

Building web apps with D3.js

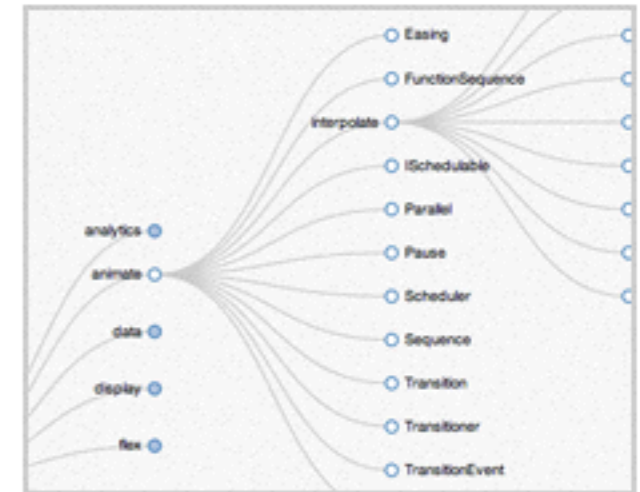
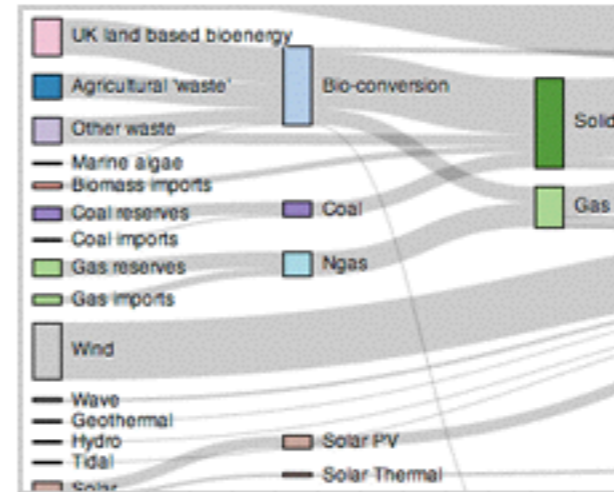
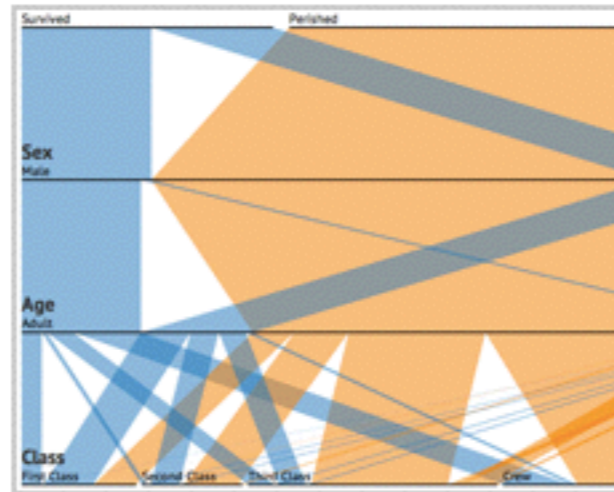
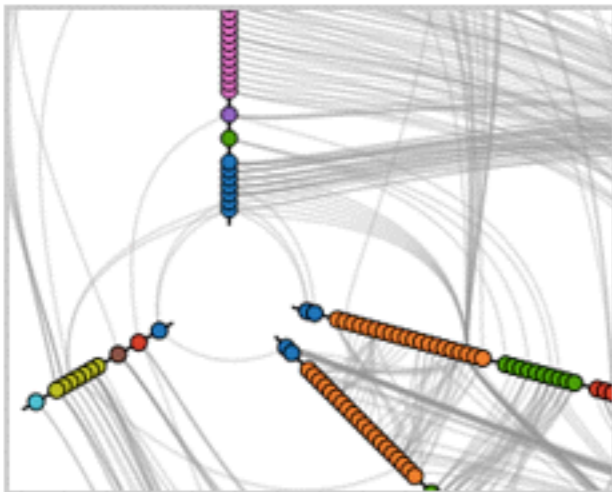
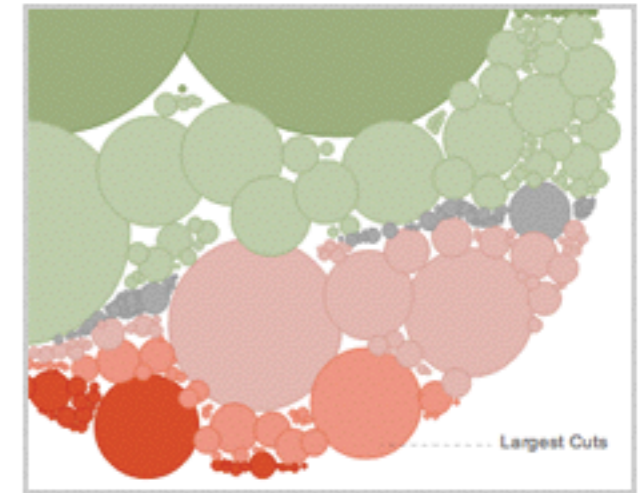
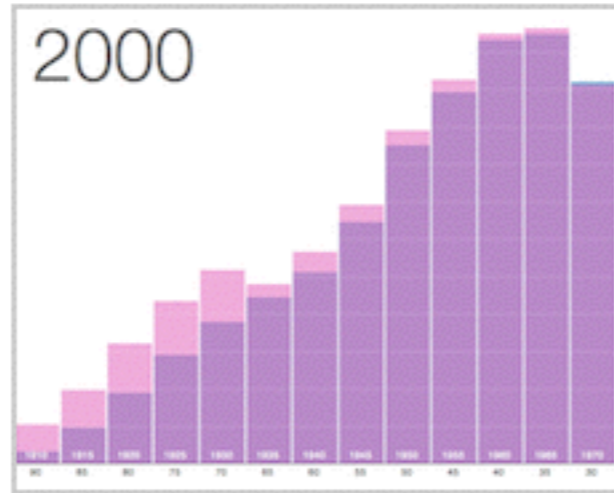
Nathan Vander Wilt
@natevw / n.exts.ch

