

# Introduction to JavaScript

GW Libraries & Academic Innovation  
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# About Steve

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- Developed websites since 2011
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# About Dan

- Senior Software Developer for GW libraries
- Graduate student in GWSPH Health & Biomedical Data Science
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# Web basics

## HTML

- Structure

## CSS

- Styles

## JavaScript

- Functionality

```
<!DOCTYPE html>
<html lang="en">
  <head>
    <meta charset="utf-8" />
    <meta name="viewport" content="width=device-width, initial-scale=1" />

    <title>Hello world!</title>

    <!-- import the webpage's stylesheet -->
    <link rel="stylesheet" href="/style.css" />

    <!-- add styles directly to the HTML -->
    <style>
      body {
        font-family: sans-serif;
      }
    </style>

    <!-- import the webpage's javascript file -->
    <script src="/script.js" defer></script>

    <!-- add javascript directly to the HTML -->
    <script>
      console.log("Hello world!");
    </script>
  </head>
  <body>
    <!-- this is the start of content -->
    <h1>Hello World!</h1>
    <p>
      This starter gives you everything you need to start working on a new
      website, and nothing more.
    </p>
  </body>
</html>
```

# What can JavaScript do?

- User interaction: menu dropdowns, tabs, carousels
- Dynamically add content to page (Ajax)
- Data visualization (Plotly, D3.js)
- Applications (Instagram)
- Anything another programming language could do (Node.js)

# JavaScript syntax basics

- Whitespace mostly doesn't matter, except for readability
- Semicolons ; end statements/lines
- Brackets {} group statements
- Comments can be // Single line or  
/\*  
Multi-line  
\*/
- Use `console.log(SOMETHING);` to show values

# Data types

- Strings (text): `'a string has quotes around it'`
- Numbers: `1, -1`
- Boolean: `true, false`
- Arrays: `['a', 'list', 'of', 'other', 'values', true, 123]`
  - Get a specific value: `array[index]` (eg. `array[0] -> 'a'`)
- Objects: `{ 'key': 'value pairs', 'length': 2 }`
  - Get a specific value: `object[key]` (eg. `object['length'] -> 2`)
- Variables: **const** `varName = 1;`
  - Use **let** to reassign later (like in loops)
- Functions:
  - **function** `functionName(name) { return `Hello ${name}`; }`
  - Also arrow functions: `(name) => `Hello ${name}`;`

# Operators

- **Math:** `+`, `-`, `*`, `/`, `%`
  - `1 + 2 -> 3`
  - `'Hello' + 'world' -> 'Helloworld'`
  - `'1' + 2 -> '12'`
- **Logical:** `&&`, `||`
  - `true && false -> false`
  - `true || false -> true`
- **Equality:** `===`, `!==`, `==`, `!=`
  - `'1' === 1 -> false`
  - `'1' == 1 -> true`
  - `'1' !== 1 -> true`
  - `'1' != 1 -> false`

# Conditionals

```
if (some statement that results in true or false) {  
    // Do something if the condition is true  
} else if (another statement that is true or false) {  
    // Do something if the new condition is true  
} else {  
    // Do something if the all conditions are false  
}
```



# Array methods

```
const nums = [0, 1, 2, 3, 4, 5, 6, 7, 8, 9];
```

```
const double = nums.map((value) => value * 2);  
-> [0, 2, 4, 6, 8, 10, 12, 14, 16, 18]
```

```
const evens = nums.filter((value) => value % 2 === 0);  
-> [0, 2, 4, 6, 8]
```

```
const sum = nums.reduce((prev, value) => prev + value, 0);  
-> 45
```

# DOM/Events

```
const element = document.querySelector(CSS_SELECTOR);
```

```
OR document.querySelectorAll(CSS_SELECTOR);
```

```
element.addEventListener('click', (event) => {  
    // Do something when an event happens.  
});
```

# Build something

- Go to [glitch.com/~fanatical-wild-blinker](https://glitch.com/~fanatical-wild-blinker)
- Select “Remix your own” at bottom right
- Using Bulma for CSS

# A Basic Data Computation and Visualization Example



## Peek at Your Sequencing Data

Quickly generate data quality reports for FASTQ files. Your data never leaves the browser.

