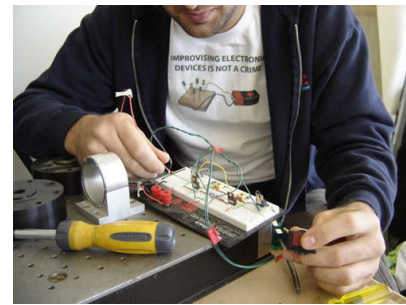




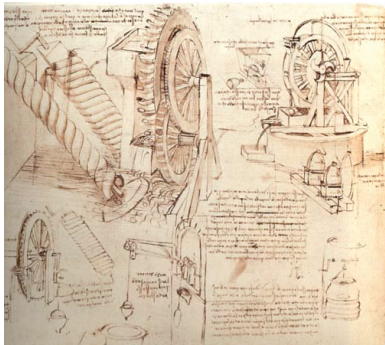
## Electricity Design Challenge

**Your Challenge:** In groups of two, you must create an effective, originally wired electricity device. This could be a generator which utilizes wind, water or human power, or it could be a motor or some other device that utilizes electromagnetic induction to perform some function. Your device will be put on display along with a detailed description of your design process (design journal), an explanation of how your device works (with accompanying diagrams), and a scientific evaluation of your device's effectiveness.

**The Machine:** Your device must use originally designed coils and use current and magnetism to perform a function. It could capture the energy within moving air, water or the human body and convert it to electricity. Depending on your original source and design- you may create enough current to move a meter, light a bulb (LED, fluorescent, or incandescent), or even run a laptop computer. Or the device could use electric current to move and perform a function—to drive a car, lift a weight, or shoot a projectile. Regardless of the function- **your design must be original!** You can draw from existing devices for inspiration if you get stuck, but we want the majority of your work to be uniquely yours! Don't be afraid to make mistakes. Struggling is part of the learning process. Each group will be approaching this challenge in a different way and will be evaluated accordingly.



What does it mean to make the most effective device? Well, there are many criteria that can be used to evaluate your machine's effectiveness. Once you decide on your design goal, you should write out in your journal the criteria you will use to evaluate your success.

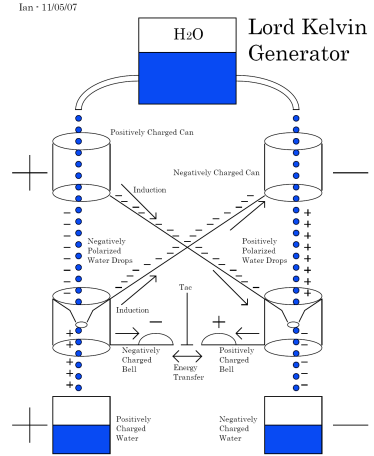


**Design Journal:** Some say that the end is nothing and the road is all. It is largely through Leonardo da Vinci's (1452-1519) illustrated journals, filled with his copious notes, that we know the extent of his scientific and artistic genius, ingenuity, and foresight. His visions of what was possible merged with intricately labeled sketches and diagrams. Your challenge is to reflect in your journal as often as possible throughout this design process. Consider it as a way to keep track of your learning -including any questions that come up, obstacles that you face, or discoveries that you make. This journal is intended to accompany your final display and present the story of your unique creation. For this reason we encourage you to write as legibly as possible! Unlined paper is preferable because it leaves room for sketches and diagrams. Each student in the group will be responsible for his/her own journal.

## Schematic Diagram—

### The “What’s Really Happening” Diagram.

How in the world does your device work? What does each part do and how does it really make or use electricity? Your diagram must include close-up sketches of the different parts of your device. For example: what is happening within the machine itself where the magnet comes in close proximity with the coil of wire? What does the magnetic flux look like and where are the electrons traveling? What physics “rules” are you employing in this interpretation? The diagram should be neat, graphically attractive, accurate, and thoroughly annotated in a way that clearly explains design and function. Include details of wiring and magnetic field lines, showing specifically how current is generated or used.



**Scientific Performance Evaluation.** This is your opportunity to conduct experiments that test the performance of your device. You must measure its output and function as completely as possible. Write up the results in a lab report that follows the criteria for scientific papers including an introduction, methods, results, and discussion.

