JavaScript 2
Lektion => 9

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Lektionstillfällets mål

Mål med lektionen

- JavaScripts objekt
- Prototyper och prototypkedja
- Klasser

- **Bra att läsa**
  https://javascript.info/classes
- **Arbetsmetod**
  - Teori och praktik varvas under lektionen

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Kort summering av föregående lektion

- Vi har gått igenom
  - Exekveringskontext
  - Scope
  - Closure

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What is JavaScript?

- JavaScript® (often shortened to JS) is a lightweight, interpreted, **object-oriented language** with first-class functions, and is best known as the scripting language for Web pages, but it's used in many non-browser environments as well.
- It is a **prototype-based**, multi-paradigm scripting language that is dynamic, and supports object-oriented, imperative, and functional programming styles.
- https://developer.mozilla.org/en-US/docs/Web/JavaScript/About_JavaScript

Functional class pattern

```
function User(name) {
  this.sayHi = function() {
    return 'Hello ' + name;
  }
}
```

Privata egenskaper

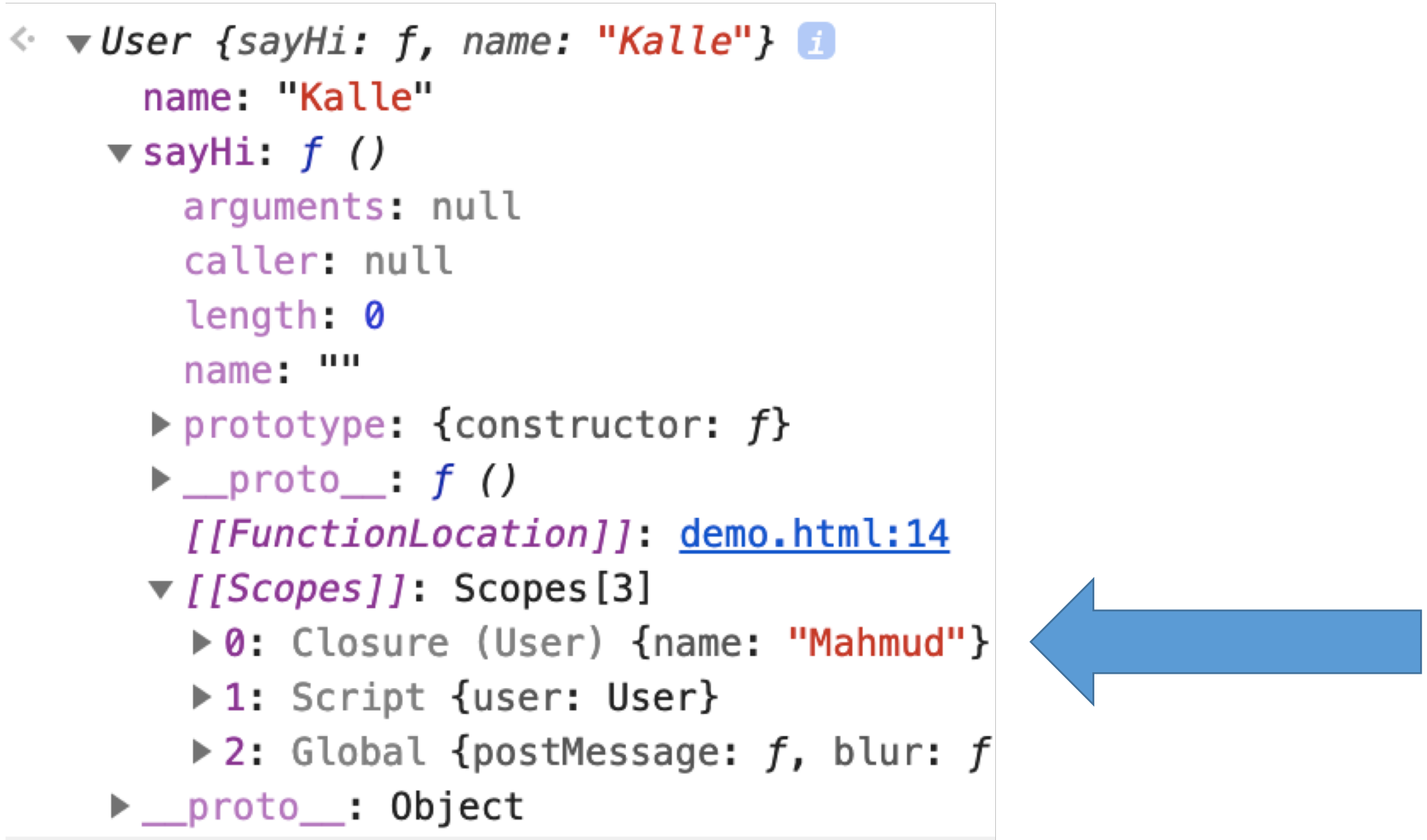
- `name` är en privat egenskap.
- Du har tillgång till privata egenskaper inne i en konstruktor.

```
let user = new User("Mahmud");
console.log(user.sayHi()); // Hello Mahmud
console.log(user.name);    // undefined
```

