# The 'this' keyword

**"The" language of the Web**

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i am not okay with this

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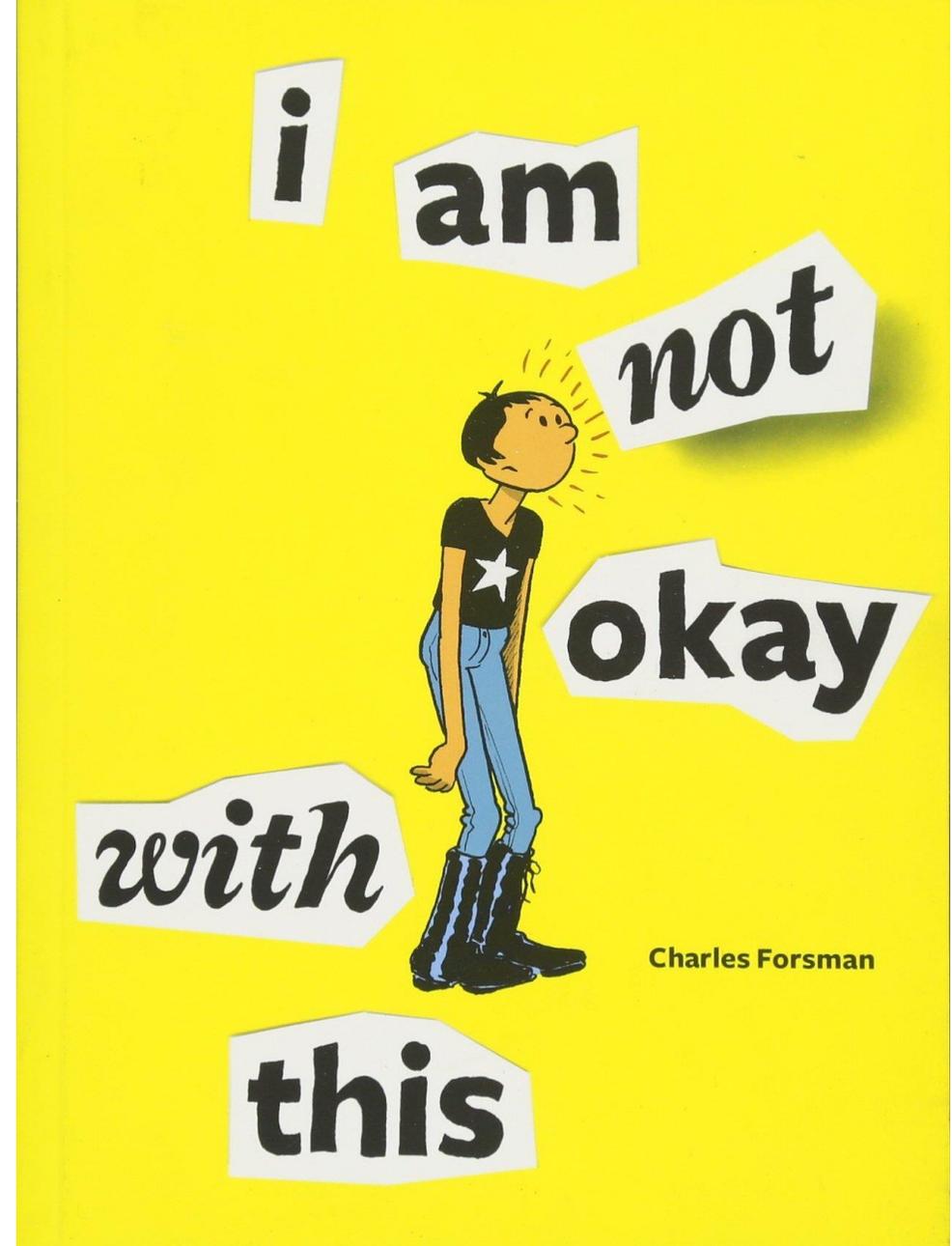
JavaScript: The Definitive Guide, 7th Edition
Chapter 8. Classes

You Don't Know JS: this & Object Prototypes

JavaScript – The language of the Web

# 'THIS'

# '`this`' in JavaScript

- Given the peculiar treatment of Objects in JS, the '`this`' keyword behaves differently than other OO languages
  - '`this`' does not refer to the function in which it appears
  - '`this`' does not (always) refer to the current object (functions are not always bound as object methods)
  - '`this`' does not refer to the context (i.e., external function) in which the function is defined
  - '`this`' does not refer to the object that generated the call (e.g., the object generating an event)
- Nevertheless, '`this`' is extremely useful in callbacks and object methods
  - We must learn its rules…

