[[Prototype]] vs __proto__ vs .prototype in Javascript

Why are there so many types of prototypes in JavaScript and what do they all do?

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It can seem very daunting when you start learning about prototypes in JavaScript. A lot of the confusion stems from the fact that there are two different **prototypes** in JavaScript that refer to different concepts. Let me explain.

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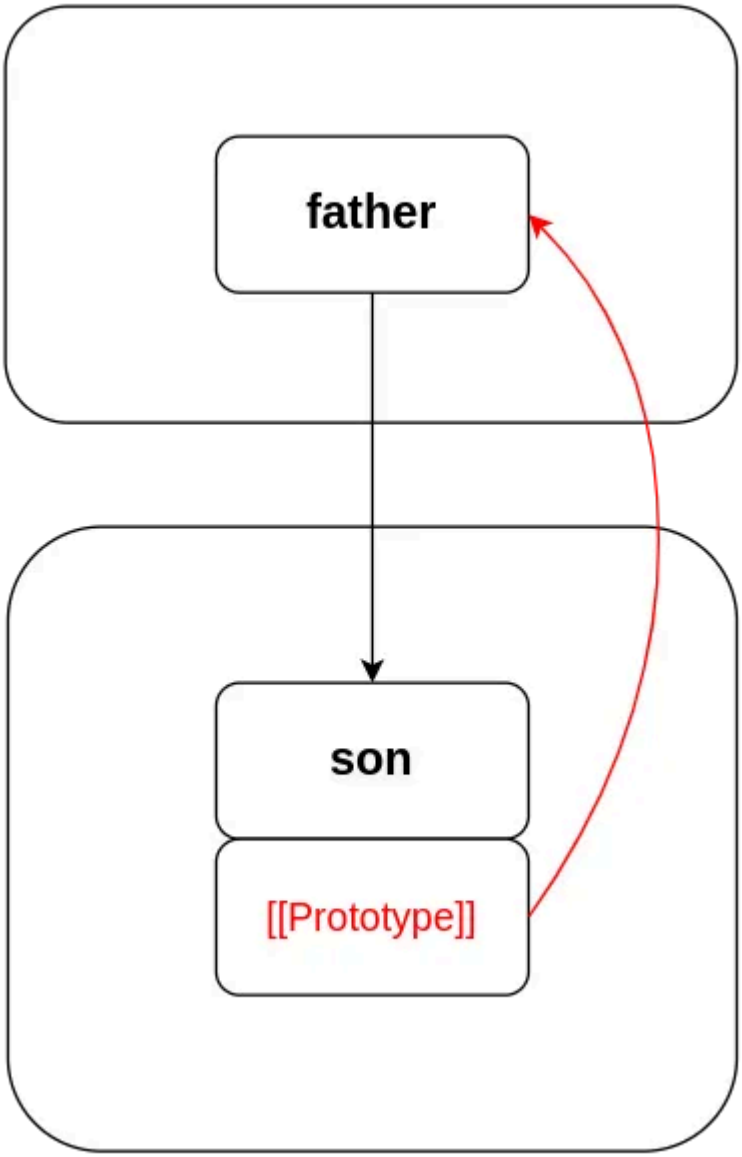
[[Prototype]]

`[[Prototype]]` is a hidden private property that all objects have in Javascript, it holds a reference to the object's **prototype**.

An object's prototype is the object that an object inherits or descends from. In the following diagram the object `son` descends from `father`, so `father` is the prototype of `son`. That means the hidden `[[Prototype]]` property of `son` points to `father`.



To summarize:

- `[[Prototype]]` is a hidden property that references an object's prototype.
- An object's prototype is the object that an object descends or inherits from.

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__proto__

`__proto__` (also called the Dunder Proto or Double Underscore Prototype) is a property of `Object.prototype` (more on that in a minute) that exposes the hidden `[[Prototype]]` property of an object and allows you to access or modify it. You should not use it as it is **deprecated**, although you may come across it in older code.

The modern way of accessing an object's prototype is by using `Object.getPrototypeOf(obj)`. You can also modify an object's prototype using `Object.setPrototypeOf(obj, prototype)` as you can see in the following example:

```
let father = {};
let son = {};

Object.setPrototypeOf(son, father);
Object.getPrototypeOf(son); // father
```

To summarize:

- `__proto__` is a method that exposes the hidden `[[Prototype]]` property and allows you to modify it.
- `Object.getPrototypeOf()` and `Object.setPrototypeOf()` are the modern ways of getting access to and setting an object's prototype.

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.prototype

`.prototype` is a special property that almost all functions have that is only used when a function is invoked as a constructor function. I say almost all because arrow functions and methods defined using the concise syntax do not have `.prototype` properties and cannot be used as constructors.

The `.prototype` property contains a reference to an object and when a constructor is used to instantiate or create a new object, `.prototype` is set as the prototype of the new object.

> *A constructor function is like an object factory that creates new objects which are instances of itself.* "What is a constructor function?"

For example, when the constructor `ObjectFactory` is used to instantiate a new object referenced by the variable `obj` on line 5 of the following code block, `obj`'s hidden internal `[[Prototype]]` property now holds a reference to the same object that is referenced by `ObjectFactory.prototype`. This means that any properties or methods defined in `ObjectFactory.prototype` are accessible by `obj.`

```
1 function ObjectFactory() {
2   this.property = `Hi, I'm a property!`;
3 }
4
5 let obj = new ObjectFactory();
6
7 console.log(typeof ObjectFactory.prototype); // object
8 console.log(ObjectFactory.prototype.isPrototypeOf(obj)); // true
```

Here on line 7, we prove that `ObjectFactory.prototype` references an object. On line 8 we prove that `ObjectFactory.prototype` is the prototype of `obj`.

Accessing a prototype's properties

```
9 // this is a continuation of the previous code block
10 ObjectFactory.prototype.prop = `I'm a property of ObjectFactory.prototype`;
11
12 console.log(obj); // ObjectFactory { property: "Hi, I'm a property!" }
13 console.log(obj.prop); // I'm a property of ObjectFactory.prototype
```

Notice that on line 10 we add a property called `prop` to the object referenced by `ObjectFactory.prototype` . Remember that `obj` ’s `[[Prototype]]` property references the same object as `ObjectFactory.prototype.`

We can see on line 12 that `obj` does not have a property called `prop`, it only has one property called `property`. However, `obj` can access `prop` on line 13 because it inherits the properties of its prototype which we know is the object referenced by `ObjectFactory.prototype`.

To summarize:

- `.prototype` is a special property that all functions have that contains a reference to an object.
- When a constructor is used to instantiate a new object, `ConstructorName.prototype` is set as the prototype of the new object.
- All instances of that constructor (the objects it creates) can access the properties of `ConstructorName.prototype`.

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I briefly mentioned `Object.prototype` earlier in the article, `Object` is the built-in constructor function that almost all objects in JavaScript are instances of, and therefore almost all objects inherit from the object referenced by its `.prototype` property, `Object.prototype`.

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I hope that this article has helped you to see the difference between these concepts! You can learn more about prototypical inheritance in JavaScript in my other article here.

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