

## Storyboard discussion and Visualization Development

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### *The database*

NSF Award Data by year, found at <<http://www.nsf.gov/awardsearch/download.jsp>>

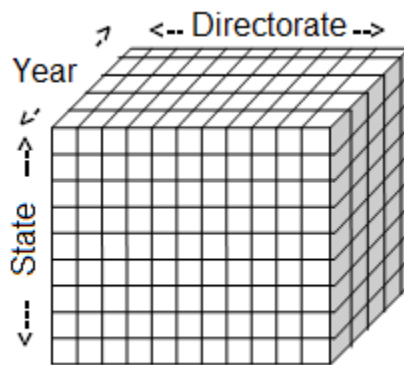
Database includes:

- Award Information (Title, Data, Amount)
- Funding Organization (Directorate, Division)
- Investigators (Name, Email)
- Institution (Name, City, State, Zip)

### *The reduced dataset*

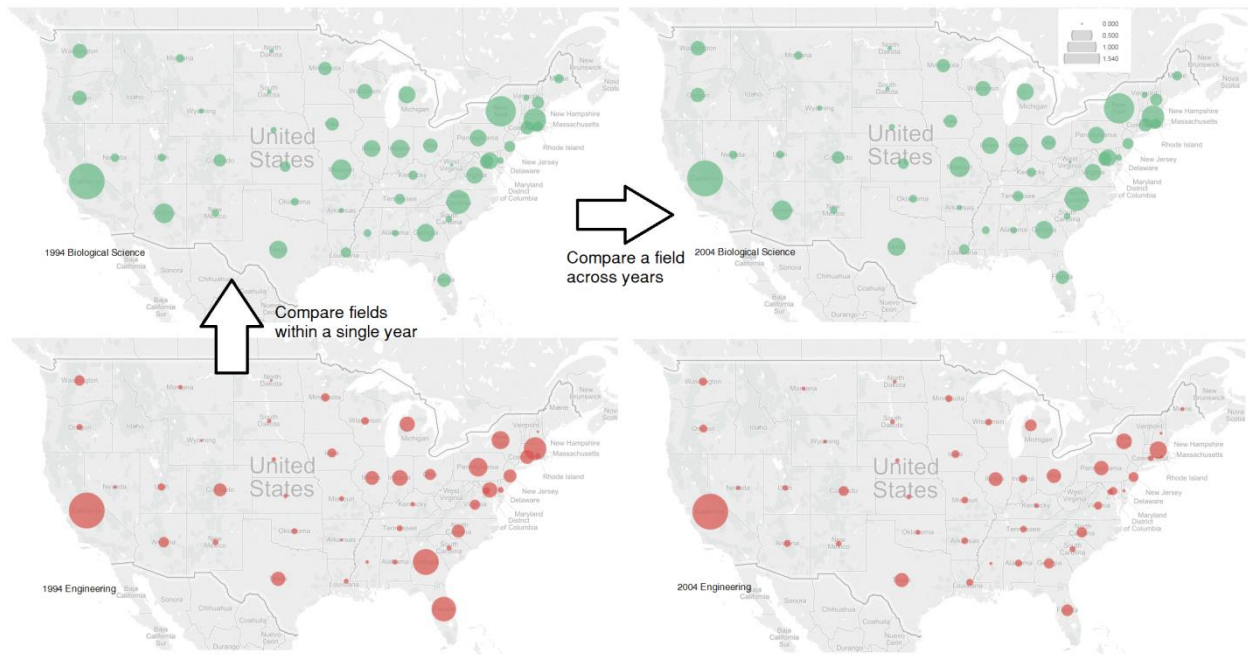
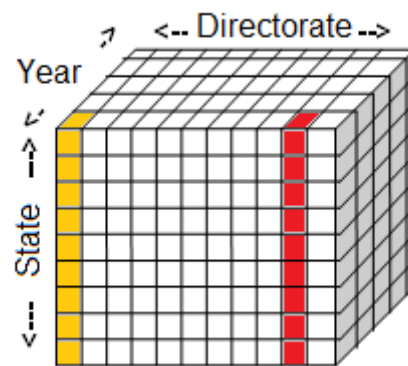
- Primarily interested in the amount of money awarded
- Want to retain simple spatial and temporal encodings and categorical information by funding agency

The result is a datacube of award amount by state, funding directorate, and year. The main interactions in the visualization should allow the user to explore the datacube and to compare the data across the three dimensions in a meaningful way.



