Make sure you answer every part of the question. Write out your answers (neatly!) and bring them to class on Tuesday. Some of these questions are closely related to questions from SZE but they are not identical—be sure that you are doing the right question!

A. One reply to Poincaré's conventionalism argues that he presents us with a false alternative: that in fact, Euclidean space + changing apparatus, and BL space + rigid apparatus, are one and the same situation. Consider the "two theories" you get when you write Newtonian mechanics in metric and imperial units: they aren't two distinct possibilities, but really the same theory with different definitions of length, weight, and so on. Similarly, perhaps the two geometries are the same theory but with separate definitions of what it is to be lm: either 1m can be defined everywhere as the length of a unit rod, or as equal to an increasing number of rods away from the center. In this case, the convention is the quite ordinary, uncontroversial one of picking definitions. What are the analogies and disanalogies between the two cases (of picking a convention for measuring lengths and pick a convention for our geometrical axioms)? Would this be a good response to Poincaré?

B. Professor Zollner attempted another experiment to show that spirits were capable of moving objects through the fourth dimension. He placed a snail shell on a table and asked the spirits to turn it into its mirror image. In what way does a spiral shell differ from its mirror image? If the shell had been turned into its mirror image, how would this have shown that spirits occupy four-dimensional space?

C. Our actual retinal images of the world are 2D. What sort of visual experiences convince us that the world is 3D? (You may want to refer back to Poincaré's discussion of our experiences.)

D. If you were to live in a hypercube, you might choose to live in its three dimensional surface, much as a two dimensional person might choose live in the 6 square rooms that form the two dimensional surface of a cube. So your house would be the eight cubes that form the surface of the tesseract. Imagine that there are doors wherever two of these cubes meet. If you are in one of these rooms, how many doors would you see? What would the next room look like if you passed through one of the doors? How many doors must you pass through to get to the farthest room? Could you have any windows to outside the tesseract? What about windows to inside the tesseract? Some of these questions are not easy. To answer them, go back to the easy case of a three dimensional cube with faces consisting of squares. Ask the analogous questions there and just extrapolate the answers to the hypercube.