

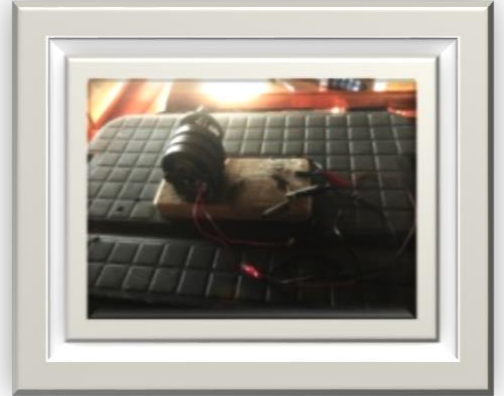
# The Sacred in Science

## Session 5 – *Electricity & Magnetism*

<http://www.redshirt.org/longer-writings/courses/the-sacred-in-science/>

### 1. *The Nature of ELECTROMAGNETISM:*

“First we try to get clearly in our minds how far the system of classical mechanics has shown itself adequate to serve as a basis for the whole of physics. Since we are dealing here only with the foundations of physics and with its development, we need not concern ourselves with the purely formal progresses of mechanics (equation of Lagrange, canonical equations, etc.). One remark, however, appears indispensable. The notion “material point” is fundamental for mechanics. If now we seek the mechanics of a bodily object which itself can not be treated as a material point—and strictly speaking, every object “perceptible to our senses” is of this category—then the question arises: How shall we imagine the object to be built up out of material points, and what forces must we assume as acting between them? The formulation of this question is indispensable, if mechanics is to pretend to describe the object completely.” (Einstein, 1950/2011, pp. 28-29)



- What is electricity and magnetism; and why do they join as *electromagnetism*?
- When did science learn about EM?
- [Low Tech Greatest Hits of All Time](#) vs [High Tech Favorites](#)
- [13 Scientists](#) in 6 Countries
- [E&M Scientist Quiz](#)
- **Take Away Mindfulness Demonstrations:**
  - A Basic Battery
  - A Human Battery

### 2. *The Earth's ELECTROMAGNETIC Fields:*

- Natural Electricity
  - Static Electricity
  - Lightning
- Natural Magnetism
  - The Earth's Magnetic Field
  - The Van Allen Belt
- **Take Away Mindfulness Demonstrations:**
  - Compasses and the shape of the Magnetic Field

### 3. *Lightning as Fire:*

- What is Fire? Is it Alive?
- “*The Earth is on Fire!*” - Where are all of the metals on the Periodic Table?
- **Take Away Mindfulness Demonstrations:**
  - Lightning & Clouds

- Water & Conductors; Wood & Insulators
- Colored Flames
- Acid as Fire
- Electricity as Fire: Battery / Charger as Electrochemical Fire
- Feeding Oxygen to a Fire

#### 4. *Static ELECTRICITY:*

- [ElectroStatics: Natural and Technological](#)
- [Take Away Mindfulness Demonstrations:](#)
  - The Robot Balloon
  - The Human Hair Electrostatic Meter

#### 5. *Moving ELECTRICITY:*

- [Current & Circuits](#)
- [Take Away Mindfulness Demonstrations:](#)
  - Building Basic Circuits
  - [Circuit Quiz](#)
  - Direct vs Alternating Electric Current
  - Simulating Volta's Battery
  - Chargers and Electroplating

#### 6. *Magnetism:*

- [Magnetic Fields](#)
  - Magnetic Force
  - ElectroMagnetic Fields
  - The Earth's Magnetic Field
  - Cosmic Rays
  - BioMagnetic Fields
- [Take Away Mindfulness Demonstrations:](#)
  - Simulation of Faraday's and Oersted's Original Experiments
  - Passing Electric Current by a Metal
  - Passing a Magnet by a Coil of Wire

#### 7. *Ohm's Law:*

- Calculating: Resistance, Voltage, and Current
- Calculating: Power & Cost
- [Ohm's Law, Power, Cost Quiz](#)

#### 8. *Induction:*

- Faraday's Big 3 Inventions: Generator, Motor, and Transformer
- [Induction: Electricity causing Magnetism and vice versa](#)
- [Take Away Mindfulness Demonstrations:](#)
  - Simulating Faraday's Big 3
  - The Speaker vs the Microphone

- The Hand Generator

For a reference to *current writers on the hoped for, next version of humankind*, go to “Good Reading” <http://www.redshirt.org/good-reading/>.

## References

Einstein, A. (1950/2011). *The theory of relativity and other essays*. New York: Open Road Integrated Media.