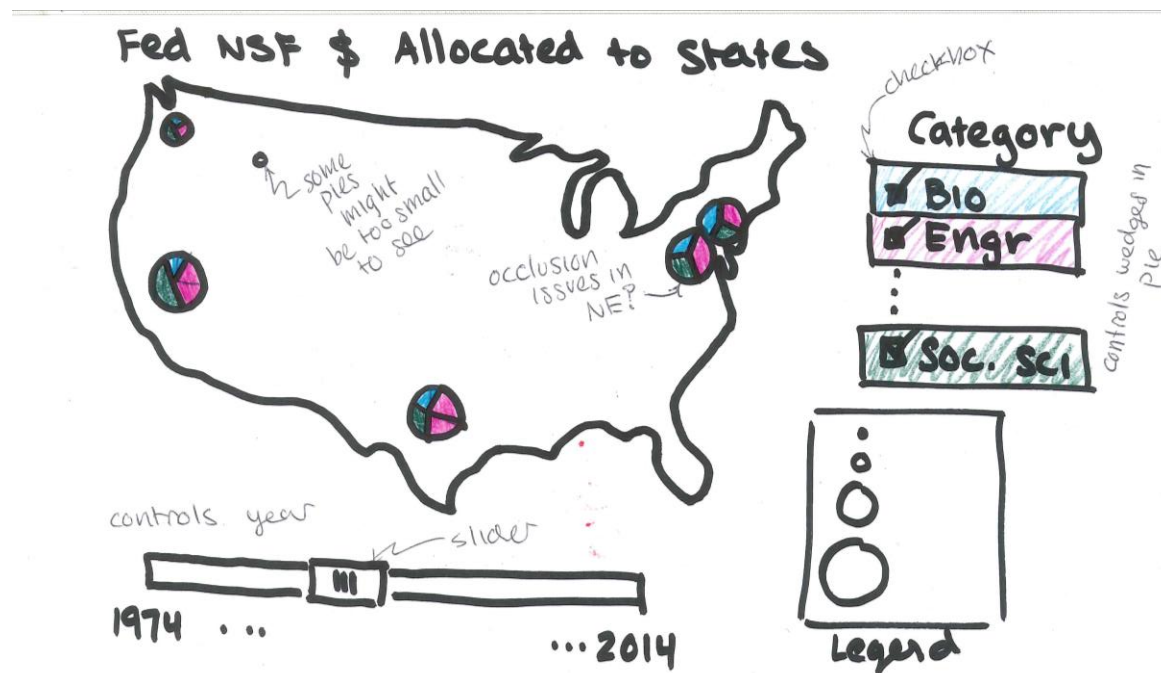
### *Visualization Development*

The decision was made to keep the scope of the visualizations two-dimensional; the logical choice for interactivity was to allow the user to select the two-dimensional view displayed. Because there is geographical data within the datacube, it made sense for the visualization to include a map displaying the data. The user could then interact with the visualization by selecting the year to display as well as the directorate/discipline to compare in terms of award amount.



### Original Design

The original design encoded the geographic data onto a map, the amount awarded to each state in the selected categories would be encoded into the size of the pie/donut chart, and comparison between the categories would be achieved by comparing the size of the wedges in each chart. Each category would have a separate color and a slider at the base of the map would allow the user to explore the time evolution of the data.



