

Web Programming

JavaScript Part III.

Outline

- Today
 - More Event-driven programming
 - More Manipulating the DOM
 - Some tricks
 - Lot's of exercises

Recap: assigning event handlers

A. In HTML

```
<div id="green_div" onclick="handle();"></div>
```

B. In JavaScript: using **on...**

```
let greenDiv = document.getElementById("green_div");  
greenDiv.onclick = handle;
```

C. In JavaScript: using **addEventListener**

```
let greenDiv = document.getElementById("green_div");  
greenDiv.addEventListener("click", handle);
```

Recap: event handlers with argument

To place string inside string, use single quotes.

A. In HTML

```
<div id="green_div" onclick="handle('blue');"></div>
```

B. In JavaScript: using **on...**

```
let greenDiv = document.getElementById("green_div");  
greenDiv.onclick = function(){ handle("hello");}
```

C. In JavaScript: using **addEventListener**

```
let greenDiv = document.getElementById("green_div");  
greenDiv.addEventListener("click", function(){ handle("hello");});
```

Recap: event handlers with this

A. In HTML

```
function handle(element){ element.style.color = "blue" }
```

```
<div id="green_div" onclick="handle(this);"></div>
```

B. In JavaScripts: using **on...** (and **C**)

```
let greenDiv = document.getElementById("green_div");  
greenDiv.onclick = handle;
```

```
function handle(){ this.style.color = "blue" }
```

Recap: this and argument

A. In HTML

```
function handle(element, color){ element.style.color = color}
```

```
<div id="green_div" onclick="handle(this, 'blue');"></div>
```

B. In JavaScripts: using **on...** (and **C**)

```
let greenDiv = document.getElementById("green_div");  
greenDiv.onclick = function(){ handle(this, "blue") }
```

Recap: run JS init function

A. In HTML no init function needed

```
<div id="green_div" onclick="handle();"></div>
```

B. In JavaScripts, use **window.onload**

```
function init(){  
    let greenDiv = document.getElementById("green_div");  
    greenDiv.onclick = handle;  
}  
window.onload = init;
```

Complete script will be executed once html is loaded.

C. In JavaScript, external

```
<script src="myfile.js" defer></script>
```

D. Place at the end of **<body>** (not recommended)

Recap: changing element content

A. Using `innerHTML`

```
let greenDiv = document.getElementById("green_div");  
greenDiv.innerHTML = "<p>Some text</p>";
```

B. Using `innerText` (for text only)

```
let greenDiv = document.getElementById("green_div");  
greenDiv.innerText = "text only";
```

C. Using `value` on form elements

```
let nameInput = document.getElementById("name-input");  
nameInput.value = "John Doe";
```


Recap: changing attributes

– Set attribute value

```
let myimg = document.getElementById("myimg");  
myimg.src = "images/new_image.png";
```

– Set style

```
let greenDiv = document.getElementById("green_div");  
greenDiv.style.backgroundColor = "green";
```

– Add/remove class

```
if (!greenDiv.classList.contains("border")) {  
    greenDiv.classList.add("border");  
}  
else {  
    greenDiv.classList.remove("border");  
}
```

Exercises #1



[github.com/dat310-spring20/course-info/tree/master/
exercises/js/more](https://github.com/dat310-spring20/course-info/tree/master/exercises/js/more)

Hint for Exercise #6

- Change the **style.display** or **style.visibility** property
- Remember the difference

```
CSS #mydiv {  
    style.display: none;  
}
```



```
CSS #mydiv {  
    visibility: hidden;  
}
```



DOM nodes

- Everything is a node
 - The document itself is a document node
 - All HTML elements are element nodes
 - All HTML attributes are attribute nodes
 - Text inside HTML elements are text nodes
 - Comments are comment nodes
- The **nodeType** property returns the type of the node

Traversing the DOM

- Finding child elements (excl. text and comment nodes)
 - **childElementCount** — number of child element an element has
 - **children** — child nodes of an element
 - **hasChildNodes()** — if an element has any child nodes
- Finding child elements (incl. text and comment nodes)
 - **childNodes** — child nodes of an element
 - The number of elements can be accessed using **childNodes.length**
- Finding parent element
 - **parentNode** — reference to the parent of the element

