



**CALIFORNIA STATE SCIENCE FAIR  
2007 PROJECT SUMMARY**

<b>Name(s)</b> <b>Foster D. Collins</b>	<b>Project Number</b> <b>J0209</b>
<b>Project Title</b> <b>Urban Solar Electric Panel Steering Testing and Proposed New System Design</b>	
<b>Abstract</b> <b>Objectives/Goals</b> The objective of the original/first phase of this project was to test if a simple solar panel steering system might improve panel energy production enough to reduce the overall system cost by requiring fewer panels. <b>Methods/Materials</b> A solar tracking system was created using Lego Mindstorms robotics components. Steered and fixed panels were mounted on a south-facing rooftop fixture tilted up so that both squarely faced the sun at noon. Output voltages of the panels were recorded on a computer every 40 seconds for 14 days of testing. <b>Results</b> steered panel produced an average of 31% more energy each day. This encouraging advantage motivated the addition of Phase 2 of the project to run 15 more days of testing with the fixed panel mounted at more-realistic, non-ideal orientations, as are more likely on typical houses. The fixed panel was positioned flat on two of the roof surfaces, which were not as steep as the ideal angle and not facing directly south. The new test data showed such significantly greater relative energy output for the steered system, 129% and higher, that Phase 3 was added with the objective of creating new 3-D CAD design concepts for low-profile, low-cost steering systems for residential rooftop use. <b>Conclusions/Discussion</b> The new preliminary concepts have modular arrays of 16-inch square panels steered by interconnected linkages, which eliminates the need to have a steering motor for every panel. Such steered rooftop solar systems should be attractive to urban home owners because they are low-profile and of such higher panel output efficiency that they should be less expensive than flat-on-the-roof installations typically offered by solar installation companies.	
<b>Summary Statement</b> A preliminary design was created for a new solar panel steering system for urban use; because the project testing proved that steered solar panels work much better than ones typically mounted flat on roofs.	
<b>Help Received</b> My dad: contacted solar panel companies, soldered solar cells, helped with data acquisition software, initiated system design concepts, did most of the 3-D CAD modeling, helped with display board graphics; Engineer friend: explained electrical theory for panel and load resistor wiring.	