### Step 1: Choose files

Choose FASTQ files to analyze

Click here to select files

Browse

or use [sample FASTQ files](#)

### Step 2: Set Parameters

General Settings

#Reads to Analyze

5000

Min Read Length

15

bp

Min Base Quality

Q

15

?

Max Low Qual Bases

40

%

?

[More settings](#)

Fastp Parameters:

```
--reads_to_process 5000
--disable_adapter_trimming
--qualified_quality_phred 15
--unqualified_percent_limit 40
--length_required 15
```

### Step 3: Run!

Run analysis »

Enter sequence here:

AGCTCCTTAGGCATCAGGATCGNNNGTT

Compute

Reset

Nucleotide Frequency  
Visualization  
goes here!

# Things we need to do

- Lay out the page and its elements
- Make each button call a new JavaScript function
- Enhance our JavaScript function to:
  - Create a static ("canned") visualization
  - Calculate nucleotide frequencies
  - Pass the nucleotide frequencies to the visualization (so that it's no longer static)

# Where can we publish our page/site?

- Github Pages (free)
  - Example:  
[github.com/kerchner/NucDist](https://github.com/kerchner/NucDist) (view at [kerchner.github.io/NucDist](https://kerchner.github.io/NucDist))  
(started with [github.com/jekyll/minima](https://github.com/jekyll/minima) theme)
- Your web server
- Other ideas?



# Also check out...

- Tools/platforms
  - [observablehq.com](https://observablehq.com) - JavaScript computational notebooks
- JavaScript libraries for data visualization
  - [d3js.org](https://d3js.org) - Data visualization - also see [d3-graph-gallery.com](https://d3-graph-gallery.com)
  - [plotly.com/javascript](https://plotly.com/javascript)
  - [vega.github.io/vega-lite](https://vega.github.io/vega-lite)
- Python in JavaScript
  - Pyodide: [github.com/iodide-project/pyodide/](https://github.com/iodide-project/pyodide/)
- Bioinformatics tools in JavaScript
  - Aioli: [github.com/biowasm/aioli](https://github.com/biowasm/aioli)
- Code read example
  - [github.com/syntheticgio/watermarker](https://github.com/syntheticgio/watermarker)

# Resources

- Mozilla Developer Network: [developer.mozilla.org/en-US/docs/Web](https://developer.mozilla.org/en-US/docs/Web)
- Stack Overflow: [stackoverflow.com/questions](https://stackoverflow.com/questions)
- Try online: [glitch.com](https://glitch.com), [jsfiddle.net](https://jsfiddle.net), [codepen.io](https://codepen.io)
- Use 3rd party libraries without downloading: [jsdelivr.com](https://jsdelivr.com)
- Tutorials/videos:
  - [linkedin.com/learning/learning-the-javascript-language-2/learn-the-language-of-the-internet](https://linkedin.com/learning/learning-the-javascript-language-2/learn-the-language-of-the-internet)  
(and more on LinkedIn learning)
  - [js4ds.org/](https://js4ds.org/)

# Coding Consultations @ GW Libraries

[calendly.com/gwul-coding](https://calendly.com/gwul-coding)

- HTML/CSS/JavaScript
- Python
- R
- General coding questions

GWUL Coding

Before reserving an appointment, please see <http://go.gwu.edu/coding> to make sure your request is something we can help with.

<p><b>Zoom Coding Consultation - Other</b></p> <p>You may book up to two coding consultations per week. Before making an appointment, see <a href="http://go.gwu.edu/coding">http://go.gwu.edu/coding</a> to make sure your request is something we can help ...</p>	<p><b>In-Person Coding Consultation - Other</b></p> <p>You may book up to two coding consultations per week. Before making an appointment, see <a href="http://go.gwu.edu/coding">http://go.gwu.edu/coding</a> to make sure your request is something we can help ...</p>
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