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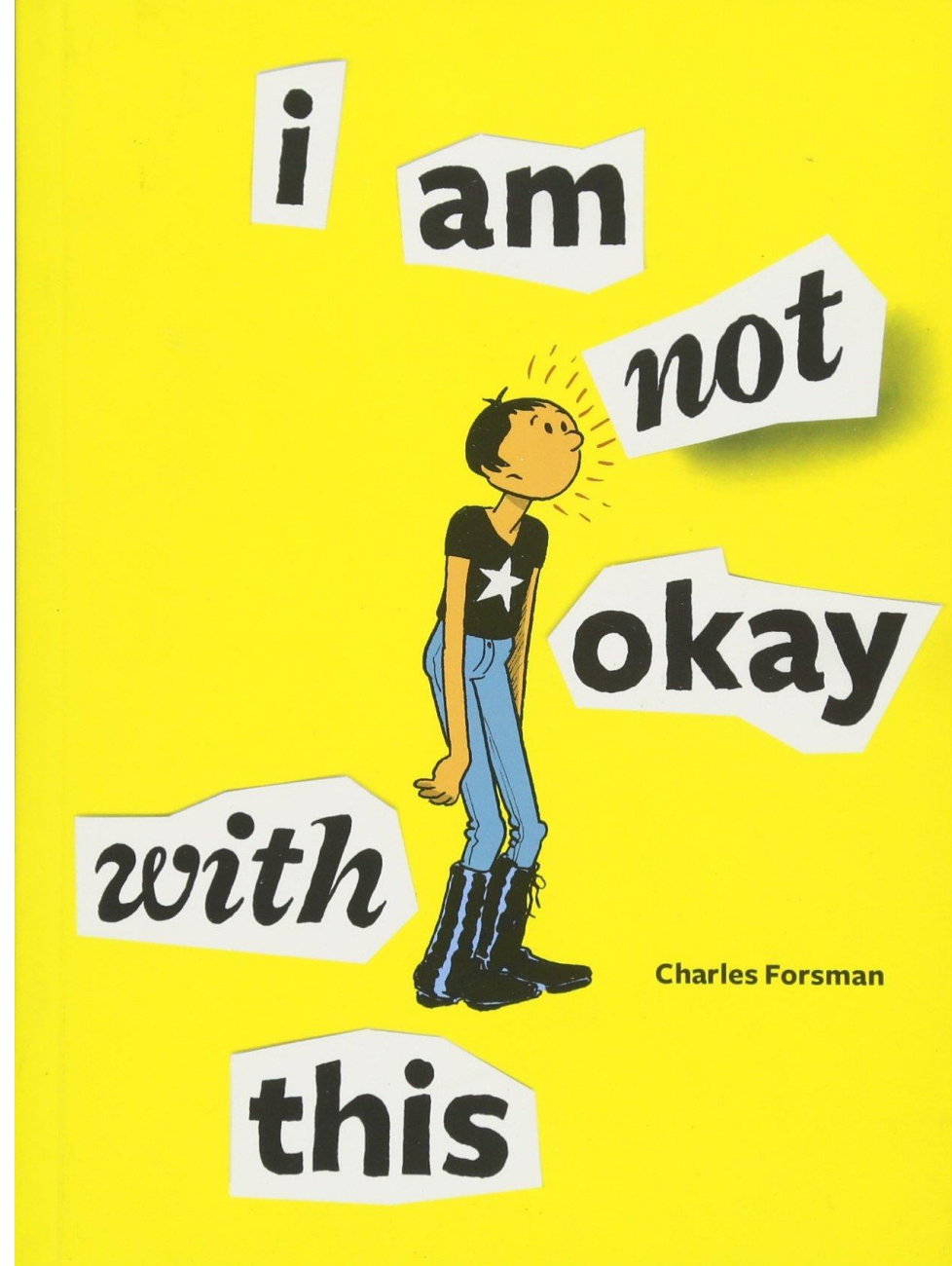
# The 'this' keyword

**"The" language of the Web**

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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 and Classes in JS, the 'this' keyword behaves differently than on 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 *objects*
- 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 references, ...)
  -  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

Try me!



```
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`
```

The screenshot shows the Chrome DevTools Loupe tool with the following code and call stack:

```
1 function baz() {
2   // call-stack is: `baz`
3   // so, our call-site is in the global scope
4
5   console.log( "baz" );
6   bar(); // <-- call-site for `bar`
7 }
8
9 function bar() {
10  // call-stack is: `baz` -> `bar`
11  // so, our call-site is in `baz`
12
13  console.log( "bar" );
14  foo(); // <-- call-site for `foo`
15 }
16
17 function foo() {
18  // call-stack is: `baz` -> `bar` -> `foo`
19  // so, our call-site is in `bar`
20
21  console.log( "foo" );
22 }
23
24 baz(); // <-- call-site for `baz`
```

Call Stack

- foo()
- bar()
- 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 or window
  - 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 = obj.foo() ;`
- `foo()` is a 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 foo() {  
    console.log( this.a );  
}  
  
let obj = {  
    a: 2,  
    foo: foo  
};  
  
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/alias!
```

Call Site

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

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

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

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

```
// "oops, global"
```

# 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` (1<sup>st</sup> parameter)
  - Inside the function, `this` is bound to `object`
  - It basically behaves like `object.foo()`, even if `foo` is not a property of `object`.

# 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

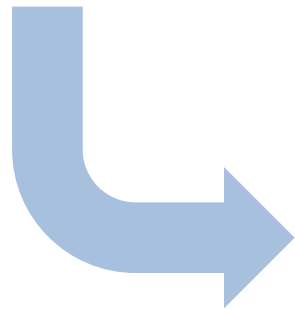
```
let obj = new Foo() ;
```

- 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   |
|--------------------------------------|---|--|
|                                      | <pre>let foo = function(n) { this.a = n ; }</pre>   |  |
| 4. New binding                       | <pre>let y = new foo(3) ;</pre>   | <b>Normal usage for object constructors</b>                |
| 3. Explicit binding                  | <pre>let y = foo.call(obj, n) ;<br/>let newfoo = foo.bind(obj) ;</pre>                          | Seldom used in user code, mostly in libraries              |
| 2. Implicit binding                  | <pre>let y = obj.foo() ;</pre>  | <b>Normal usage for object methods</b>                     |
| 1. Default binding                   | <pre>let y = foo() ;</pre>  | Never use.<br>Does not work in Strict mode.                |
| <b>Exception:</b><br>Arrow Functions | <pre>let foo = (n)=&gt;{ this.a = n ; }</pre> <p>Uses surrounding scope (closure over this)</p> | 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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