Example

🔗 examples/js/more/dom_traverse.html

```
function traverse(element, level) {
  let line = "";
  // indentation
  for (let i = 0; i < level; i++) {
    line += "  ";
  }
  // print element
  line += element.nodeName;
  console.log(line);

  // recursively traverse child elements
  if (element.hasChildNodes()) {
    for (let i = 0; i < element.children.length; i++) {
      traverse(element.children[i], level + 1);
    }
  }
}

window.onload = function () {
  traverse(document.body, 0);
}
```

Traversing the DOM (2)

- Some convenience properties
 - **firstChild** — first child node of an element
 - **firstElementChild** — first child element of an element
 - **lastChild** — last child node of an element
 - **lastElementChild** — last child element of an element
 - **nextSibling** — next node at the same node tree level
 - **nextElementSibling** — next element at the same node tree level
 - **previousSibling** — previous node at the same node tree level
 - **previousElementSibling** — previous element at the same node tree level
 - **parentElement** — parent element node of an element

Exercises #2, #2b



[github.com/dat310-spring20/course-info/tree/master/
exercises/js/more](https://github.com/dat310-spring20/course-info/tree/master/exercises/js/more)

Hint for Exercise #2

- Change the **style.display** or **style.visibility** property
- Remember the difference

```
CSS #mydiv {  
    style.display: none;  
}
```



```
CSS #mydiv {  
    visibility: hidden;  
}
```



Creating HTML elements

- To add a new HTML element

- Create the element

```
let h2 = document.createElement("h2");
```

- Set the content of the element

```
h2.innerHTML = "Article header";
```

- or

```
let text = document.createTextNode("Article header");  
h2.appendChild(text);
```

- Append it to an existing element (otherwise it won't appear on the page)

```
let art1 = document.getElementById("article1");  
art1.appendChild(h2);
```

Inserting new HTML element

- **appendChild()** adds new element after the last child element of the parent
- **insertBefore()** inserts before a specified child node

```
let newItem = document.createElement("li");
newItem.innerHTML = "Water";
// get the parent element
let list = document.getElementById("mylist");
// insert before the first child
list.insertBefore(newItem, list.children[0]);
```

Removing or replacing HTML elements

- To remove or replace a HTML element
 - You must know the parent of the element
 - If you identified the element, you can use the **parentNode** property to find its parent

- **removeChild()** — removes a given child element

```
let art1 = document.getElementById("article1");  
art1.parentNode.removeChild(art1);
```

- **replaceChild()** — replaces a given child element

```
let art1 = document.getElementById("article1");  
let art2 = document.createElement("article");  
art1.parentNode.replaceChild(art2, art1);
```

