

Electricity & Magnetism

Course Demonstrations

We will explore just what electricity and magnetism really are and how they are always found together in nature. We will also handle actual electrical circuits and real magnets. Demonstrations will include: Volta's homemade batteries & electroplating, Super Magnets, Faraday's generator & motor, and Hertz's speakers & microphones.

* **Week 1 of 9** (*Nature of EM Field*)

- * **The First Human-made Compass** from a wooden spoon with a magnet in a bowl of water
- * **Human Circuit with Energy Tube** connected to a ring of people
- * **Small Compasses** showing magnetic field around a magnet
- * **Iron Filings** in zip lock or in oil in a clear container
- * **Bruce Lipton** As Above, So Below ... Compare Evolution of the Species (see 00_Nature of EM Fields) to Humans to 1 Human Day to 1 Human Life (B. H. Lipton, 2005, 2006, 2014; B. H. Lipton, Bhaerman, S., 2009)
- * **Compass:** Navigating your path, aligning with a field ... your 'true worth' = guiding principles ... inner compass/intuition when you enter a room ... connection with: Sun, Stars, Natural World, your local environment ... the first compass demo with a wooden spoon (China) related to Big Dipper (a spoon that also points north)
- * **Human Circuit:** bioelectricity, nervous system, Joe Dispenza: neural plasticity - neurons that 'fire together – wire together' (Dispenza, 2017), earth's meridians, meditation on circuit of energy that goes with breath/intention
- * **Making the Invisible Visible** with iron filings -> so with consciousness as causative, Emerson: "The ancestor of every action is a thought.", "A Fact is the end or last issue of spirit." (Emerson, Atkinson, & Ebrary, 1992)

* **Week 2 of 9** (Mark Hanf: *Geometry of Fields*)

- * **Biomagnetism** as in animal migration
- * **Van Allen Belt traps destructive particles and some Cosmic Rays** but many come through, such as the 'OMG' particle which is 3×10^{20} eV \sim 480 joules \sim 100 cal \sim .1 Cal
- * **Strong Magnets** as a pure phenomenon
- * **Simple Motor** from C or D battery, paper clips, and coil
- * **EM Train** from small super magnets on a battery, running in an extended coil
- * **Yin Yang -> Rotate in 3D -> Torus** as a basic shape of nature: red blood cells, flowers, seeds, fruits -> Spiral as vortex, egg with serpent
- * **Spin & Coil of Electromagnetism:** motors/generators go with natural tendency of humans/nature to spin (Whirling Dervishes, children on playgrounds, eddy currents in wind and stream)
- * **Coil of the Spine** is like electric current spiraling around a wire

* **Week 3 of 9** (*Electric Circuits*)

- * **"Milk Maiden" Story** as segue to Observing vs. Analyzing (as she leaves, perhaps it is the boy's loss because he saw nothing in the box – good scientists are good observers – there is always more to see and experience) – taken from a story in *The Heart of the Hunter* (Van der Post, 1961)
- * **Circuitry as a Language** use circuit quiz as review
- * **Non-magnetic Brass Ball** as a test of observation vs. analysis, jumping to a conclusion (Ball has an oil as thick as honey in it, so it rolls slowly as the liquid inside runs.)
- * **Basic Circuits:** build series vs parallel

- * **Naming:** observing and knowing vs. thinking and naming – Goethe says that ‘naming can kill’ because you may stop observing when you name something and think you know all about it (Goethe, 1840/1970)
- * **Observing vs. Thinking:** "The simple reason why the majority of scientists are not creative is not because they don't know how to think; but because they don't know how to stop thinking." (Tolle, 2011)
- * **Resistance** and resistance calculations – resistance = physicality itself

* **Week 4 of 9** (*Induction, Lenz's Law*)