# The Golden Rule

- Within each function, the 'this' keyword is always *bound* to some specific object

- The binding of 'this' depends exclusively on the *call site* of the function (how the function is called)

  – ☢ Does not depend on *how* the function is declared (function expression, function statement, passed reference, …)

  – ☢ Does not depend on *where* the function is declared (global, object property, nested, …)

- 🛑 Notable exception: Arrow Functions (see at the end)

# The *Call Site* Of a Function

- Locate where the function is called from
  – Imagine being in a function, just called
  – Go back one step in the *call stack*, and check where you were just before being called
  – That location is the true call site

- The same function might be called from different places, in different times
  – Each time, the call site for *that invocation* is the only important information

# Sample Call Site Analysis

```javascript
function baz() {
    // call-stack is: `baz`
    // so, our call-site is in the global scope

    console.log( "baz" );
    bar(); // <-- call-site for `bar`
}

function bar() {
    // call-stack is: `baz` -> `bar`
    // so, our call-site is in `baz`

    console.log( "bar" );
    foo(); // <-- call-site for `foo`
}

function foo() {
    // call-stack is: `baz` -> `bar` -> `foo`
    // so, our call-site is in `bar`

    console.log( "foo" );
}

baz(); // <-- call-site for `baz`
```

# Rule #1: Default Binding

- Standalone function invocation

  ```
  let a = foo();
  ```

  – Normal function call

  – Default rule, applies if other special cases don't apply

- When in strict mode, '`this`' inside '`foo`' is **undefined**

- When not in strict mode, '`this`' inside '`foo`' is the global object

  – `global` in nodejs, or `window` in the browser

- It is useless, no reason to use it

  – 👁🗨Never use '`this`' inside functions called in standalone mode

# Rule #2: Implicit Binding

- Called in the context of an object (method)

  `let a = `$\texttt{obj.foo()}$` ;`

- `foo` is a (function-valued) property of `obj`
  - Defined inline with a function expression
  - Defined elsewhere but assigned to a property
- Inside `foo()`, this refers to `obj`
  - The specific object instance on which the function is called
  - `this.a` refers to property `a` of `obj`

```
function extrafoo() {
        console.log( this.a );
}

let obj = {
        a: 2,
        foo: extrafoo
};


obj.foo(); // 2
```

# Beware: Losing The Object Reference

```
function foo() {
        console.log( this.a );
}

let obj = {
        a: 2,
        foo: foo
};

let bar = obj.foo;
// function reference/alias!
```

Call Site

```
bar(); // "oops, global"
```

```
function foo() {
        console.log( this.a );
}

function doFoo(fn) {
// `fn` is just a reference to `foo`
        fn();
}
```

Call Site

```
let obj = {
        a: 2,
        foo: foo
};

doFoo( obj.foo ); // "oops, global"
```

# Beware: Losing The Object Reference

```
function foo() {
      console.log( this.a );
}

let obj = {
      a: 2,
      foo: foo
};

let bar = obj.foo;
// function reference/al

Call Site

bar(); // "oops, global"
```

```
function foo() {
      console.log( this.a );
}

function doFoo(fn) {
// `fn` is just a reference to `foo`
      fn();
}
```

// "oops, global"

Must be careful, if we pass the function reference around, we lose the object reference, and the "default binding" will be applied.

👁 **Always pass objects, never functions**, if you want 'this' to work in the passed object 👁

# Rule #3: Explicit Binding

- You may call a function indirectly, with a *calling method* (natively defined for all JS functions)

  ```
  let y = foo.call(object, param, param, param)
  let y = foo.apply(object, [param, param, param])
  ```

- In this case the call to `foo` is *explicitly bound* to the `object` (1st parameter)

  – Inside the function, `this` is bound to `object`

  – It basically behaves like `object.foo()`, even if `foo` is not a property of `object`.