Publika egenskaper

```
let user = new User("Mahmud");
user.name = "Kalle";
console.log(user.name);     // Kalle
console.log(user.sayHi()); // Mahmud

Varför?
Kolla i Chrome DevTools
```

Privata egenskaper lagras i en closure



Privata metoder

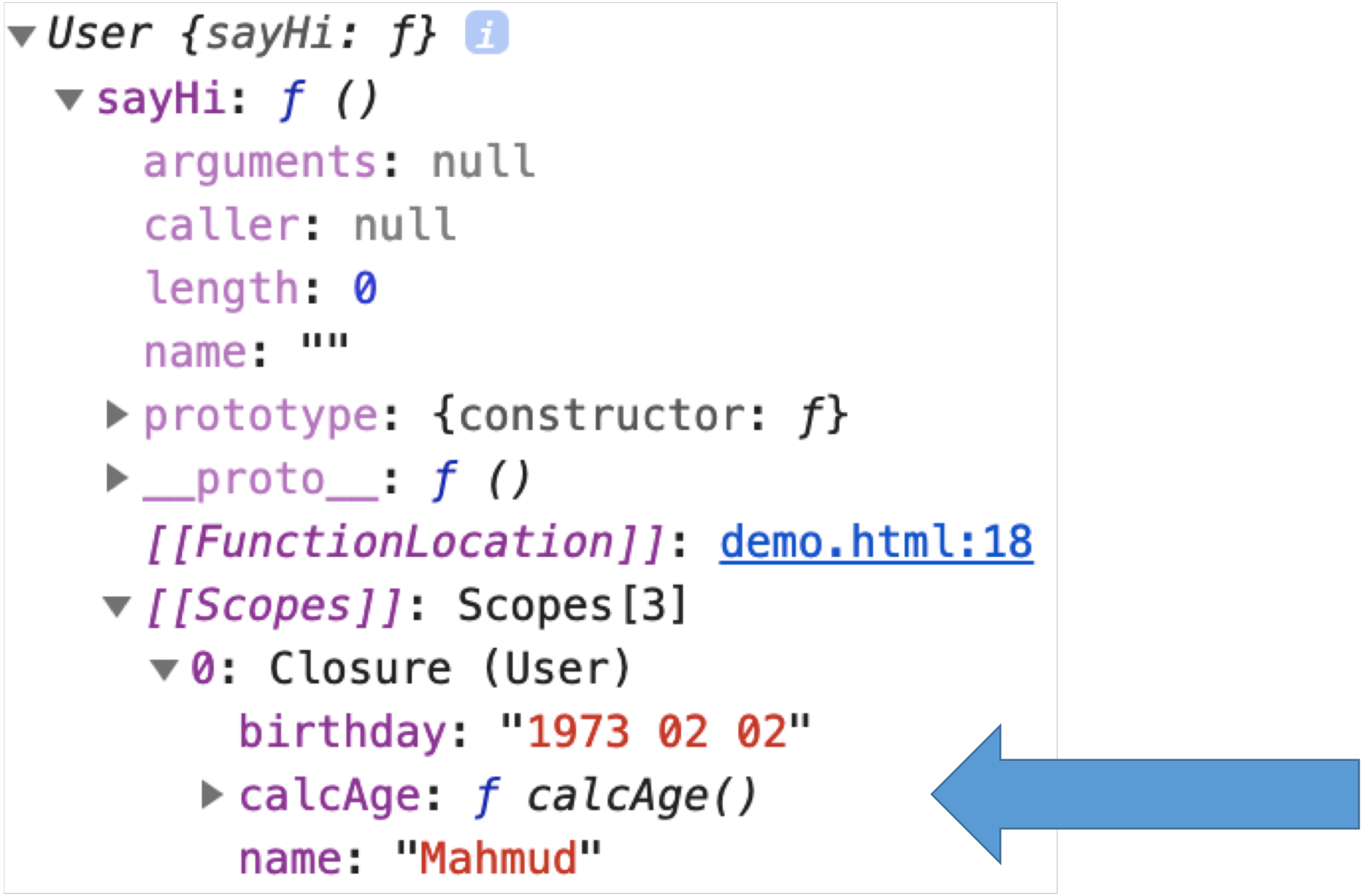
```
function User(name, birthday) {
  function calcAge() {
    let birthDate = new Date(birthday);
    return new Date().getFullYear()-  birthDate.getFullYear();
  }

  this.sayHi = function() {
    return (`Hello ${name}, age: ${calcAge()}`);
  }
}
```

Privata metoder - fortsättning

- Metoden calcAge() är en privat metod.
- Du får använda metoden inuti konstruktorn.

```
let user = new User("Mahmud", "1973 02 02" );
console.log(user.sayHi());

user.calcAge();
```

Privata metoder lagras i en closure



Factory class pattern

```
function User(name, birthday) {
  function calcAge() {
    let birthDate = new Date(birthday);
    return new Date().getFullYear() - birthDate.getFullYear();
  }
  return {
    sayHi() {
      return `${name}, age:${calcAge()}`;
    }
  }
}
```

Factory class pattern – fortstättning

- Men hjälp av en factory returnerar vi publika egenskaper och metoder.
- Vi behöver inte använda nyckelordet `new`
  (Jämför med föregående exempel).
- Allt annat är precis samma som ”Functional class pattern”.

```
let user = User("Mahmud", "1973 02 02");
console.log(user.sayHi());
```

