

## **December, 1996 - James J. Grant, Physics**

This is not a commentary on teaching so much as it is an observation on learning, my students' and my own. When I began teaching, many years ago, I taught traditional physics to traditional science students. My method of instruction was the only one I knew, the way that physics had been taught to me. Whatever the topic, I would begin with a well defined premise or question and proceed slowly, methodically and logically, to the conclusion, whether it be a new theory or simply a new application of an old idea. The students responded well. Most questions fell into the category of "would you explain again how you got from step b to step c?" Clearly I had found a compatible audience.

Some years later I began teaching my first course for non-science majors. There were new topics to be covered and different goals to be reached. The premises or questions that I would begin with and the conclusions toward which I would aim, would differ from my traditional science courses. But, I assumed, the process of moving from premise to conclusion would remain unchanged, not mathematical, but nonetheless linear and logical. To explain, for example, our current understanding of the nature of light, I would begin with some early ideas and misconceptions and work through the series of experiments and deductions that eventually lead to Maxwell's theory of electromagnetic radiation.

Students in these courses asked questions, but invariably the questions were about trying to understand the final conclusion, not about how I got from step b to step c. More important, it became clear from test papers that, for many students, the details of my presentation had done more to confuse than to clarify the main issue. Brevity and simplicity, it seemed, might be more important than rigorousness.

I still needed to present new ideas in the context of change and discovery. That's essential since the same process may eventually render these new theories as obsolete as their predecessors. But I learned, as others had before me, to do this without all the rigor that had been traditional in the science classroom. In trying to simplify things, I sometimes found myself resorting to analogies that caused the physicist side of me to wince. Nevertheless, I gradually became comfortable with this, once alien, style of teaching and confess, on occasion, to enjoying it.