




Course Organization Notes

Big Bang & Black Holes

ASTR/PHYS 109

David Toback

Last updated 3/10/2021



Intro Lecture Notes (for before Unit 1)



Overview

First describe how everything fits together, then describe the assignments in detail

This document can be found at

<http://tobackgroup.physics.tamu.edu/toback/109/CourseOrganization.pdf>

Class Time

- We meet Monday, Wednesday and Friday from 9:20AM-10:10PM
- This is a hybrid course
[tamu.zoom.us/s/3123637926](https://tamu.zoom.us/j/3123637926)
password in eCampus
- Will use the full time period
- I expect you to be on time, and prepared for class by being caught up with all the assignments

Course Home Page/Web Page

<http://tobackgroup.physics.tamu.edu/toback/109>

Most things can be found there

Need help? email at

109QuizHelp@physics.tamu.edu and

109GeneralHelp@physics.tamu.edu

Syllabus on Howdy and eCampus

Don't need to write this all down!

Copy of all the lecture notes at

<http://tobackgroup.physics.tamu.edu/toback/109/Lectures/>

Regular and Honors Sections

- **Regular sections**
 - ASTR 109, Section 501
 - PHYS 109, Section 501
- **Honors sections**
 - ASTR 109, Section 201
 - PHYS 109, Section 201

There is no difference between the Physics and Astronomy sections (All meet together)

This course counts as 3 credit hours for your "Life and Physical Sciences Core Courses" requirement

Honors vs. Regular Sections

- There is no difference between the Physics and Astronomy Honors sections lectures - All meet together
 - You should have gotten an email from me
- Assignments are the same, except students in the Honors section have an extra paper on a topic we agree upon - See Course Webpage
- Want to be in the honors section but couldn't get in? In the honors section but want to get out? Let me know and we'll fix it

Coming to Class

- Need you to be proactive **DURING** class!! Get into it and have fun
- Laptops/cellphones are **NOT** allowed in class with 2 exceptions since they are too distracting
 - During Zoom Polls
 - Will allow them for notes in the first 5 rows with *explicit* permission

Grades

The course grade will be:

- Papers Assignments in Peerceptiv: 85%
- Small Assignments in eCampus: 15% (each with equal weight)
 - PLRQ Assignments
 - End-of-Chapter quizzes
 - Feynman Diagrams

No in-class exams or final

The lab (ASTR/PHYS 119) is a separate course, not required, and NOT being run this semester