### The benefits

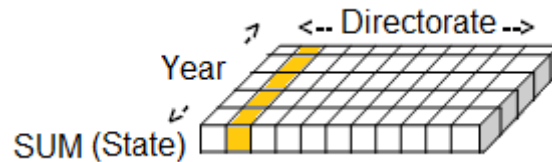
- This strategy allows for easy comparison between the funding of each discipline in each state
- The visualization is clean and conveys a significant amount of information

### The potential issues

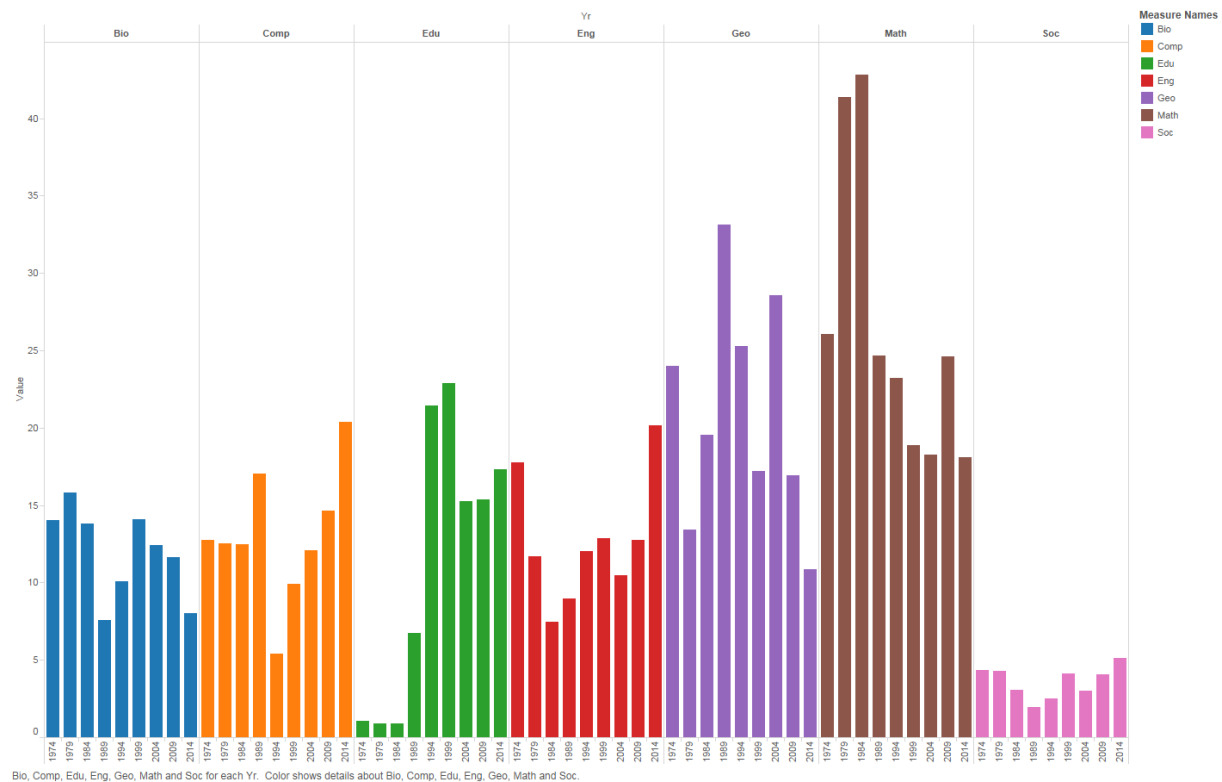
- There is a potential for occlusion in the North-Eastern region due to the density of geographic information
- Because some of the states have small budgets and because the national budget has grown throughout the years, scaling the circles and the wedges would become difficult. Some circles may be too small to see and the wedges would be even smaller, making the comparison difficult
- This visualization also does not allow for direct comparison between the other two variables in the datacube (funding amount to discipline versus year)
- Pie charts are not the best way to convey detailed information

## Second Design

Because the original design does not allow for comparisons between the other two variables (funding amount to directorates based on year) it was decided to include a secondary visualization, a bar chart that would allow for a comparison of the total amount awarded in a single directorate across the included years.



