



Introduction à D3.js

Cours #2

<https://lyondataviz.github.io/teaching/lyon1-m2/2017/>

Romain Vuillemot

OUTLINE

HUMAN PERCEPTION: PREATTENTIVE FEATURES






VISUAL MAPPINGS

INTRODUCTION A D3.JS

VISUAL MAPPING & INTERACTION AVEC D3.JS

SIMPLE DATAVIZ AVEC D3.JS & BLOCKBUILDER

data-vis-jobs@googlegroups.com



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Welcome! This list is intended to help data visualization folks find, post, and share primarily contract jobs. We need this list because the number of data-vis related jobs has exploded, and it has become difficult to find talented workers to do these jobs – Or to find other people to give your feelers to, when you're booked. The list will be tool agnostic, both static and/or interactive visualization work is welcome here. Possible skills I imagine living here: D3.js, Raphael.js, Processing / Processing.js, Paper.js, Flash, Illustrator, Excel, Tableau, R (ggplot2), Python - matplotlib / chaco / traits/ bokeh / d3.py etc, Gephi/NodeXL/sigma.js.

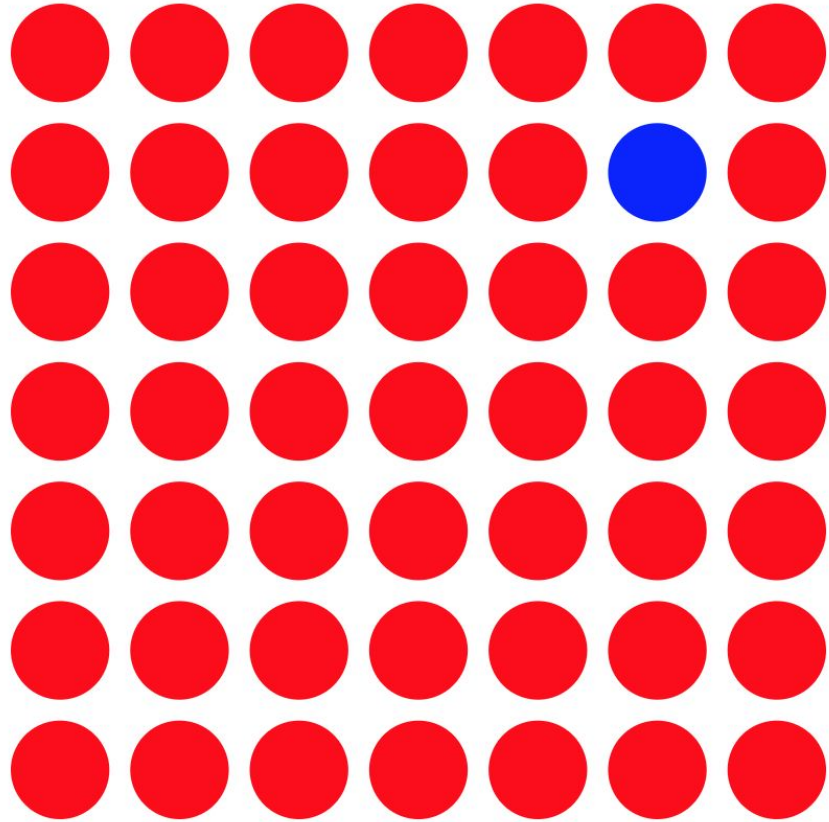
The job postings will be moderated, to keep it on-target. To post to this group, send email to data-vis-jobs@googlegroups.com. Specify if it's full-time, contract, contract-to-hire; and whether remote work is ok. INCLUDE AN EMAIL ADDRESS FOR REPLIES IN THE BODY OF YOUR TEXT. Replies that get sent to the list address will be blocked from appearing!

- Best, Lynn (@amicas)

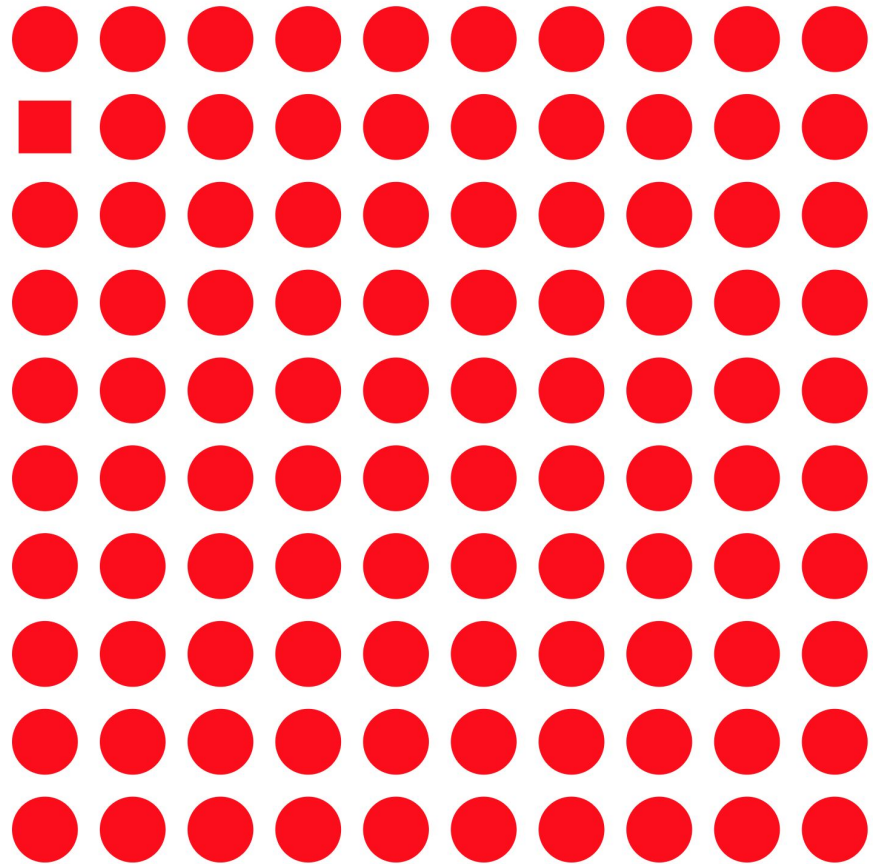
	Stamen is hiring a design technologist to work at our busy dataviz design studio in San Francisco (1)	Nov 7
By Eric Rodenbeck	1 post - 14 views	
	Looking for a graphic design intern (paid) (1)	Nov 7
By Rebecca Galloway	1 post - 9 views	
	Looking for a Front End Developer (1)	Nov 7
By Rebecca Galloway	1 post - 8 views	
	Post-Doctoral Position in Data-Driven Video Stories (1)	Nov 5
By Jonathan Hook	1 post - 28 views	
	Seeking "Complex Starburst" Chart Developer - Contract (1)	Nov 5
By Matthew Tutty	1 post - 43 views	
	Design internship with data visualization studio - Washington, DC (1)	Oct 25
By William Merrow	1 post - 66 views	
	D3.js and REACT.js to re-build Data Vis Platform (1) fulltime newyork	Oct 24
By Samantha Epstein King	1 post - 92 views	
	6-Month Paid Internship in Interaction Design and Data Visualization in Zurich, Switzerland (1)	Oct 23
By Solange Vogt	1 post - 75 views	
	Parse.ly is hiring a frontend / UI / UX engineer (1)	Oct 20
By Andrew Montalenti	1 post - 97 views	

HUMAN PERCEPTION

IS THERE A BLUE CIRCLE?



IS THERE A RED SQUARE?



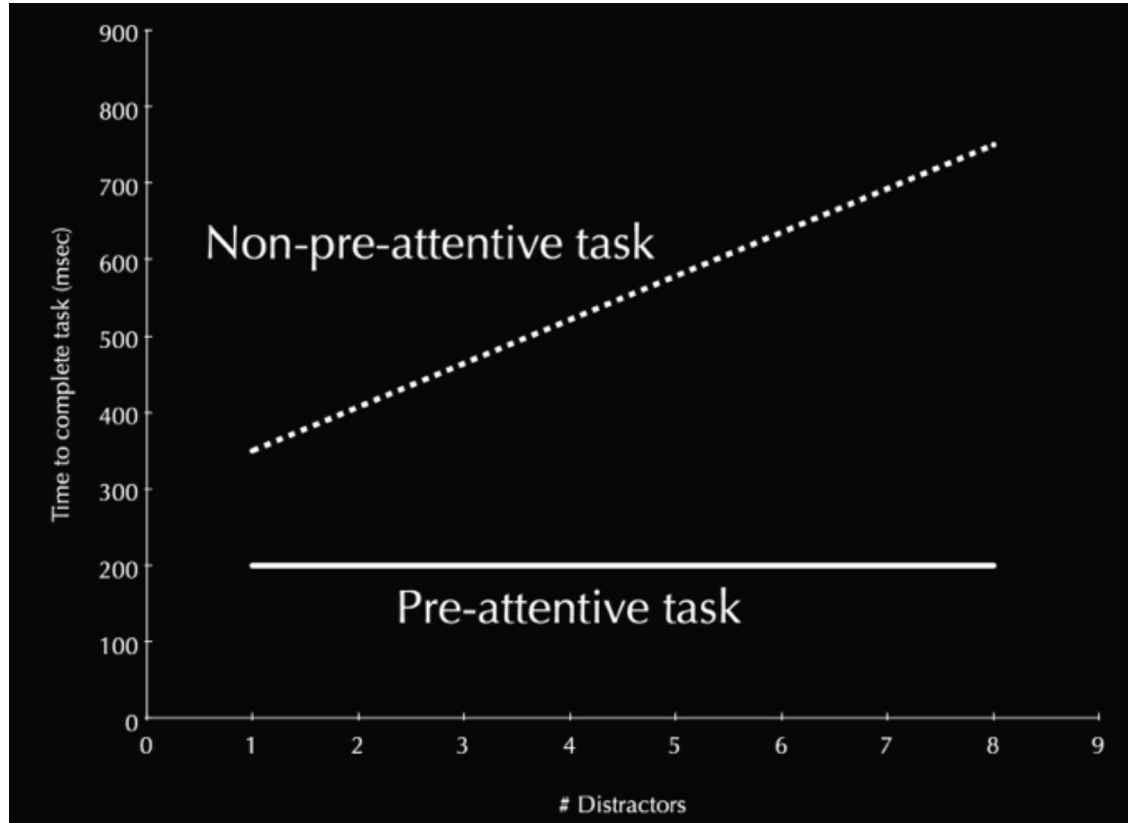
FIND NUMBER 3

142416496357598475921765968474891728482
285958819829450968504850695847612124044
074674898985171495969124567659608020860
608365416496457590643980479248576960781
285960799918712845268101495969124567781
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960799164964575127879918712845298496912
223591649645759588198250963576596080596

