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The ‘this’ keyword

“The” language of the Web

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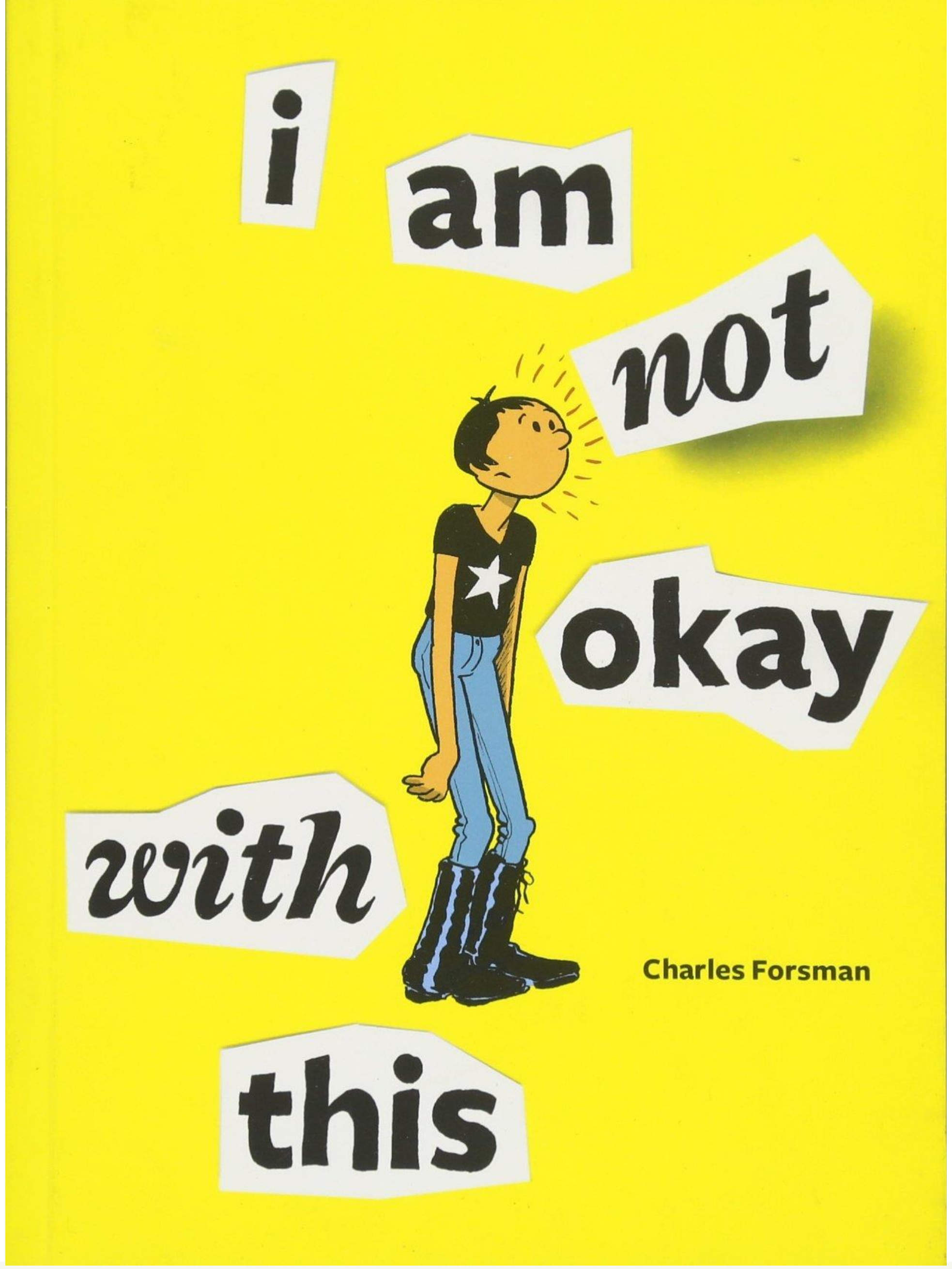


JavaScript: The Definitive Guide, 7th Edition
Chapter 8. Classes

You Don't Know JS: this & Object Prototypes

JavaScript – The language of the Web

‘THIS’