Spoilers

- Why D3.js?
- Tips and tricks
- What to expect when building *web apps* with D3.js

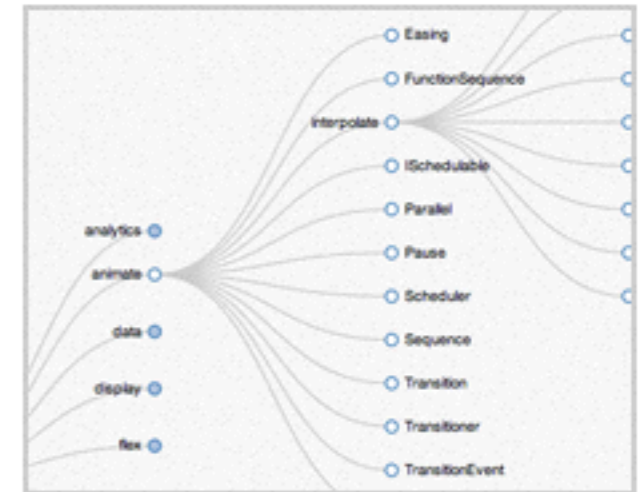
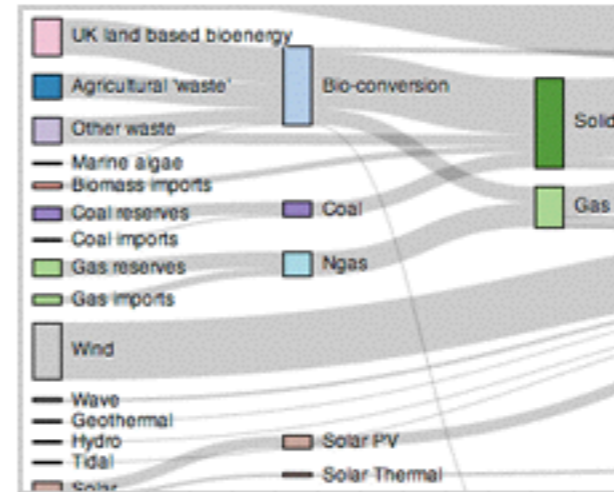
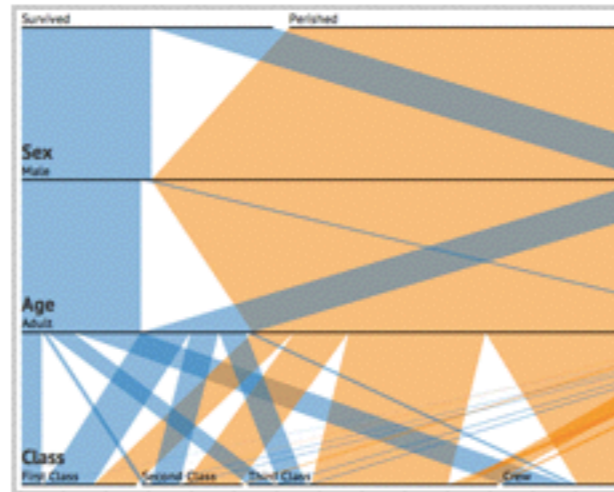
