Physics 430I Short Paper 2

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1 Important Information

Length $\sim$ 2 typed, double-spaced pages ($\sim$ 600 words)

Due: April 7, 2005

2 Description of Assignment

Make sure you do the assigned reading from Lindley first (through page 154). Then read the attached article by Alain Aspect (*Nature* **398**, 189-190) entitled "Bell's inequality test: more ideal than ever". Write a two-page essay response to these readings in which you address the following topics:

- What conclusions are we forced to draw about quantum mechanics based upon the violation of Bell's inequality in experiments with entangled photons or electrons? Note that more than one conclusion can be drawn and I want you to mention all the possibilities.
- Which of these conclusions do you think makes the most sense? You may choose one or some combination. Briefly defend your choice.
- What loopholes remain in the experimental confirmation of the violation of Bell's inequality? Do you think that there is any chance that the experiments are flawed and that better experiments would show that Bell's inequality is not violated?
- Do you think the fact that quantum mechanics violates Bell's inequality indicates that quantum mechanics is flawed or incomplete? Or is the violation of Bell's inequality revealing something very deep about the way nature works?

You are responsible for reading what Lindley and Aspect have to say about the EPR experiments and the hope is that you will understand what they are trying to say. You should convey that understanding in your paper. Note that you are writing your paper to a professional physics audience (me), so you don't need to explain what the EPR experiment is (either its history or the technical details of the experiment). Just do your best to give clear answers to the questions. Good luck!