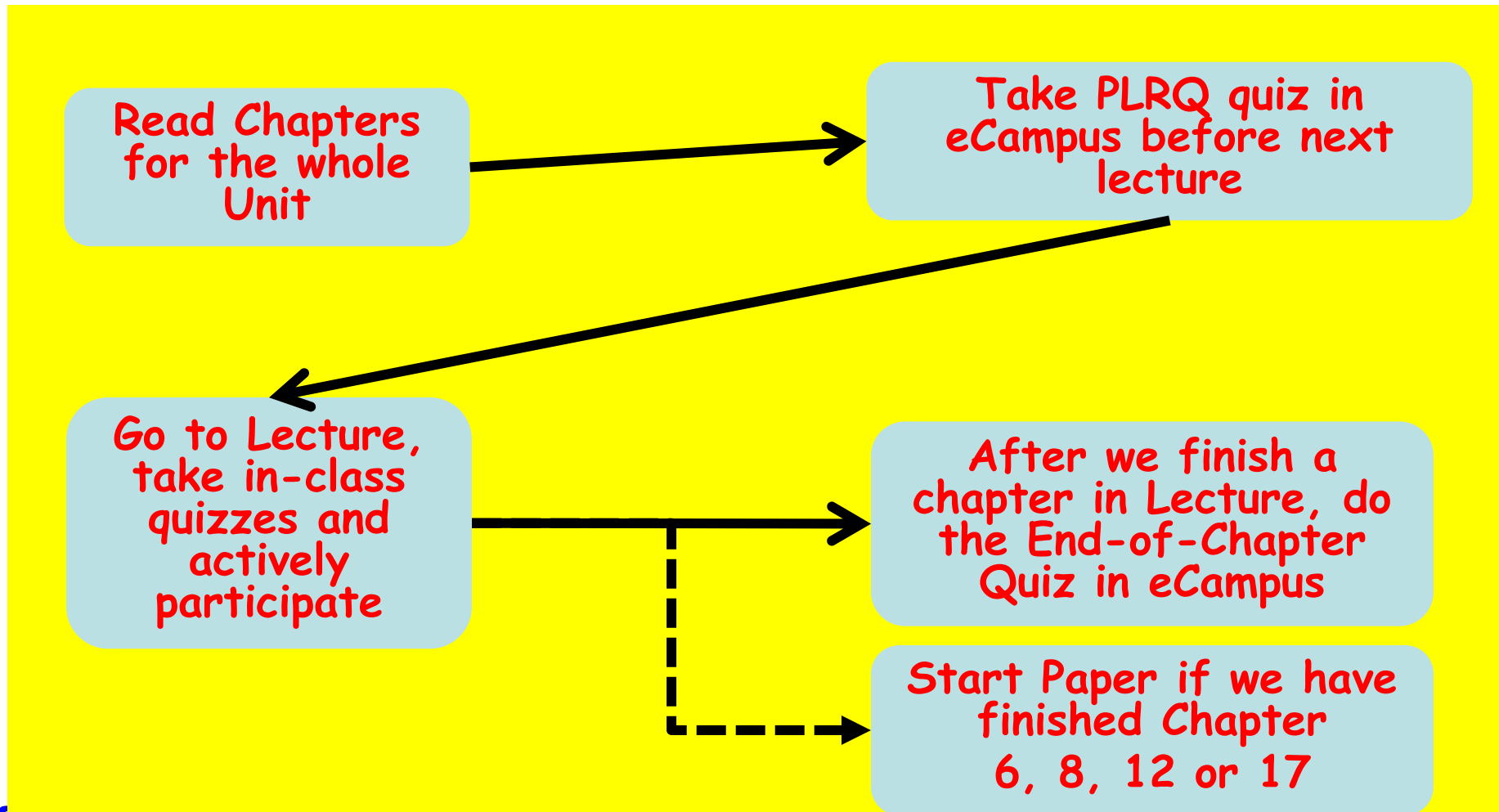
Grades

- I like for my students to do well and I like giving lots of good grades
- While I do give lots of A's, this is not an "Easy A" class despite what you may have heard
- Do all the work and I'll make it worth your while, both in terms of fun and your grade
 - If you blow off the easy stuff or don't ask for help when you need it, then I'm unlikely to have much sympathy when you ask for a grade change at the end of the semester
 - I've given lots of F's
- It will be a lot of work, so if you don't want to keep up with the class every day, work hard and stretch your mind, you should drop now
- I'll expect you to keep at it until you get it right

Typical Order of Things

(Things will be a little different for the first week)

<http://tobackgroup.physics.tamu.edu/toback/109/ClassSchedule.pdf>



Tentative Schedule for 2021A

This document can be found at

<http://tobackgroup.physics.tamu.edu/toback/109/ClassSchedule.pdf>

This space intentionally left blank...



eCampus

Where you will find all
the online assignments

Login instructions at

http://tobackgroup.physics.tamu.edu/toback/109/ECampus_Quiz_Instructions_and_Help.pdf

Use eCampus for many things

- **Papers: (Part of your grade)**
 - Peerceptiv
 - TurnItIn
- **Warmup Quizzes: (Not part of your grade, but required)**
 - 5 Separate sets of quizzes
 - All are Pass/Revise and require 100%
 - The exception Astronomy Misconception Survey (AMS) which is just one attempt (do the best you can do)
- **Pre-Lecture Reading Questions (PLRQ): (Part of your grade)**
 - Quizzes
 - Written Assignment (Submit your own questions for Unit 2 only as Pass/Revise)
- **End-of-Chapter (EOC) quizzes: (Part of your grade)**
 - All the quizzes are designed that you need 50% to move to later quizzes
 - There will be a end of semester AMS (second AMS) before Chapter 20 opens
- **Feynman Diagram Assignments**
 - Learning how to draw Feynman Diagram (later in the semester)
- **Other:**
 - Announcements
 - Grades

More on Page 42



General Information About Quizzes in eCampus

- Warmup quizzes and PLRQ Quizzes
 - Today's lecture
- End-of-Chapter (EOC)
 - Later lecture
- Feynman Diagrams
 - Later lecture