- Often used inside libraries, rarely in the final programs

# Hard Binding

- Even the explicit binding may be "lost", if you pass the function around (instead of passing the object)

- You may force a binding to a function using its `.bind()` method to construct a new 'bound' function

```
let newfoo = foo.bind(object) // newfoo is a bound function
let y = newfoo(params)
```

- The newfoo function will always be bound to object

# Rule #4: **new** Binding

- When an object is created with a constructor function call, the function is bound to the newly created object
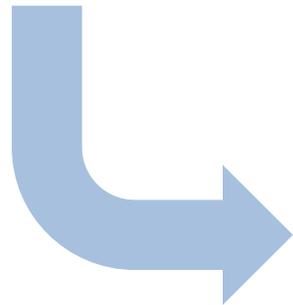
  ```
  let obj = new Foo() ;
  ```

  – Within Foo, `this` refers to the new object (later assigned to obj)

# *Aside*: How '**new**' Works

- JS constructor call
  - when a function is invoked with new in front of it

```
let object = new Func() ;
```

1. a brand-new object **{}** is created (aka, constructed) out of thin air
2. the newly constructed object is [[Prototype]]-linked *(not relevant now)*
3. the newly constructed object is set as the **this** binding for that function call
4. unless the function returns its own alternate object, the new-invoked function call will automatically return the newly constructed object.

# Summary Of Rules

- Is the function called with new (**new binding**)? If so, `this` is the newly constructed object.

  `var bar = `**`new`**` Foo() ;`

- Is the function called with `call` or `apply` (**explicit binding**), even hidden inside a `bind` *hard binding*? If so, `this` is the explicitly specified object.

  `var bar = foo.`**`call`**`( obj2 ) ;`

- Is the function called with a context (**implicit binding**), otherwise known as an owning or containing object? If so, `this` is *that* context object.

  `var bar = `**`obj1`**`.foo() ;`

- Otherwise (**default binding**). If in *strict mode*, `this` is `undefined`, otherwise `this` is the global object (`global` in node, `window` in browsers).

  `var bar = foo()`

# Exception : Arrow Functions =>

- 🚫 The above rules **do not apply** to Arrow Functions

  `let fun = (n) => { this.a=n; }`

- Arrow functions adopt the '`this`' binding from the enclosing function scope (or global scope)
  - Check the call site *of the enclosing function*!
- Extremely handy in event handlers and callbacks

```
function foo() {
    setTimeout(() => {
    // `this` here is lexically
    // adopted from `foo()`
        console.log( this.a );
    },100);
}

var obj = {
    a: 2
};

foo.call( obj ); // 2
```

# In Practice…

| Rule | Example at call site | Suggestion |
|------|---------------------|------------|
| | `let foo = function(n) { this.a = n ; }` | |
| 4. New binding | `let y = new foo(3) ;` | **Normal usage for object constructors** |
| 3. Explicit binding | `let y = foo.call(obj, n) ;`<br>`let newfoo = foo.bind(obj) ;` | Seldom used in user code, mostly in libraries |
| 2. Implicit binding | `let y = obj.foo() ;` | **Normal usage for object methods** |
| 1. Default binding | `let y = foo() ;` | Never use.<br>Does not work in Strict mode. |
| **Exception:**<br>Arrow Functions | `let foo = (n)=>{ this.a = n ; }`<br>Uses surrounding scope (closure over `this`) | Useful in callbacks (event handlers, async functions, …) |

# In Practice…

| Rule | Example at call site | Suggestion |
|------|----------------------|------------|
| | `let foo = function(n) { this.a = n ; }` | |
| 4. New binding | `let y = new foo(3) ;` | **Normal usage for object constructors** |
| ~~3. Explicit binding~~ | ~~`let y = foo.call(obj, n) ;`~~ <br> ~~`let newfoo = foo.bind(obj) ;`~~ | ~~Seldom used in user code, mostly in libraries~~ |
| 2. Implicit binding | `let y = obj.foo() ;` | **Normal usage for object methods** |
| ~~1. Default binding~~ | ~~`let y = foo() ;`~~ | ~~Never use.~~ <br> ~~Does not work in Strict mode.~~ |
| **Exception**: <br> Arrow Functions | `let foo = (n)=>{ this.a = n ; }` <br> Uses surrounding scope (closure over `this`) | Useful in callbacks (event handlers, async functions, …) |

# References

- You Don't Know JS: this & Object Prototypes - 1st Edition, Kyle Simpson, https://github.com/getify/You-Dont-Know-JS/tree/1st-ed/this%20%26%20object%20prototypes , Chapter 1 and Chapter 2

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