained. "The laws of nature allows pairs of particles, called virtual particles, to spontaneously appear." (Comins, 459) What is astonishing

about this is that it was proven in a laboratory, meaning that it was real and it is not just something that we think is occurring somewhere in space.

After revisiting the chapter on black holes and going through it with a fine tooth comb, I have a great understanding of this astonishing occurrence that is happening. I never thought that black holes had so much depth to them and that there were so many components to their existence. It goes to show how complex astronomy is as a whole when one simple aspect of it is so intricate. After taking this course, I have begun to think about simple concepts in more depth. I knew nothing about astronomy coming into this semester and now I know more than I could have even imagined. I originally thought that this course consisted of memorizing constellations and basic concepts like that, however I am coming out of this course completely satisfied because it has pushed the limits. I have a new understanding of what is going on both around me and above me. I can't help but wonder when I look at the sky and I have AST 109 & 110 to blame and thank for that. I think about space with a whole new perspective. There is so much going on up there that I had no idea was even occurring. Who would have known that there a different kinds of stars and black holes. I grew up thinking a star was a star and a planet was a planet, but after re-visiting all of my notes and re-thinking the course I am realizing how overlooked this subject is. I wish that when I took sciences growing up that there was more emphasis on astronomy because it is such an interesting and informative topic. I can only hope that now teachers make a point to take some time in regards to teaching their young students about astronomy because it is just as important as any other aspect of science. I am thoroughly intrigued by what this subject contains, there is so much I still have yet to learn about. The fact that I can easily sit down and write a paper on one simple aspect of astronomy speaks greatly to its complexity.

It excites me to think about what we are going to discover in the future in regards to astronomy. If we know this much now, I can not imagine what it will be like 100 years from now.

What is great about this topic is that we can constantly build upon what we already know. It is a never ending cycle that requires continuous research because it is constantly updating itself. Simply researching black holes has brought such an interest of astronomy as a hole to me. I know that even after this course is finished, I am going to continue to keep myself updated on what is going on in the celestial world; there is too much going on that I don't want to miss out on.

Bibliography:

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