Warmup Quizzes

- In the "Quizzes" folder, then go to "Required Warm-ups"
- Five sets of quizzes, each with multiple easy quizzes and designed to teach you how to do things in the course (and practice for the science later)
 - Part 1 - Warmups: First quizzes and "Astronomy Misconception Survey" (AMS). First set is just to get going in the course. Since AMS is just designed to tell us what you know coming into the course you only get one try and it won't count as part of your grade
 - Part 2 - How to ask for help/additional attempts: When you are done with AMS, a new set of quizzes will open. They are "How To Ask For Help/Additional Attempts for eCampus Quizzes." There are 6 of them. Since most people don't get all the quizzes quickly, and need to learn to get good at them, this is how we help-you-help-us teach you to ask for help in a useful way
 - Part 3 - Requirements: This quiz is designed to teach you about the Requirements in the course. Most of what you will need to answer those quiz question is in this document
 - Part 4 - Peerceptiv: This is about learning how to use the Peerceptiv system. We'll come back to this later when we are starting to get to papers in the course
 - Part 5 - Feynman Diagrams: This is about learning how to draw Feynman diagrams. We'll come back to this later when we get to them

This space intentionally left blank...

Discouraging Guessing


- You get unlimited attempts, but to discourage guessing if you use too many attempts and need more, you will have to request them from the instructor
 - All-but-Feynman Diagram quizzes: 5 attempts
 - Feynman Diagram quizzes 2 attempts
- There are a set of warmup quizzes to help you get good at asking for more attempts
- Help for the quizzes with specific instructions on how to request more attempts can be found at

http://tobackgroup.physics.tamu.edu/toback/109/ECampus_Quiz_Instructions_and_Help.pdf

<http://people.physics.tamu.edu/toback/109/Diagrams/FeynmanDiagramAssignments.pdf>

Getting Help/Additional Attempts for Quizzes

- **Send an email at 109QuizHelp@physics.tamu.edu**
- **Two ways: Send email where you type in the information, or send a copy of the worksheet we have provided**
 - **Instructions on Page 3 of**
http://tobackgroup.physics.tamu.edu/toback/109/ECampus_Quiz_Instructions_and_Help.pdf
 - **Follow the instructions on how to get to all the information about your previous attempts that you will need to send us in your request**
 - **For good examples see Page 4 of that document, or P40 of this one**
 - **Direct link to an excel worksheet at**
<http://tobackgroup.physics.tamu.edu/toback/109/RequestingAttemptsWorksheet.xlsx>
- **With that information we can usually figure out what is causing you to struggle (and will usually just give you two more attempts)**
- **Then again, maybe you are correct and we need to fix it in eCampus! If that's the case, we'll give you extra credit!**
- **Extra credit for ANYTHING you can help me fix anywhere in the course**



Pre-Lecture Reading Questions (PLRQ)

Pre-Lecture Reading Questions

- It is important to learn how to ask good science questions (or tell if a question is good scientifically), and to be well prepared for Lecture
- For these reasons we will have a number of PLRQ Assignments
 - Quizzes
 - In the "Quizzes" folder, then go to "PLRQ Quizzes"
 - Ten questions per Unit, 6 Units (First quiz is broken into two parts)
 - Written assignment to be submitted (more on this later)
- Guidelines for what we are looking for at

http://tobackgroup.physics.tamu.edu/toback/109/PLRQ_Guidelines.pdf

How can I tell if a question is well asked?

- 1. Is it obvious the question-asker read the Unit (or rather, is it not obvious that they didn't read)?*
- 2. Is the question relevant to this unit's reading?*
- 3. Is the question clear and well-phrased?*
- 4. Does it reflect critical thinking?*
- 5. Is it relevant to the science of the reading?*

Two Types of PLRQ Assignments

1. Quizzes, Units 1-6

- Each Unit has a quiz with 10 questions where you evaluate the quality of each question
 - Quiz 1 is actually broken into two pieces
- Designed to help you decide if it's a good question
- Feedback will help you learn about whether it is good, and contain some physics answers
- Won't get the same questions for each quiz
- The grades for each are just the highest grade you achieve. Unlimited attempts, but need to ask for more after Attempt 5

2. Submit your own questions for Unit 2

- Pass/Revise until you get 4 excellent questions
- You write your own questions and submit to the *PLRQ Unit 2 Written Assignment Quiz* in the same folder (will be graded by hand)

Lab Course
ASTR/PHYS 119
(Not being run for
Spring 2021)

This space intentionally left blank...



