

## How to Learn Physics

Michael Good  
mgood@email.unc.edu

*Physics is a test of character, not of intelligence.*

Physicists are an arrogant bunch. They claim that their subject encompasses all of the natural world. They claim they are after the fundamental laws of nature, understanding reality and divining the ultimate secrets of nature. Anyone who thinks they do this for a job has to be arrogant. If you want to learn physics, you must proceed with confidence. You must be brave.

*Physics is like sex, sure it produces practical results, but that's not why we do it.*

Sure life is made better by funding fundamental research in physics. When Maxwell was first studying electromagnetism, few people were visualizing ahead to the day when we could each have our own light bulbs and computers. But the motivation of a physicist studying the fundamentals is not the immediate technological applications, but the novel ways of understanding the world we live. The physicist receives joy and pleasure from looking at the world in a new light, refining his/her thoughts and letting creativity and imagination guide them in discovery. The physicist thinks that the laws of nature are beautiful. The physicist wants to see nature completely exposed and naked; nature is beautiful and physics is the study of that beauty.

*Physics is about escaping the prison of the received thoughts and searching for novel ways of thinking the world, about trying to clear a bit the misty lake of our insubstantial dreams, which reflect reality like the lake reflects the mountains.*

Beyond problem solving, beyond outsmarting one another, and beyond technological applications, physics is an art and physics gives many physicists meaning to life.

If you prefer to use technology as your motivation for doing

physics, here is a list of inventions spawned directly from physics, not merely explained by physics,(as physics claims to explain everything physical). As far as I know, these inventions would not have been possible without first an understanding of the fundamental physical theory leading to their creation.

## **1 Electromagnetism**

- TV
- Radio
- Microwave oven
- Radar
- X-rays

## **2 Quantum Mechanics**

- Magnetic Resonance Imaging (MRI)
- Scanning Tunneling Electron Microscope
- Lasers
- Transistor
- Computers
- World Wide Web

## **3 Relativity**

- Atomic clocks
- Guidance systems for spacecraft
- Nuclear Power Plants
- Global Positioning System

## 4 Thermodynamics and Statistical Physics

- Refrigerator
- Car (internal combustion engine)

## 5 Classical Mechanics

- Skyscrapers
- Modern Bridges

These are obviously only a few inventions born from physics. When you think of more widely familiar inventions, technologies used by almost everyone, that are direct children of these respective theories please tell me.

*Of what immediate social benefit is my theory? Absolutely none.*