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This is a graded discussion: 10 points possible

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D15(BH) Weekly Discussion

[Erin O'Connor](#)

Apr 27 at 2:32pm

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Due this week

First, be sure to do the reading and watch the lectures:

Assigned reading and lectures

Then answer the following questions in this discussion forum (and yes, you may look to see what others write, but try to find what they might have missed and you should go back to the original reading and lectures to get answers for yourself). Then post your own question at the end, and then answer someone else's question. If no question is available, go ahead and check back later until the due date. If nothing comes available you can then pick any question you wish.



We hope to emulate a seminar classroom environment where students can share ideas. Always be respectful with all communications you have with your esteemed fellow colleagues (your fellow students) in this course.

- 1. DISCUSS in some detail something you found unusually interesting or intriguing in the reading or lecture material. Are there new insights that you have gained (something you had not thought of or considered before)? Focus on one of the concepts and explain as best you can in your own words. (4 pts)
- 2. Post a question that you have about something you read. Be sincere. What do you want to know? Write the word QUESTION all in caps, so that your fellow classmates know what your proposed question to the class is. (3 pts)
- 3. ANSWER the question of another student according to what we discussed in the lectures or what you read in the assigned readings (don't just make something up). Try to answer a question that no one else has responded to yet (but not a hard and fast rule). A good way to respond to another student's question would be to say something like, "Good question! The answer can be found on page..." and give the quote from the reading. You are free to reference other sources outside of class material, but always consider the credibility of the source, state what the source is, and give the link. (3 pts)



[← Reply](#)[https://](https://canvas.sbcc.edu/courses/46681/users/373514)**Luke Rutherford** (<https://canvas.sbcc.edu/courses/46681/users/373514>)

May 7, 2022



DISCUSS:

I found the history of Isaac Newton most interesting, especially how often he was involved in controversy. The conflict between Newton and Leibniz seemed overly escalated. I understand that a mathematical discovery like calculus would be preferably credited to the correct person, but investigating your friends seems like a reach. I was also disheartened by Newton stating he took great satisfaction in breaking Leibniz's heart. The fact they both independently developed a part of calculus, but since Newton achieved it first Leibniz's achievement was discredited.

QUESTION:

Was thoughtful consideration given to Einstein's political views?

[← Reply](#)<http>**Erin O'Connor** (<https://canvas.sbcc.edu/courses/46681/users/24247>)

Yesterday



Yes, many years ago when I first read the book, this had a big impact on me as well. I had falsely assumed that just because a scientist was famous and very intelligent, that they would be nice. I guess that's not a prerequisite to being smart and famous. The real world is not so nice as one would hope.

[← Reply](#)<https://>**Sarah Savage** (<https://canvas.sbcc.edu/courses/46681/users/375381>)

May 7, 2022



DISCUSS:

When starting this class, I really had no idea that knowledge of so many theories and disciplines would be necessary in order to understand black holes. As was mentioned in the lecture, we need at least a basic understanding of cosmology, quantum physics & mechanics, thermal dynamics, quantum electro dynamics, general & special theories of relativity, classical Newtonian physics, particle physics, string theory, M theory... Each one of these is so in-depth that thousands of scientists can devote their entire careers to each! I'm amazed that we've covered as much as we have, and it has really proven to me the saying that "the more you know, the more you know you don't know."

One thing that is interesting to me is how so many scientists who are seeking the truth of the universe and the laws that rule it have attempted to inject a man-made construct into it and made decisions based on it. At the risk of being controversial, I am an atheist, though I was brought up Catholic. In my opinion, God is a man-made construct and religion is a political tool to control the masses. I don't intend to insult anyone, just stating my belief. My thought process is that factoring God into the laws of physics is akin to inserting the cosmological constant to make the math work out. Could the human desire for meaning have clouded our scientific judgement? I'm curious whether religion plays as big a role in today's science as it did 100 years ago and whether it's easier to get the masses to accept new science when God is factored in.

