

Extra Credit Opportunities in Physics 100

March 21, 2007

To earn extra credit, you may write up to two papers on selected topics. Listed below are three. If you have a particular passion to write on something not listed here, run it by me and I'll consider it. I may add more throughout the semester, but don't count on it! :)

Each extra-credit paper will be worth up to one full homework assignment (or roughly 2% of your total grade). Doing both extra-credit assignments could then raise your total grade percentage by as much as 4%—perhaps enough to turn a strong 'C' into a 'B-.' Of course, being extra-credit, the points these papers earn their authors will not be considered in determining the grade curve. In other words, they will only help the authors, not hurt everyone else!

Each paper must be double-spaced and typed¹. Grammar, spelling, and neatness all count as though you were in an English exposition class. Full credit will only be given to well-argued, well-organized papers meeting these requirements and the requirements outlined in each description, below. **If you are uncomfortable with your English abilities or writing skills (for whatever reason), I am more than happy to help you in any way I can.** The point of these extra-credit assignments is to sharpen your writing and reasoning skills and get you to think about the course material in a different, more socially relevant, light.

For each paper you choose to write, on **Monday, May 7, 2007 (in lecture)**, you will need to turn in a rough draft that I will proof-read and then return to you for correction. **The final version of the extra-credit assignments will be due on Friday May 18, 2007 (in lecture)**, two days before the final exam (May 21st). Papers may also be submitted in electronic form (email preferred), if you do not have access to a printer.

That said, here are the three paper topics you may choose from (remember, you can only turn in two!):

¹Computers are available for your use in the ISC, among other places on campus. If you need help finding a computer to use, let me know!

Extra Credit Opportunity #1

Attend the lecture entitled "Evolution and Art, Evolution of Art," to be delivered by one of our own Physics/Astronomy faculty, Mohsen Janatpour on April 20, 2007 at 7:30 pm in the College of San Mateo Main Theater². In addition to being an astronomer and physicist, Mohsen is an artist³ Here is the write-up of the event (it is also posted on the class web page):

Why do we enjoy artworks? Why do we create them? Are we hardwired for the appreciation of art or is that a culturally learned trait? I will argue, as the anthropologist Ellen Dissanayake has, that there must have been evolutionary advantages to creation and appreciation of works of art. Indeed, as she puts it, we are not only *Homo sapiens*, but also *Homo aestheticus*. That is appreciation of art is innate in. In this presentation, I will discuss some of the social and individual advantages of Art from an evolutionary point of view. Also, in this 20th presentation of Art and Science, I hope to complete and exhibit my Symvisio VII.

After attending the lecture, write up a 900-1,500 word paper⁴ clearly describing the central topics and ideas presented in the talk and whether or not you agree with them— you must use logical, well thought-out arguments to either support Professor Janatpour's theories or discredit them, being sure to draw on your own reactions to the artworks presented at the event⁵.

²Admission is FREE, and there's a reception (i.e. food and stuff) following!

³Visit his website: www.mohsensart.com.

⁴This is equivalent to approximately 3-5 pages of double-spaced, 12pt font, and reasonable margins

⁵For example: You found Painting X to be harmonious because it uses Y and Z colors. This is/isn't in keeping with the evolutionary theory of art that was presented because of the following reasons...

Extra Credit Opportunity #2

We are living in a very unique time. The world has come to depend on the consumption of large amounts of energy—much of it in the form of fossil fuels, such as coal and gasoline. With current usage rates, we are quickly depleting the amount of fossil fuels available to us as well as generating a lot of greenhouse gasses and other forms of pollution.

Adding to this energy crisis are China and India, whose economies (and fossil fuel usage) are growing at staggering rates ($\sim 10\%$ per *year*). It is clear that there aren't enough fossil fuels to go around the world for much longer. Even if there were, it's not clear if the environment could support their continued use.

For this extra-credit assignment, you will write a 900-1,500 word⁶ mini-research paper addressing one of three proposed alternate fuels for automobiles whose supporters claim will solve the energy crisis:

- The use of hydrogen-powered cars
- The use of all-electric cars
- The use of bio-diesel-powered cars.