- * **Introduce 13 Scientists:** why did they all come to same ideas at same time in separate places?
- * **Magnetizing / Demagnetizing** iron by stroking with magnet, then applying hammer or fire
- * **Lenz's Law: Solid Copper & Super (neodymium) Magnets:** Slow slide, Slow Drop, Slow Swing ...
The super magnet is the size of a hockey puck. I have three chunks of copper: 3/8" plate, 1/2" plate and a 1" x 3" round piece. Of course, the copper is not magnetic, but if I let the magnet stand on the copper, then tip it over, it falls so slowly that you can't hear it land. You probably know the reason - that the movement of the magnet sets up a current in the copper which creates an opposing magnetic field. Some variations are possible sliding, dropping, and swinging the magnet by the copper. I found out that these copper sheets are moved next to strong magnets on locomotives as a braking system without friction. They build up heat; but do not wear down brake shoes. Unfortunately, they have not been able to be used to reclaim the electricity for recharging like regenerative braking systems in the electric cars. (Lenz's Law)
- * **Magnets Inducing Current** Oersted vs Faraday (Induction)
- * **Faraday Generator:** by moving magnet within copper coil sets up opposing magnetic field (Induction)
- * **Pendulum Magnet:** very gently swing magnet over others or near copper - watch varied motions. (Lenz's Law)
- * **Floating Apple:** repelled by super magnet (Lenz's Law)
- * **Alignment** of a field (or your backbone) allows more flow – like crimping a water hose – temporary mis-alignment requires re-centering
- * **We** are always interacting with other people's fields.
- * **Empty Space** is always full of information as EM fields.
- * **Radio** carrier wave is the frequency of the radio station - but the songs are chosen by you. Your carrier wave can be gratitude, then you can meditate on goals.
- * **Nowhere – now here:** center as transcendental gateway to outside of space & time – beyond spacetime can be achieved by going in.
- * **Codes** or **Rules** of any game are necessary to make it fun and to know how to play. If you can't unlock a lock – you need the key or the code – this is the law or rule of the game.

* **Week 5 of 9** (*Technology that uses Induction*)

- * **Induction Notes**
- * **Faraday's Big 3: Generator, Motor, Transformer:** first re-enact primitive observations that led to these technologies; then show practical samples of each. (Faraday, 1839/1965, 1860/2012)
- * "Nothing is too wonderful to be true if it be consistent with the laws of nature." - Michael Faraday
- * "When a mathematician engaged in investigating physical actions and results has arrived at his own conclusions, may they not be expressed in common language as fully, clearly, and definitely as in mathematical formulae? If so, would it not be a great boon to such as well to express them so --- translating them out of their hieroglyphics that we might also work upon them by experiment?" - Michael Faraday, to James Clerk Maxwell in 1857

- * **Working Electric Motor:** simple with one battery, complex with horseshoe magnet and windings
- * **Working Generator:** from original telephone – show output with meter, then let students feel the electricity
- * **Working Transformer:** step down vs. step up
- * **Induction** as our effect on others, **Transformers** as our ability to ‘step up/down’ another person
- * **Transforming vs. Resisting** in human terms – physical world is already a resistance – the natural tendency of anything alive (Tao) is to transform ever and ever better
- * **Basic Sound System:** build your own garage band system, then run it backwards. See a speaker as a motor and a microphone as a generator and a transformer as both a generator and a motor combined.
- * **13 Scientists** use scientist quiz as review
- * **‘YES’:** Summon more than your normal strength by holding a heavy object (16 lb. shot put). (Wise, 2011)
- * **Water and Copper are Diamagnetic:** repel from a magnet because an atomic level induced current opposes the magnetic field. This is a quantum mechanical response of the charge in the atom. On a Newtonian level, water always seeks to go in the same circular motions as the molecule of H₂O. Waves at a beach and meandering rivers are circles (torus in 3 dimensions) that turn into spirals by adding a linear component of the water going downhill.
- * **The Electromagnetic Field vs. Quantum Unified Field:** Circle exists in the idea-world or non-material, spiritual world. Show difference between Electromagnetic Spectrum, which exists in material, physical world. One can get ‘outside’ the electromagnetic, physical world different ways. Going Within is one way: mother writing about son in her journal at exact moment something happens to him, or simple experience of no time and no place. Quantum Entanglement & Superposition is another way (no time, no space).

- * **Week 6 of 9** (*Electrochemistry, Batteries, Electroplating*)
 - * **The Epi-EM Field:** There are cases where information travels faster than the speed of light. EM waves and all of the material of the physical world have the ceiling of the speed of light and are made of EM fields. But science is just now considering that above the EM field is the Quantum Unified field – which can give information to the EM matter faster than the speed of light. This information can alter matter. Therefore, if we call the physical world of EM fields and matter the *natural* world, then the information and changes from the quantum unified fields might be called the *supernatural* world.
 - * **Acid in Battery** as a kind of fire
 - * **Chemistry of a Battery:** Zinc (Zn) has two electrons in its outer orbit and is glad to lose them. Copper (Cu) loves to get either one or two electrons. So, Zn is the negative electrode in the battery and Cu is the positive. The electrons flow from the Zn to the Cu.
 - * **EM Spectrum:** if the spectrum was drawn on a graph from LA to NY (3,000 miles long), the visible portion of the spectrum would be the width of a dime
 - * **Frequency:** means how frequently something happens. It has many meanings in science.
 - * **Electric Circuits** have a cycle 60 times a second (60 Hz or Hertz). This means it switches direction back and forth for alternating current (AC). In most other countries it’s 50 Hz.
 - * **Sound** that is audible to humans range from 20 Hz to 20,000 Hz (or 20 kHz).
 - * **Electromagnetic Fields** vibrate as the magnetic field causes the electric field and back at very high frequencies. They range from Hz to mega (10⁶), giga (10⁹), tera (10¹²), ... (10²⁰) Hz. This includes radio waves through visible light to x rays.
 - * **Colored Flames**
 - * Red - strontium nitrate, lithium chloride
 - * Orange - calcium chloride
 - * Yellow - sodium chloride

