**Phys 402**
Spring 2009
Homework 7
Due Friday, April 3, 2009 @ 9 AM

EXAM #2, covering all material up to and including this HW assignment will be held on Wednesday April 8, 2009 from 9:00 AM to 10:50 AM in Phys 1201.

1. Griffiths, 2nd Edition, Problem 9.7   **2-Level Rabi flopping problem. Eliminate $c_b(t)$ to get a 2nd order ODE for $c_a(t)$. Guess a solution of the form $c_a(t) = Exp[\lambda\, t]$, where λ is complex. Use the initial conditions on c_a and c_b to determine the unknown coefficients.**

2. Griffiths, 2nd Edition, Problem 9.8   **Stimulated vs. spontaneous emission from a blackbody radiator.**

3. Griffiths, 2nd Edition, Problem 9.20   **Magnetic Resonance a) Pauli spin matrices! b) Time-dependent Schrödinger equation!**

Extra Credit #8
Griffiths, 2nd Edition, Problem 9.11   **Selection Rules and matrix element calcualtions!**
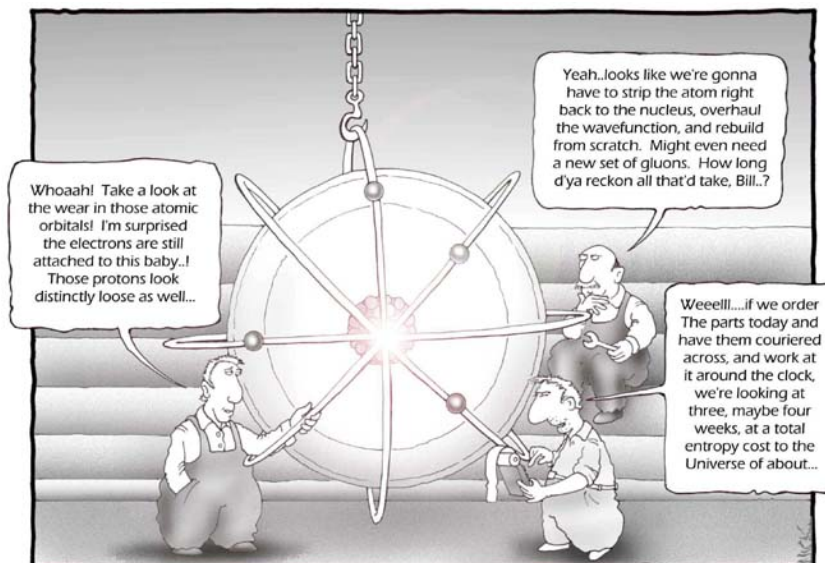
Quantum mechanics.

Physics 402
Spring 2009
Prof. Anlage
Discussion Worksheet for April 1, 2009

1. Electric quadrupole matrix element selection rules. Suppose we relax the constraint that the electric field is uniform over the size of an atom. By expanding the traveling wave (see Fig. 9.3) electric field $\vec{E}(y,t) = E_0\hat{z}\cos(ky - \omega t)$, find the potential experienced by the electron in the atom to next order of approximation ($ky \ll 1$). This is the electric quadrupole potential. Estimate how big the correction is relative to the original term for optical radiation.

2. What is the form of the quadrupole matrix element? For the hydrogen atom, what selection rules on changes in the quantum number *m* arise from this type of matrix element?