Example

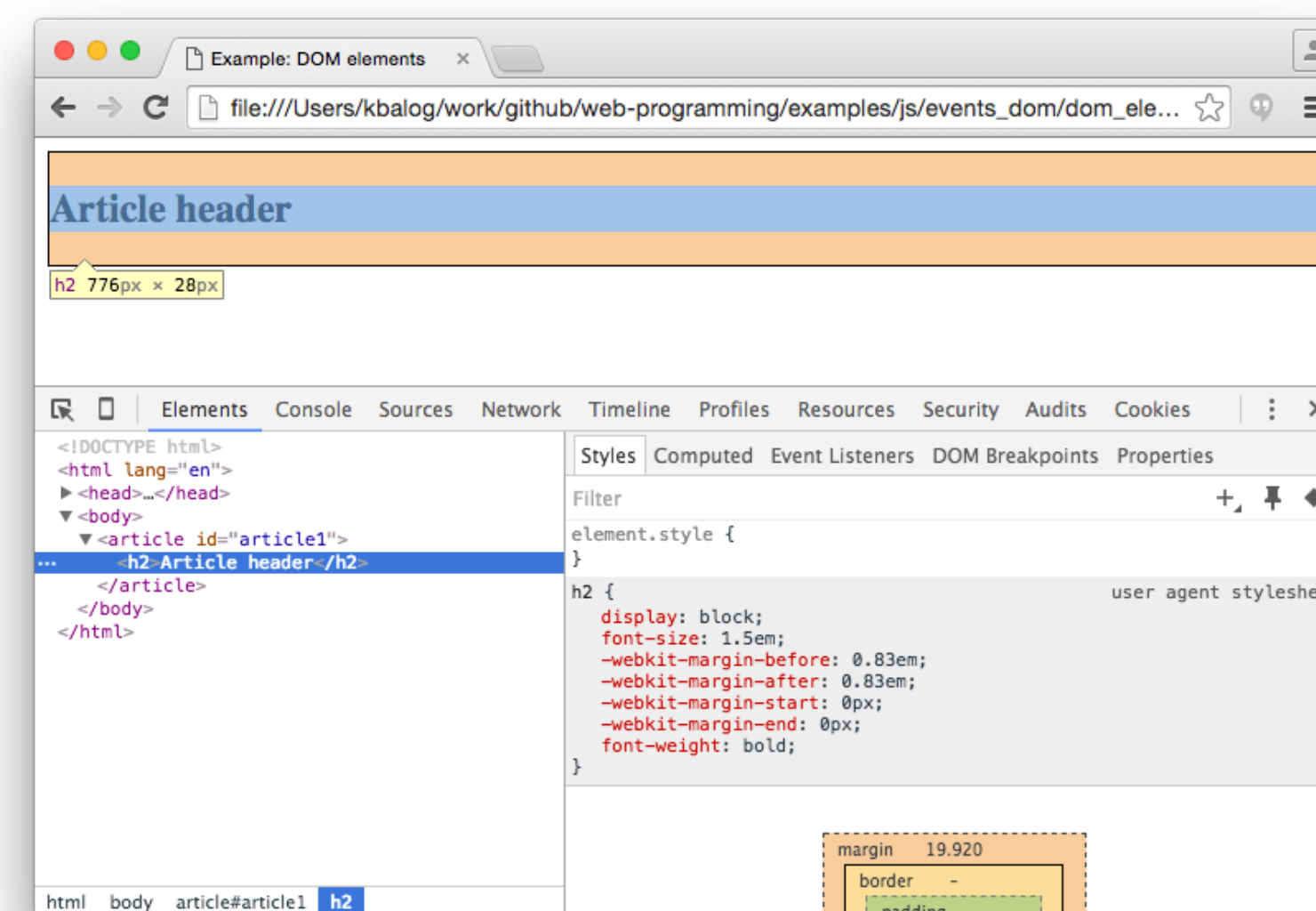
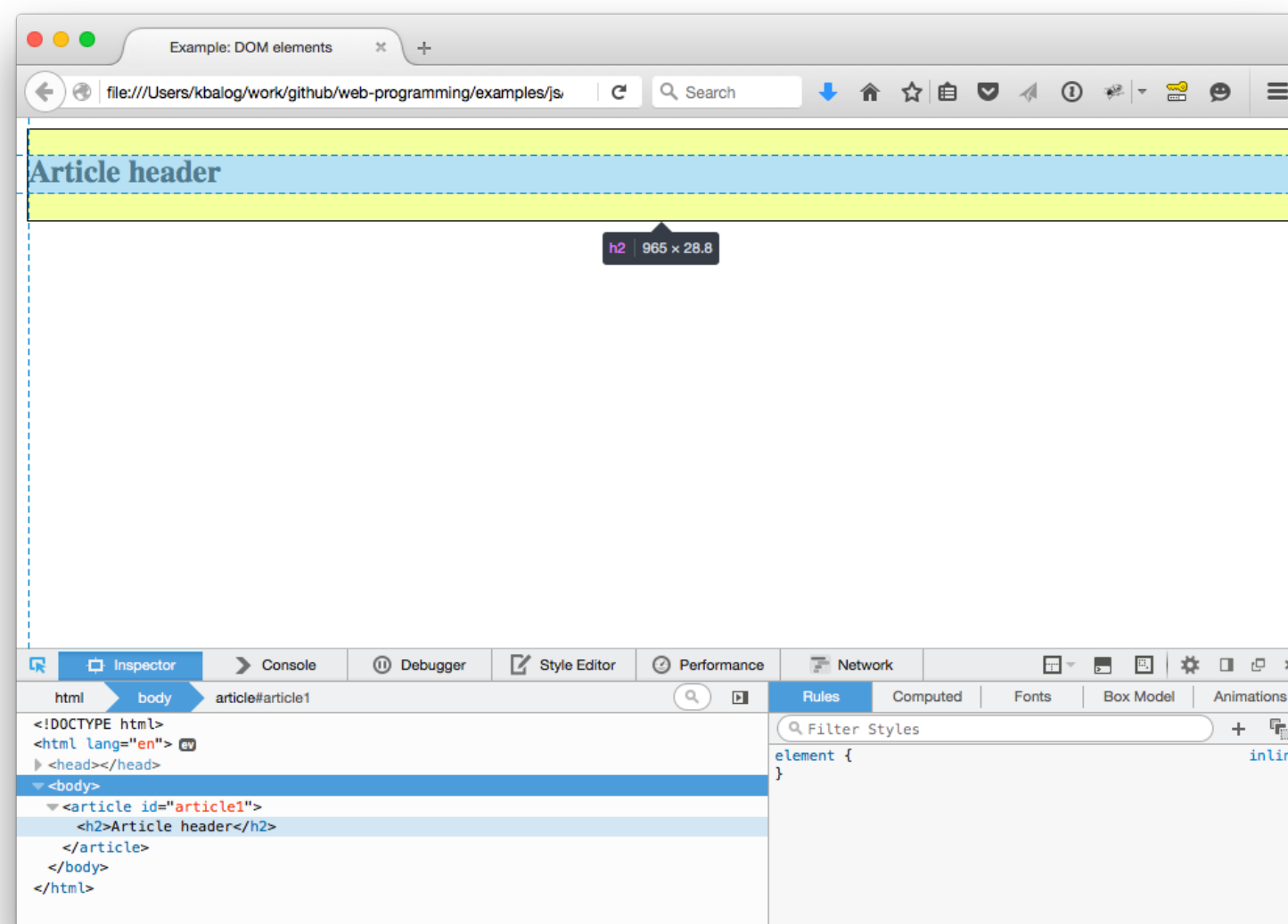
🔗 examples/js/more/dom_elements.html

```
<script>
  function addArticleHeader() {
    // create a new heading
    let h2 = document.createElement("h2");
    // set the content of the new element
    h2.innerHTML = "Article header";
    // identify parent element
    let art1 = document.getElementById("article1");
    // append to parent element
    art1.appendChild(h2);
  }
</script>
```

```
<body>
  <article id="article1"></article>
</body>
```