- * Green - copper sulfate
- * Blue - alcohol
- * Violet - potassium chloride
- * **Electroplating as Electrochemical Fire**
- * **Batteries:** Basic, Human, Sanded Pennies, Fruit & Vegetable Batteries
- * **Marbles in Oil:** show light as electromagnetic phenomenon as Pyrex displays same index of refraction as Wesson Vegetable Oil, causing inner jar to disappear. Perhaps put marbles in inner Pyrex container as a clue since marbles gather oddly in or around inner container. Good powers of observation reveal what is truly happening.

- * **Week 7 of 9** (Mark Hanf: *Geometric Shapes of Nature, Chemical Etching*)
 - * **Yin Yang** if reiterated as fractal makes a line as the diameter of the circle. Therefore, Pi is the ration of that line to the circle that the Yin Yang started in. Pi is a ratio that is irrational, paradoxically.
 - * **Mandelbrot Fractal** as a famous fractal that demonstrated self-similarity if you zoom in on it. "Similarities don't make things the same, just as differences don't make things different" – Hanf (Mark's father)
 - * **Paradox** arises in geometric shapes of nature and in their philosophic implications. In the West, we see things as either right or wrong, weak or strong, outside or inside ... but not both. In the East, they see the Middle Way where things might paradoxically be right and wrong, weak and strong, outside and inside.
 - * **Spirals** are the path and shape made by moving in a circle while moving along a line. It is a basic shape of nature related to the circle, the vortex, and the torus. Examples are: vines, EM waves, electrical current, DNA, ocean waves, snakes, shells, plants, galaxies, and the fetus.

- * **Week 8 of 9** (*Electrostatics, Electricity as Fire*)
 - * **Candle Orb:** Observation
 - * **Epi-EM / Quantum Field:** is outside space and time, it is where the real circle, line, triangle, square exist, it is also where one can be totally with another and achieve **Sympathetic Vibration**
 - * **Sympathetic Sound Waves:** tuning forks, guitars, violins, a **Hand Clap**, a clap of thunder as lightning rips air apart and creates a shock wave that moves faster than the speed of sound
 - * **Air Gun** to show pulse of air.
 - * **Copper rods** rubbed with violin string resin to produce sound waves.
 - * **Sympathetic Matter Waves:** **Pendulum Clocks, Tuning Forks**
 - * **Sympathetic Gravity Waves:** Moon affecting tides, sap in trees, human fluids / moods
 - * **Sympathetic EM Waves:** Sun flares affecting human affairs, sensing a person's 'vibe', heart thought / heart magnetic field
 - * **Human Heart is Sympathetic to Sun** as seen in these calculations:
 - * Plato said that humankind changes consciousness every 2,160 years. This is the time it takes the ecliptic to move through one sign of the Zodiac and is now called a Platonic month. Therefore, one 360 degree rotation of the ecliptic takes 72 years. Therefore, a Platonic year is 25,920 years.
 - * Some ancients believed that a harmonious person would live 72 years and would have 72 heartbeats per minute. It was said that the heart was like a pendulum that swung back and forth to make 1 cycle. This cycle occurs with each breath, which is once per 4 heartbeats. Therefore, a harmonious person has 25,920 breaths in one day?
 - * **Sympathetic Quantum Waves:** outside of / inside of EM field, mother writing about son in diary at exact time of something happening to son, what if you could go outside of space and time and touch two places at the same time or whisper to two people at the same time ... could there be beings living in the Quantum / Epi-EM Field working with us? ... can we?