I liked playing around with the Drake Equation websites. I had a thought about what our definition of alien life is when I saw that in the equation the N_e comes before the f_l . We factor in the average number of planets that may develop an ecosystem before factoring in the fraction of planets that succeed in developing life. So it seems like the Drake Equation is defining life as animal life because an ecosystem would include plant life. If alien plant life could develop consciousness, intelligence, communication, interstellar communication, and we are looking for animal life, then it seems possible that we could not only miss finding intelligent life right in front of us because we're looking for an exoplanet with beings like us, and also raises ethical implications for when humans do find and populate a habitable planet with an ecosystem. The alien ecosystem may appear to be "only" plant life when we arrive but we may ignorantly invade and eradicate an intelligent species because our definition of alien life is too narrow?

QUESTION:

Do you think that alien life should be defined as animal life or anything living with a life cycle that replicates?

← Reply



Franco Diaz Campo (<https://canvas.sbccc.edu/courses/46681/users/403036>)

Sunday



ANSWER

Hi Sarah,

I do think it should be called animal life because until we don't know how it is, and how it is defined, we could not say they are identical to us.

What a nice question to analyze.

← [Reply](#)



Erin O'Connor (<https://canvas.sbcc.edu/courses/46681/users/24247>)

Thursday

Great discussion. It's good to feel comfortable to express your views. Everyone's views should be respected, including those who are religious or spiritual, and those who feel that's not right for them. Open discourse can allow all of us to feel comfortable with our own beliefs and yet still accept other's views. About what is life, the general definition is something that replicates, and then when we're talking about intelligent life, at least with regard to Interstellar communication, we are talking about the ability to build transmitters and receivers that could send signals and receive signals between planetary systems in space. Whether it's animal, or plant, or some other type of life we don't yet understand, shouldn't matter and so you have some very valid points in that the Drake equation should be unbiased with regard to the type of life we understand, it should focus specifically on the most important characteristic which is any type of life that can develop Interstellar communication.

← [Reply](#)



Franco Diaz Campo (<https://canvas.sbcc.edu/courses/46681/users/403036>)

Sunday

Hi everyone,

This is the last week of class, and I think I took advantage of this week and enjoyed what we have left of it. First, we had a great meeting with Jason Barrios, who presented to us an excellent project of NASA, which he seemed very passionate about. Then, we had a different video and discussion, in which we had to see the video and make excellent work. Lastly, we saw an incredible video about the universe, life, and related things. It was my favorite part of the week because it was like a summary of all we've seen during this semester.

I liked a lot this week's assignments!

QUESTION

On a scale from 1-10, how much did you enjoy this class"

← [Reply](#)



Abigail Jacobs (She/Her) (<https://canvas.sbccc.edu/courses/46681/users/367167>)

Sunday

Hi Franco!

I would give my experience a 9, not a 10 because honestly, I was very confused through most of the material because I bit off much more than I could chew. I found this class to be extremely interesting but definitely challenging. Overall I really enjoyed this class and I learned way more than I thought I would!

← [Reply](#)



Malcolm Tircuit (<https://canvas.sbccc.edu/courses/46681/users/427388>)

Thursday

I would give this class a 10 out of 10! Even with having a lot of school work to do on top of this class I was still motivated to learn the material because of how intriguing it was to me. I learned so much and I am so glad I took it!

← [Reply](#)



Naomi Xu (<https://canvas.sbccc.edu/courses/46681/users/27955>)

Thursday

10/10!!!!!!!!!!!!!! The class was so fun, I saw and learned so many cool things, and despite their being a hearty amount of material, they go by really quickly just because of how interesting all this is. It was such a good contrast class to balance my calculus class.

← [Reply](#)



Erin O'Connor (<https://canvas.sbccc.edu/courses/46681/users/24247>)

Thursday

I'm glad to hear you enjoyed this week' activities and that you liked the philosophical ending with the extra credit assignment with a famous physicist Lawrence Krauss. It's been great having you in the class and I have enjoyed your feedback and discussion posts.

← [Reply](#)



(<https://>

Victor Jensen (<https://canvas.sbccc.edu/courses/46681/users/416476>)

Sunday

Well, Hawking finally answered my question about what he meant earlier about a universe where the big bang isn't the only possibility.

I also enjoyed him talking about modern philosophy, although I'd argue modern philosophy cares more about moral dilemmas than science and so there is a lot more to philosophy than just debating the quirks of linguistics.