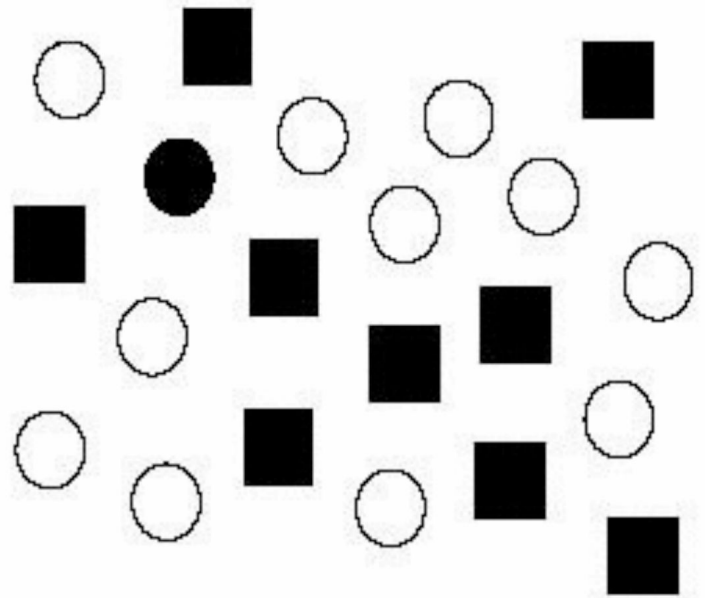
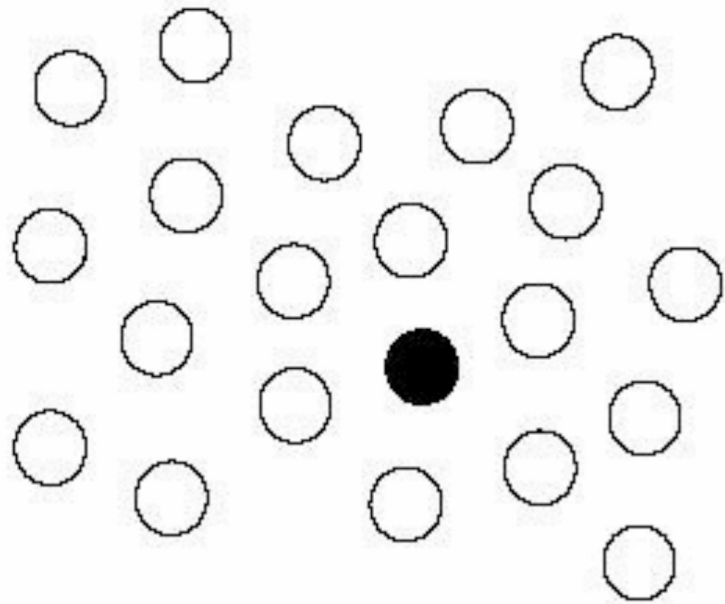
FIND NUMBER 3

142416496**3**57598475921765968474891728482
285958819829450968504850695847612124044
074674898985171495969124567659608020860
608**3**6541649645759064**3**980479248576960781
285960799918712845268101495969124567781
874241649645757659608149596912456701285
960799164964575127879918712845298496912
22**3**59164964575958819825096**3**576596080596

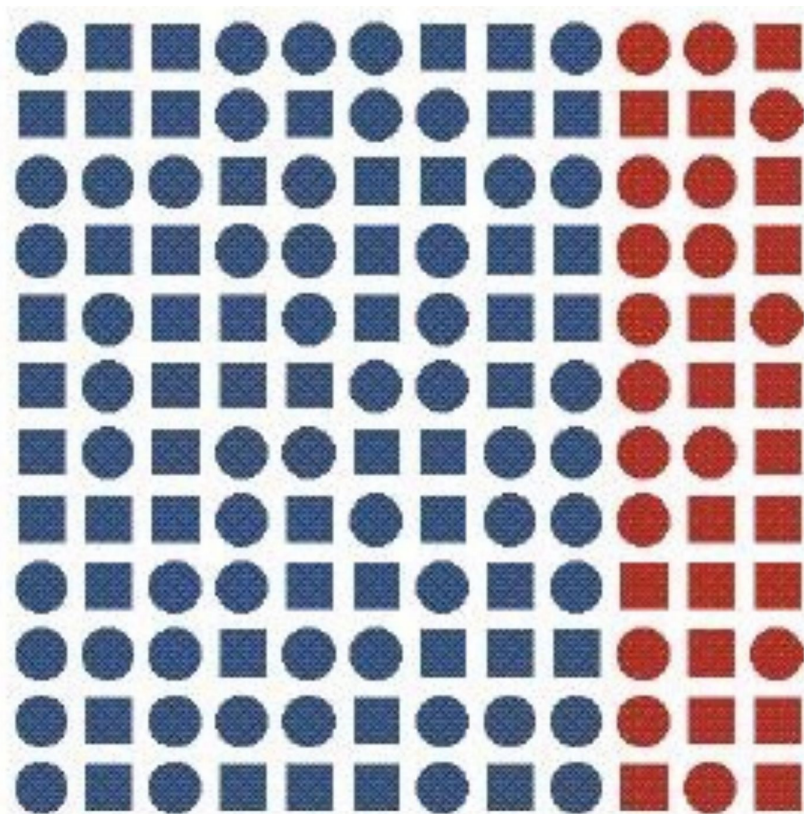
PRE-ATTENTIVE PERCEPTION



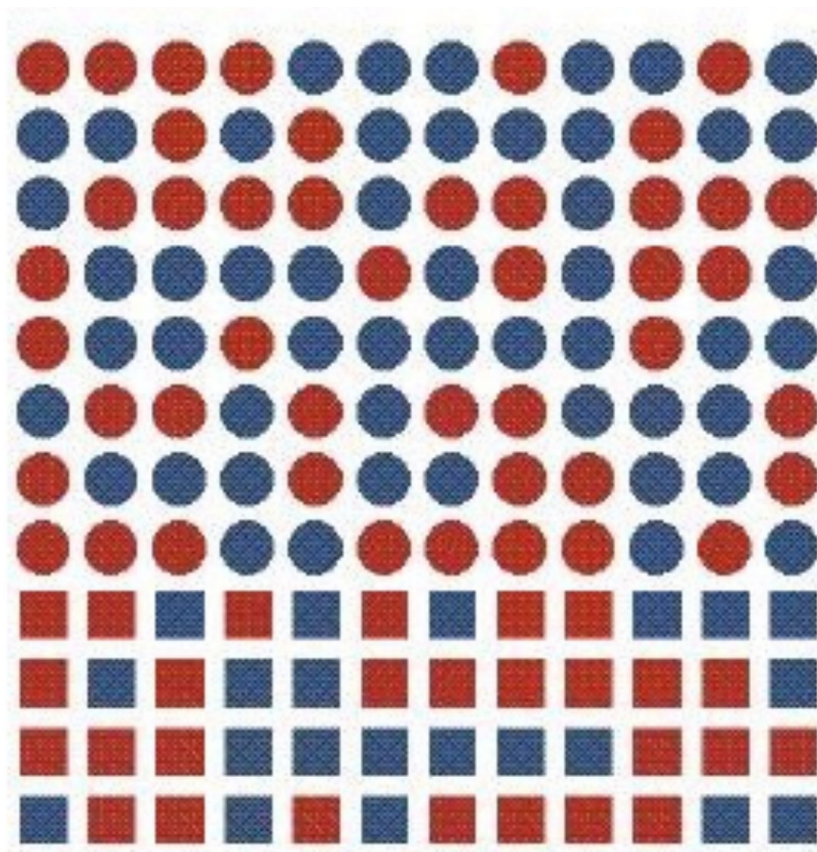
PRE-ATTENTIVE PERCEPTION ONLY WORK WHEN 1 DIFFERENCE



IS THERE A BORDER?

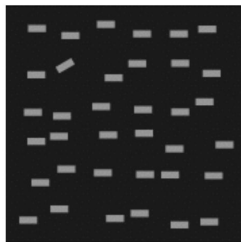


IS THERE A BORDER?

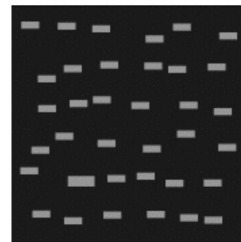


OTHER PRE-ATTENTIVE FEATURES

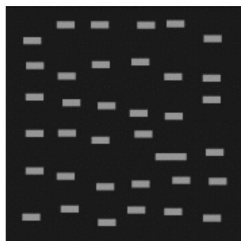
orientation



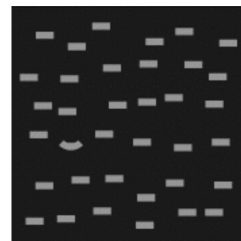
size



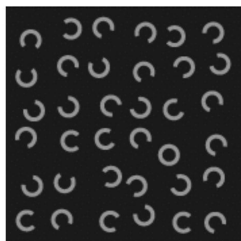
length, width



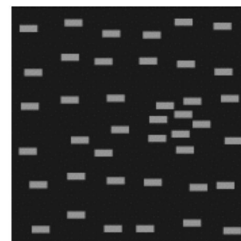
curvature



closure



density, contrast



Visual Mappings

TOOLS (GOOGLE VISUALIZATION)

Overview

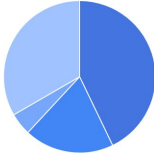
Hello, Charts!

