# Electromagnetic Linear Actuator

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**Background**
A linear actuator generates straight line motion. Typically, linear actuators are powered either pneumatically, or hydraulically. However, there are other power sources, such as: mechanically, piezoelectric, and electro-mechanical.

When a current is sent through a wire, a magnetic field is created. This field can be concentrated using a cylindrical coil of copper known commonly as a solenoid.

**Purpose**
The goal of this project is to build and test a linear actuator that is driven by electromagnetic forces. However, if an electric wave generator is attached, it could also be operated as a reciprocating piston. In that respect, it can be used as a simple air/water pump (using tubes at the ends and a side that opens/closes), or be used as a piston driven electric engine (analogous to an internal combustion engine).

**Design/Method**
The Electromagnetic Linear Actuator utilizes electromagnetic induction within a solenoid, copper wire wrapped around PVC pipe, to create the magnetic field. Inside the PVC pipe, a magnet will react to the generated magnetic field and be pushed. A rod, which is connected to the magnets, will act to transfer the force outwards. A power source and electric wave generator will be used to induce and control the magnetic field. A Vernier Wireless Dynamics Sensor System (WDSS will be used to measure the force output by the linear actuator). Data will be collected from the WDSS via Vernier's Logger Pro Software. Displacement of the actuator rod will be measured visually with a camera and ruler.

**Results MORE WORK**
The Linear Actuator is to be tested in: the psi (pounds per square inch) of the actuator rod, the displacement of the actuator rod, and its ability to do work. Once the wave generator is attached, it will also be tested on sustainable spm (strokes per minute).

**Conclusions**
If the Linear Actuator proves to be successful, the next step will be to test usable applications including: a pneumatic/hydraulic pump, or as an electric motor.