



**CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY**

Name(s) Cameron W. Wallace	Project Number J1935
Project Title Coefficient of Restitution: A Comparison of Major League and Little League Baseballs	
Objectives/Goals The Coefficient of Restitution (COR) is the ratio of the relative velocity before and after impact of two colliding bodies. For baseballs, the COR is established by ASTM International to equal .5460 +/- .032 when the ball strikes a 4 in. piece of ash at 85 ft/sec. My project tests whether there is a difference in the COR when comparing Major League (MLB) balls and Little League (LL) balls each manufactured by Rawlings. My hypothesis is that the MLB baseballs will meet the required COR, and the LL baseballs will have a lower COR value.	
Abstract Methods/Materials Using two independent methods and three trials for each ball, I calculated the velocity of two MLB baseballs and two LL baseballs before and after hitting a 4 in. ash strike plate at approximately 85 ft/sec. Method 1, FIXED TIME-VARIABLE DISTANCE, used a high-speed camera and Photoshop software to measure the distance in pixels the ball traveled in .0294 seconds (12 frames). I calculated velocity in ft/sec and miles/hr, then calculated the COR as V_{out}/V_{in} . Method 2, FIXED DISTANCE-VARIABLE TIME, used an electronic speed trap that I built to measure the time the ball took to travel 12.125 inches (the fixed distance between two light walls). Using Vernier LoggerPro software to find the time between voltage drops, I calculated V_{out} and V_{in} , and then COR.	
Results The average COR of the two MLB baseballs over three trials for each of two methods was .5388. The average COR of the two LL baseballs over three trials for each of two methods was .5227. This was a difference in COR of .0161.	
Conclusions/Discussion I proved my hypothesis correct that the COR of the MLB baseballs was within ASTM standards, and the COR of the LL baseballs was lower by .0161. Research by Dr. Robert Adair (The Physics of Baseball, 2002, p. 95) states that the mean ball-to-ball difference in COR of MLB baseballs currently in use is actually only .005. This means the difference in COR I found between MLB and LL balls is three times that which would be expected for MLB balls alone. I attribute this difference to the dissimilar quality of materials and workmanship used in manufacturing the MLB and LL balls. The real world application of this experiment is that an MLB baseball is livelier than a LL ball, and would travel farther if hit equally hard. As an extension of this experiment, I also tested the COR of two NCAA baseballs, and found it to be between that of the MLB and LL balls.	
Summary Statement My project compared the Coefficient of Restitution (COR) of Major League and Little League baseballs, finding that the average COR of the MLB balls met the ASTM standard of .5460 +/- .032, and the average COR of the LL balls was .0161 lower.	
Help Received Shawn Howard, Pacific Gas and Electric: Schematic, assisted in design for Speed Trap; Dr. David Kagan, Chico State University: Schematic for Speed Trap; Bob Wallace: My father helped me build the Speed Trap; Scott Wallace, Aeromech Engineering: my brother provided the computer equipment for Method 1.	