QUESTION: Think there'll ever be a point in the future where humans can answer the "why" of mathematics? Personally, I doubt it and think the answer really is "because that's the way it is." Under the Incompleteness principle, we can never prove all of math and have to accept that some things just work because they do. The "why" of the universe I feel will also always be incomplete.

← [Reply](#)



(<http>

Erin O'Connor (<https://canvas.sbccc.edu/courses/46681/users/24247>)

Yesterday

I haven't heard of the incompleteness principle, but that intrigues me and I'll have to look into it some more. I agree with you, sometimes things are just the way they are because that's how they are and us humans try to put too much meaning into things that sometimes just "are". It reminds me of when they interview a famous rock band and ask what the meaning is behind the words of a famous song, and the rock artist will say something like, "I never thought about it! I just picked random words!" Haha.

← [Reply](#)



(<https://>

Malcolm Tircuit (<https://canvas.sbccc.edu/courses/46681/users/427388>)

Sunday

DISCUSS:

I thought it was really exiting that we might soon find intelligent life with the James Webb telescope. I cant wait for the discoveries that will take place in my lifetime! I found it very hopeful that there might be maybe thousands of habitable planets in our galaxy alone. It seems kind of like a giant universe just waiting for us to discover.

QUESTION:

Whats the probability that life on another planet started around the same time as life on ours. Isn't it possible that intelligent life is common but the time intervals between each civilization is great?

← [Reply](#)



Abigail Jacobs (She/Her) (<https://canvas.sbccc.edu/courses/46681/users/367167>)

Sunday

Discussion:

This week we had a crash course on life found on other planets, are we alone? These planets are called exoplanets, we have found thousands, and many more are waiting to be confirmed as possible exoplanets. With the James Webb space telescope, we can almost detect oxygen on the plants that we have found that could possibly support life. We see traces of life going back 4 billion years here on earth, there was life before that but there isn't a trace. Because the process to create life is so easily done there could definitely be life out there. I have always been interested in this idea and I hope that there is another life out there that we can possibly learn a thing or two about regarding the proper care of our planet.

Question:

Did it ever launch since it was supposed to in 2018?

← [Reply](#)



Erin O'Connor (<https://canvas.sbccc.edu/courses/46681/users/24247>)

Thursday

Yes, the James Webb Telescope was launched this year and is on the verge of revolutionizing modern astronomy. It's an infrared telescope so we can peer through the dust and gas that enshrouds many of the universe's secrets. So it's going to be an exciting

decade of space exploration. I'm glad you felt the class was a nine, meaning that you learned many new things, and I understand the frustration of not feeling like you can understand everything. We discussed the most complicated and least understood science of the universe, so hopefully with this brief introduction you will feel more comfortable discussing these topics with others as new science and new experiments and new satellites are developed and make the news and become topics of conversation among the general population. It was great to have you in the class with us.

← [Reply](#)



[https://](https://canvas.sbccc.edu/courses/46681/users/354278) **Alak Fryt (He/Him)** (<https://canvas.sbccc.edu/courses/46681/users/354278>)

Sunday

DISCUSSION: Reading about all the things that Einstein went through during his lifetime was really interesting. I feel like I've never really understood who Einstein was except for $E=MC^2$ but of course there's much more than that. He was a very courageous person and seeing how willing he was to stand up to his own country was pretty crazy to me.

QUESTION: How do you think you would respond if there was a newspaper released about how great it was to hear that you specifically would never be back to your own country?

← [Reply](#)



[http](http://canvas.sbccc.edu/courses/46681/users/122267) **Lexie Brent** (<https://canvas.sbccc.edu/courses/46681/users/122267>)

Monday

Hi Alak! Interesting question ... it would certainly depend on the circumstances hahaha. If I were in Einstein's position, I think I would have gotten used to the hate that someone with great renown like him would certainly receive. Also, if it was coming out of Nazi Germany I think my response to any negative press from them would be, "I must be doing something right!"

← [Reply](#)



[http](http://canvas.sbccc.edu/courses/46681/users/24247) **Erin O'Connor** (<https://canvas.sbccc.edu/courses/46681/users/24247>)

Thursday

Very thoughtful questions about Einstein's life. How horrible war is, besides the loss of life and tragic injustice, to be banned from your own country, the place you identify with and

grew up at, these are some of the unexpected tragedies and personal sufferings that people endure.