- Quickstart
- Load the Charts Library
- Prepare the Data
- Customize the Chart
- Draw the Chart
- Draw Multiple Charts


Chart Types

- [Chart Gallery](#)
- Annotation Charts
- Area Charts
- Bar Charts
- Bubble Charts
- Calendar Charts
- Candlestick Charts
- Column Charts
- Combo Charts
- Diff Charts
- Donut Charts
- Gantt Charts
- Gauge Charts
- GeoCharts
- Histograms
- Intervals
- Line Charts
- Maps
- Org Charts
- Pie Charts
- Sankey Diagrams
- Scatter Charts


Pie Chart



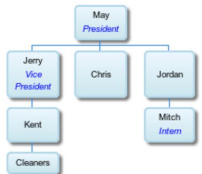
Bubble Chart



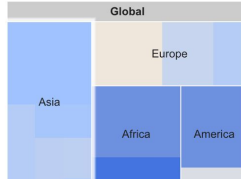
Donut Chart



Org Chart




Treemap



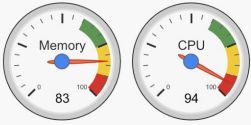
Table

	Name	Salary	Full Time
1	Marie	\$24,700	✓
2	Albert	\$25,200	x
3	Enrico	\$25,700	✓
4	Lise	\$26,600	✓

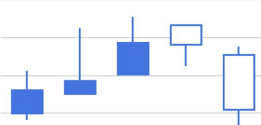
Timeline



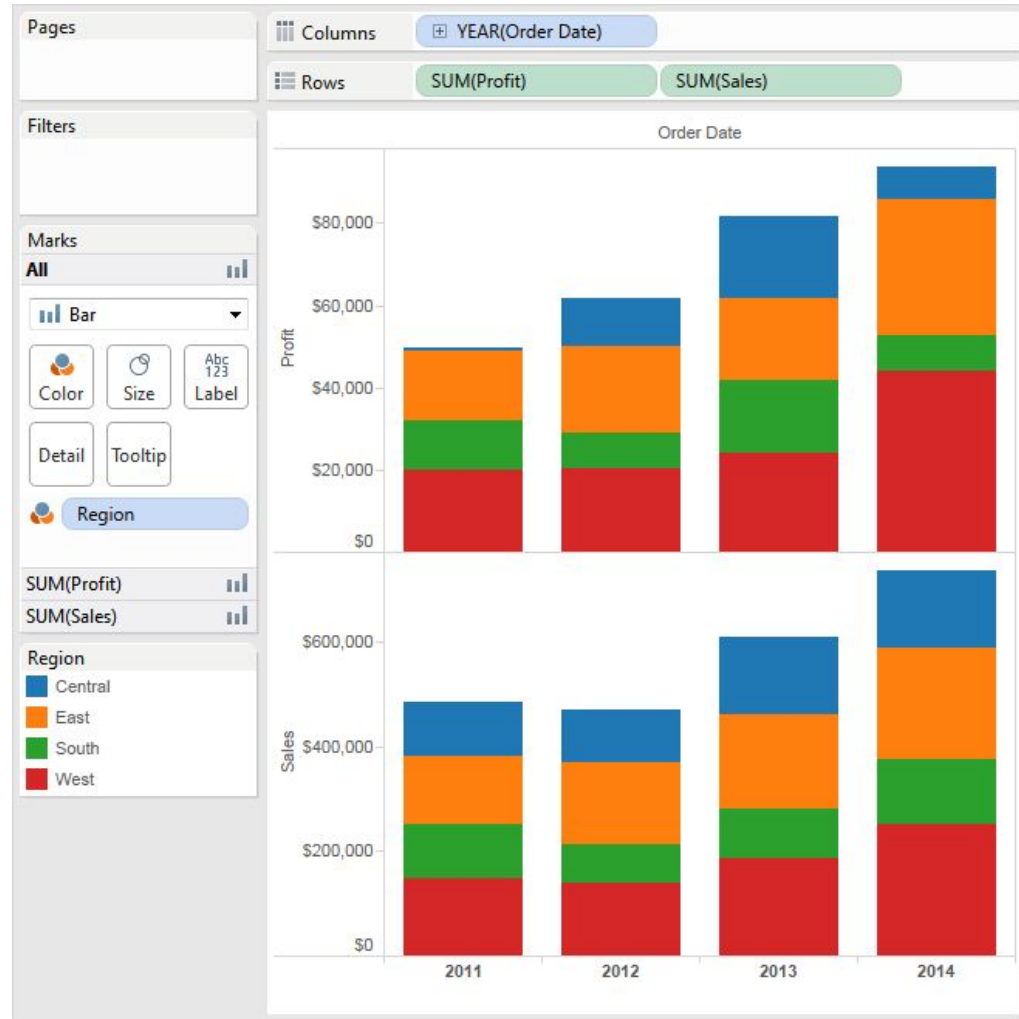
Gauge



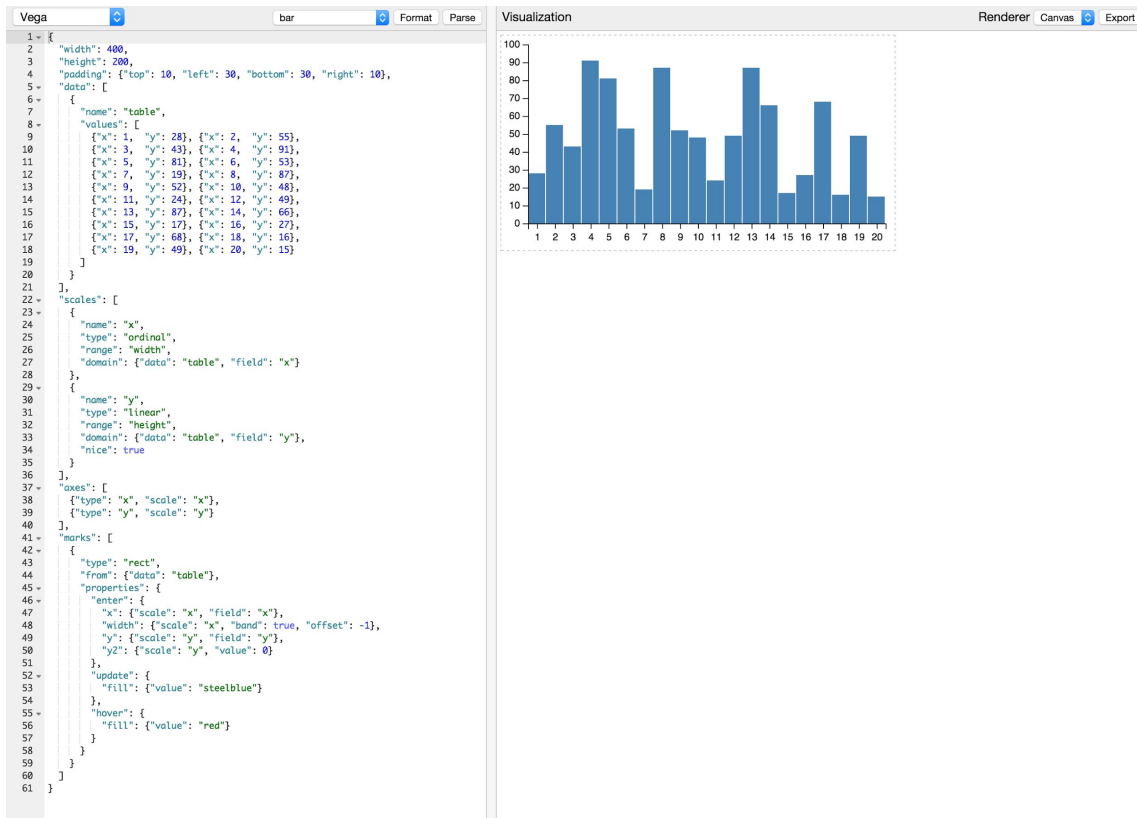
Candlestick Chart



TOOLS (TABLEAU)

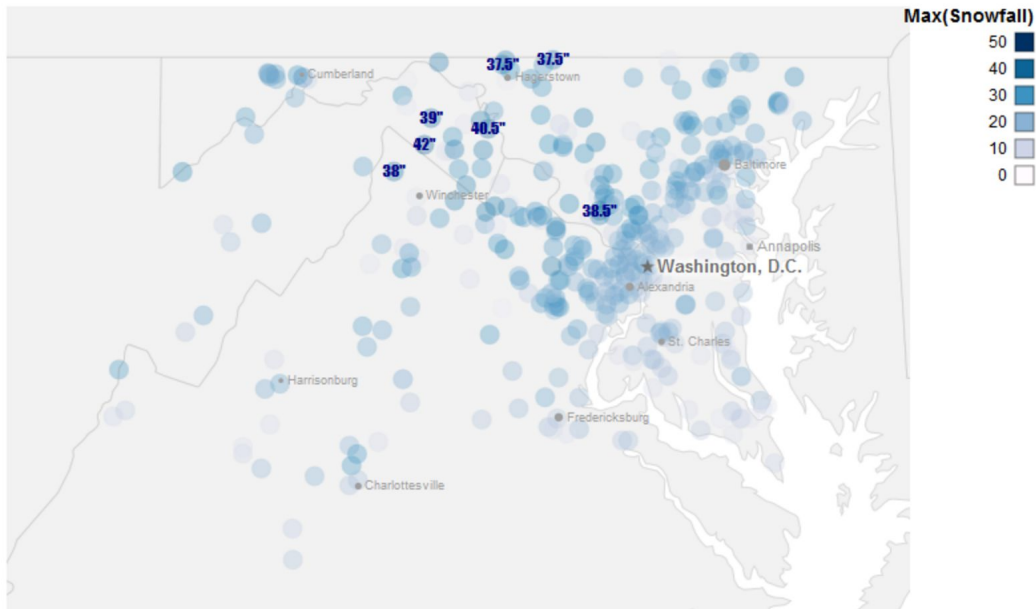


TOOLS (VEGA)