Prototype-based classes


```
function User(name) {
  this._name = name;
}

User.prototype.sayHi = function() {
  return (`${this._name}`);
};
```

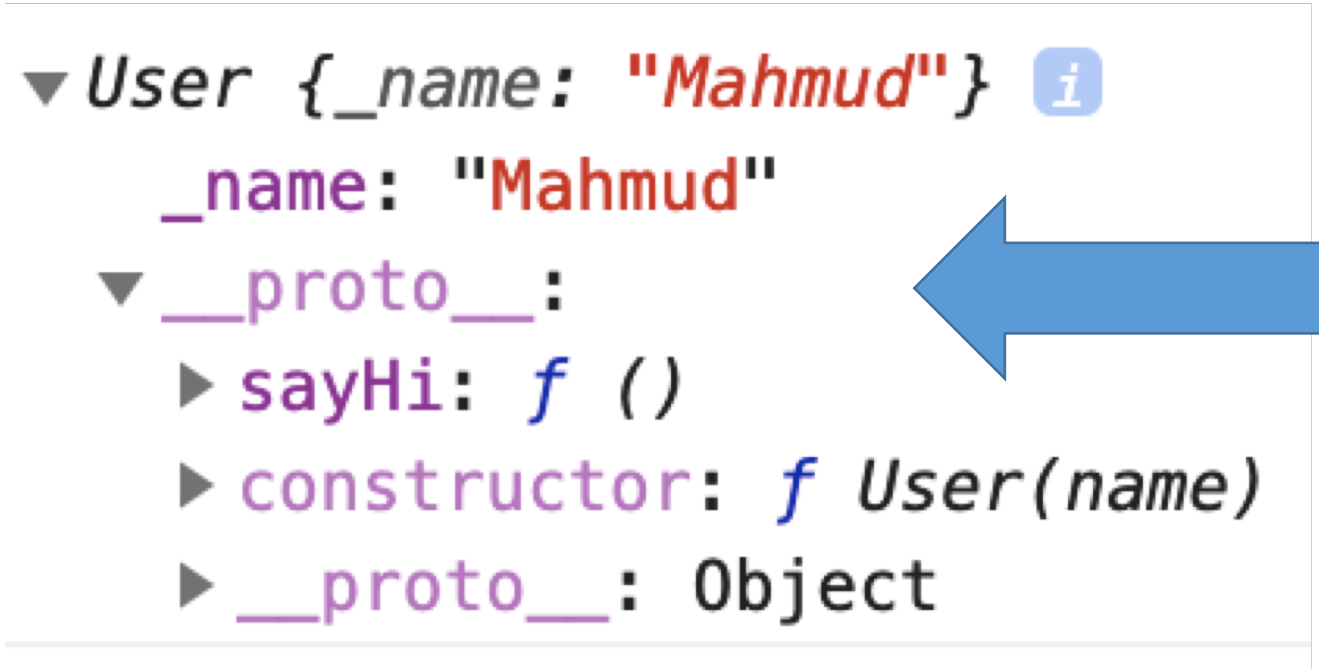
Konstruktorn skapar objekt med data

```
let user = new User("Mahmud");
```

Metoder lagras i prototypen

Metoder lagras inte i varje objekt.

```
console.log(user.sayHi());
```



"Prototypal pattern is more memory-efficient" *

* https://javascript.info/class-patterns

Prototype-based classes – fortsättning

```
function User(name, birthday) {
  this._name = name;
  this._birthday = birthday;
}

User.prototype._calcAge = function() {
  let birthDate = new Date(this._birthday);
  return new Date().getFullYear() - birthDate.getFullYear();
};

User.prototype.sayHi = function() {
  return (`${this._name}, age: ${this._calcAge()}`);
};
```

Data lagras i objektet
Metoder lagras i prototypen

```
let user = new User("Mahmud", "1973 02 02");
console.log(user.sayHi());
```

```
▼User {_name: "Mahmud", _birthday: "1973 02 02"}
    _birthday: "1973 02 02"
    _name: "Mahmud"
  ▼__proto__:
    ▶sayHi: ƒ ()
    ▶_calcAge: ƒ ()
    ▶constructor: ƒ User(name, birthday)
    ▶__proto__: Object
```

