



# CALIFORNIA STATE SCIENCE FAIR 2017 PROJECT SUMMARY

<b>Name(s)</b> <b>Elias B. Gilbert</b>	<b>Project Number</b> <b>S0811</b>
<b>Project Title</b> <b>Is Sprawl Wasting Our Time? Computer Models, Big Data, and Google APIs for City Planning</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> I explored how the way our streets are laid out (sprawl) affects the amount of time we spend doing driving-related activities. My project examined three activities: searching for parking (cruising), waiting at intersections, and the time spent travelling to a resource like a gas station or doctor's office. I hypothesized that people spend less time cruising in denser cities, but more time at intersections. I also expected that it would take less time to get to resources in a denser area.</p> <p><b>Methods/Materials</b> I created computer models to examine driving activities for different city layouts and then validated them with real data. First, I created a model based on real maps from 10 cities and towns and simulated a car driving around to find randomly generated parking spots, replicating the model for 12 different proportions of open spots. On foot, I mapped open and filled parking spots for 7 neighborhoods in Santa Cruz and used those distributions for more realistic simulations. Next, I created another model using proportions of intersection degrees to calculate how much time a car would spend at intersections in a fictional 1-mile trajectory. Then my dad drove me and I timed how long we spent at intersections in 10 min intervals in the 7 neighborhoods. Finally, I generated 600 random points across the US and found their sprawl using Python and a big database of street connectivity. Then, I calculated the closest resource from 5 categories to those locations with Google Maps APIs.</p> <p><b>Results</b> The computer models showed that cars would cruise less and wait longer at intersections in places with less sprawl (denser cities). However, sprawl only made a difference when the density of cars in the area was high. My real data showed no relationship between sprawl and either cruising or intersection times. In the Google APIs study, I found that it took less time to drive to resources in areas with less sprawl, regardless of the type of destination.</p> <p><b>Conclusions/Discussion</b> Altogether, my data suggests that sprawl affects many aspects of how we waste time while driving, which must all be weighed carefully in city planning. As sprawl affects different components of time-wasting differently, city planners must consider the factors separately based on the needs of their individual communities.</p>	
<b>Summary Statement</b> I used computer models and collected data to test the effects that different street layouts (sprawl) have on the amount of time we spend looking for parking, waiting at intersections and going places.	
<b>Help Received</b> I was advised extensively by Professor Dr. Adam Millard-Ball in the Environmental Studies department of UC Santa Cruz but conducted the actual research on my own. My father drove the car so that I could take my real-life data.	