<https://vega.github.io/>

TOOLS (BRUNEL)

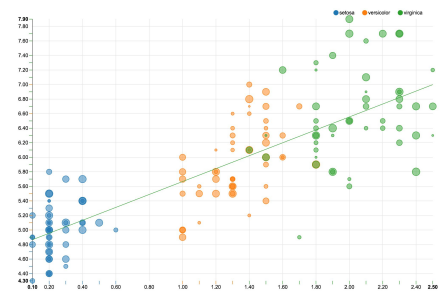
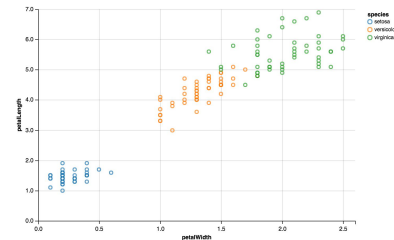
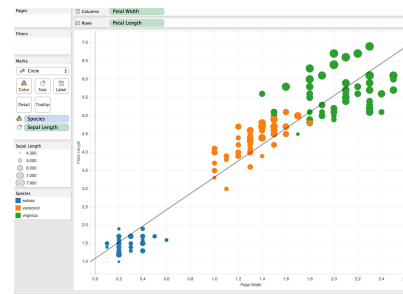
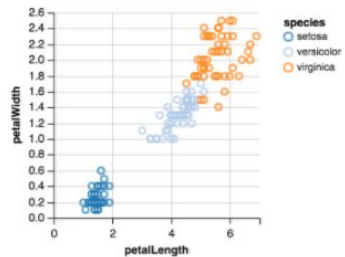
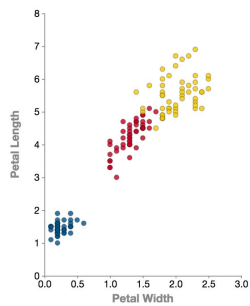
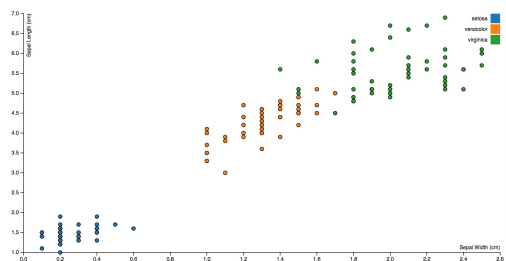


Brunel Code:

```
map('usa') + x(Lat) y(Lon) max(Snowfall) color(Snowfall:blues) tooltip(City,Snowfall) style("stroke-  
width:0;opacity:.4;size:15px") +  
map('labels') + x(Lat) y(Lon) max(Snowfall) top(Snowfall:10) label(Snowfall, '') text style("font-  
family:Impact;fill:darkblue") tooltip(City,Snowfall)
```

<https://developer.ibm.com/code/open/brunel-visualization/>

TOOLS LOOK&FEEL + DEFAULT



D3.JS

D3.js <https://d3js.org/>

Créé ~ 2011 par Mike Bostock et al.

Bostock, Michael, Vadim Ogievetsky, and Jeffrey Heer. "*D³ data-driven documents*." IEEE transactions on visualization and computer graphics 17.12 (2011).

Descendant d'une longue lignée de toolkits (Stanford): Prefuse (Java), Flare (Flash), Protovis (JavaScript)

Top-10 des repositories les [plus populaires](#) sur Github

D3.js <https://d3js.org/>

🔍 D3 (Data-Driven Documents or D3.js) is a **JavaScript library** for visualizing data using **web standards**. D3 helps you bring data to life using SVG, Canvas and HTML. D3 combines powerful visualization and interaction techniques with a **data-driven approach to DOM manipulation**, giving you the full capabilities of modern browsers and the freedom to design the right visual interface for your data.

<https://github.com/d3/d3/wiki>

>> D3 is a visualization kernel

Similarités avec jQuery

```
d3.select('#foo')  
  .style('background', '#000')  
  .on('click', function() {})  
  .append('div');
```

```
$('#foo')  
  .css('background', '#000')  
  .click(function() {})  
  .append($('

</div>'));


```

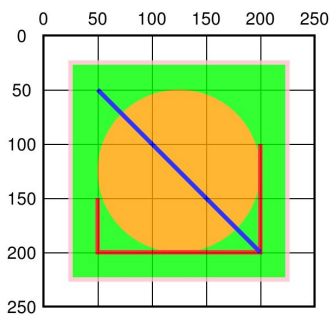
```
// Selection en pur JS  
function $(x) {  
  return document.querySelectorAll(x);  
}
```



Rappel de CSS

```
<style>
  body { margin:0;position:fixed;top:0;right:0;bottom:0;left:0; }
  rect {
    fill: none;
    stroke: black;
    stroke-width: 1px;
  }
</style>
```


Rappel de SVG



```

<?xml version="1.0" encoding="UTF-8" ?>
<svg xmlns="http://www.w3.org/2000/svg" version="1.1">
  <rect x="25" y="25" width="200" height="200" fill="lime" stroke-width="4" stroke="pink" />
  <circle cx="125" cy="125" r="75" fill="orange" />
  <polyline points="50,150 50,200 200,200 200,100" stroke="red" stroke-width="4" fill="none" />
  <line x1="50" y1="50" x2="200" y2="200" stroke="blue" stroke-width="4" />
</svg>

```

De très nombreux exemples!

D3.js official website <https://d3js.org/> & documentation

D3 Blocks <http://bl.ocks.org/mbostock/>

Examples <https://bost.ocks.org/mike/example/>

Big List par Christian Viau <http://christopheviau.com/d3list/>

Blockbuilders (live coding) <http://blockbuilder.org/>

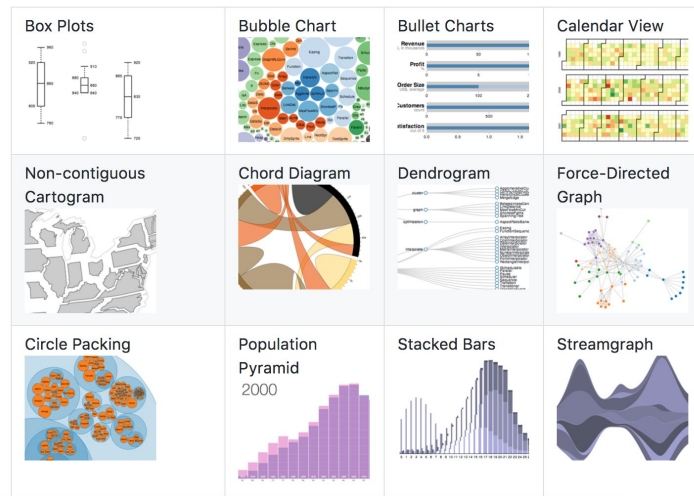
Gallery

Mike Bostock edited this page 5 days ago · 1260 revisions

Wiki › Gallery

Welcome to the **D3 gallery**! More examples are available on bl.ocks.org/mbostock. If you want to share an example and don't have your own hosting, consider using [Gist](https://gist.github.com) and bl.ocks.org. If you want to share or view live examples try runnable.com or vida.io.

Visual Index



BlockBuilder

Created by <https://github.com/enjalot>

Open Source

<https://github.com/enjalot/blockbuilder>

Based on GitHub hosting

Create a block from scratch

Search a block

Fork a block

Search the Blocks

Showing 100/7011 of the most relevant blocks.

- Simple modification based on mbostock's Bullet Charts. @enjalot
- dance 5 @enjalot
- Simple modification based on mbostock's Bullet Charts. @dgrcock
- Woman (height) @dgrcock
- Treemap MS PowerBI @aazemberg
- Closest Point on a Path and its Tangent l1 (faster tangent method) @andreas87

```
1 <!DOCTYPE html>
2 <head>
3   <meta charset="utf-8">
4   <script src="https://d3js.org/d3.v3.min.js"></script>
5   <style>
6     body { margin:0;position:fixed;top:0;right:0;bottom:0;left:0; }
7     rect {
8       fill: none;
9       stroke: black;
10      stroke-width: 1px;
11    }
12  </style>
13 </head>
14
15 <body>
16   <script>
17     // Feel free to change or delete any of the code you see in this editor!
18     var svg = d3.select("body").append("svg")
19     .attr("width", 960)
20  </script>
```

NEED A GitHub ACCOUNT!

<https://lyondataviz.github.io/teaching/lyon1-m2/2017/>

D3 v3 → D3 v4

<https://github.com/d3/d3/blob/master/CHANGES.md>

<https://github.com/d3/d3/wiki/time-formatting>

Most D3 functions are now modules

```
<script src="https://d3js.org/d3.v4.min.js"></script>
```

```
<script src="https://d3js.org/https://d3js.org/d3-random.v1.js"></script>
```

d3 / d3

<> Code

! Issues 3

🔗 Pull requests 0

📖 Wiki

📊 Insights

Time Formatting

Mike Bostock edited this page on Jun 30, 2016 · 41 revisions

This page has moved!