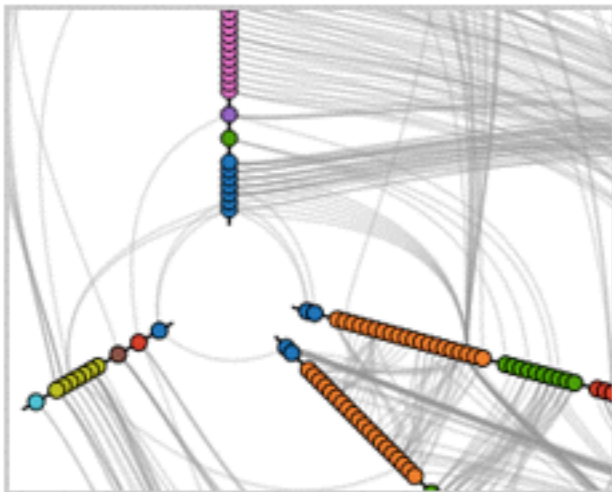
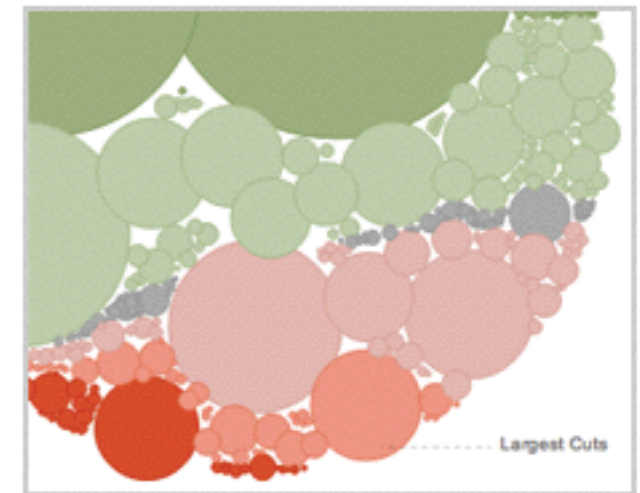
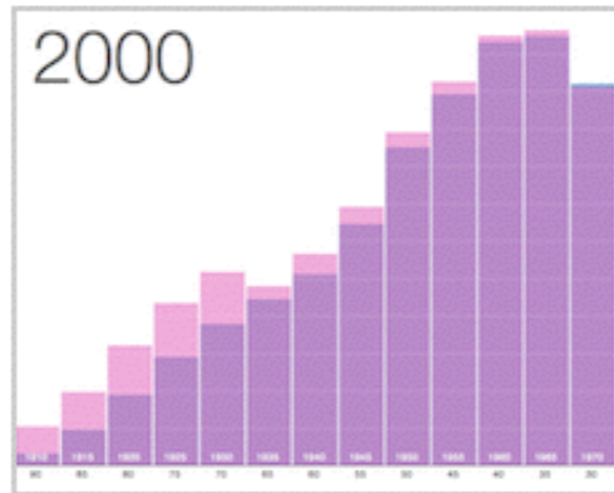
What is D3?

[JavaScript library by Mike Bostock et al.]



