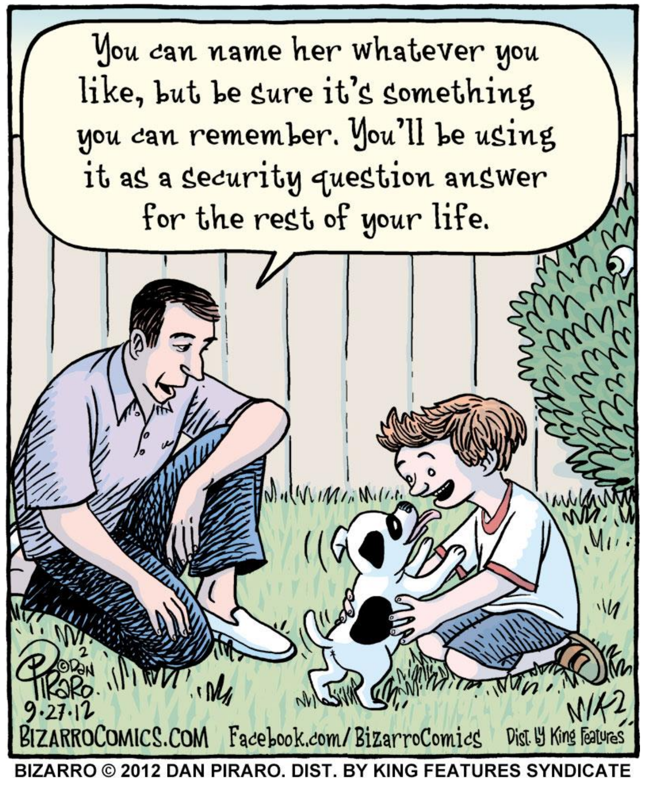
# CSE 337

LECTURE 10: EVENTS


You can name her whatever you like, but be sure it's something you can remember. You'll be using it as a security question answer for the rest of your life.
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## Selecting groups of DOM objects

- methods in document and other DOM objects (* = HTML5):

| **name** | **description** |
|---|---|
| getElementsByTagName | returns array of descendents with the given tag, such as "div" |
| getElementsByName | returns array of descendents with the given name attribute (mostly useful for accessing form controls) |
| querySelector * | returns the first element that would be matched by the given CSS selector string |
| querySelectorAll * | returns an array of all elements that would be matched by the given CSS selector string |

## Getting all elements of a certain type

highlight all paragraphs in the document:

```
var allParas = document.querySelectorAll("p");
for (var i = 0; i < allParas.length; i++) {
  allParas[i].style.backgroundColor = "yellow";
}
```
JS

```
<body>
  <p>This is the first paragraph</p>
  <p>This is the second paragraph</p>
  <p>You get the idea...</p>
</body>
```
HTML

## Complex selectors

highlight all paragraphs inside of the section with ID "address":

```
// document.getElementById("address").getElementsByTagName("p")
var addrParas = document.querySelectorAll("#address p");
for (var i = 0; i < addrParas.length; i++) {
  addrParas[i].style.backgroundColor = "yellow";
}                                                                   JS
```

```
<p>This won't be returned!</p>
<div id="address">
  <p>1234 Street</p>
  <p>Atlanta, GA</p>
</div>                                                            HTML
```

## Common querySelectorAll issues

- many students forget to write . or # in front of a class or id

```
// get all buttons with a class of "control"
~~var gameButtons = document.querySelectorAll("control");~~
var gameButtons = document.querySelectorAll(".control");                JS
```

- querySelectorAll returns an array, not a single element; must loop over the results (document.querySelector returns just the first element that matches, if that's what you want)

```
// set all buttons with a class of "control" to have red text
~~document.querySelectorAll(".gamebutton").style.color = "red";~~
var gameButtons = document.querySelector(".gamebutton");
for (var i = 0; i < gameButtons.length; i++) {
  gameButtons[i].style.color = "red";
}
```

Q: Can I still select a group of elements using querySelectorAll even if my CSS file doesn't have any style rule for that same group? (A: Yes!)