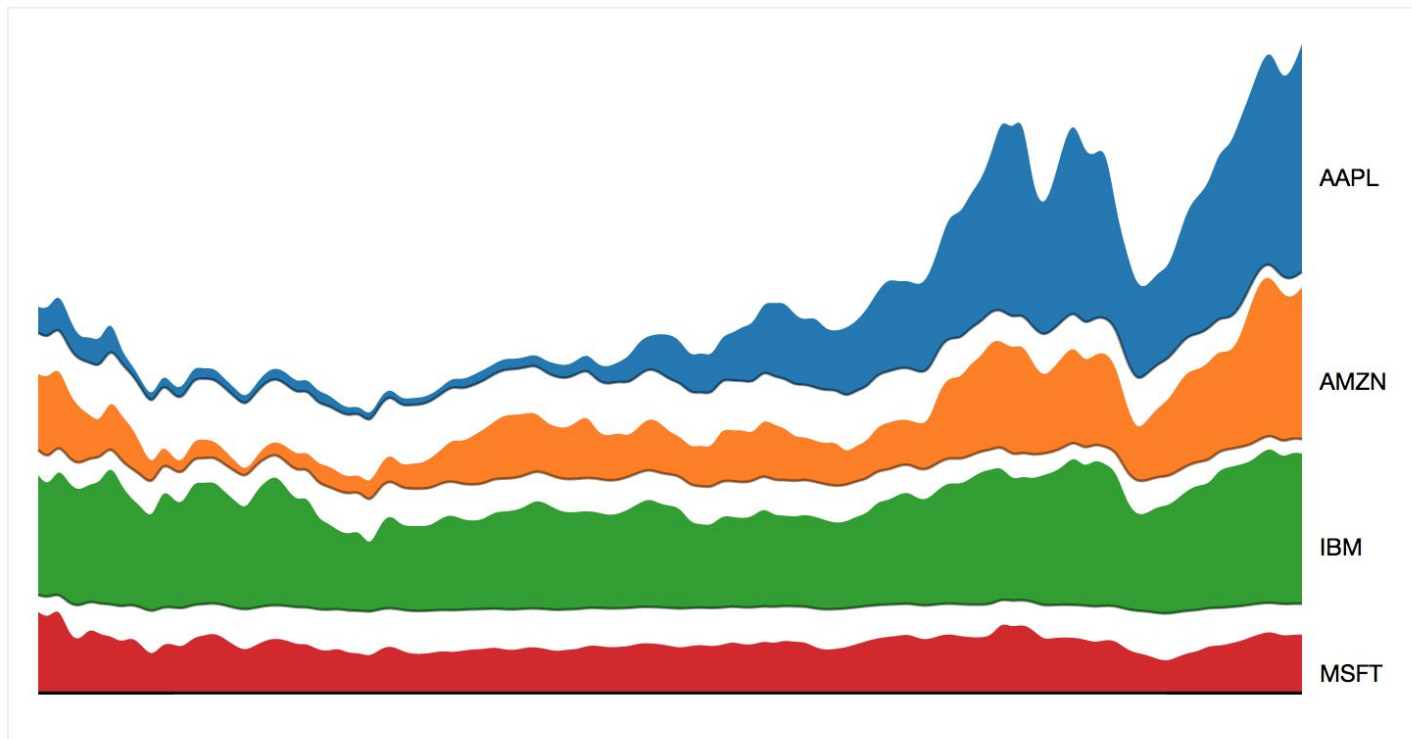
See the [D3 4.0 API Reference](#).

See the [Changes in D3 4.0](#).

See the [D3 3.x API Reference](#).

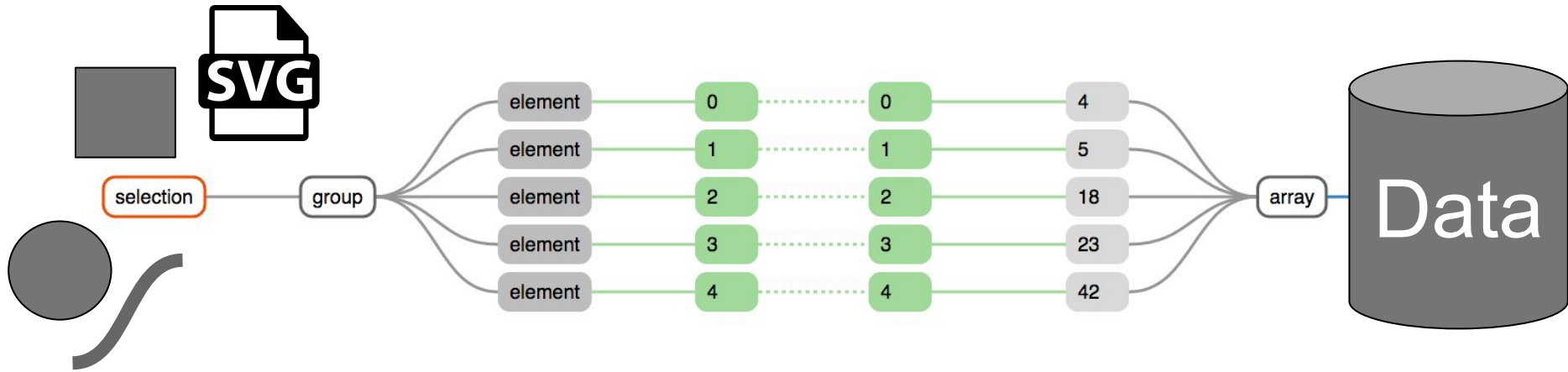
D3 Show Reel

<https://bl.ocks.org/mbostock/1256572>



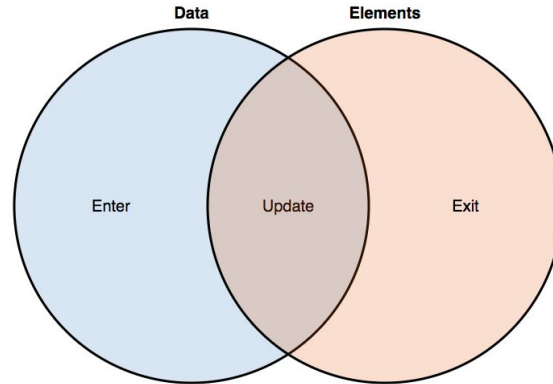
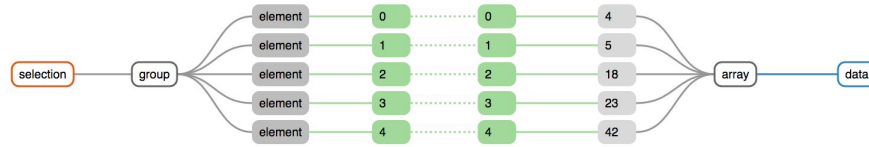
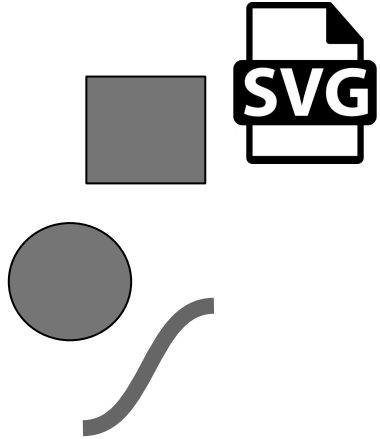
D3 Fundamentals

D3.js principe de base (data binding)



<https://bost.ocks.org/mike/selection/>

D3.js principe de base (data binding)



<https://bost.ocks.org/mike/selection/>

Data binding <http://kristw.github.io/d3-data-binding/>

D3.js principe de base (data binding)

.data([1,2,3,4])

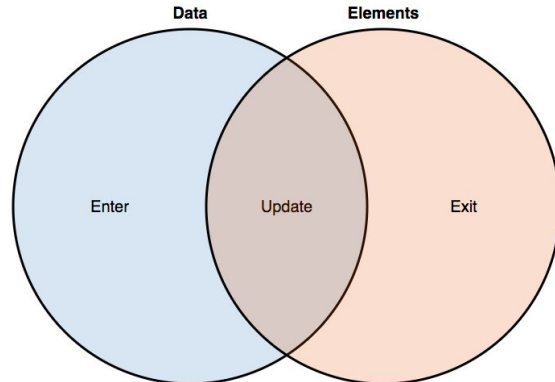
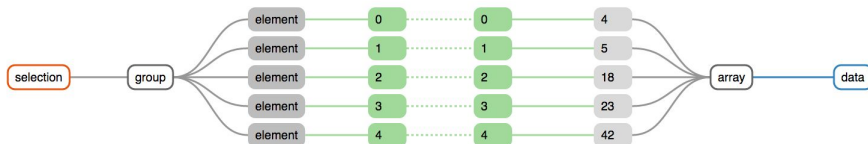
- Enter: [1,2,3,4]
- Update: [1,2,3,4]
- Exit: []

• **.data ([1,2,3,4,5,6])**

- Enter: [5,6]
- Update: [1,2,3,4,5,6]
- Exit: []

• **.data ([1,2,3])**

- Enter: []
- Update: ???
- Exit: [4,5,6]

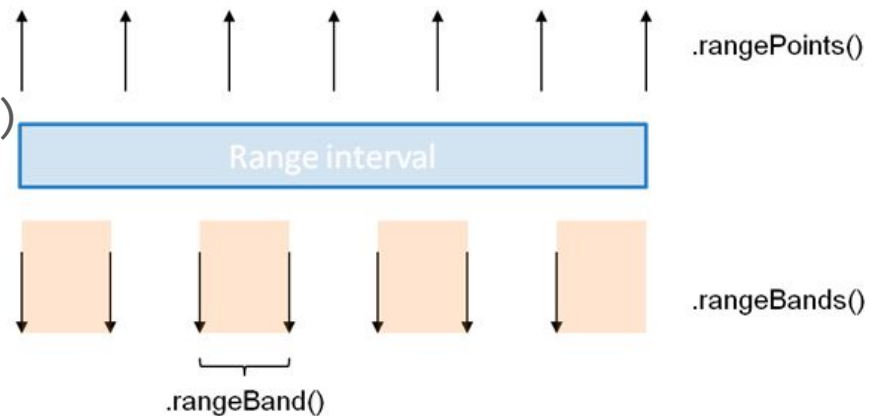
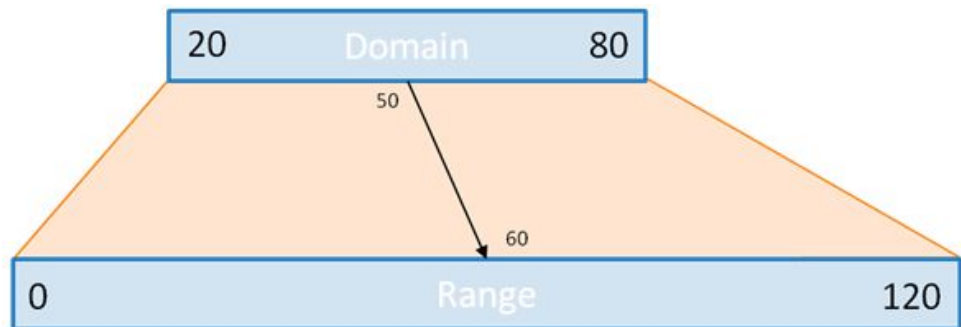


D3.js principe de base (scales)

```
var xscale = d3.scale.linear( )  
.domain( [min, max] )  
.range( [minOut, maxOut] )
```

```
group.attr("x", function(d,i) {  
  return xscale(d.size);  
})
```

```
var colorscale = d3.scale.category10( )  
.attr("fill",function(d,i) {  
  return colorscale(d.type)  
})
```



D3 v3 → D3 v4 (again!)

