Nuclear Lunch Questions from "Dark force detection in e-p collisions"
For discussion on February 6, 2013

1. Why could the excess microwave emission from the Galactic center and the high-energy e+ excess perhaps imply dark matter? (**Youngshin**)
2. What is the "WMAP Haze"? (**Shamim**)
3. Is there a difference between the "standard" WIMP particle and the one that can explain these astrophysical observations? Why is a boson that has a mass at (or below) the GeV scale favoured by those observations? (**Nowo**)
4. Does dark matter interact non-gravitationally with standard-model particles in such a scenario? If so, how does the strength of this interaction compare with, e.g. the gravitational attraction between dark matter and "ordinary" matter? (**Cody**)
5. What effects other than the ones the authors have considered could contribute to the background? Could effects they have ignored be mistaken for a signal? (**Arbin**)
6. What is a "beam dump" experiment? How does it constrain the mass and coupling of the X? (**Sushil**)
7. If the X exists, give some reasons why X → e- e+ has never been observed in other experiments. Alternatively, what are the special features of this experiment which allow it to probe regions of X parameter space that have not already been excluded? (**Anthony**)
8. How could you do this experiment with only detecting three particles in the final state? What would be the downside of proceeding in that way? (**Dilu**)
9. Why is the coupling of X to the proton expected to NOT contribute much to the result? [Hint: look at Appendix E.] (**Linda**)
10. How does a windowless gas target work? (**Azamat)**
11. Why are the authors interested in a signal to background that satisfies S/Sqrt(B) > 5? (**Andrea**)
12. What is kinematic mixing, and how is it relevant in the models considered here? (**Bijaya**)