- * **Robot Balloon:** helium, else it works pretty well with regular balloon
 - * **Fire is Moved by Magnetic Field**
 - * **Lightning:** as extreme example of friction and static, from rubbing electrons from cloud movement, recent theories are that ice crystals in the clouds do the electron ripping. Lightning Facts: up to 10^9 volts voltage, 10^5 amps current, 10^{10} watts power, 54,000 degrees F. This is hotter than the surface of the Sun, which is 10,000 degrees F; but the interior of the Sun is about 27,000,000 degrees F.
 - * **Exercise of Envisioning Lightning:** go to Epi / Quantum Field, outside of space and time and imagine a tree growing at increasing speeds or vibrations
- * **Week 9 of 9** (Variable ... according to how course proceeded.)
- * **Grounding:** as lightning rod, house circuitry, electronic equipment, a human grounding with the earth
 - * **Resistance:** In an electrical circuit, the resistance is the part that does the work (the heating element in the stove, the lighting element in the incandescent bulb). In a human being's circuit on this planet (her or his life), the physical world is the resistance is the trials and difficulties that cause growth.
 - * **Heating Element** from an incandescent bulb, toaster or a range getting hotter with more current, then glowing, giving off light.
 - * **Electricity as Fire:** large light bulb, Tesla Coil (Munson & Constant, 2018; Tesla & Glenn, 1999), Electric Pickle, Electric Hot Dog
 - * **Putting Things Together ... Are You More Like a Phone or an Oven?**
 - * **Naming Can 'Kill'** - but don't worry about this – we need to communicate
 - * **Circle, Torus, and Sacred Geometry** comes from the world of ideas – a non-material world. What do you think, is that world separate or is it like electricity and magnetism – inextricably together?
 - * **Resonant Frequency** occurs in a Tesla Coil; but it occurs every time you push someone on a *swing (matter)* or you stroke a *violin (sound)* string or you have another *color (EM)* of light or you synchronize with several *others (people)* in the beat of a song. You might say that attaining resonance means you found the perfect frequency of vibration to go higher and higher – stronger and stronger. Story of how Tesla had a frequency tapping machine on a pole driven into the bedrock of Manhattan that started to vibrate his building.
 - * **Tesla** was interested in the frequency of electromagnetic, but also gravity and matter itself. In other words, the level of vibration of a thing.
 - * **Lipton** said the body's cells 'listen' to EM fields and can change gene instructions.
 - * **Dispenza** said brain can receive information or ideas that change melatonin and other chemicals in the body faster than the speed of light – just like quantum entangled particles.
 - * **Quantum Entanglement** has a partner effect – **Quantum Superposition** – so physical matter can disobey space and time.
 - * **Faraday** said "Nothing is too wonderful to be true if it be consistent with the laws of nature."
 - * **Ostensibly separate forces** at the physical, EM field level (Gravity – strength 1, Weak Force - strength 10^{32} , EM - strength 10^{36} , Strong - strength 10^{38} Force, ?maybe a fifth force?). Could these be unified at the Epi-EM, quantum level. Is that why Einstein proposed a Unified Field Theory.
 - * **Heart thought** has been proven to occur. Actual thinking done in the heart itself. "The most dramatic story illustrating this involved an 8-year-old girl who after receiving a heart transplant from a 10-year-old girl, began having nightmares about being murdered. The donor had indeed been murdered, and the perpetrator had not been caught. The patient's mother took her to a psychiatrist who was convinced that the girl was dreaming about events that had actually occurred. They contacted the police, who opened an investigation using the girl's detailed account of the murder, including information on the time and place

of the crime, the weapon, the physical characteristics of the criminal, and the clothing the murderer was wearing. The killer was identified, arrested, and convicted.” (Dispenza, 2017)

- * so putting these things together, my question is **Can we change the world, heal things, have fun?**
- * **The Final Story ...**
 - * **Physical vs. Non-Physical:** Body is physical, in the EM field, therefore it serves as a resistance to change, a record of the past, a holder of personality vs. pure ideas in the idea world. The non-physical world of ideas, the quantum field, is the world of the pure circle, pure love, the here & now. It has little resistance to change and is outside (or inside) space and time.
 - * Remember that there are things we don't see until we do.
 - * magnetic field until iron filings
 - * electric field until super magnet fell slowly
 - * how the brass ball rolled slowly
 - * magnetism making an electric field and vice versa (Faraday)
 - * the glass in the oil
 - * the orb of the candle
 - * the torus of air from the air gun
 - * **Our Purpose** may have something to do with having so much fun on this Earth that we keep *observing* the physical, electromagnetic matter until we see the beauty and wonder and perfection of the non-physical, non-material world.

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