# CALIFORNIA STATE SCIENCE FAIR
## 2004 PROJECT SUMMARY

**Name(s)**
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**Project Number**
**J0217**

**Project Title**
## Collisions: Mass and Inertia. What Comes Down. . . Might Go Up!

**Abstract**

**Objectives/Goals**
My objective is to demonstrate, by using a collision and lever system, a direct relationship between the loss of kinetic energy and the inertia of the lever. By altering the mass of the lever and each pair of balls (effort and load), I believe that the inertia of the lever is responsible for the loss and transformation of kinetic energy.

**Methods/Materials**
Materials include a large grid to measure movement of all projectiles, levers of various mass and length made of iron, aluminum, plastic, and wood, steel balls of 10 different masses (2 of each), an electromagnet to provide an accurate dropping point, and a video camera as a reliable witness. After set-up of the first lever, the first mass is placed on the load end. Electromagnet suspends the second (effort) mass. As the effort hits the lever, the load is projected upwards. Testing is completed when all levers have encountered all masses.

**Results**
Results are calculated using the formula: mgh (potential energy) = .5mv^2 (kinetic energy). If the amount of energy applied to the lever on the effort side is subtracted from the lever's load side, the loss of kinetic energy will be the difference of the two. My data confirms that a larger mass, unlike a smaller mass, achieves greater resistance (ie., the inertia of the lever) over a lesser mass.

**Conclusions/Discussion**
The inertia existing in the lever is directly responsible for the loss of kinetic energy between two colliding equal masses. I found that the longer levers provided greater transfer of energy, overall, than the shorter levers of equal mass. The acrylic plastic lever seems to be helped by a "springboard" effect that appears not to be present in any of the other levers. My project gives me a clearer view about the interaction of masses under force. Energy cannot be destroyed or created. It is simply transformed. But where has that unaccounted for energy gone? How can I quantify what seems lost? Perhaps, in my next project.

**Summary Statement**
My project attempts to demonstrate the transference of kinetic energy from one mass to another through a collision process with a movable intermediate mass, the lever.

**Help Received**
My father helped me with design, procedure, graphics and calculations of my project; my mother helped with organizing and typing my report.