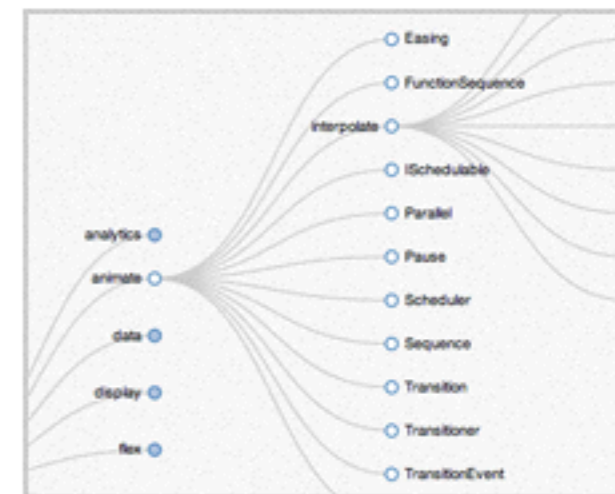
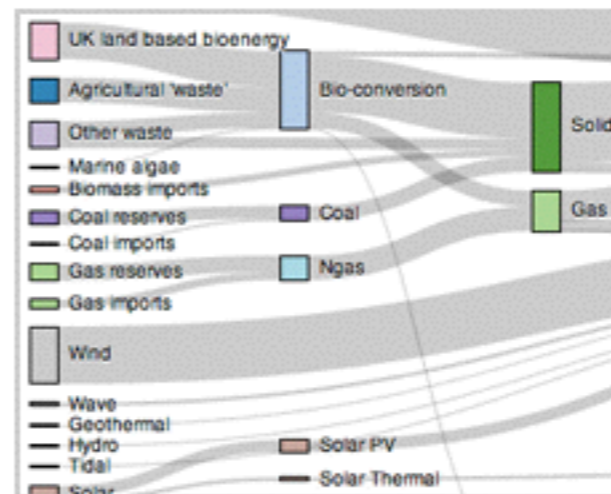
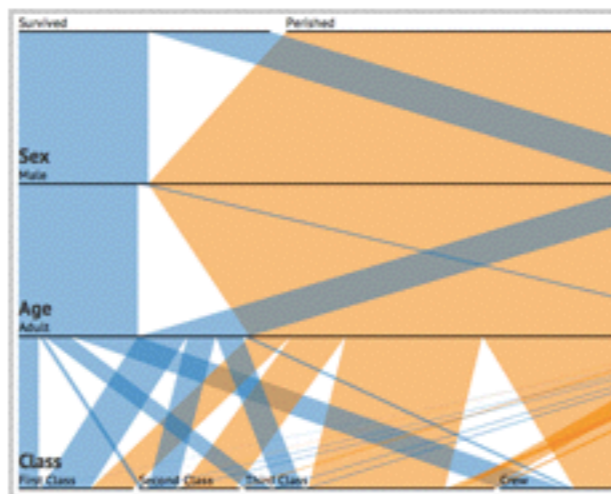
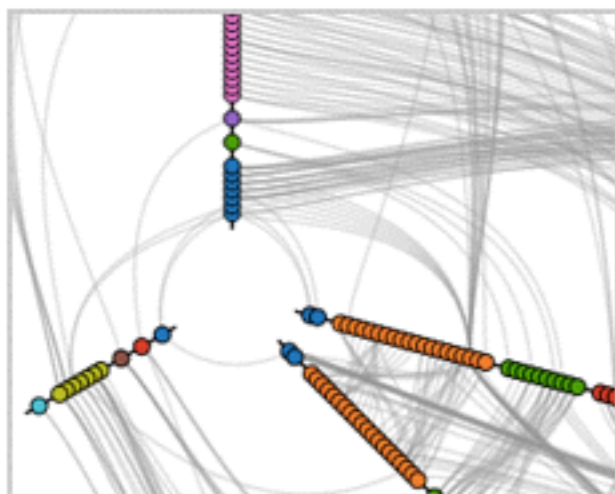
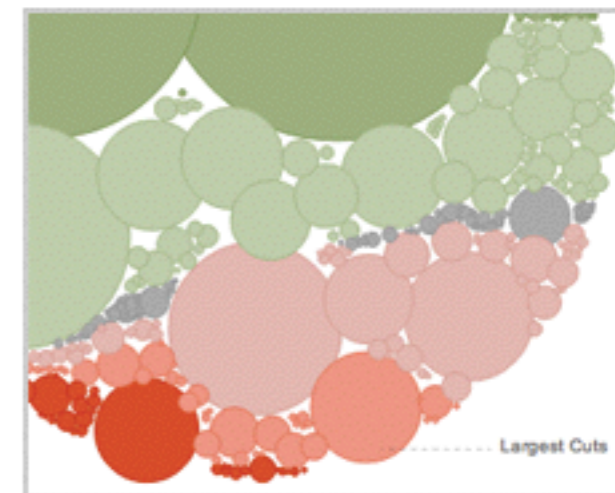
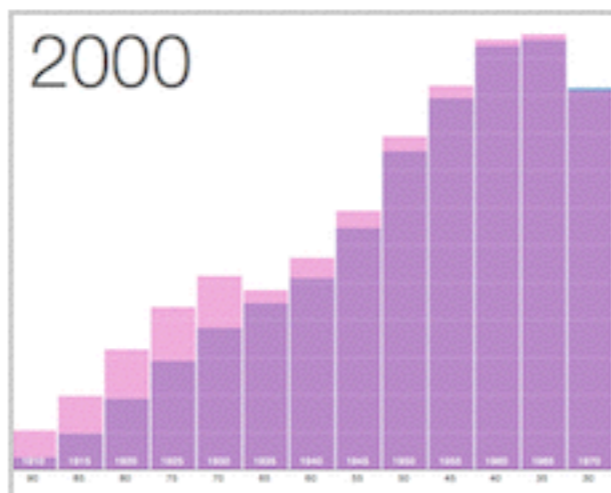
<http://d3js.org>