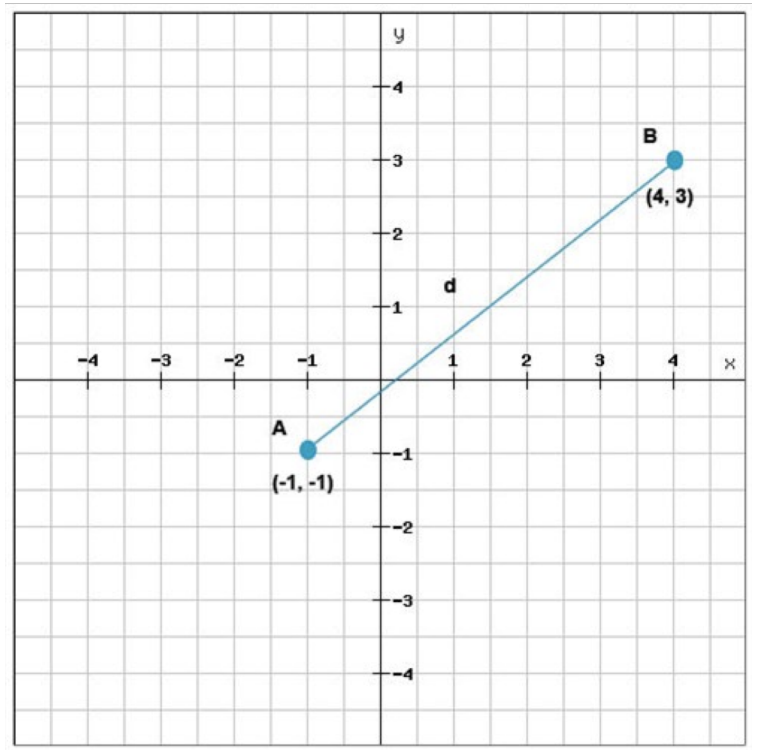
Objektet har tillgång till allt som finns i prototypen

```
> user
◂ ▶User {_name: "Mahmud", _birthday: "1973 02 02"}
> user._name
◂ "Mahmud"
> user._birthday
◂ "1973 02 02"
> user._calcAge()
◂ 46
> user.sayHi()
◂ "Mahmud, age: 46"
>
```

Programmerare brukar skapa “privata” egenskaper och metoder med _ som prefix

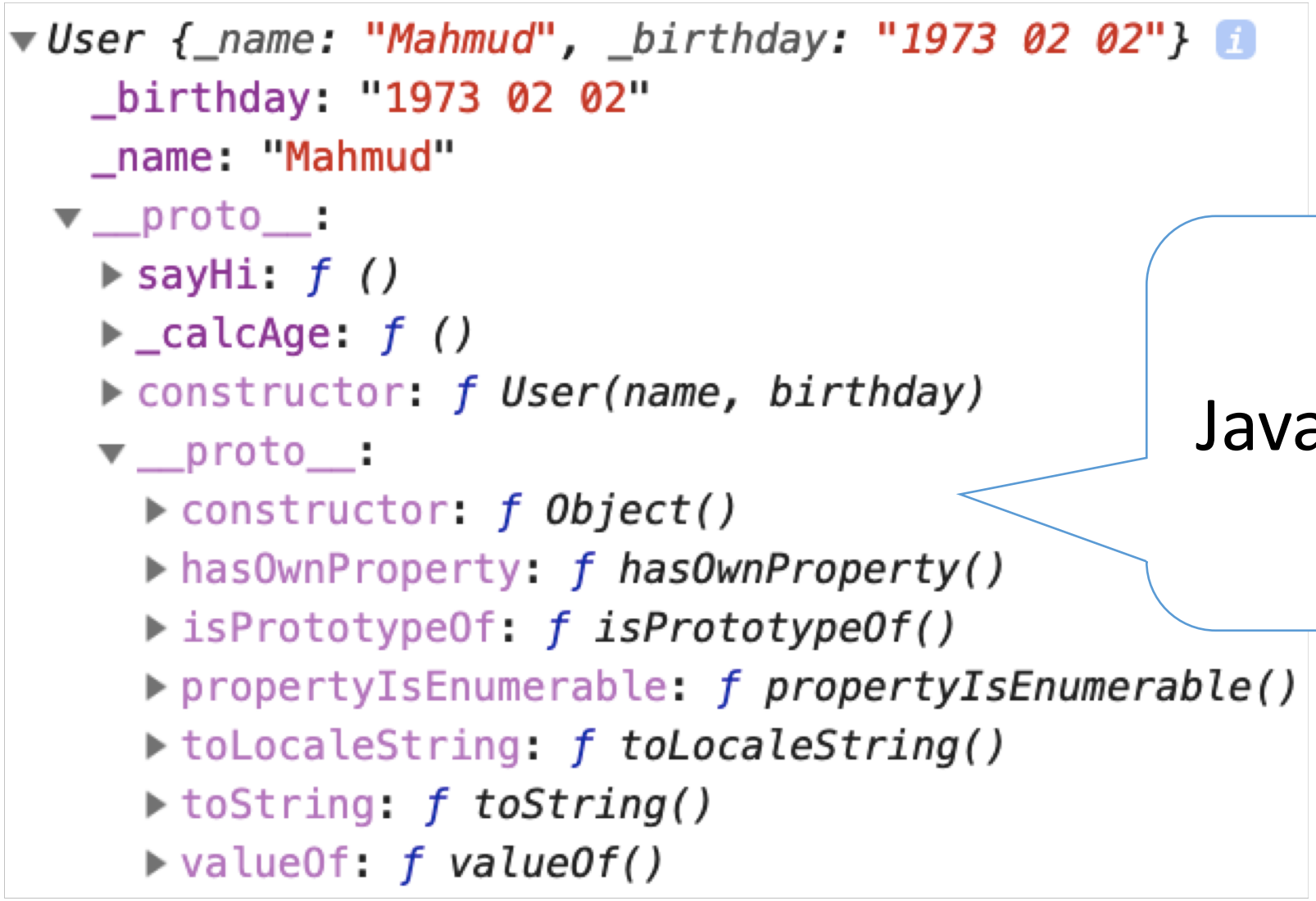
Övning

1. Skapa en konstruktor som beskriver en punkt i en tvådimensionell värld.
2. Skapa en metod i prototypen som beräknar avståndet mellan två punkter.
3. Skapa två punkter (två objekt).
4. Beräkna avståndet mellan punkterna.