## JavaScript events

| | | | | | | |
|---|---|---|---|---|---|---|
| abort | blur | change | click | dblclick | error | focus |
| keydown | keypress | keyup | load | mousedown | mousemove | mouseout |
| mouseover | mouseup | reset | resize | select | submit | unload |

- the `click` event (`onclick`) is just one of many events that can be handled

## The event object

```
function name(event) {
  // an event handler function ...
}                                                    JS
```

- Event handlers can accept an optional parameter to represent the event that is occurring. Event objects have the following properties / methods:

| **property name** | **description** |
|---|---|
| type | what kind of event, such as "click" or "mousedown" |
| target | the element on which the event occurred |
| timeStamp | when the event occurred |

## Mouse events

| | |
|---|---|
| click | user presses/releases mouse button on the element |
| dblclick | user presses/releases mouse button twice on the element |
| mousedown | user presses down mouse button on the element |
| mouseup | user releases mouse button on the element |

clicking

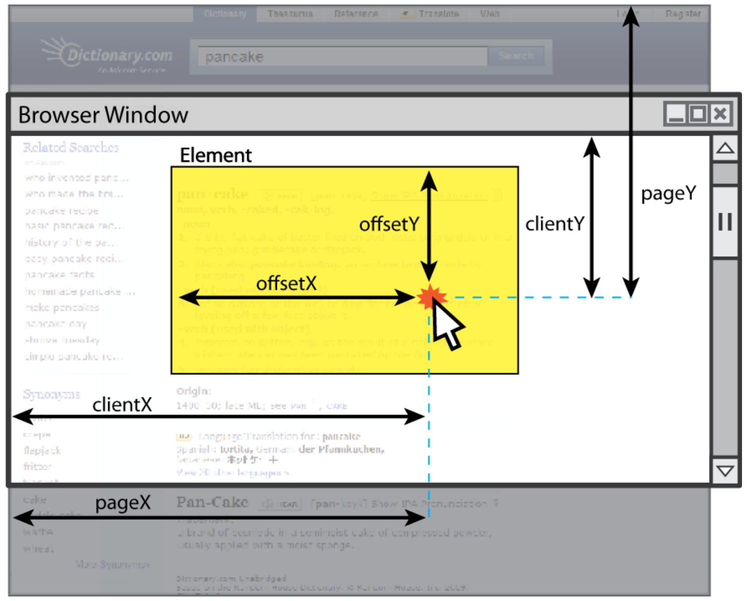
| | |
|---|---|
| mouseover | mouse cursor enters the element's box |
| mouseout | mouse cursor exits the element's box |
| mousemove | mouse cursor moves around within the element's box |

movement

## Mouse event objects

The `event` passed to a mouse handler has these properties:

| **property/method** | **description** |
|---|---|
| clientX<br>clientY | coordinates in *browser window* |
| screenX<br>screenY | coordinates in *screen* |
| offsetX<br>offsetY | coordinates in *element* (non-standard) |
| button | integer representing which button was pressed (0=Left, 1=Middle, 2=Right) |



# Mouse event example

```html
<pre id="target">Move the mouse over me!</pre>
```
HTML

```js
window.onload = function() {
  var target = document.getElementById("target");
  target.onmousemove = target.onmousedown = showCoords;
};

function showCoords(event) {
  document.getElementById("target").innerHTML =
    + "screen : (" + event.screenX + ", " + event.screenY + ")\n"
    + "client : (" + event.clientX + ", " + event.clientY + ")\n"
    + "button : "  + event.button;
}
```
JS

```
screen : (333, 782)
client : (222, 460)
button : 0
```
output

## The keyword this

```
this.fieldName                     // access field
this.fieldName = value;            // modify field

this.methodName(parameters);       // call method                  JS
```

- all JavaScript code actually runs inside of an object
- by default, code runs in the global `window` object (so `this` === `window`)
    - all global variables and functions you declare become part of `window`
- the `this` keyword refers to the current object

# Event handler binding

```
window.onload = function() {
  document.getElementById("textbox").onmouseout = booyah;
  document.getElementById("submit").onclick = booyah;
                               // bound to submit button here
};

function booyah() { // booyah knows what object it was called on
  this.value = "booyah";
}
```

JS

output

- event handlers attached unobtrusively are **bound** to the element
- inside the handler, that element becomes `this`

# Fixing redundant code with this

```
<input id="huey"  type="radio" name="ducks" value="Huey"  /> Huey
<input id="dewey" type="radio" name="ducks" value="Dewey" /> Dewey
<input id="louie" type="radio" name="ducks" value="Louie" /> Louie     HTML
```

```
function processDucks() {
~~  if (document.getElementById("huey").checked) {~~
~~    alert("Huey is checked!");~~
~~  } else if (document.getElementById("dewey").checked) {~~
~~    alert("Dewey is checked!");~~
~~  } else {~~
~~    alert("Louie is checked!");~~
~~  }~~
  alert(this.value + " is checked!");
}                                                                    JS
```

```
○ Huey ○ Dewey ○ Louie                                           output
```