Data-Driven



<http://d3js.org>

Data-Driven Documents



<http://d3js.org>

D3 applies Data to DOMs

```
var arr = ["eggs", "bacon", "coffee"],
    sel = d3.selectAll("li").data(arr);

sel.append('span').text(function (d) {
    return d[0].toUpperCase()+d.slice(1);
});
```

D3 applies Data to DOMs

```
var arr = ["eggs", "bacon", "coffee"],  
    sel = d3.selectAll("li").data(arr);  
  
sel.append('span').text(function (d) {  
    return d[0].toUpperCase()+d.slice(1);  
});
```

```
> window.$ = d3.selectAll;
```


D3 applies Data to DOMs

```
var arr = ["eggs", "bacon", "coffee"],
    sel = d3.selectAll("li").data(arr);

sel.append('span').text(function (d) {
  return d[0].toUpperCase()+d.slice(1);
});
```

Why not web apps?

There are only two hard things in Computer Science: cache invalidation and naming things.

– Phil Karlton, via <http://martinfowler.com/bliki/TwoHardThings.html>

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- Beloved 1
- Eleven
- Flatland
- The Jacket
- Eleven Tenths

6 My clothes have failed me. I remember the green coat
 8 that I wore in fifth and sixth grades when you either danced
 like a champ or pressed yourself against a greasy wall, bitter
 as a penny toward the happy couples.
 9 When I needed a new jacket and my mother asked what
 11 kind I wanted, I described something like bikers wear: black
 leather and silver studs with enough belts to hold down a
 13 small town. We were in the kitchen, steam on the windows
 14 from her cooking. She listened so long while stirring dinner
 15 that I thought she understood for sure the kind I wanted.
 18 The next day when I got home from school, I discovered
 draped on my bedpost a jacket the color of day-old

- Interesting!
- Why is color important?
- no note
- something

Sample Print... Close

This is a test

He wanted a different jacket and the one his family could afford made him embarrassed.

Here is some typing. ↘	Student response #2	Type notes here...
Type notes here...		Type notes here...