- Bildkälla: https://www.matteboken.se/lektioner/matte-2/geometri/avstandsformeln

Inheritance (arv)



Alla objekt i JavaScript ärver från **Object**

Object.prototype.hasOwnProperty()

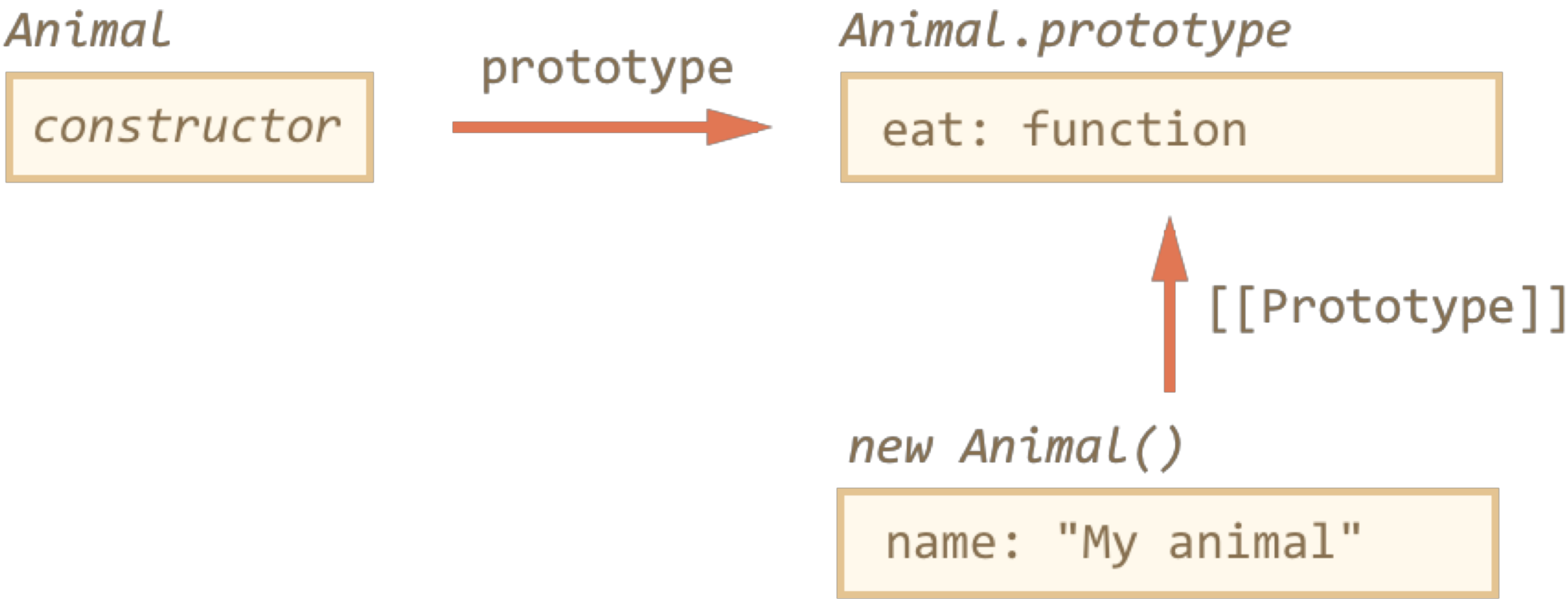
```
> user.hasOwnProperty('_name')
< true
> user.hasOwnProperty('_birthday')
< true
```

- https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects/Object/hasOwnProperty

Arv – En superklass som beskriver ett djur

```
function Animal(name) {
  this.name = name;
}

Animal.prototype.eat = function() {
  return (`${this.name} eats.`);
};

let animal = new Animal("My animal");
console.log(animal.eat());
```