← [Reply](#)



Lukas Gott (<https://canvas.sbccc.edu/courses/46681/users/417976>)

Sunday

DISCUSS: I found the James Webb telescope to be incredibly interesting. The idea of micro shutter and being able to determine a fraction of a light to 1 to 10,000 size of a human hair is incredible. Then using the light of an object to determine detailed characteristic such as chemical composition and temperature is a huge development for space study. This all while protecting the near spec from nearby planets through high tech cooling systems is a incredible feat.

QUESTION: Do you think it's likely that the James Webb telescope will discover an Alien civilization?

← [Reply](#)



Brian Wolden (<https://canvas.sbccc.edu/courses/46681/users/274832>)

Sunday

Hi Lukas,

Interesting question! I think it would be hard for the James Webb telescope to detect an alien civilization but I hope that it will be able to help narrow down the variables in the Drake Equation and give us a more accurate representation of the frequency of life in our galaxy. Having a better understanding of the atmospheres of exoplanets will go a long way. Particularly if we find oxygen in abundance since, as was pointed out in (I think) the Crash Course Astronomy video this week, stable oxygen atmospheres are likely hard to maintain without life to produce it.

← [Reply](#)



Erin O'Connor (<https://canvas.sbccc.edu/courses/46681/users/24247>)

Thursday

There are many things we expect to discover or hope to discover with the James Webb Telescope, but as with all scientific exploration, the most interesting things will be those

that we don't expect. Perhaps we will discover an alien civilization. Perhaps we will discover something even more amazing. We have many years ahead with the James Webb Telescope and I'm looking forward to see what will come of it.

← Reply



Brian Wolden (<https://canvas.sbccc.edu/courses/46681/users/274832>)

Sunday

DISCUSSION

I have been hearing about the James Webb Space Telescope for many years now and have (somewhat passively) followed the many delays in its development and launch. I'm so excited that it's launch and the first data coming from it coincided with this class as it has taught me a lot about what the telescope hopes to do and how, using the technology developed for the telescope, it can collect those data. First, the telescope is being positioned in the L2 Lagrange point so that the Earth can block much of the heat/light from the Sun, preventing that light from interfering with its measurements. Since it needs to operate at -233 degrees Celsius, additional measures need to be taken to keep the telescope cool enough to operate properly. To accomplish this, a large (and intricately designed and tested) heat shield was added to the telescope to block heat from the Sun and Earth itself. This heat shield is made of a plastic material called kapton which is then coated with a layer of aluminium to reflect light as kapton itself is translucent. Some layers also have silicon added. The layers of kapton and aluminium work kind of like a heat sink in a computer, with slots in each layer exposed to space, which also allows reflected radiation to be reflected out along the sides, preventing the heat shield from retaining too much heat. All of this helps the telescope as a whole stay below -233 C, but the mid-infrared detection unit needs to be even cooler at just 7 degrees Kelvin, so active cooling is added for this component. The telescope itself is made up of 18 hexagonal segments each 6.5 meters in diameter and composed of beryllium coated in gold. This allows for the mirrors to both be light but rigid so that they won't change over time or with heat fluctuations. Since beryllium isn't reflective, the gold coating is used as the reflective substance. While gold isn't great at reflecting many frequencies of visible light, it is particularly good at reflecting infrared light. This forms a mirror more than five times the size of that found on the Hubble Space Telescope, allowing for the James Webb telescope to collect data on very dim objects such as light from just after recombination after the Big Bang, and potentially even detect spectrographic data from the atmospheres of exoplanets. Since this telescope is not accessible as the Hubble Space Telescope is, on site repairs are not possible (as was required for Hubble). Instead, the reflective panels of the James Webb Telescope are adjustable allowing them to move independently of one another, and even adjust curvature,

and therefore be adjusted to ensure proper focusing of light. All of these mirrors reflect light to the primary mirror (which is also adjustable), which then reflects that light into the cassegrain focus in the aft optics subsystem. Within this array, there are two more mirrors and a highly sensitive image stabilization tool. This allows the telescope to keep its target in its sights to an incredible degree of precision, allowing for long exposures. This is just a brief overview of some of the amazing technology that went into making, launching, and deploying telescope and I'm really excited to see what it is able to tell us about our Universe!