Sync (+transform)

c.f. Message-passing vs. data synchronization
Anant Narayanan, RealtimeConf 2013

<https://vimeo.com/77352415>

Applying Data to DOM, pt. 2

```
<ul></ul>
```

```
<script>
```

```
var arr = ["eggs", "bacon", "coffee"];
```

```
updateDOM();
```

```
arr.pop(), arr[1] = "spinach";
```

```
updateDOM();
```

```
function updateDOM() {
```

```
    var sel = d3.select('ul').selectAll("li").data(arr);
```

```
    sel.enter().append('li');
```

```
    sel.exit().remove();
```

```
    sel.text(function (d) {
```

```
        return d[0].toUpperCase()+d.slice(1);
```

```
    });
```

```
}
```

```
</script>
```

Applying Data to DOM, pt. 2

```
<ul></ul>
```

```
<script>
```

```
var arr = ["eggs", "bacon", "coffee"];
```

```
updateDOM();
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    var sel = d3.select('ul').selectAll("li").data(arr);
```

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    sel.enter().append('li');
```

```
    sel.exit().remove();
```

```
    sel.text(function (d) {
```

```
        return d[0].toUpperCase()+d.slice(1);
```

```
    });
```

```
}
```

```
</script>
```


Magic Ink

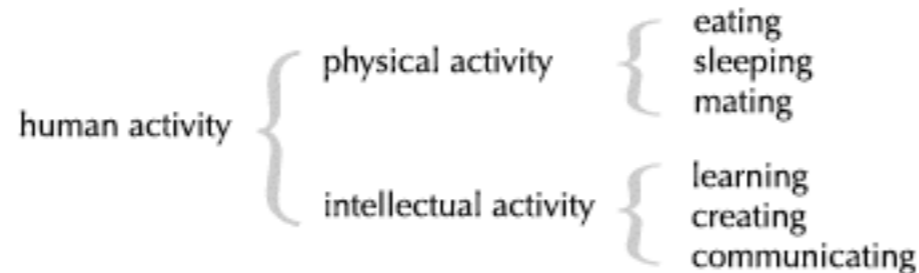
<http://worrydream.com/MagicInk/>

Three types of apps

What is software for?

Software is for people. To derive what software should do, we have to start with what *people* do.

Consider the following taxonomy of human activity:*



At the present, software can't do much for physical needs—if your avatar eats a sandwich, you remain hungry. But people are increasingly shifting their intellectual activities to the virtual world of the computer. This suggests three general reasons why a person will turn to software:

- To learn.
- To create.
- To communicate.

I propose that software can be classified according to which of these needs it serves. I will call these categories *information* software, *manipulation* software, and *communication* software.

http://worrydream.com/MagicInk/#what_is_software_for

Three types of apps

- Information
- Manipulation
- Communication (i.e. Read+Write)

http://worrydream.com/MagicInk/#what_is_software_for

Reducing Interaction

Manipulation software design is hard, but most software is information software.

– *Bret Victor, <http://worrydream.com/MagicInk/>*

"Most [of] software is information..."

context-sensitive graphical forms and research into obtaining and using environment and history, the clicking and dragging that characterizes modern information retrieval will be made to seem laughably archaic. But every condonation of "interactivity," from the annals of academia to the corporate buzzvocabulary, postpones this future.

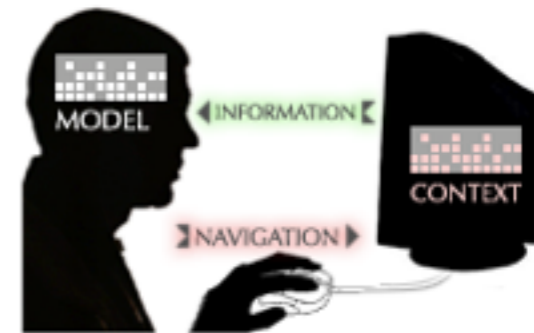
Reducing interaction

When the user is forced to interact, the software assumes the form of manipulation software. The external model, manipulated through navigation, is the software's model of the context. However, unlike genuine manipulation software, the user does not *care* about this model—it is merely a means to the end of seeing relevant information.

The designer's goal is to let the user adequately shape the context model with as little manipulation as possible. Assuming that graphic design, history, and the environment have been taken as far as they will go, there are a few techniques that can lessen the impact of the remaining interaction:

- **Graphical manipulation** domains present the context model in an appropriate, informative setting.
- **Relative navigation** lets the user *correct* the model, not *construct* it.
- **Tight feedback loops** let the user stop manipulating when she's close enough.

Graphical manipulation. Command-line systems are criticized for forcing the user to learn the computer's language. Modern GUIs may be easier to use, but they are not much different in that respect. The GUI language consists of a grammar of menus, buttons, and checkboxes, each labeled



D3 does "Manipulation" too

sel