Other Stuff

Class Time

- Lecture will be a time where you and I interact by asking and answering each others questions
- You will need to prepare BEFORE lecture
 - Do the reading assignments
 - Do the "Pre-Lecture Reading Questions" Quiz
 - Be ready to answer questions in class
- If you don't understand something, ask a question in class!

In Class Quizzes

- We will be doing a lot of polls in class using Zoom
- Can use phone or computer

Accounts, email and eCampus

*You are
responsible for
checking your
official email
periodically for
announcements*

This space intentionally left blank...

Required Textbook

Required Textbook

- *Big Bang, Black Holes, No Math (Toback)*
 - Extra credit for students who email me corrections which make it better (list of previous corrections online)
 - eBook or paper is fine
 - Can order at bigbang.physics.tamu.edu
 - First 4 chapters online if your book is late
 - http://tobackgroup.physics.tamu.edu/toback/109/ThisSemester/Textbook_temp.pdf
 - Copy on Reserve at Evans if needed

Recommended Textbooks

Recommended (not required) books

- *Briefer History of Time* (Hawking)
- *The Science of Interstellar* (Thorne)
- *Theory of Everything* (Hawking)
- *Stephen Hawking's Universe* (Filkin)
- *The First Three Minutes* (Weinberg)
- Other readings on the Web

Make sure you get the most up-to-date versions of each (see webpage)

- Not "*Brief History*", *Briefer History*
- Paperbacks available for each
- Looks like about \$15 for ALL of them (with shipping) if you get them online

Recitation and TA Help


- While there is no recitation for this course, there is a Teaching Assistant (TA).
- They can help you:
 - Understand the science and get good at learning how to understand how to use Peerceptiv, and do the things necessary to pass the quizzes
 - Give you feedback on your papers to make them better
 - Help review your case if you think you were mis-graded
- Their emails are on the main page

Just for Fun...

- We have created a “just for fun” Facebook account for students (past, present and future) who want to stay in touch with the course
- *Learning about the Big Bang and Black Holes Without the Math*
- It's not part of the course, but I try to post fun, related things there periodically
 - If you send me something fun (and appropriate for public consumption) I'll post it for everyone
 - If you send me something fun, but inappropriate, I'll say thank you and just enjoy privately
- Also, lots of fun stuff on <http://tobackgroup.physics.tamu.edu/toback/109/Video/>



Second round of Intro Notes



More Information About Quizzes in eCampus

- Warmup & PLRQ Quizzes
 - Earlier lecture
- End-of-Chapter (EOC)
 - Today's lecture

End-of-Chapter Quizzes

- There are End-of-Chapter quizzes for each chapter
 - Helps ensure you have a good knowledge of some of the important FACTS for each chapter
 - Will be done online, using eCampus
 - Need 50% any quiz to move to later quizzes
 - Are assigned AFTER we finish the chapter in lecture, and due before the next lecture
 - If you need more attempts, follow the standard instructions

EOC Quizzes Continued

- When you are finished with Warmups 1-3, the End-Of-Chapter Quizzes folder becomes available
 - In the "Quizzes" folder, then go to "End-of-Chapter Quizzes" folder
 - The Chapter 1 is actually a reminder "How to ask for more attempts Quiz"
 - After you are done with that you move to Chapter 2
 - EOC quiz due AFTER we finish the chapter in lecture

Example of a Good Email if you run out of attempts or need help

Howdy,

I'm struggling with End of Chapter quiz Chapter 3:

Question 12: "Which of the following are thought of as a composite particle? Select all that apply."

1. Atom (Yes. Atoms are composed of protons, neutrons, and electrons)
2. Quark. (No. Quarks are listed as fundamental particles in Table 3.1)
3. Electron. (No. Electrons are listed as fundamental particles in Table 3.1)
4. Neutrino. (No. Neutrinos are listed as fundamental particles in Table 3.1)

Feedback: Hint: Any particle that is not a fundamental particle must be a composite particle

IT HAS:

- THE NAME OF THE QUIZ
- THE QUESTION NUMBER
- THE TEXT OF THE QUESTION
- THE ANSWER NUMBERS AND TEXTS...
- YOUR ANSWER AND REASON WHY CLOSE TO ONE ANOTHER
- THE FEEDBACK (or a note that there is none)
- AND NO RANDOM FORMATTING CLUTTERING UP EVERYTHING

THIS IS A GOOD E-MAIL! MAKE YOUR EMAILS FOR HELP LOOK LIKE THIS!