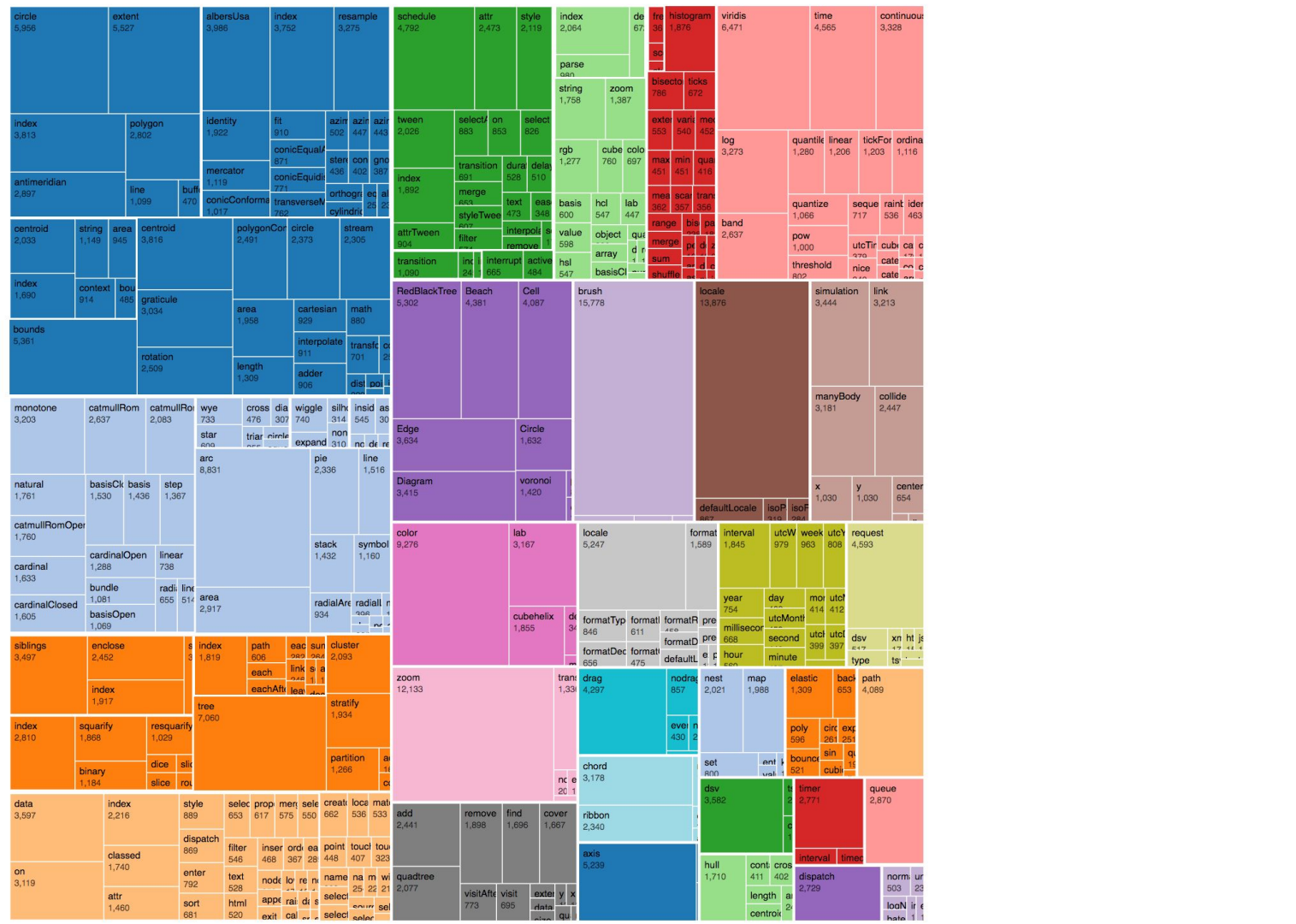
Ex: now using a flat name space

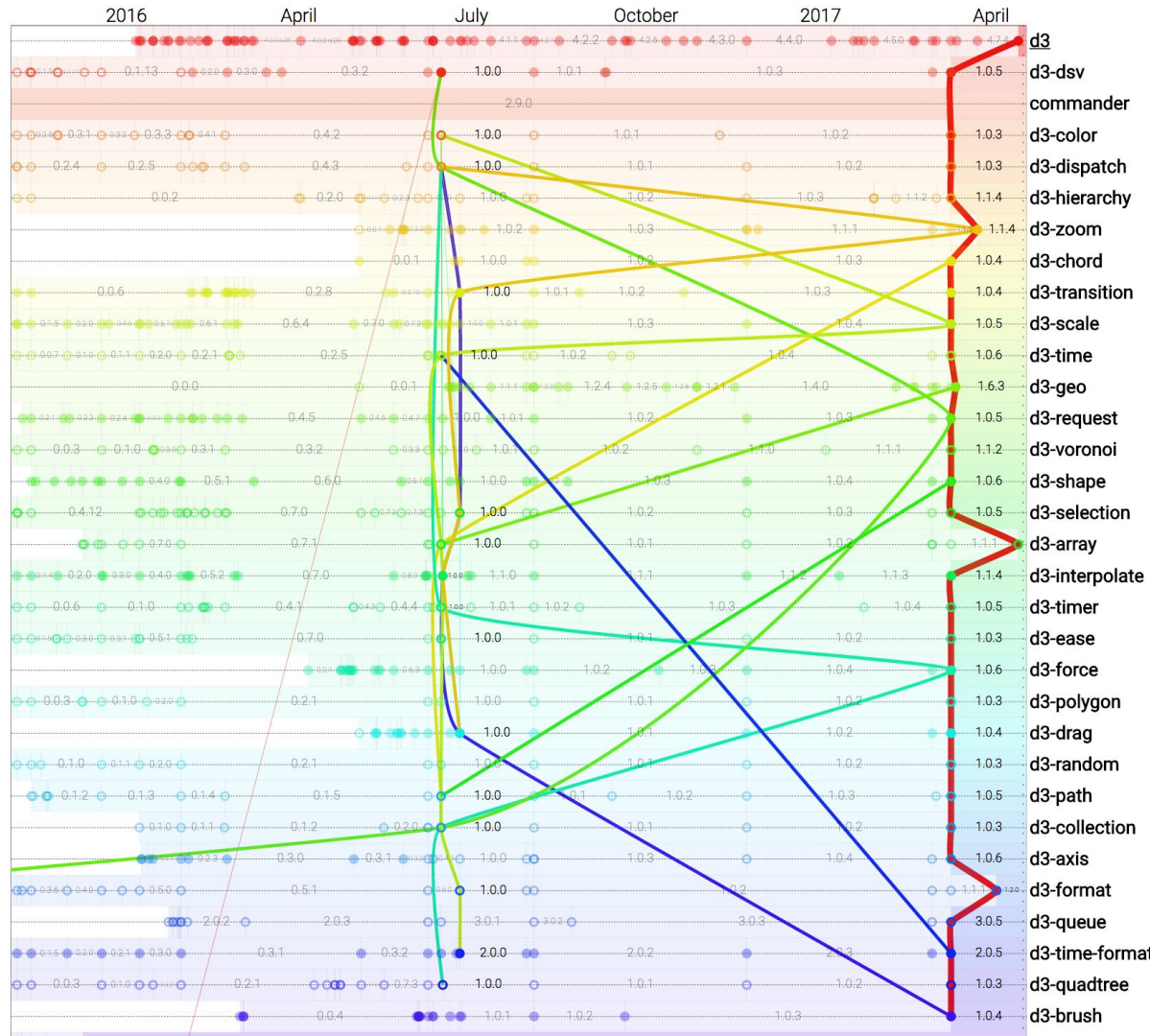
```
var x = d3.scale.linear().range([0, 500]).domain([0, data.length]);
```

```
var y = d3.scale.linear().range([0, 100]).domain([0, d3.max(data)]);
```

```
var x = d3.scaleLinear().range([0, 500]).domain([0, data.length]);
```