```
.attr('contentEditable', true)  
.on('blur', function (d,i) {  
  arr[i] = this.value;  
});
```

Tips and tricks

"Templating"

"Templating"

```
var myForm = sel.append('form');  
myForm.append('label').attr('for',...);  
myForm.append('textarea').attr('name',...);  
myForm.append('p').text("Detailed instructions...");
```

```
var someLabel = myForm.append('label');  
someLabel.append('input').attr('type',  
"checkbox");  
someLabel.append('span').text("Some option");
```

"Templating"

```
var myForm = sel.append('form'),
    textLabel = myForm.append('label')...,
    textArea = myForm.append('textarea')...,
    details = myForm.append('p')...,
    checkboxLabel = myForm.append('label'),
        checkbox = checkboxLabel.append('input'),
        labelLabel = checkboxLabel.append('span')...;
// NAMING IS _also_ HARD!
```

`.call(function (sel) {...})`

```
sel.append('form').call(function (sel) {
  sel.append('label').attr('for',...);
  sel.append('textarea').attr('name',...);
  sel.append('p').text("Detailed instructions...");
  sel.append('label').call(function (sel) {
    sel.append('input').attr('type', "checkbox");
    sel.append('span').text("Some option");
  });
});
```

[and yes just consistently use sel/d/i/j by default]

"Towards Reusable Charts"

article by Mike Bostock

<http://bost.ocks.org/mike/chart/>

(c.f. <https://gist.github.com/natevw/5979039> for
a boilerplate-reducing helper)

Using "reusable charts"

```
var chart = sparkline().size([100,100]).colors(...);  
  
d3.select('#chart').datum(sensorLog).call(chart);  
  
// great for small multiples, too  
d3.selectAll('.chart').data(sensors).call(function (sel) {  
  sel.enter().append('svg').classed('chart', true);  
  sel.exit().remove();  
  sel.call(chart);  
});
```

Towards Reusable... "widgets"!

```
var form = survey().questions(...).allRequired(true);
```

```
d3.select('#survey').datum(initial).call(form);
```

```
/* one survey is bad enough
```

```
d3.selectAll('.survey').data(sensors).call(function (sel) {
```

```
  sel.enter().append('form').classed('survey', true);
```

```
  sel.exit().remove();
```

```
  sel.call(form);
```

```
});
```

```
*/
```

```
.on('input', ...)
```

[instead of 'change' or 'keyup' or whatever / not really D3.js specific...]

```
.select(function () { ... })
```

[for advanced DOM manipulation]

.select(function () { ... })

```
9     When I needed a new jacket and my mother asked what no not  
11 kind I wanted, I described something like bikers wear: black  
    leather and silver studs with enough belts to hold down a somet  
13 small town. We were in the kitchen, steam on the windows  
14 from her cooking. She listened so long while stirring dinner
```

`.select(function () { ... })`

```
d3.selectAll('.highlight').data(...)  
  .select(function (d) {  
    var el = document.createElement('span');  
    // ... crazy DOM manipulation here ...  
    return el;  
  }).classed('highlight', true);
```

d3.dispatch

"d3.dispatch provides a convenient lightweight mechanism for loosely-coupled components"

— <https://github.com/mbostock/d3/wiki/Internals#events>

d3.dispatch

```
function myController() {  
  var c = d3.dispatch('change', 'etc');  
  c.method = function () {  
    ...  
    c.change(42);  
  }  
  return c;  
}
```

```
var control = myController();  
control.on('change', function (val) {  
  
});
```

View model vs. stateful DOM

[decide, understand what you've chosen!]

What to expect

What to expect:

- The good
- The bad
- The merely ugly

View model vs. stateful DOM

Form controls (i.e. stateful elements) still feel a bit weird.

Repetition

```
d3.selectAll('input').data(...)  
  .property('value', function (d) { return d.field; })  
  .on('change', function (d) { d.field = this.value; });
```

Repetition

