

Homework XII

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Today's assignment involves readings, some very difficult, on some extremely speculative ideas in physics. You should work in groups to understand one of these readings, which you will have ten minutes to present tomorrow in class. You can and probably should use Google to do some more research on these topics. Some of these articles are long, manage your time wisely! You're not expected to be an expert, just give a short presentation on the main ideas.

Reading 1 Boltzmann Brains

Read the New York Times article “Big Brain Theory” linked on the website. This is actually an ongoing debate, and the non-dominance of Boltzmann brains over normal observers is considered a condition for the validity of a measure. Do you think that there should be any Boltzmann brains at all?

Note: A similar paradox was proposed with the substitution of babies for brains.

Reading 2 The End of Time

A group of Berkeley physicists recently proposed that time has about a fifty percent chance of ending in the next 3 billion years. The paper is available from the arXiv¹, <http://arxiv.org/pdf/1009.4698>. You may not need to read every detail in the paper to understand the major ideas.

Reading 3 Quantum Immortality

Quantum immortality is, according to some, the consequence of a somewhat popular interpretation of quantum mechanics known as the *Many Worlds Interpretation*

¹The arXiv is where almost all physics papers now make their debut, and is free for anyone to read. Although many papers are eventually published in journals, most grad students check the arXiv for new results rather than waiting until they hit journals. Check it out!

(MWI). Read the article at <http://joehubris.com/node/51> and the accompanying interview to get a start. You will probably want to do more research.

Reading 4 Anthropic Principle

Alan Guth (inventor of inflation and esteemed cosmologist) recently gave a colloquium at Berkeley advocating the usefulness of the anthropic principle. Read Lee Smolin's commentary on the anthropic principle from the arXiv, <http://arxiv.org/abs/hep-th/0407213>. I would divide up some of the sections of this article. Also see the exchange between Leonard Susskind and Smolin at http://www.edge.org/3rd_culture/smolin_susskind04/smolin_susskind.html.