For more details see page 3 of

http://tobackgroup.physics.tamu.edu/toback/109/ECampus_Quiz_Instructions_and_Help.pdf

Can also use

<http://tobackgroup.physics.tamu.edu/toback/109/RequestingAttemptsWorksheet>.

Note: This is an interactive work sheet. You should have an entry for each box that is yellow. You can print it to .pdf or email the excel file to 109help@physics.tamu.edu			
Instructions on how to fill out this sheet can be found here (page 3)			(Last updated 9/3/2018 D. Toback)
Basic Information			
Tell us your name	Dave Elnson	Tell us the quiz name (e.g. EOC Chapter 13a)	Chapter 06 Quiz
Tell us the question number	7	Tell us how many option-answers there are	5
Copy/Paste the full text of the question you are struggling with			
Which of the following interactions listed can NOT be adequately described with Newton's laws of gravity? Said differently, if Newton's laws and General Relativity give basically the same answer, then Newton describes them adequately.			
A Copy/Paste of the feedback from eCampus itself (if any) that the quiz gives you when it tells you you didn't get the question right. If there is no feedback, just say "No feedback".			
Careful. Just because Newton's results aren't perfect, doesn't mean they aren't good enough to describe something adequately. Newton just fine describing a rock falling to the Earth.			
Information about the option-answers in the quiz that you will either click or not click (Yes/No)			
A Copy/Paste of the text of option-answer 1			
The attraction between dogs and cats			
Your Yes/No answer	No		
WHY? you picked that answer			
Both dogs and cats have mass, therefore there is a gravitational pull according to Newton			
A Copy/Paste of the text of option-answer 2			
The attraction between the Earth and the Moon			
Your Yes/No answer	No		
WHY? you picked that answer			
The earth and the moon have lots of mass and a strong gravitational attraction according to Newton			
A Copy/Paste of the text of option-answer 3			
Newton's laws can describe all the listed interactions			



More Stuff About Grades

More Detail on Grades, Revisions and Pass/Revise/Fail

- **For the online eCampus quizzes:**
 - **Warmup Quizzes (including AMS):**
 - These are not counted as part of your grade.
 - All except AMS are Pass/Revised. You must keep taking them until you get a 100%. AMS only gets one try (just do the best you can)
 - You will have unlimited attempts to pass for all quizzes excluding AMS (again, just one try, do the best you can). If you need more than 5 attempts you will have to do a Request for Additional Attempts following the instructions at http://tobackgroup.physics.tamu.edu/toback/109/ECampus_Quiz_Instructions_and_Help.pdf#page=3
 - **EOC quizzes are Pass/Revise, but where 50% is passing. You will get unlimited attempts to get as high a grade as you want for each quiz. If you need more than 5 attempts you will have to do a Request for Additional Attempts following the instructions above**
 - There is a second AMS quiz which is not part of your grade before EOC 20 opens
 - **For the PLRQ:**
 - Main quizzes you get unlimited attempts to get the grade you want (can get a 0%)
 - Written assignment is pass/revise (4 excellent questions = 100%)
- **For Papers:**
 - Papers 1-4 will have grades on a curve. You can do revisions. Not pass/revise
- **Late penalties**
 - There are late penalties for all assignments

This space intentionally left blank...

Regrades and Revisions

- If you think you were misgraded on ANY assignment, send an email to 109GeneralHelp@physics.tamu.edu
- Revisions, resubmissions, additional attempts are allowed for many assignments, and we are here to help you do better



Notes for Before we Start Chapter 4



Papers

http://tobackgroup.physics.tamu.edu/toback/109/WritingAssignments/Papers_and_Peerceptiv.pdf

Paper Topics and Due Dates

- Papers will be announced before we start the chapter
- Assigned after we finish the chapter
- 4 Papers
 - Paper 1: Evidence for Dark Matter
 - Assigned after Chapter 6, Typically week 5
 - Paper 2: Evidence Stars are made of Atoms
 - Assigned after Chapter 8, Typically week 7
 - Paper 3: Evidence Universe started with a Big Bang
 - Assigned after Chapter 12, Typically week 10
 - Paper 4: Evidence for Black Holes
 - Assigned after Chapter 17, Typically week 14