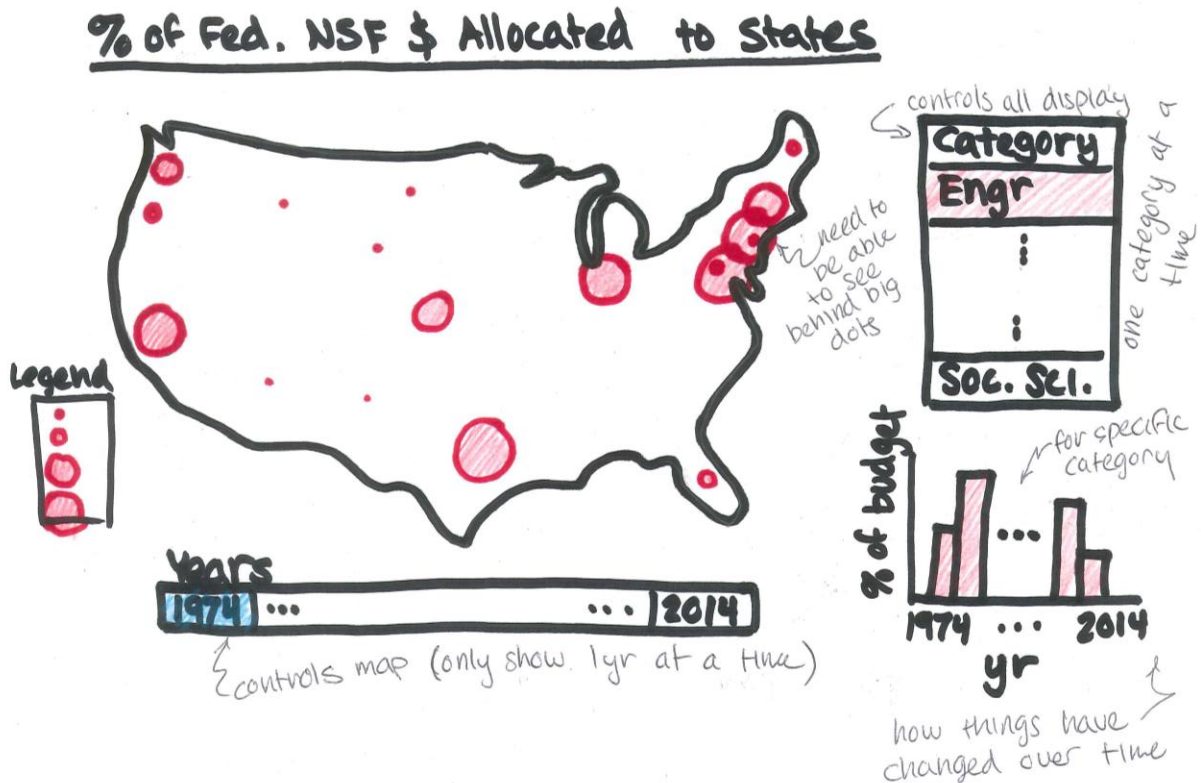
Sheet 3



To remedy some of the issues identified with the pie charts, the second design opted for bubbles instead, restricting the choice of category to a single discipline at a time. In addition, the slider was converted to buttons as well, in order to make it clearer which year the user selected and because the temporal information is discrete and not continuous (which is implied by a slider).

One of the other issues identified was the change in national funding amount. This made scaling the bubbles more challenging and made the scale of the bubble variable based on the year selected. To fix this issue the geographic data was normalized based on the yearly national funding amount, so that the

data displayed would be the percentage of the national budget spent in each state in a given discipline in a given year.



#### **The benefit**

- Normalizing the bubbles to the national budget meant that the bubble scale could be the same for each year
- Including the bar chart means that changes in national funding could be recognized over time
- By making the bubbles partially transparent, occlusion issues in the NE were mitigated

#### **The potential issues**

- This strategy does not allow as easy a comparison between the funding directorates in each state.

#### **Additional Fixes**

- Including tooltips for the bubbles that include the state and the % of the year's federal budget would make the chart easier to read, especially in the densely populated North-East region.
- The tooltips and colored discipline bubbles made a legend unnecessary and cleaned up the visualization