Phys 140 - QoR
Boyda/Wensley

Homework due February 28:

Reading

- §2.1 of G&Z
- Grangier, Roger, and Aspect, "Experimental evidence for a photon anticorrelation effect on a beamsplitter" (1986). Study through the introduction and the first experiment (to the top of p. 177).

Writing

Please type up your responses. For the paper by Grangier, Roger, and Aspect:

1. In a few sentences, state the main result of their first experiment and the key features of the set up that allowed them to obtain the result.
2. Find a section of about ten lines in the paper that you find interesting or challenging. Paraphrase the passage, sentence by sentence, expressing the essence of what the text is saying but in a way you might say it.
3. Write two questions that you could bring up in discussion of the text in class.

Problems

Fill in the algebra for the perturbation theory derivation on the interaction of an electron and an electromagnetic wave:

1. Show:
$$\frac{dc_m}{dt} = \frac{-i\lambda}{\hbar}\sum_n c_n(t)\langle\phi_m|H'|\phi_n\rangle e^{\frac{-i}{\hbar}(E_n-E_m)t}$$
2. By expanding
$$c_m(t) = c_m^{(0)}(t) + \lambda c_m^{(1)}(t) + \lambda^2 c_m^{(2)}(t) + \ldots$$
and matching powers of λ, show that
$$\begin{aligned}\frac{dc_m^{(0)}}{dt} &= 0\\ \frac{dc_m^{(1)}}{dt} &= \frac{-i}{\hbar}\sum_n c_n^{(0)}(t)\langle\phi_m|H'|\phi_n\rangle e^{\frac{-i}{\hbar}(E_n-E_m)t}\end{aligned}$$
and derive an expression for $\frac{dc_m^{(2)}}{dt}$.