Modern Models of Motion **Project Ideas**

Physics

- Sweet Spot of a Baseball Bat
- Projectile Motion with a Trebuchet
- Relativistic Motion of beta particles
- Coupled Oscillations (Wilberforce Pendulum)
- Oscillating Electric Circuits
- Computer Simulation of a Trip to Mars
- Recreation of Young's Double-slit experiment
- Variation of Magnetization with Temperature
- Building a Wave Demonstration
- Mapping Nodal Lines of a Vibrating Plate
- Efficiency of a Wind Turbine
- Building a Cosmic Ray Detector

Calculus

- Modeling the Growth of Bread Mold
- What is the most efficient way to stack cards so they reach out as far as possible from a table?
- Study the Life of Newton, Leibniz, Bernoulli Brothers, etc and work out one of their more interesting proofs for yourself.
- Solve the Falling Ladder Paradox – does the top fall at infinite speed at it reaches the ground?
- Pursuit Curves – e.g. what is the path followed by a dog who swims towards a duck which moves around a circular path at the edge of a pond?
- Create a Harmonograph: A machine the draws Lissajous figures

Books

- *Physics, Fun, and Beyond: Electrifying Projects and Inventions from Recycled and Low-Cost Materials,* by Eduardo de Campos Valadares (Prentice Hall; ISBN 978-0131856738)
  The Flying Circus of Physics, by Jearl Walker (Wiley; ISBN 978-0471762737)
- *Student Research Projects in Calculus*, by Cohen, Gaughan, et. al. (MAA, 1992; ISBN 0-88385-503-8).
- *Turning the World Inside Out and 174 Other Simple Physics Demonstrations,* by Robert Erlich, (Princeton University Press; ISBN 978-0691028873)
- *Calculus Mysteries and Thrillers*, by R. Grant Woods, (MAA, ISBN 978-0883857113)
- *Calculus: An Active Approach with Projects*, by Hilbert (John Wiley & Sons, Inc ISBN 978-0471003168)