

Drew:

In what ways is this class going well?*

I like cosmology so far. It is the hardest STEM class I've taken, and I feel behind a good portion of the time, but it's also more interesting and rewarding than any STEM I took in high school. I really appreciate Brian's availability and passion; he seems very invested in our success and willing to put extra hours toward it. We also get into some really active discussions in class, and

In what ways could this class be better?*

I have two areas I think we could improve on: First, I feel like we waver between enthusiasm and going off the rails almost every class. I like this feeling a lot, but I think we can pull it back sometimes and cover more material. Second, I want to figure out a better balance of working collectively and individually on the problem sets. I'm not sure what this would look like yet, but right now I can either work totally collaboratively or totally alone, and I want to look for a better balance between these extremes.

Max:

In what ways is this class going well?*

I think that the early homework assignments fundamentally changed how I perceived the world. Relativity is such a mind-boggling idea, and the fact that it can be backed up by what has traditionally been such a logical language in math is a strange experience. Seeing how numbers can justify the unjustifiable has been truly remarkable. I think the lectures on the homework and our inevitable follow-up questions have also been valuable.

In what ways could this class be better?*

This class is going way too fast. I realize that "Cosmology" is the title, but I'm sacrificing my understanding of relativity and black holes to reach it. I don't think this tradeoff is worth it. In addition, some of the homework questions are an algebraic grind. I understand that deriving Schwarzschild and all the other equations requires clever algebra, and going through these steps is a good pedagogical method of demonstrating the process of discovery and evolution of these physical theories, but some of these problems go down tangents that require hours of work for a predictable result. It can be discouraging to lose the thread of the interesting amidst a forest of the

numerically banal. The most satisfying problems are those that require a complete shift in the traditional ways we consider physical problems. I love when a couple of us start physically reenacting the problem to get over a conceptual hurdle. It seems like this stuff is very hard, not just from a math perspective, but from a "this theory makes no sense on the first try" perspective, but the class structure doesn't recognize this. It's useless to speed past an area of misunderstanding to get to a more advanced topic, especially when the former is a prerequisite for the latter. Often, lectures go so fast that I don't even know when to ask to slow down, and am worried that Brian will not want to grant my request in favor of his (well designed) class plans.

Ethan:

In what ways is this class going well?*

The course material is naturally very exciting and alluring. Brian does a good job being accessible for questions about homework (and being clear when he won't be accessible). I appreciate that Brian both comes to class knowing what relevant equations or diagrams in the textbook he needs to supplement with lecture and also leaves open space for the students to highlight their questions and difficulties. I'm impressed at the sheer fact that we've been able to go through special relativity and a metric for black holes at a non-surface level understanding in just a couple months.

I also commend Brian for his creative ways to make this class not require calculus knowledge, even if they feel a little silly at times.

In what ways could this class be better?*

The class is a bit fast paced, but I don't think unreasonably so. I'm more worried about the fact that problem sets, by leaning on the more challenging textbook problems, don't always establish a baseline comfort. I think like we've only used the Lorentz transformation four times, which meant I haven't gotten an intuitive feel for when to use it, how to decide which frame is prime, or when it's fine to use just time dilation and length contraction instead.

The class felt a lot smoother to me when we were learning special relativity, and I think one reason why is that there seemed to be a very clear narrative about how the realization that c is constant in all frames can lead to the realizations about how space and time can be affected and intertwined by speed. For general relativity, I'm much less sure what the narrative is (perhaps Ben's historical overview will help with this).

Similarly, at this point the material we're learning feels a bit detached from reality (I mean, we're working with r and t coordinates that don't correspond to distance and time, and as far as I can tell,

have no easily explainable meaning—I have no idea what a spacetime slice really says beyond visualizing each variables' relationships). This seems to be a necessary part of learning this material, but it would be helpful to have some reminders that these things do indeed connect to human lives, even if it's a brief 5-minute overview of how GPS uses general relativity or the experiments that were able to make these things apparent to researchers.

Ben:

In what ways is this class going well?*

I think there have been moments in the course which have been very exciting and encourage real independent exploration of the material. I also think that the newness of the subject matter encourages a tight bond between the students, which has been nice.

In what ways could this class be better?*

I sense a certain lack of sympathy on Brian's part for the experience of encountering these ideas for the first time. It seems to me that there is a disconnect between explanations that are helpful for Brian and explanations that are helpful for the class - almost like Brian is teaching this class as a refresher for students who have already learned the material. For instance both the problem sets and Brian's in-class digressions have a tendency to feel rather cute, like a joke that's going over my head. A few problems obviously contribute to the arc of the class. But the relevance of others is very obscure. From talking to the other students, I think it's fair to say that no one understands the significance of the exercise where we plotted points on a sphere. We can do these kinds of exercises until the cows come home - and even get better at them - but I don't know how conducive they are to understanding relativity if the symbols we manipulate aren't connected to the concepts we discuss in class. What makes it especially difficult is the fact that Brian has a rhythm which, while pleasant to listen to, remains consistent in its ups and downs no matter what he's talking about. This means the thrust of a class and Brian's digressions from it are tricky to differentiate, especially without a clear idea of which point he is treating in the first place.

There's clearly a way that Brian is comfortable teaching a class, which doesn't involve veering out into sloppy, low-intensity STEM courses geared towards literary minded humanities students. I'm not asking him to do that. All I'm asking for is a couple headers to the classes and the homework assignments that make it obvious where we are in the syllabus, what we're doing, and where we're headed. I don't think any of us are hostile towards him as a teacher, or towards being in the class.

But I hope the midterm helps Brian realize that this class is really quite lost and needs some conceptual signposts with which to reorient itself.