For whichever alternative fuel you choose, you must address these core issues:

- What is the energy density (e.g. Joules/liter) of the fuel?
- Where does this energy come from?
- How does the energy it takes to produce this fuel compare to the amount that can be extracted for useful work like getting from place A to place B?⁷
- From your calculations above, you must show that the fuel is either a *source* of energy or a means of *storing and transporting* energy.
- If the fuel is not a source of energy, then what, if anything, is gained by using it (e.g. does it reduce greenhouse gas emissions? Is it stored in such a way that extracting it in the vehicle has a very high efficiency?)?

⁶This is equivalent to approximately 3-5 pages of double-spaced, 12pt font, and reasonable margins

⁷For example, if it takes 100 J to produce one liter of Fuel X, which has 80 J of useful energy, then the fuel is only 80% efficient.

- What are the drawbacks and hidden costs to using this fuel? (e.g. Does the fuel require so much energy and environmentally damaging techniques to produce that it is actually worse than gasoline?).
- Examine how the fuel compares to gasoline for each of these points

Finally, explain how you might envision people using this fuel, including the production and distribution of it, and what living in a world that relies on this fuel would be like.

As this is a research paper, you must cite any information you use. For example, the internet is a good source of information, but be sure to keep track of what web site you get that information from!

Extra Credit Opportunity #3

Note: *Because there is so much lingo to wade through involving nuclear reactors, this choice is a hard one—and unless you have a particular interest, you should probably not choose it.*

Traditionally, people in the United States have been against nuclear energy, citing the difficulty in dealing with the toxic waste by-products and the possibility of a disaster occurring—such as what happened in the Ukraine (Chernobyl) and even in the U.S. (Three Mile Island).

As the world is coming to grips with higher demand for energy at the same time energy resources are diminishing, a lot of people are pointing towards nuclear energy as the way to go: it is quiet (making it nice for small power plants), reliable, generates no airborne emissions, and very importantly: there's a lot to be had.

U.S. citizens generally feel that the drawbacks still outweigh the benefits, so many people believe that the US will never fully adopt nuclear power and will continue to rely on fossil fuels (e.g. coal-burning power plants).

Some of these pundits feel that the United State's need for fossil fuels can be sustained for quite some time if the thirst for them in rising nations like India and China can be quenched with nuclear power. In other words, there is the suggestion that the U.S. can continue on the same track it is on, so long as the rest of the world changes to nuclear power.

For this extra-credit assignment, you will research this topic and address the following points in a 900-1,500 word⁸ mini-research paper:

- How does a nuclear reactor work? (No need for extreme details on the physics of fission/fusion– just a rough idea of what goes on in a nuclear reactor).
- What are the good things about nuclear power? (Expound on what was mentioned above)
- What are the bad things about nuclear power? (Expound on what was mentioned above)
- What are the moral implications of this suggestion? (There are several aspects to this)
- What extra drawbacks are there to building traditional nuclear reactors across the globe– think about hostile and potentially hostile nations (and even ‘friendly’ nations). How might breeder reactors help address this problem? ⁹
- What might some alternatives be to introducing nuclear power, and what are their pros/cons?

After outlining the essential core issues, present your opinion on nuclear power and the suggestion that it be used in other nations to reduce competition with the U.S. for fossil fuels.

As this is a research paper, you must cite any information you use. For example, the internet is a good source of information, but be sure to keep track of what web site you get that information from!

Closing Notes and Remarks

These are all pretty ‘juicy’ subjects, and you may be wondering what I’m really after. Please ask me if you have any questions or need a bit of help addressing the issues outlined above or just getting started (e.g. what to choose, how to find information, etc.)! This is a non-trivial assignment, and I realize that.

⁸This is equivalent to approximately 3-5 pages of double-spaced, 12pt font, and reasonable margins

⁹See, for example,
in.rediff.com/news/2005/aug/25nuke.htm
www.world-nuclear.org/sym/1999/pdfs/wilson.pdf
www.armscontrol.org/act/2005_10/Oct-Japan.asp.