QUESTION

In reading the Rare Earth Hypothesis, it does seem like the odds of extraterrestrial life are somewhat less likely than some permutations of the Drake Equation have previously concluded. The Drake Equation obviously requires A LOT of conjecture, as we basically only have Earth from which to gather data. However, it does seem like there is a fair amount of conjecture in the rare Earth hypothesis as well, particularly in regards to how life could and would form. Our knowledge of how life forms (outside of Earth) is so limited (or really zero, since we have nothing to base it on) it seems dangerous to assume that we know more than we do, particularly when it could take funding away from SETI and other similar organizations. Given how little we know, the safer assumption seems to be that life on Earth isn't unique. The galaxy (and even more so, the Universe) is huge, so there are a lot of potential combinations of attributes some planet or moon may have to create some form of stable life. I'm getting to a question, I promise...

I know the James Webb telescope is looking for exoplanets and, more importantly, will hopefully be able to analyze the atmosphere of those exoplanets. This will undoubtedly help give more precise data for the Drake Equation. I also know we are looking for signs of life (current or extinct) within our own solar system. So, my question is, is there any other research going on in any sort of meaningful way to help narrow down the possible inputs for the Drake Equation? Are there exobiologists proposing any weird, alternative theories for how life could form in the more extreme environments that the proponents of the rare Earth hypothesis says makes up most of the Universe, particularly in regards to radiation? More generally, what is the response to the Rare Earth Hypothesis now? Has it gained any more steam or has it remained a small minority opinion? Have there been any thorough responses or refutations to their hypothesis?

 [Reply](#)



Erin O'Connor (<https://canvas.sbccc.edu/courses/46681/users/24247>)

Thursday

Very thoughtful responses as usual. With regard to the Rare Earth Hypothesis, there was a lot of buzz around this when the book first came out but I haven't heard as much since

then. Now I don't focus on this or monitor this specific topic all the time, but I did just now Google Rare Earth Hypothesis and found and there's a Wikipedia page on it. Here it is for you to continue exploring further if you wish to do so.

https://en.wikipedia.org/wiki/Rare_Earth_hypothesis

← [Reply](#)



Lexie Brent (<https://canvas.sbccc.edu/courses/46681/users/122267>)

Sunday

The idea of scientific determinism is very interesting to me. The idea of God creating the universe and then leaving it alone is one I recognize as deism. I've found this philosophical/religious belief fascinating for a while, especially its historical significance in European countries like France. I've never thought about it in a scientific way before though. To be honest, I am surprised by how much Stephen Hawking talks about the relationship between religion and science as often it feels like they are mutually exclusive in a way. While watching the lecture I thought "maybe only God can know the unified theory, if they created it" and then to see that reflected in the book, as in if we understood the universe with a theory like that "we would know the mind of God."

Question: "... try to fit the waves into our preconceived ideas of positions and velocities ..." the question that perhaps there aren't even particles to be examined and analyzed but it's really just waves ... is there any way to know? How could we know whether or not it's all just waves?

← [Reply](#)



Erin O'Connor (<https://canvas.sbccc.edu/courses/46681/users/24247>)

Thursday

Yes, I think that's a common misconception that people have about science and religion being mutually exclusive. You very eloquently outlined the issue and I'm glad that you found it fruitful that we didn't shy away from this topic, but embraced it and tried to work with it. I find it all very interesting, and you seem quite philosophical and to enjoy these debates and discussions as well.

← [Reply](#)

[https://](https://canvas.sbccc.edu/courses/46681/users/27955)**Naomi Xu** (<https://canvas.sbccc.edu/courses/46681/users/27955>)

Tuesday

DISCUSS

I loved the way hawking concluded his book, it made me kind of laugh thinking how the church gets so defensive against science even though there has never been any proof to rule out "god", there's always something bigger that's out there

[← Reply](#)<http>**Naomi Xu** (<https://canvas.sbccc.edu/courses/46681/users/27955>)

Thursday

QUESTION

What is your favourite object in space? (ie. star, planet, nebula, cluster, galaxy, probe.....) and why.

[← Reply](#)<http>**Erin O'Connor** (<https://canvas.sbccc.edu/courses/46681/users/24247>)

Thursday

I'm still into the stack of turtles....

[← Reply](#)