Style of the Paper

- Explain it to someone who isn't taking the class (no jargon)
- ~600 words (This is the equivalent of both sides of a sheet of paper, double spaced)
- No citations or quotes! Use your own words
- Only use information from the book
- Text should be professional. You are "trusted guide" not a "buddy" or "comedian"
- Use the format assigned

Paper Format

- **Must follow expected Format**
 - Like the case a trial lawyer will make
- **Each paper is usually 5 paragraphs:**
 - Introduction paragraph that gives the “answer” up front and outlines the evidence
 - Lawyer's opening statement
 - Body paragraphs where you “make the case”
 - Make the case using evidence
 - 1 paragraph per piece of evidence (often, but not always, three)
 - Conclusion paragraph that ties it together
 - Lawyer's closing arguments
 - Not just restating the evidence

tobackgroup.physics.tamu.edu/toback/109/WritingAssignments/samplepaper.shtml

Different than usual...

- Each Paper Assignment has 3 Stages, all in Peerceptiv
 1. Text Submission
 - Also submit to TurnItIn
 2. Review (evaluate others text)
 - You are required to do 3 reviews
 - You should do these as soon as you submit (assuming others have submitted before you to Review)
 3. Give Feedback to your Reviewers
 - You need to do this for each Review, but it can only happen after your paper has been Reviewed
- Your grade is based on quality of your text (graded on a curve), but you only get a grade if you pass the Review and Feedback portions. If you don't pass your Reviews the first time you will have to do more
- Actual dates from the Lecture notes

Help Available for the Writing Stage

- There is a Feedback Assignment for each paper
- We have also set things up so you can submit a revision (to the same assignment) but you will need to do a full set of Reviews and Feedbacks
- We also recommend going to the Writing Center

Biggest reasons people don't do well

1. Don't read all the hand-out instructions on how to use Peerceptiv

http://tobackgroup.physics.tamu.edu/toback/109/WritingAssignments/Papers_and_Peerceptiv.pdf


2. Don't read all the paper-specific instructions given in the assignment

- *Hints given in addition to requirements*

3. Don't do all the Peerceptiv stages and/or Forget to submit to TurnItIn

4. Don't get help when you need it

- Go to the Writing Center or submit to them for feedback
- Submit a draft for feedback
- Read the hints on the handouts



Peerceptiv for Papers In eCampus

http://tobackgroup.physics.tamu.edu/toback/109/WritingAssignments/Papers_and_Peerceptiv.pdf

Why are we using Peerceptiv?

- **Skills:**

- People in the real world need to do multiple drafts of documents, often with others, until they are excellent
- People in the real world need to know how to tell the difference between an excellent document and a mediocre one
- People in the real world need to know how to give feedback on documents others have written that will help them get turned from being mediocre into something that is excellent

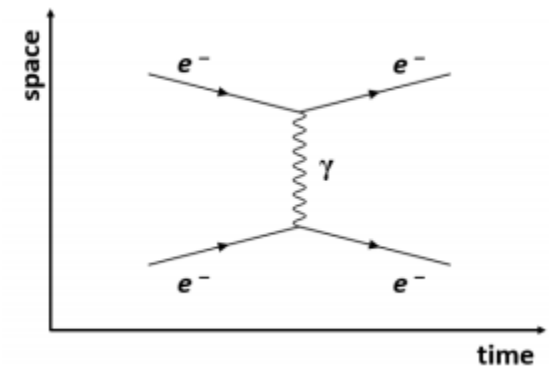
- **How does this impact you?**

- You need to get good at this for after you graduate
- Learn to better evaluate/improve your own work to ensure it is excellent BEFORE you submit it for a grade

This space intentionally left blank...

Feynman Diagram Assignments

- Learning to write down the diagrams that dictate what occurs at various times during the evolution of the universe since the Big Bang until today
- There are 4 short assignments for the course in eCampus in the Quizzes Folder
 1. *Electromagnetic Force Interactions (Chapter 7)*
 2. *Strong Force Interactions (Chapter 8)*
 3. *Annihilation and Creation (Chapter 9)*
 4. *Nuclear Decays (Chapter 12 and 14)*



<http://tobackgroup.physics.tamu.edu/toback/109/Diagrams/FeynmanDiagramAssignments.pdf>
and
<http://tobackgroup.physics.tamu.edu/toback/109/Diagrams/DrawingFeynmanDiagrams.pdf>