



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Zoe R. Alvarado	Project Number 36175
Project Title How Does the Trajectory of a Horse Change as the Height of a Jump Increases?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals As a horse jumps over an obstacle, the biomechanics of the equine have to adjust to the increase in height. This experiment explores the changing nature of the jumping horse.</p> <p>Methods/Materials This experiment was conducted in an arena; using two different horses. Both horses were jumped three times at each height, were jumped without a rider, using a lunge rope and meter stick. A tape measure was used to measure the points of take off and landing and a rake was used to clear ground after each jump. It was documented with a Canon 7D digital camera, set to sequence mode and a tape measure was used. The photographs were then printed and analyzed with the raw data.</p> <p>Results</p> <ol style="list-style-type: none">1.) At lower level jumps, both horses leave the ground closer to the jump itself.2.) For higher level jumps, the joint axes are spread out significantly more.3.) With jumps measured at 6" and 12", the fetlocks and hocks were a little less than 1-foot from the jump itself. At 18" and above, the fetlocks and hocks at least 3 times farther away.4.) Both horses stayed relatively horizontal at the 6", 12" and even 18" jumps. Both broke the horizontal line and rose higher for jump set at 24".5.) The higher the jump, the lower the spine and head came as both horses cleared jump.6.) Both horses landed farther away as the height of the jump rose.7.) The hip and stifle lower for the higher jumps; slightly lower at medium heights and remain level for low jumps. Both horses brought their center of gravity under them for higher jumps.8.) At the last full stride before the jump, both horses are typically the same distance from the jump despite the increases in height. At the end of the jumps though, both horses are farther away as the height of the jump increases. <p>Conclusions/Discussion Both horses cleared jumps of 6", 12" and 18" without breaking their stride or the shape of their trajectory. With a jump set to 24", the horses had to change from a stride to jump mode and alter the shapes of their trajectories in order to clear the increased height.</p>	
Summary Statement I jumped two horses to see how their trajectory and biomechanics changed as the jumps were increased.	
Help Received Mother took photographs of experiment. Carlie Scarbery, a local horse trainer, oversaw and helped me jump both horses. Dr. Witt did vet check on both horses.	