



# CALIFORNIA STATE SCIENCE FAIR 2015 PROJECT SUMMARY

<b>Name(s)</b> <b>Leo J. McGrath</b>	<b>Project Number</b> <b>S1112</b>
<b>Project Title</b> <b>Best Time to Breathe? Changes in Air Quality Due to Different Factors in an Urban Area</b>	
<b>Objectives/Goals</b> My objective in this project was to find patterns in the changes in CO, NO(2), and particulate matter levels due to time and weather in my local area. In particular, I was looking for patterns in the variables that were constantly changing and the correlation between these variables. In terms of time and weather I was looking at time of day, day of week, temperature, and humidity.	
<b>Abstract</b> <b>Methods/Materials</b> For data collection, I used an Arduino Uno, a Grove shield and several Grove sensors to create a small air quality station. I then made a program that would run all the sensors and collect their data. The station was placed outside, and could measure the levels of CO, NO(2), and particulate matter in the air, as well as the temperature and humidity. This station was connected to a computer that recorded the data every minute. For data analysis, that data was transferred into Excel. In Excel I put the data into graphs so that I could find the patterns I was looking for. I also looked for averages and correlations.	
<b>Results</b> As for results, the gases see-sawed predictably during the day. Surprisingly, the particulate matter didn't vary during the day in any predictable way, but rather built up during the week and dropped off on the weekends and holidays. The particulate matter had much more variation than the gases. When answering this question, I realized that it wasn't well stated because time is not an easily distinguishable variable in changes in air quality. Trying to focus on time as a single variable is more difficult than I expected. This is because I couldn't easily separate time from confounding weather variables. Meanwhile, in terms of the correlations, I found that there is very little correlation between the gases and particulate matter. Also, there was a strong correlation between the gases and the humidity. Unlike the gases, there was essentially no correlation between particulate matter and humidity. In conclusion, the lower the humidity the lower the levels of gases, but the particulate matter could be higher or lower.	
<b>Conclusions/Discussion</b> In conclusion, both the gases and the particulate matter are affected by changes in time and weather, but in different ways. Gases tend to see-saw predictably throughout the day, while particulate matter builds up during the week and drops off during the weekend. Finally, these time-based patterns can be temporarily overwhelmed by weather variables.	
<b>Summary Statement</b> My project looks at the patterns in the changes in CO, NO(2), and particulate matter levels due to weather and time.	
<b>Help Received</b> My dad helped teach me the basics of programming and how to use more complicated parts of Excel.	