- if the same function is assigned to multiple elements, each gets its own bound copy

## Removing a node from the page

```
function slideClick() {
  var bullet = document.getElementById("removeme");
  bullet.parentNode.removeChild(bullet);
}                                                                    JS
```

- odd idiom: *obj*.parentNode.remove(*obj*);

# Multiple window.onload listeners

```
~~window.onload = function;~~
window.addEventListener("load", function);                JS
```

- it is considered bad form to directly assign to `window.onload`
- multiple .js files could be linked to the same page, and if they all need to run code when the page loads, their `window.onload` statements will override each other
- by calling `window.addEventListener` instead, all of them can run their code when the page is loaded

## Getting/setting CSS classes

```
function highlightField() {
  // turn text yellow and make it bigger
  var text = document.getElementById("text");
  if (!text.className) {
    text.className = "highlight";
  } else if (text.className.indexOf("invalid") < 0) {
    text.className += " highlight";    // awkward
  }
}                                                          JS
```

- JS DOM's className property corresponds to HTML class attribute
- somewhat clunky when dealing with multiple space-separated classes as one big string

## Getting/setting CSS classes with classList

```
function highlightField() {
  // turn text yellow and make it bigger
  var text = document.getElementById("text");
  if (!text.classList.contains("invalid")) {
    text.classList.add("highlight");
  }
}                                                            JS
```

- classList collection has methods add, remove, contains, toggle to manipulate CSS classes
- similar to existing className DOM property, but don't have to manually split by spaces

## Keyboard/text events

| **name** | **description** |
|---|---|
| focus | this element gains keyboard **focus** (attention of user's keyboard) |
| blur | this element loses keyboard focus |
| keydown | user presses a key while this element has keyboard focus |
| keyup | user releases a key while this element has keyboard focus |
| keypress | user presses and releases a key while this element has keyboard focus |
| select | this element's text is selected or deselected |

## Key event objects

| **property name** | **description** |
|---|---|
| keyCode | ASCII integer value of key that was pressed (convert to char with String.fromCharCode) |
| altKey, ctrlKey, shiftKey | true if Alt/Ctrl/Shift key is being held |

- issue: if the event you attach your listener to doesn't have the focus, you won't hear the event
  - possible solution: attach key listener to entire page body, `document`, an outer element, etc.

## Key event example

```
document.getElementById("textbox").onkeydown = textKeyDown;
...
function textKeyDown(event) {
  var key = String.fromCharCode(event.keyCode);
  if (key == 'S' && event.altKey) {
    alert("Save the document!");
    this.value = this.value.split("").join("-");
  }
}                                                          JS
```

- each time you push down any key, even a modifier such as Alt or Ctrl, the `keydown` event fires
- if you hold down the key, the `keydown` event fires repeatedly
- `keypress` event is a bit flakier and inconsistent across browsers

## Stopping an event

| **event method name** | **description** |
|---|---|
| preventDefault | stops the browser from doing its normal action on an event; for example, stops the browser from following a link when <a> tag is clicked, or stops browser from submitting a form when submit button is clicked |
| stopPropagation | stops the browser from showing this event to any other objects that may be listening for it |

- you can also `return false;` from your event handler to stop an event

## Stopping an event, example

```html
<form id="exampleform" action="http://foo.com/foo.php">...</form>
```

```js
window.onload = function() {
  var form = document.getElementById("exampleform");
  form.onsubmit = checkData;
};

function checkData(event) {
  if (document.getElementById("state").length != 2) {
    alert("Error, invalid city/state.");  // show error message
    event.preventDefault();
    return false;                         // stop form submission
  }
}
```

JS

## Some useful key codes

| **keyboard key** | **event keyCode** |
|---|---|
| Backspace | 8 |
| Tab | 9 |
| Enter | 13 |
| Escape | 27 |
| Page Up, Page Down, End, Home | 33, 34, 35, 36 |
| Left, Up, Right, Down | 37, 38, 39, 40 |
| Insert, Delete | 45, 46 |
| Windows/Command | 91 |
| F1 - F12 | 112 - 123 |

# Page/window events

| name | description |
|---|---|
| contextmenu | the user right-clicks to pop up a context menu |
| error | an error occurs when loading a document or an image |
| load, unload | the browser loads the page |
| resize | the browser window is resized |
| scroll | the user scrolls the viewable part of the page up/down/left/right |
| unload | the browser exits/leaves the page |

- The above can be handled on the `window` object