Animal

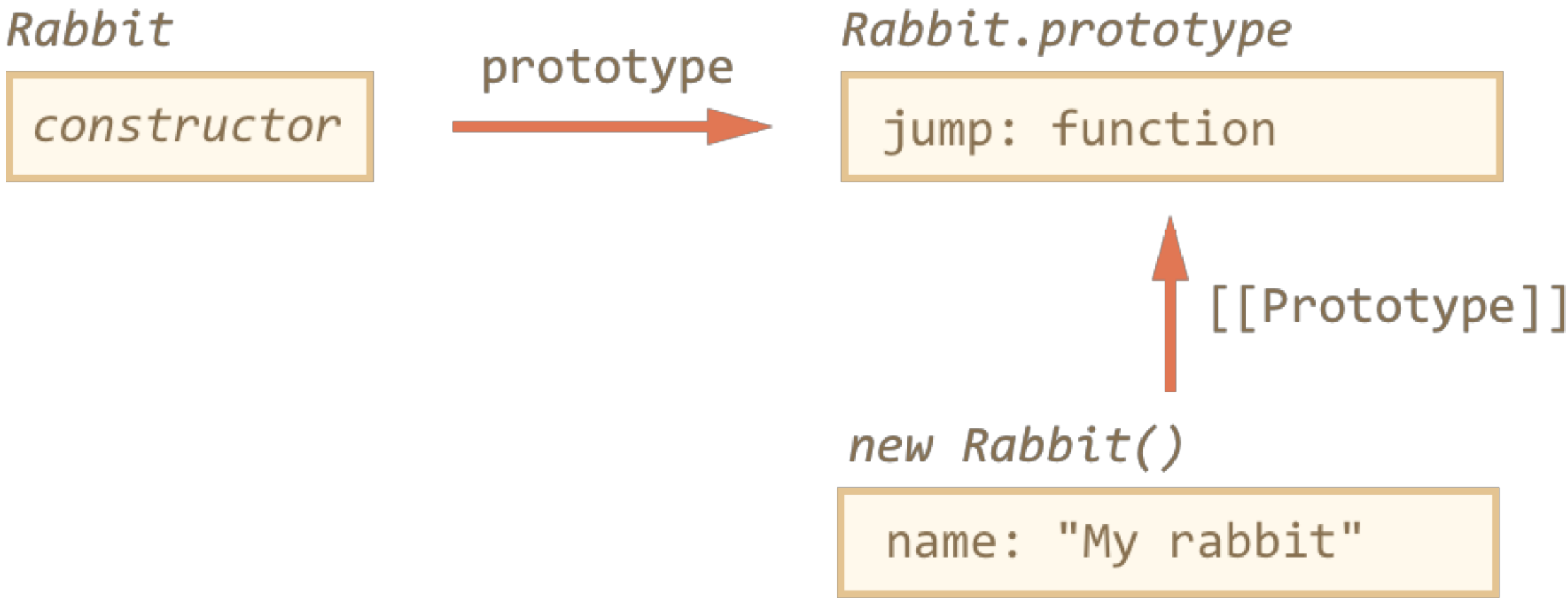


https://javascript.info/class-patterns

Arv – En klass som beskriver en kanin

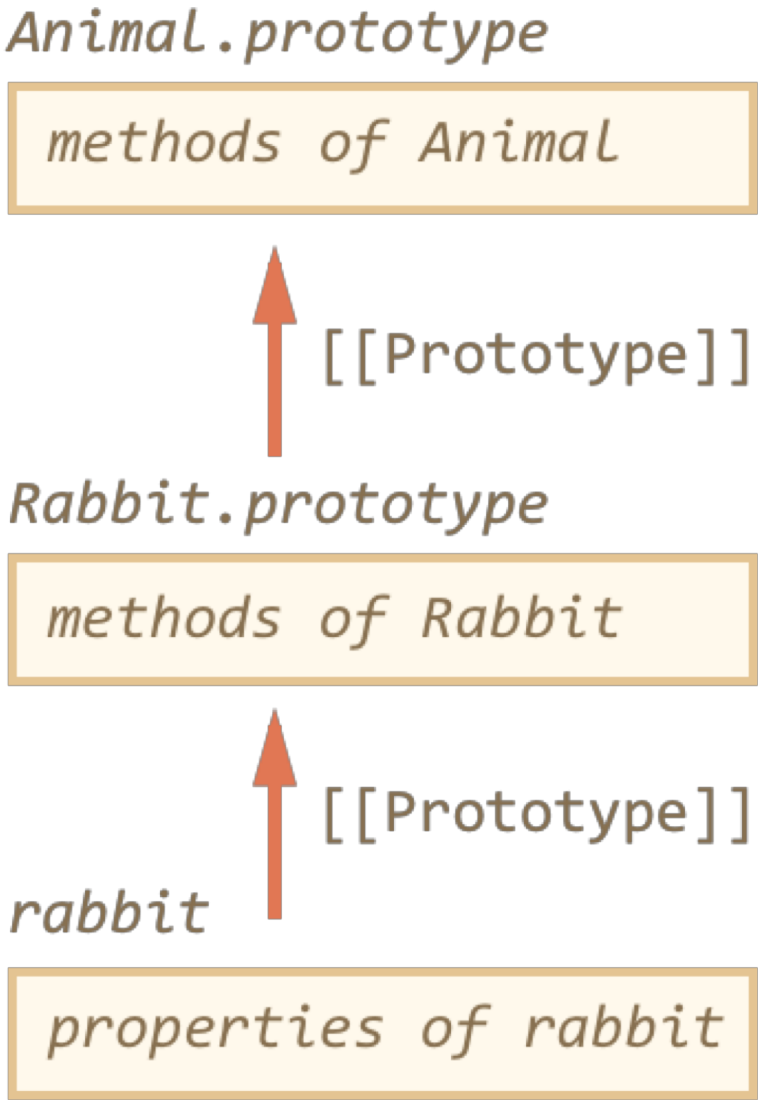
```
function Rabbit(name) {
  this.name = name;
}

Rabbit.prototype.jump = function() {
  return (`${this.name} jumps!`);
};

let rabbit = new Rabbit("My rabbit");
console.log(rabbit.jump());
```

