### Introduction

In our research, we will look at geographical fault lines to determine if they are the major link between earthquakes and location. We will compare a city prone to earthquakes—San Francisco—to a city not prone to earthquakes—New York—to see the differences in building damages caused by one. Analyzing these statistics will aid for safer building codes in areas both prone and not prone to Earthquakes.

### Research Questions

- What is the correlation between major earthquakes and location in recent years?
- How can this information aid in disaster preparedness for areas prone to Earthquakes?

### Background

- An Earthquake is one of the most destructive natural causes in today’s world which leads to death, disaster, and geological deformations.
- With recent major disasters such as the March 11th, 2011 Japan Earthquake and the April 18th 1906 Great San Francisco Fire, all what was left was death and destruction.
- Because of new development such as Seismographs and the Richter Scale, we now have some understanding of how an why an Earthquake occurs.
- Since Earthquakes primarily affect infrastructures, we must first better improve the way buildings are built to withstand one.

### Materials

Throughout our research project, we utilized our trip to the Museum of Natural History. Our visit consisted of investigating and exploring the information of geological problems that humans have to live with. Aside from our trip, we also used academic databases to find evidence of when and where earthquakes occur on the San Andreas fault.

### Methods

In order to solve our research question, we had to observe earthquake patterns to see if any mathematics can be incorporated. Since earthquakes don’t follow an exact pattern, we can only try to speculate when a massive earthquake is bound to occur. Aside from that, we had to rely on how we can prepare ourselves. We took financial statistics and graphed them to analyze any correlations.

### Findings

![Effect of Earthquake Damage on the Economy of Two Major Cities](image)

According to our findings, we discovered that when comparing two geologically different cities—one that lies under a fault line San Francisco and another that doesn’t lie on a fault line New York—they would yield completely different results. The damage cost recorded from these two cities when a earthquake hit are drastically different. New York didn’t experience a drastic economic downfall, compared to San Francisco, which suffered a average of 203 million dollars. According to geologists, if an earthquake of a magnitude of 7.5 or higher hit New York, it would cause an estimated 197 billion dollars in damage costs. An earthquake in San Francisco would result in 120 billion dollars. This shows how the different cities are already prepared with their own unique infrastructure.

We also analyzed seismic patterns and noticed that earthquakes don’t follow a specific trend and rather are spontaneous. Mathematically, we were unable to decipher a specific linear equation that would help predict earthquakes, since there is no correlation between location and time. The closest we got to predicting earthquakes was by analyzing earthquake records around the San Andreas fault and looking to see if there were any seismic gaps. This briefly showed that, around an interval of 150 years, there is a possibility of an major earthquake hitting, but throughout those years, all earthquakes that would occur would be neutral.

### Conclusions

Throughout our research, we have found that earthquakes are most disastrous in areas where fault lines collide. This is because, along fault lines, Earth’s tectonic plates are colliding and moving against each other, causing friction. The pressure that is built from the plates constantly rubbing against each other causes an Earthquake. By choosing two cities that are geologically different, we can see the different obstacles that each city must have to overcome to withstand an earthquake. Our research shows that earthquakes cannot be predicted with much accuracy, but rather we can only prepare ourselves for the worst. Overall in our findings we found out that there is a major correlation between earthquake dates and locations. Fault lines cause earthquakes to follow a specific seismic pattern, compared to locations that aren’t near fault lines. This helps us create specific infrastructures according to location. It is for this reason why our data showed that damage is far less in locations that don’t lie on fault lines. By having this information, it helps us prevent less damage and deaths. So if a major earthquake was to hit San Francisco, it would not be as catastrophic as it hitting New York.

### References