‘`this`’ in JavaScript

- Given the peculiar treatment of Objects 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)

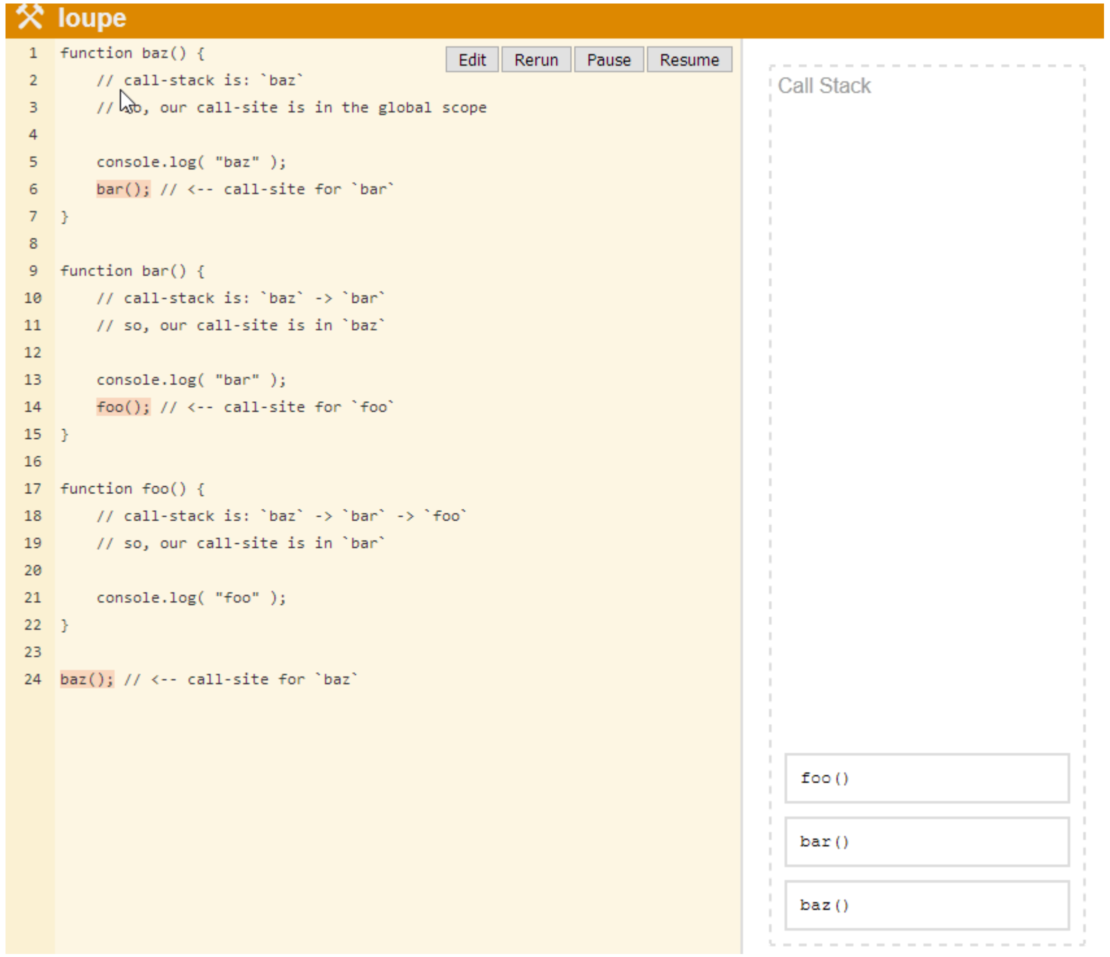
The *Call Site* Of a Function

- 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

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`
```



```
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 = 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/
```

Call Site

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

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

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

Call Site

```
/ "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 here)*
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) ;`
	`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. Does not work in Strict mode.
Exception: Arrow Functions	`let foo = (n)=>{ this.a = n ; }` 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) ;`~~ ~~`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.**~~ ~~**Does not work in Strict mode.**~~
Exception: Arrow Functions	`let foo = (n)=>{ this.a = n ; }` 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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