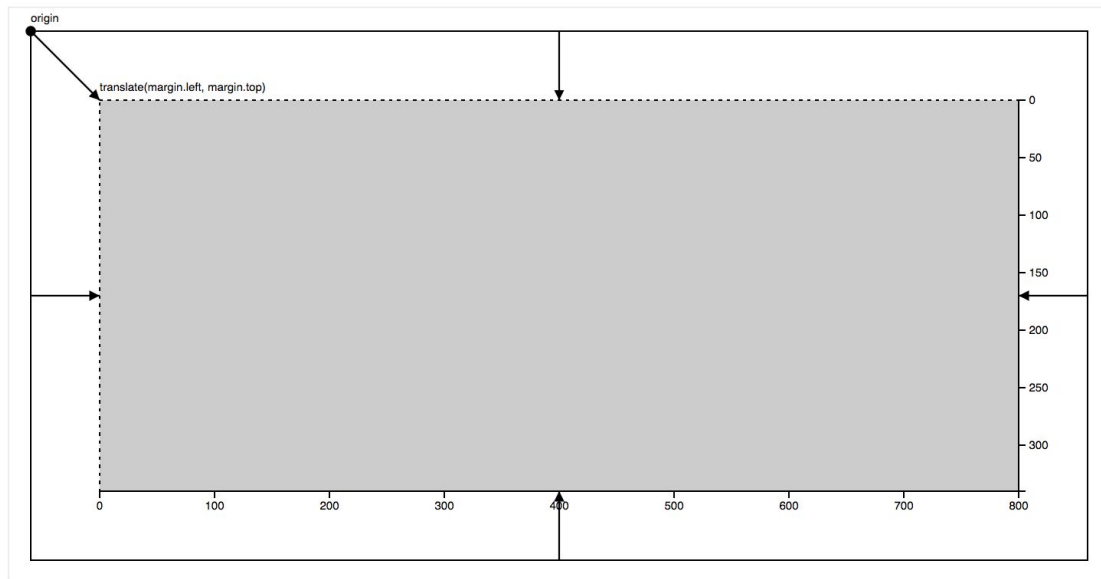
```
var y = d3.scaleLinear().range([0, 100]).domain([0, d3.max(data)]);
```





D3.js principe de base (Page layout)

Margin convention <https://bl.ocks.org/mbostock/3019563>



D3.js principe de base (DOM inspection)

<https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference>

The image shows a browser window displaying a D3.js visualization of a hierarchical tree structure. The visualization is a treemap where nodes are colored and sized based on their data. A context menu is open over a node, with options like "Look Up 'HierarchicalCluster'", "Copy", "Search Google for 'HierarchicalCluster'", "Print...", "Save to Zotero", "Inspect", "Speech", and "Add to iTunes as a Spoken Track". The DOM inspector at the bottom shows the selected node's structure, including its data and SVG elements.

```
<g transform="translate(415, 101)"></g>
<g transform="translate(310, 209)"></g>
<g transform="translate(310, 306)"></g>
<g transform="translate(336, 209)"></g>
<g transform="translate(336, 274)"></g>
<g transform="translate(336, 338)">
  <rect id="flare.util.Sort" width="38" height="63"
    fill="rgb(201, 202, 78)"></rect>
  <clipPath id="clip-flare.util.Sort"></clipPath>
  <text clip-path="url(#clip-flare.util.Sort)">
    <title>flare.util.Sort
      6,887</title>
  </g>
  <g transform="translate(375, 209)"></g>
  <g transform="translate(420, 209)"></g>
  <g transform="translate(375, 264)"></g>
  <g transform="translate(375, 333)"></g>
  <g transform="translate(411, 264)"></g>
  <g transform="translate(411, 310)"></g>
  <g transform="translate(411, 356)"></g>
  <n transform="translate(465, 0)"></n>
```

```

  <_data_: co
    > data: {name: "Sort", size: 6887, id: "flare.util.Sort"}
    > depth: 2
    > height: 0
    > parent: co {data: {_, height: 2, depth: 1, parent: co, children:
      > value: 1
      > x0: 336
      > x1: 374
      > y0: 338
      > y1: 401
      > __proto__: Object
    }
    > __proto__: SVGRectElement
  > SVGRectElement
  > SVGGeometryElement
  > SVGGraphicsElement
```

<https://bl.ocks.org/mbostock/4063582>

D3.js principe de base (Transitions)

<https://bost.ocks.org/mike/transition/>

D3.selectAll(...).transition() Explained

```
○ start
○ d3.selectAll("circle")
● .transition()
  .attr("delay", func(d,i){return 1000*i})
  .attr("duration", func(d,i){return 1000*(i+1)})
  .attr("cy", func(d,i){return 30*(i+1)})
○ end
```

selectAll(...).transition() schedules *SEVERAL transitions
As explained in [Transitions Are per-Element and Exclusive](#), `selectAll(...).transition()` schedules 1 transition per selected element. This example schedules 7 transitions, one per circle. Each transition has its own *delay*, *duration*, and end value of the *cy* attribute. *delay* and *duration* allows to derive the start time and the end time of a transition.

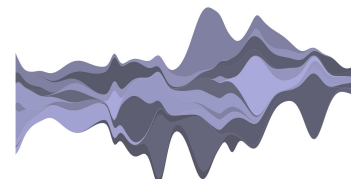
*In the D3 world, *scheduling* a transition means *defining* a transition, ie. setting its properties.

Circle Index	Start Time	End Time
1	0s	1s
2	1s	3s
3	2s	5s
4	3s	7s
5	4s	9s
6	5s	11s
7	6s	13s

<http://bl.ocks.org/Kcнарf/9e4813ba03ef34beac6e>

D3.js principe de base (Advanced)

Axes! (bar chart) <https://bost.ocks.org/mike/bar/3/>



Complex layouts

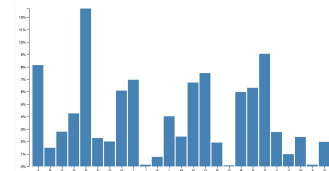
Streamgraph <https://bl.ocks.org/mbostock/4060954>

Treemap <https://bl.ocks.org/mbostock/4063582>



Transitions (show reel) <https://bl.ocks.org/mbostock/1256572>

Geo maps <https://bost.ocks.org/mike/example/>



Utilisation avec canvas (bar chart) <http://blockbuilder.org/mbostock/946ddf8a32b3b660ffd8>

Basic D3.js how-to

Hello World // 3 little circles

<https://bost.ocks.org/mike/circles/>

Introduction à D3.js (Vadim Ogievetsky, co-créateur de D3.js) :

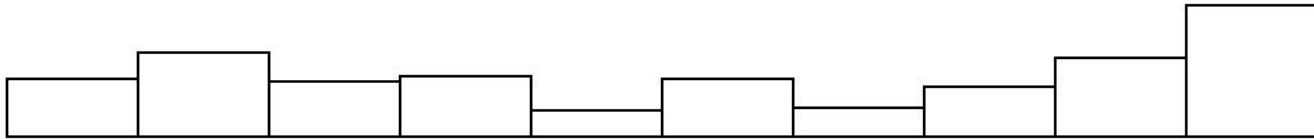
<http://vadim.ogievetsky.com/IntroD3/#1>

Ressources en ligne par Lynn Cherny

<https://github.com/arnicas/d3-faq>

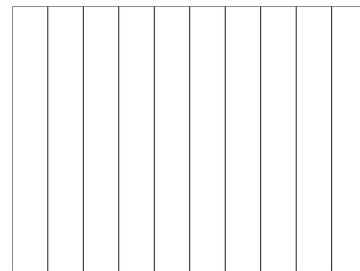
<https://github.com/arnicas/interactive-vis-course>

Let's make a bar chart

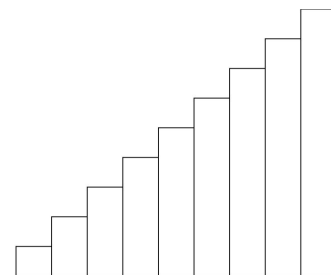
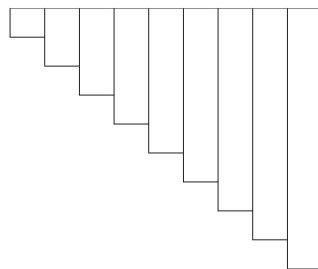
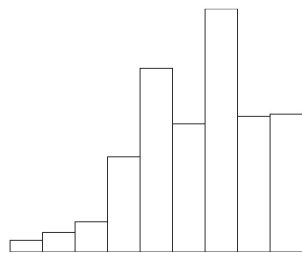


Visual mapping of a bar chart

Layout: Vertical grid



Rectangle

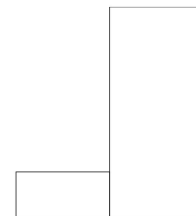
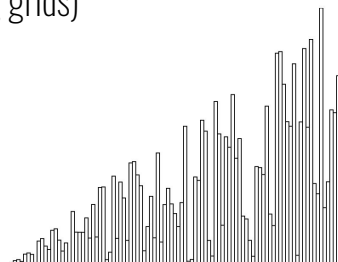


Height

Position

<http://blockbuilder.org/romsson/00733297a7d852d377301d55ed8a4226> (using grids)

!!! Proportion/aspect ratio



Pure SVG bar chart

```
<svg width="960" height="500">
  <rect y="178" x="50" width="50" height="22"></rect>
  <rect y="168" x="100" width="50" height="32"></rect>
  <rect y="179" x="150" width="50" height="21"></rect>
  <rect y="177" x="200" width="50" height="23"></rect>
  <rect y="190" x="250" width="50" height="10"></rect>
  <rect y="178" x="300" width="50" height="22"></rect>
  <rect y="189" x="350" width="50" height="11"></rect>
  <rect y="181" x="400" width="50" height="19"></rect>
  <rect y="170" x="450" width="50" height="30"></rect>
  <rect y="150" x="500" width="50" height="50"></rect>
</svg>
```



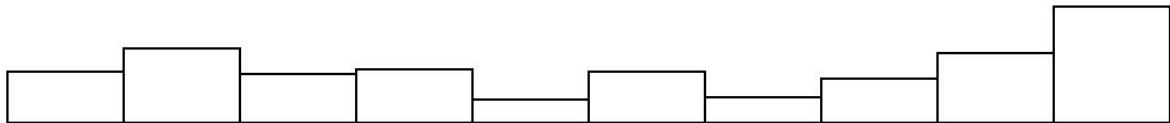
<http://blockbuilder.org/romsson/36b1cdc599e8f341a33892f143cf087f>