Dev hint

- When using JS to change the DOM, use the browser's web inspector tool to see the modified HTML source
- Viewing the page source will only show the initial HTML



Exercise #3, (#3b)



[github.com/dat310-spring20/course-info/tree/master/
exercises/js/more](https://github.com/dat310-spring20/course-info/tree/master/exercises/js/more)

JS tricks

- Array iteration
- Query selectors
- Arrow functions

Array iteration

- Use **for** with index

```
for (let i = 0; i < arr.length; i++) {  
    console.log(arr[i]);  
}
```

- Use **for of**

```
for (let el of arr) {  
    console.log(el);  
}
```

- Use **forEach(function...)**

```
arr.forEach(function(element, index){  
    console.log(element);  
});
```

Query selectors

- Previous methods use id, tagName or class:

```
// get one element using its id  
let element = document.getElementById("mydiv");  
  
// get all elements with given tag  
let array = document.getElementsByTagName("div");  
  
// get all elements with given class  
let array = document.getElementsByClassName("nolog");
```

querySelector

– document.querySelector(“css-selector”)

- find first element that matches a css selector

```
// get one element using its id  
let element = document.querySelector("#mydiv");  
  
// get first element with given tag  
let element = document.querySelector("div");  
  
// get first element with given class  
let element = document.querySelector(".nolog");  
  
// get first matched by complex selector  
let element = document.querySelector("#mydiv .nolog+div");
```

querySelectorAll

- **document.querySelectorAll("css-selector")**
 - find **all** elements that matches a css selector

```
// get all divs  
let array = document.querySelectorAll("div");  
  
// get all divs with class nolog  
let array = document.querySelectorAll("div.nolog");  
  
// get all divs without class nolog  
let array = document.querySelectorAll("div:not(.nolog)");
```

querySelector/querySelectorAll

– `element.querySelectorAll("css-selector")`

- find **all** elements that matches a css selector among descendants of an element

```
// get all divs inside this  
let array = this.querySelectorAll("div");
```

Arrow functions

- Shorter anonymous functions

```
// get all elements with given tag  
let divs = document.getElementsByTagName("div");  
divs.forEach(function(element){  
    console.log(element);  
});  
  
// using arrow function  
divs.forEach((element)=>{ console.log(element) });
```

Arrow functions

- But they do not have own **this**

```
let mydiv = document.getElementById("mydiv");  
mydiv.onclick = function(){  
    // this refers to the mydiv  
    this.style.backgroundColor = "blue";  
}  
  
mydiv.onclick = ()=>{  
    // this refers to the global object  
    this.style.backgroundColor = "blue";  
}
```

Avoid using **this** inside arrow function.

https://www.w3schools.com/js/js_arrow_function.asp

Example

🔗 examples/js/more/event_listener.html

```
<script>
  function init() {
    document.querySelectorAll("div").forEach(
      (element) => {element.addEventListener("click", showAlert)}
    );
    document.querySelectorAll("div:not(.nolog)").forEach(
      (element) => {element.addEventListener("click", log)}
    );
    window.onload = init;
  }
</script>
```

```
<body>
  <div></div>
  <div class="nolog"></div>
  <div></div>
  <div class="nolog"></div>
  <div></div>
</body>
```


setTimeout()

- Use **setTimeout** to schedule the execute a function (once)

```
function hello(){  
    console.log("hello");  
}  
  
// say hello after one second  
setTimeout(hello, 1000);
```

- Use **setInterval** to schedule execution regularly

```
// say hello every one second. Save the timer.  
let timer = setInterval(hello, 1000);  
  
... // do other stuff  
  
// stop saying hello  
clearInterval(timer);
```

Always clear your timers!

setTimeout with argument

- Pass function argument to **setTimeout** or **setInterval**

```
function makeBlue(element){  
    element.style.backgroundColor = "blue";  
}  
  
let mydiv = document.getElementById("mydiv");  
setTimeout(makeBlue, 1000, mydiv);
```

setTimeout with this

- Function passed to **setTimeout** is executed with **this** set to global scope!

```
function Dog(name){  
  this.name = name;  
  this.info = function(){ console.log(this.name); }  
  this.bark = ()=>{ console.log(this.name); }  
}
```

```
let mydog = new Dog("Tiffy");
```

```
// this does not work  
setTimeout(mydog.info, 1000);
```

```
// this does work since arrow function has no own scope  
setTimeout(mydog.bark, 1000);
```

Avoid **this** or use arrow function!

- [Read this stackoverflow answer](#)

Exercises #4



[github.com/dat310-spring20/course-info/tree/master/](https://github.com/dat310-spring20/course-info/tree/master/exercises/js/more)
exercises/js/more

Exercises #5-7



[github.com/dat310-spring20/course-info/tree/master/
exercises/js/more](https://github.com/dat310-spring20/course-info/tree/master/exercises/js/more)

References

- W3C JavaScript and HTML DOM reference
<http://www.w3schools.com/jsref/default.asp>
- W3C JS School
<http://www.w3schools.com/js/default.asp>
- Mozilla JavaScript reference
<https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference>