

Phys1007

The Big
Questions

Learning
Portfolio

Joseph Curtis
3952239

Liquid Space.

This article I found quite interesting. It explores some recent theories about a 'quantum ether' ie what space is truly made of or what some scientists think that a subatomic vacuum is made of. Unlike that of the 19th century, this ether is not the medium in which light propagates, it's an implication of Heisenberg's uncertainty principle. Quantum ether comprises subatomic particles which constantly 'pop' into being from nowhere and then disappear again. So, because the particles' wavefunctions are everywhere at once, there is also a probability that they will appear there.

I find it interesting to see quite a different modern view of an old concept such as this. The theory states that the universe is not just empty space, but contains some substance or some thing that acts upon normal matter, if only slightly. Some physicists believe that this 'quantum vacuum' causes inertia and solves the age-old problem of relative motion and acceleration. Of significance to me is the fact that scientists dared to revisit the discredited '*ether*' theory, since it had been discredited for some time. Although the theory is not exactly the same as the previous one, the new theory is similar in that it claims that a vacuum is not just void but is filled with a seething mass of 'virtual particles'. So now, some theories that were once considered false, can be supported once more, in some manner. This makes one think of some other discredited theories that may have some basis in reality in the future, perhaps the world is flat after all!

Taming The Multiverse.

This article explaining David Deutsch's multiverse theories really helped me understand the concepts of his 'many worlds theories'. The view expressed in our lecture was that everything in existence is in an endless state of superposition – a difficult concept to understand.

In this interpretation, Deutsch treats the multiverse as if it were a quantum computer able to do incredibly fast calculations and capable of being in many states at one. He thinks that all the different superpositions are in different universes and the reason why we do not see quantum things happening to large objects is because it is extremely hard to interact with those universes above the quantum level. So like we discovered in the lectures in the two slit experiment, in one universe the electron went through one slit and in another universe it went through the other. Deutsch's theory in my opinion, explains the 'many worlds interpretation of quantum mechanics' in a more aesthetic way.

He also explains the theories of quantum computers. When a quantum computer is presented with a problem, it's counterparts in other universes also work on the problem and so get it done incredibly fast. If quantum computers are around sometime in the future, perhaps they will help us understand the true nature of the universe, if there is one.

My Big Questions Goals:

- To more broadly understand the fundamental theories about the universe and how they relate to human beings in everyday life.
- To explore the concepts of science and expand my understanding of science as a whole.
- To think more deeply about the nature of the universe with a view to understanding it better.
- To learn about quantum mechanics.
- To learn about the possibilities for extra-terrestrial life.

Time Twister

This article explores one method for time travel. Not just forward time travel, but travel backwards through time. Using a beam of light, beamed into a circle and super cooled. Really cool, to the temperature of BEC. This slows the light down to a few meters per second and when light slows down, its inertia and therefore its energy, increases. With this super energy the space-time around the laser beam becomes distorted much like space-time near a black hole does. So the axes of space-time relative to the inside of the circle of light are bent so space becomes time and vice versa. The article states that theoretically if you could walk around inside this laser circle, you could walk forwards or backwards in time.

This is a different concept than any we have talked about in the lectures regarding time travel and I think it is quite an interesting concept. I am quite interested in time travel and the paradoxes encapsulated therein, especially in the consequences of relativity on the nature of time. If one person's past can be another's future and you can't change the past then can you change the future? Theories like this proposing that time travel into the past is at least *theoretically* possible make you think about the logical consequences and paradoxes implied. What kind of natural laws would need to be in existence to explain time travel with these logical constraints. I think that the predetermined universe concept is a valid one, because if there are infinite universes then all of them would be predetermined because they represent all possibilities.

Another nice thing about this article is that it solves the problem that if time travel into the past is possible, then why don't we see time travelers from the future all the time? In this article, you could only travel back to when the device was first activated. This still does not solve the grandfather paradox though, because the person who went through could still come back to just before they went in and kill themselves. An interesting alternative to bizarre wormholes and negative energies required for some other forms of time travel proposed.

What Lies Beneath

The concepts about what things are made of at the most fundamental level are a big part of what we have been learning about in lectures and also of particle physics. Scientists spend millions of dollars trying to find out what things are made of at the most fundamental level. This is done in the hope of discovering a grand unified theory. This article however, says that in the long run, does it really matter what things are made of. The entire quantum universe may be composed of quasiparticles that emerge out of indeterminable cosmic stuff. This stuff can never be probed to find out what it is made of and to try is just a waste of time, or so the article says. I believe that this is a very anti-realist view of the universe. Trying to find a viable model for the universe by studying the emergence of quasiparticles from stuff, not trying to find out about the true nature of the quantum world.

I think that this viewpoint is quite interesting. It is apart from any theories that we have learned about, probably because it is majorly speculative and probably wrong. I still like to find out about these alternate theories for the universe to get a different and opposing view from what we have learned. It is interesting to find out such a wide range of theories about the universe apart from the conventional ones. Although all the widely accepted theories that we have today started out as radical new ideas that were ludicrous. However it is hard to think that this theory may become the next convention.

Francis Bacon - Experiments touching Sulphur and Mercury

The first lecture from Susan Stockalmeyer about the origins of modern science I found particularly interesting. After this lecture I was looking up Sir Francis Bacon on the web to see what kind of information there was. I wished to further understand this nature of science as it first emerged. I came across this article in which describes Bacon describes the basic principals of chemistry. You can see the forming of scientific method in the words he uses as well as the general language. He is talking as if there has been experimentation done and that these are pure scientific facts, without bias. You can see that this is the birth of modern scientific method. I also find it very interesting just to see the perceptions about the world that people in the past have had. When you think of all of the scientific facts that we take for granted in the modern age and then look back to what was thought in the past, you can get an understanding of the difficulties involved in the original development of these ideas. He talks about the “two great families of things” and Air and flame. We know now that chemistry is in actuality nothing to do with mixing Water and Earth together to form a substance. These things that were absolute truth then have no grounding now.

I think that if something so obviously scientific and correct in Bacon’s day can turn out to be so incorrect that in a hundred years who can say what we take for fact now will be correct. Science is not absolute, however is evolving with humanity and is always biased by the current beliefs of the time. Although the whole aim of science is to provide an objective view into the workings of the universe, this can never be.

Big Questions Conclusion.

I thoroughly enjoyed most of the content of this course and I believe that I have gained a great deal in my general knowledge of science. Even if I am not going on to do any science units I still think that the things I have learned here will benefit me. I especially liked the *Quantum Mechanics* and *Life in the Universe* sections of the course. I think that it is a pity that we did not get to do more of *the Life in the Universe* section because that is the one that I did the course for. The learning portfolio was something that I have not ever done anything like. It was an interesting experience and I think that it worked out fairly well for the assessment of the course.

I believe that I have satisfied all of my goals that I set out at the beginning of this portfolio and perhaps fulfilled some goals that I did not know I had at the beginning. Overall I would rate it an enjoyable experience with much valuable knowledge gained.