Rabbit



https://javascript.info/class-patterns

Inheritance chain (Prototypkedja)



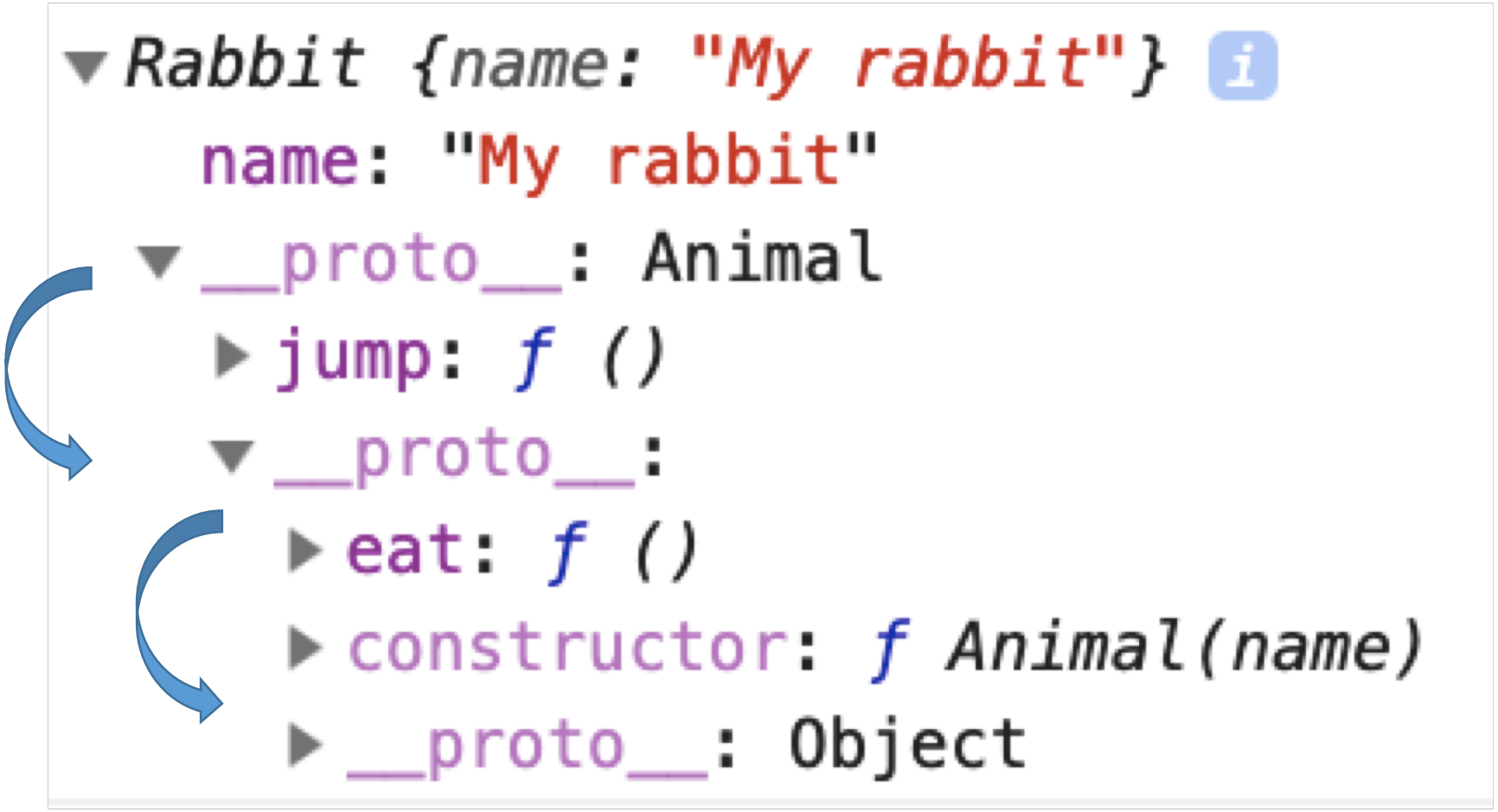
https://javascript.info/class-patterns

En kanin ärver djurens egenskaper och metoder

```
// OBS! Sätt detta före kaninens egna metoder!

Rabbit.prototype = Object.create(Animal.prototype);


// Eller så här. OBS! Deprecated (Rekommenderas ej)
// Rabbit.prototype.__proto__ = Animal.prototype;
```

https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects/Object/proto

Prototypkedja



Övning 1 – Hitta felet

```
1  function Animal(name) {
2    this.name = name;
3  }
4
5  Animal.prototype.walk = function() {
6    alert(this.name + ' walks');
7  };
8
9  function Rabbit(name) {
10   this.name = name;
11 }
12
13 Rabbit.prototype = Animal.prototype;
14
15 Rabbit.prototype.walk = function() {
16   alert(this.name + " bounces!");
17 };
```

Lösning finns här: https://javascript.info/class-patterns

Övning 2 – Rewrite to prototypes

- The Clock class is written in functional style.
- Rewrite it using prototypes.
- P.S. The clock ticks in the console, open it to see.
- Open a sandbox for the task.
- https://javascript.info/task/rewrite-to-prototypes