D3 bar chart without data binding

```
var svg = d3.select("body").append("svg")
  .attr("width", 960)
  .attr("height", 500)

var data = [22, 32, 21, 23, 10, 22, 11, 19, 30, 50];

data.map(function(d, i) {
  svg.append("rect")
    .attr("y", 200 - d)
    .attr("x", 50 + (i * 5)
    .attr("width", 50)
    .attr("height", d);
});;
```

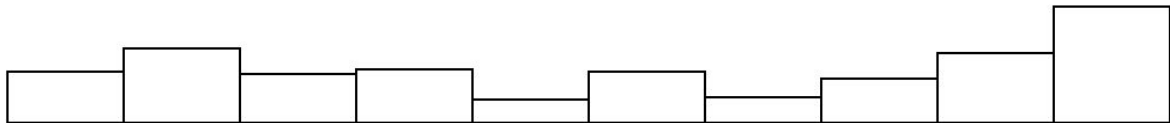


D3 bar chart *with* data binding

```
var svg = d3.select("body").append("svg")
  .attr("width", 960)
  .attr("height", 500)

var data = [22, 32, 21, 23, 10, 22, 11, 19, 30, 50];

data.map(function(d, i) {
  svg.append("rect")
    .attr("y", 200 - d)
    .attr("x", 50 + (i * 5)
    .attr("width", 50)
    .attr("height", d);
});;
```



D3 bar chart *with* data binding and scales *from dataset*

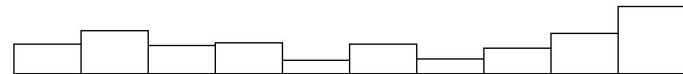
```
// No domain (yet!)
var x = d3.scale.linear().range([0, 500]);
var y = d3.scale.linear().range([0, 100])

var g = svg.append("g").attr("transform", "translate(100, 0)");

d3.dsv(";", "dataset.csv", function(data) {

  // Domain after data have been loaded!
  x.domain([0, data.length]);

  // Accessor for value
  y.domain([0, d3.max(data, function(d) { return d.value; })]);
```

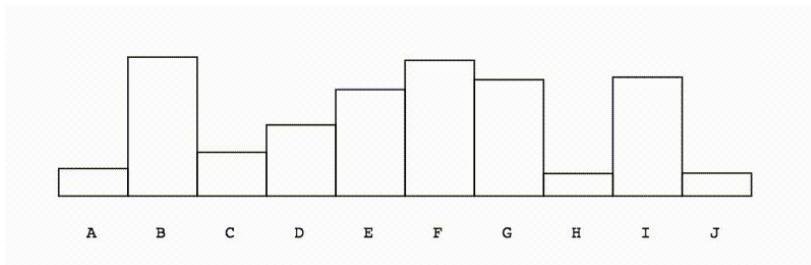


Where is the dataset???????

<http://blockbuilder.org/romsson/66505e5ae61b0908ee857ecf54e508d9>

D3 bar chart *with* animation

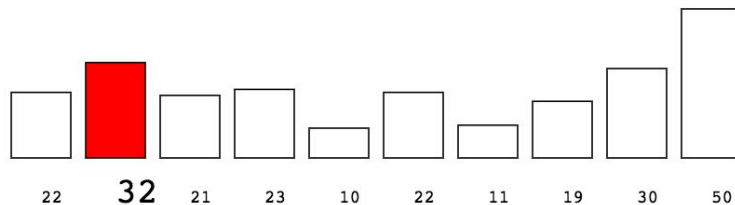
```
setInterval(function(d) {  
  
    data.forEach(function(d) {  
        d.value = Math.random();  
    });  
  
    y.domain([0, d3.max(data, function(d) { return d.value; })]);  
  
    g.selectAll("rect").data(data).transition()  
        .attr("y", function(d) { return 170 - y(d.value); })  
        .attr("height", function(d) { return  
}, 500)
```



<http://blockbuilder.org/romsson/98c007fd3367cd0665ebd15299c3bfdc>

D3 bar chart *with* interaction

```
g.selectAll("rect").data(data).enter().append("rect")
  .attr("x", function(d, i) { return x(i); })
  .attr("y", function(d) { return 170 - y(d); })
  .attr("height", function(d) { return y(d); })
  .attr("width", 500 / data.length - 10 )
  .on("mouseover", function(d) {
    d3.select(this).style("fill", "red");
    // Should be using Ids instead of values
    d3.selectAll("text").filter(function(e) {
      return d === e;
    })
    .style("font-size", 24);
  })
  .on("mouseout", function(d) {
    d3.select(this).transition().duration(500).style("fill", "white");
    // Should be using Ids instead of values
    d3.selectAll("text").filter(function(e) {
      return d === e;
    })
    .transition().duration(500)
    .style("font-size", 12);
  });
```



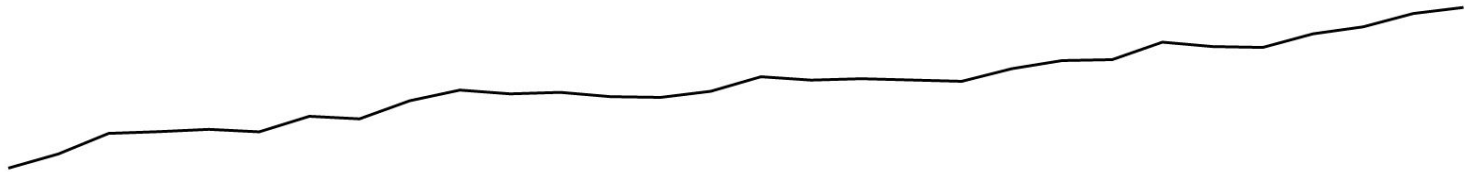
<http://blockbuilder.org/romsson/c607174fc6fd5c7bfaa804d46ca70eab>

D3 bar chart *responsive* to web page

```
var width = window.innerWidth,  
    height = window.innerHeight;  
  
d3.select(window).on('resize', resize);  
  
function resize() {  
  
    // Update  
  
}
```

No link because not working with blockbuilder (fixed width)!

Let's make a line chart



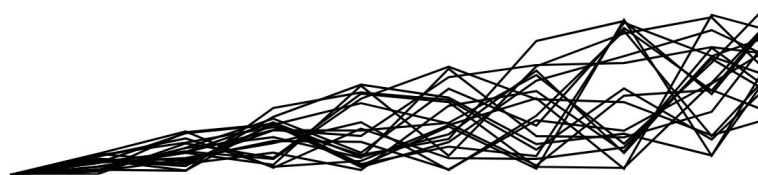
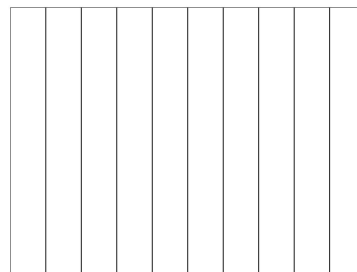
Visual mapping of a line chart

Layout: Vertical grid

Mark: Line

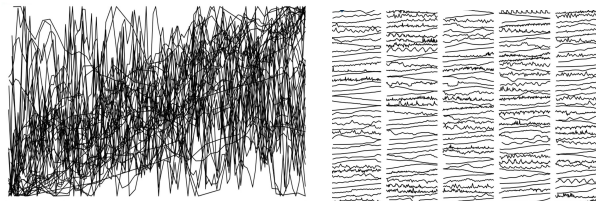
Property: Height

Property: Position



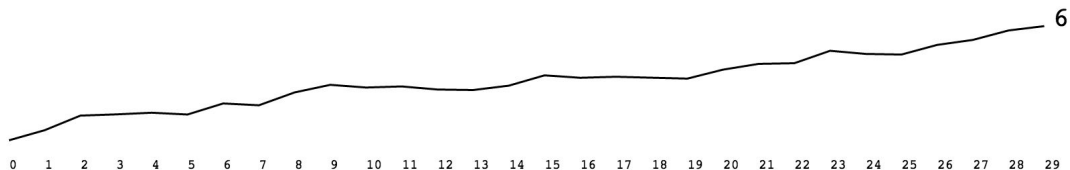
<http://blockbuilder.org/romsson/a801f6359447802c43b2f322885fbf67>

!!! Proportion/aspect ratio/number of elements



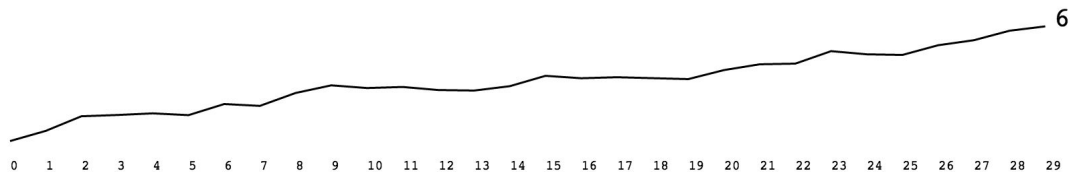
Simple line chart using SVG

```
<svg width="960" height="500">  
  <path class="line" d="M56,360L162,280L268,320L374,240L480,200L586,320L692,360"></path>  
  <text y="420" x="56" style="font-size: 10px; font-family: monospace;">Jan 16</text>  
  <text y="420" x="162" style="font-size: 10px; font-family: monospace;">Feb 16</text>  
  . . .  
</svg>
```



<http://blockbuilder.org/romsson/855207ac5fb5c170de59b9c69ea56012>

Simple line chart with d3js



<http://blockbuilder.org/romsson/855207ac5fb5c170de59b9c69ea56012>

Interactive line chart with d3js

Regular line chart

Dots for each data point

Vertical line

Time axis

