An Interactive Visualization of the Geological Time Scale Using D3.js

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Abstract

Data visualization provides an efficient way to present data on the Web. It also offers the possibility that allows users to interact with the Web. This work focused on the visualization of the Geological Time Scale, which has an ordinal and hierarchical structure. By using the JavaScript library D3.js (Data-Driven Documents), we created several visualizations for the Geological Time Scale. The earth's time history is divided into different eras, periods, etc. The D3 visualizations that we developed display the structure and relationships nicely. Also, D3 allows users to interact with the visualizations, as the layout of these examples can change if they are clicked. For example, the tree expands if the nodes are clicked, and the hierarchy table opens the corresponding Wikipedia page if its cell is clicked.

Research Objective

- Visualize the Geological Time Scale and use it as a gateway to retrieve more information from the Web.
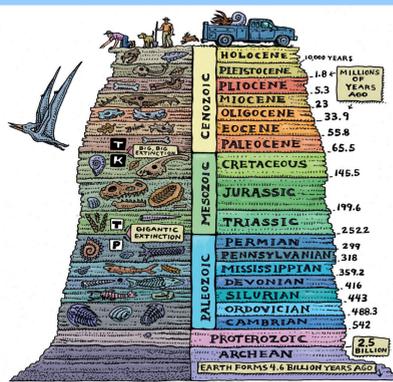
"The geological time scale (GTS) is a system of chronological measurement that relates stratigraphy to time, and is used by geologists, paleontologists, and other Earth scientists to describe the timing and relationships between events that have occurred throughout Earth's history."

-- From Wikipedia

Image from: http://www.earth-time.org

What is D3?

Basics of D3.js:
- D3 (Data-Driven Documents) is a JavaScript library that can be used for manipulating documents that are based on data.
- Allows data represented in a json file to be easily represented using many different visualization formats.
- Enables visualizations based on static or dynamically retrieved data.

How to create a D3 visualization:
1. Look online for a D3 visualization that you would like to use.
2. Copy the code at the bottom of the page and save it as a .html file.
3. Download the D3.js files and save out the data files as a json.
4. Start your web server.
5. Change the code of the .html file to read in the name of the json file.
6. Run the .html file.

See http://d3js.org

json snippet (Data File)

json (JavaScript Object Notation) is a convenient format for representing structured data using native JavaScript. Below is an example of representing a geological time period using json.
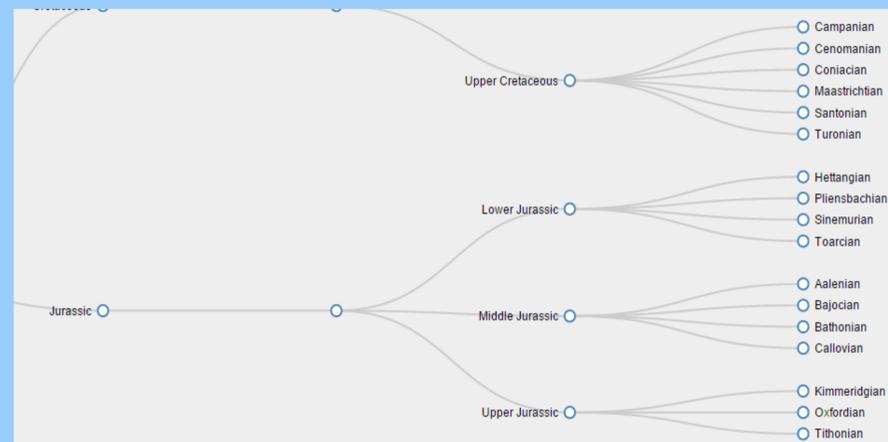
```
"name": "Lower Ordovician", "colour": "#1A9D6F",
"children": [
    {
    "name": "Tremadocian", "colour": "#33A97E", "size": 500
    },
    {
    "name": "Floian", "colour": "#41B087", "size": 500
    }
]
```
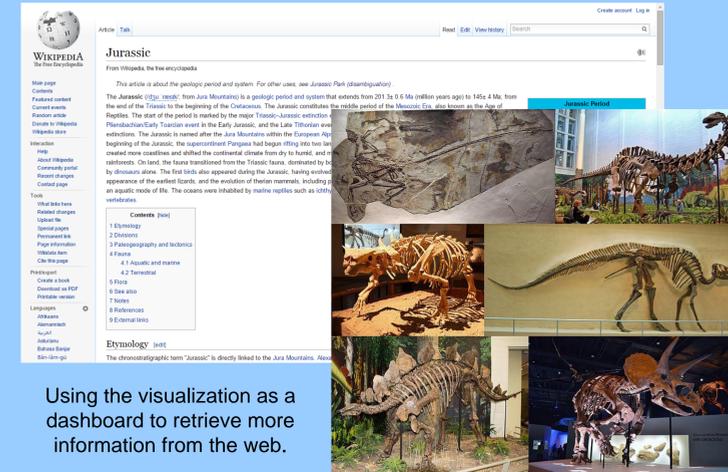
See http://json.org

D3 Visualization Examples

Tree Layout

Hierarchy Table

Using the visualization as a dashboard to retrieve more information from the web.

Sunburst

Image from: http://geotime.tw.rpi.edu

Sunburst is courtesy of Marshall Ma. Data used to create the Tree Layout and the Hierarchy Table were taken from this visualization.

Conclusion

- D3 is very useful for visualization structured data such as the Geological Time Scale.

- Visualization of structured data provides a platform for retrieving more information from the Web.

References/Acknowledgements

Ma, X., Fox, P., 2013. Recent progress on geologic time ontologies and considerations for future works. Earth Science Informatics 6 (1), 31–46.

DO NOT USE THIS SPACE