The “class” syntax

The “class” construct allows one to define prototype-based classes with a clean, nice-looking syntax.

https://javascript.info/class

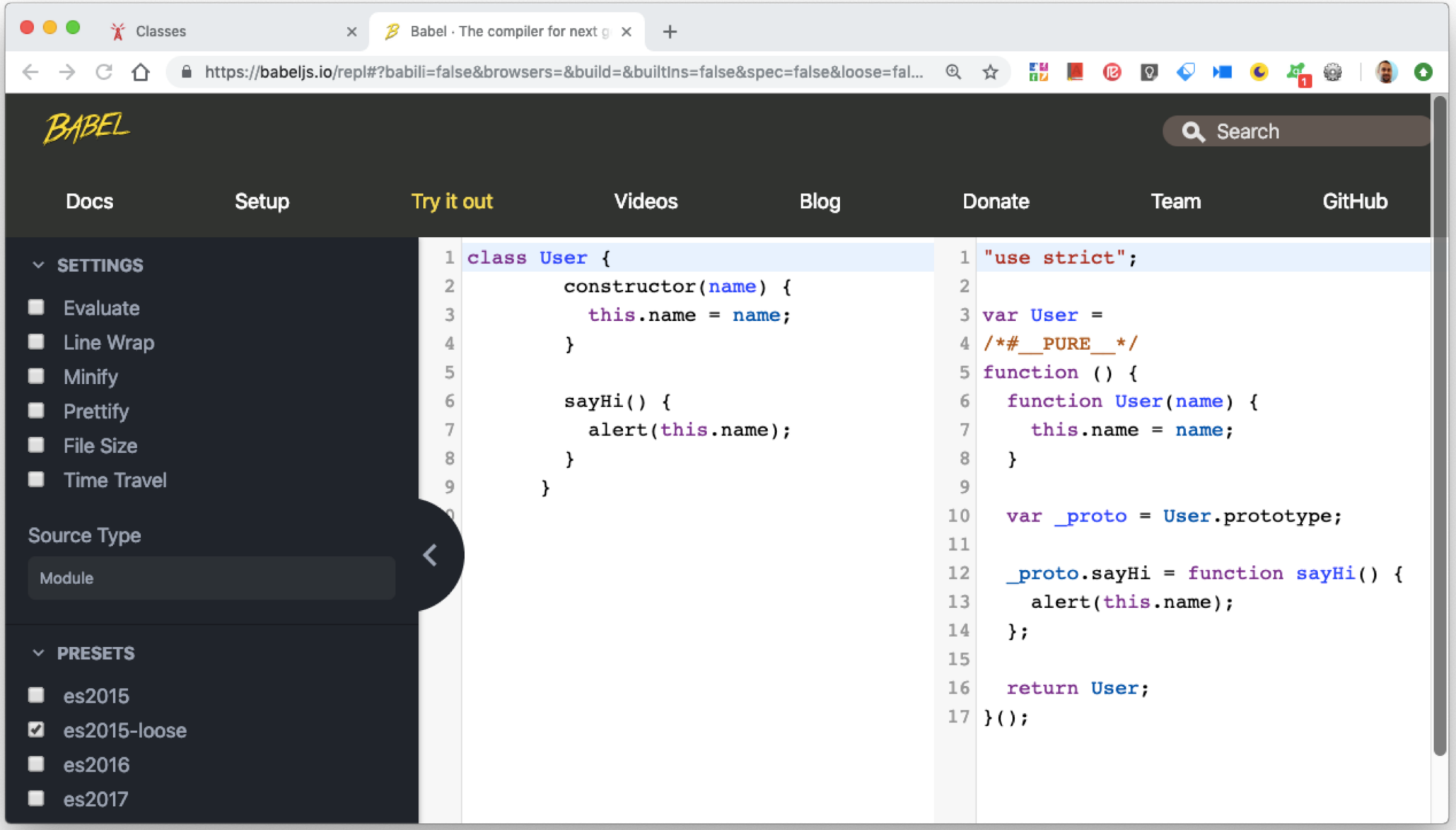
Prototype-based class

```
function User(name) {
  this.name = name;
}

User.prototype.sayHi = function() {
  alert(this.name);
};
```

class syntax

```
class User {
  constructor(name) {
    this.name = name;
  }

  sayHi() {
    alert(this.name);
  }
}
```

Babel – https://babeljs.io/repl



Övning – Rewrite to class

- Rewrite the Clock class from prototypes to the modern “class” syntax.
- P.S. The clock ticks in the console, open it to see.
- Open a sandbox for the task.
- https://javascript.info/task/rewrite-to-class

JavaScript OOP Crash Course (ES5 & ES6)
Brad Traversy https://youtu.be/vDJpGenyHaA

Object-oriented Programming in JavaScript: Mosh Hamedani https://youtu.be/PFmuCDHHpwk

Summering av dagens lektion

- JavaScripts objekt
- Prototyper och prototypkedja
- Klasser

- **Bra att läsa**
  https://javascript.info/classes

- Reflektioner kring dagens lektion?

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Framåtblick inför nästa lektion

Lycka till med projektarbetet

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