



# CALIFORNIA STATE SCIENCE FAIR 2006 PROJECT SUMMARY

<b>Name(s)</b> <b>James R. Hepler</b>	<b>Project Number</b> <b>J0114</b>
<b>Project Title</b> <b>"Arrow"dynamics</b>	
<b>Objectives/Goals</b> I undertook this project to determine which combination of fletch and arrowhead provides the most stability to the arrow, thus making it the most accurate.	
<b>Abstract</b> I made 8 arrows for each of the following 4 fletch types: 12.5 cm Pope and Young, 12.5 cm shield, 10.0 cm parabolic, and 7.5 cm parabolic. The 8 arrows of each fletch type were fitted with 6.5 g arrowheads (which were later removed and replaced with 11.3 g arrowheads). The arrows of each fletch type were then randomly divided into 2 groups of 4. Each group was fired from a 15.9 kg (35 lb.) draw weight longbow at a 40 cm-wide target from a distance of 18.3 m. The group sizes (distances between the 2 widest shots) were measured individually with a cm ruler. The two groups of four arrows were then mixed and again randomly divided into 2 groups of four. This process was the same for every combination of fletch and arrowhead. Twenty-five groups of four arrows each, and therefore a total of 100 arrows, were fired, measured, and recorded for each of the 8 combinations of fletch and arrow type (a total of 800 arrows).	
<b>Methods/Materials</b> I made 8 arrows for each of the following 4 fletch types: 12.5 cm Pope and Young, 12.5 cm shield, 10.0 cm parabolic, and 7.5 cm parabolic. The 8 arrows of each fletch type were fitted with 6.5 g arrowheads (which were later removed and replaced with 11.3 g arrowheads). The arrows of each fletch type were then randomly divided into 2 groups of 4. Each group was fired from a 15.9 kg (35 lb.) draw weight longbow at a 40 cm-wide target from a distance of 18.3 m. The group sizes (distances between the 2 widest shots) were measured individually with a cm ruler. The two groups of four arrows were then mixed and again randomly divided into 2 groups of four. This process was the same for every combination of fletch and arrowhead. Twenty-five groups of four arrows each, and therefore a total of 100 arrows, were fired, measured, and recorded for each of the 8 combinations of fletch and arrow type (a total of 800 arrows).	
<b>Results</b> The results of my experiment were as follows: the 12.5 cm Pope and Young fletches, with both types of arrowheads, had smaller group sizes than all the other combinations. The 12.5 cm shield fletches had the next smallest group sizes, then the 10 cm parabolic fletches, which were followed closely by the 7.5 cm parabolic fletches.	
<b>Conclusions/Discussion</b> I conclude that Pope and Young fletches, the largest, provided the optimum in stability and precision, most noticeably with the lightweight 6.5 g arrowheads. The smaller fletches did not do nearly as well as the Pope and Young, although the difference was less pronounced with the heavier arrowheads. The Pope and Young type of fletch is not commonly used today; I believe that this is so because its shape, with its setback rear, makes a whirring sound as it rotates in flight, making it less desirable for hunting. Target archers do not commonly use this fletch, but I believe they should. As a result of my findings in this experiment, I will use my arrows with 6.5 g arrowheads with Pope and Young fletches in my future archery tournaments.	
<b>Summary Statement</b> I tested 8 different types of arrows to determine which is the most accurate.	
<b>Help Received</b> Father provided transportation to the archery range and supervised the shooting. Mother helped set up display board.	