```
d3.selectAll('input').data(...)  
  .property('value', function (d) { return d.field; })  
  .on('change', function (d) { d.field = this.value; });
```

(positively: explicitness)

Cached/computed values

[d3.dispatch could *maybe* help]

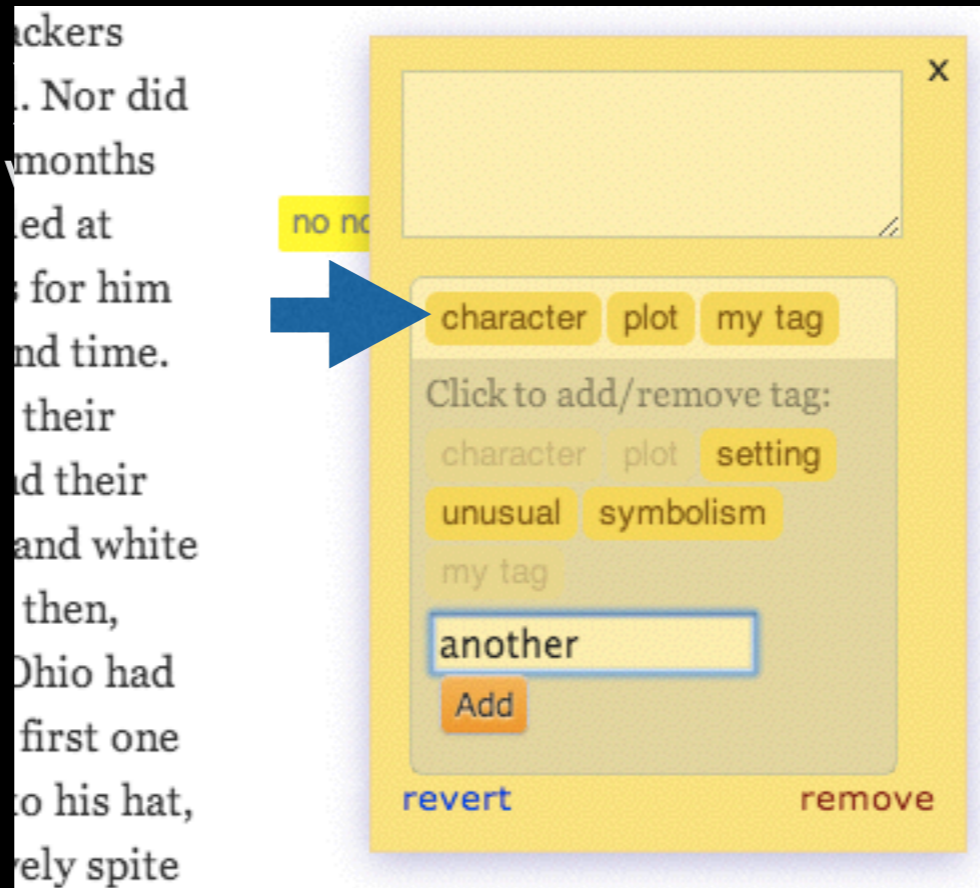
Accessing parent data

```
sel.selectAll('input').data(function (d) { return d.arr; })  
  ...  
  .append('button').text("Del").on('click', function (d,i,j) {  
    // now you have the item and indexes...but not container!  
  });
```

Accessing parent data

```
sel.selectAll('input').data(function (d) { return d.arr; })
```

```
...  
.append('button'  
  // now you have  
});
```



```
, function (d,i,j) {  
  // but not container!
```

Accessing parent data

```
sel.selectAll('input').data(function (d) { return d.arr; })  
  ...  
  .append('button').text("Del").on('click', function (d,i,j) {  
    // now you have the item and indexes...but not container!  
  });
```

see: <https://github.com/mbostock/d3/issues/20>

The awesome

- Clean
- Focused
- Composable

Sensemaker — App

localhost:4000/app?set=test

10. Who is Myop? (Character Map) [go there](#) done

← select set Hello, alice! logout

Close

Beloved 1

Eleven

Flatland

The Jacket

Eleven Tenths

Sample

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Interesting!

Why is color important?

no note

something

Print... Close

Sample

This is a test

He wanted a different jacket and the one his family could afford made him embarrassed.

Here is some typing. ↵	Student response #2 ▾	Type notes here...
Type notes here...		Type notes here...

0 save(s) in progress

Thanks!

@natevw

<http://exts.ch>