Quiz 0:
Cognitive Psychology of Physics

In 80s and 90s, a research team led by three physics professors, David Hestenes, Malcolm Wells, and Gregg Swackhamer, began studying the problem of why college students find physics so difficult and express so must frustration in physics classes. Their main insight was to create a conceptual test of Newton's Laws of Motion called the **Force Concept Inventory**, and to give it out to students in physics classes.

Most of the questions in traditional college courses were computational questions in which students applied formulas to find numerical answers. The questions on the force concept inventor were, by contrast, entirely conceptual multiple choice questions.

They had the following findings:

a) Students performed very poorly on the force concept inventory, indicating a lack of conceptual understanding of the principles of physics.

b) Students held a very consistent set of misconceptions. The researchers could logically trace which particular wrong answers the students would select.

c) Many of the misconceptions that students followed actually matched the historical theories of natural philosophers acting before the discovery of physics.

d) Some physics classes led to dramatic gains on the results, but many led to little or now improvement.

For this quiz, you can

a) Take the force concept inventory, grade yourself, and analyze the questions you got wrong. You are not taking it for a grade but as a tool to judge your own understanding of these concepts. All of the questions deal with concepts we will cover in AP Physics 1, but several we have not gotten to yet. Do not expect to get a perfect score.

(Also, right now I only have the simplified version, designed for younger physics students. But frankly, it isn't very different and actually gets to the point more quickly than the college version.)

Unfortunately, I am not allowed to hand it out, so you will need to either come during a bulldog block or work on it during a quiz day.

b) Read one of the research papers written by David Hestenes team analyzing patterns of incorrect answers in the force concept inventory.

c) Pick one of these patterns of incorrect answers. Identify questions on the force concept inventory which bring out these particular answers, and describe why students appear to pick the wrong answers in patterns. Briefly summarize the research on this particular question.

d) Develop your own explanation of how *you would explain* to a student who did not answer this particular question correctly.