Q

What are the best ways to transfer data?

Two main forms of (structured) data transfer

XML

```
<employees>
 <employee>
  <firstName>John</firstName>
  <lastName>Doe</lastName>
 </employee>
 <employee>
  <firstName>Anna</firstName>
  <lastName>Smith</lastName>
 </employee>
 <employee>
  <firstName>Peter</firstName>
  <lastName>Jones</lastName>
 </employee>
</employees>
```

JSON

```
{"employees":[
  { "firstName":"John",
    "lastName":"Doe" },
  { "firstName":"Anna",
    "lastName":"Smith" },
  { "firstName":"Peter",
    "lastName":"Jones" }
]}
```

XML vs JSON

Both JSON and XML:

- are "self describing" (human readable)
- are hierarchical (values within values)
- can be parsed and used by lots of programming languages
- can be fetched with an XMLHttpRequest

For AJAX applications, JSON is faster and easier than XML:

XML

Fetch an XML document
Use the XML DOM to loop through the document
Extract values and store them in variables

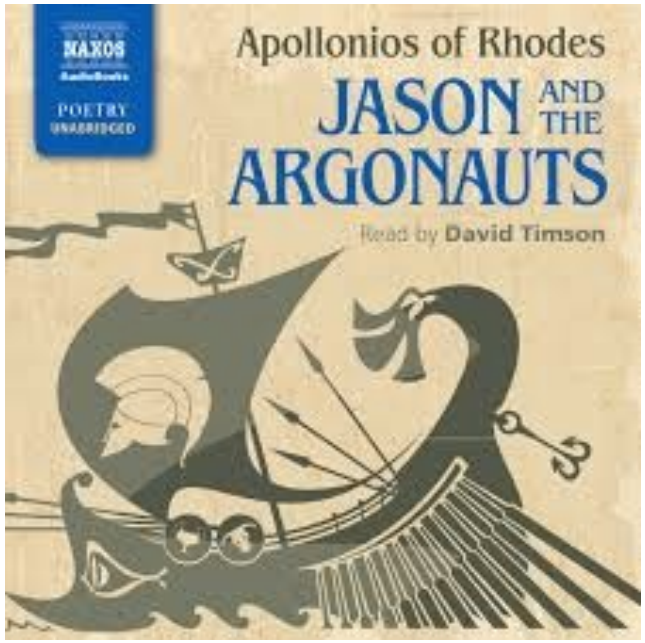
JSON

Fetch a JSON string
JSON.Parse the JSON string

JSON – JavaScript Object Notation

JSON is a language-independent data format.

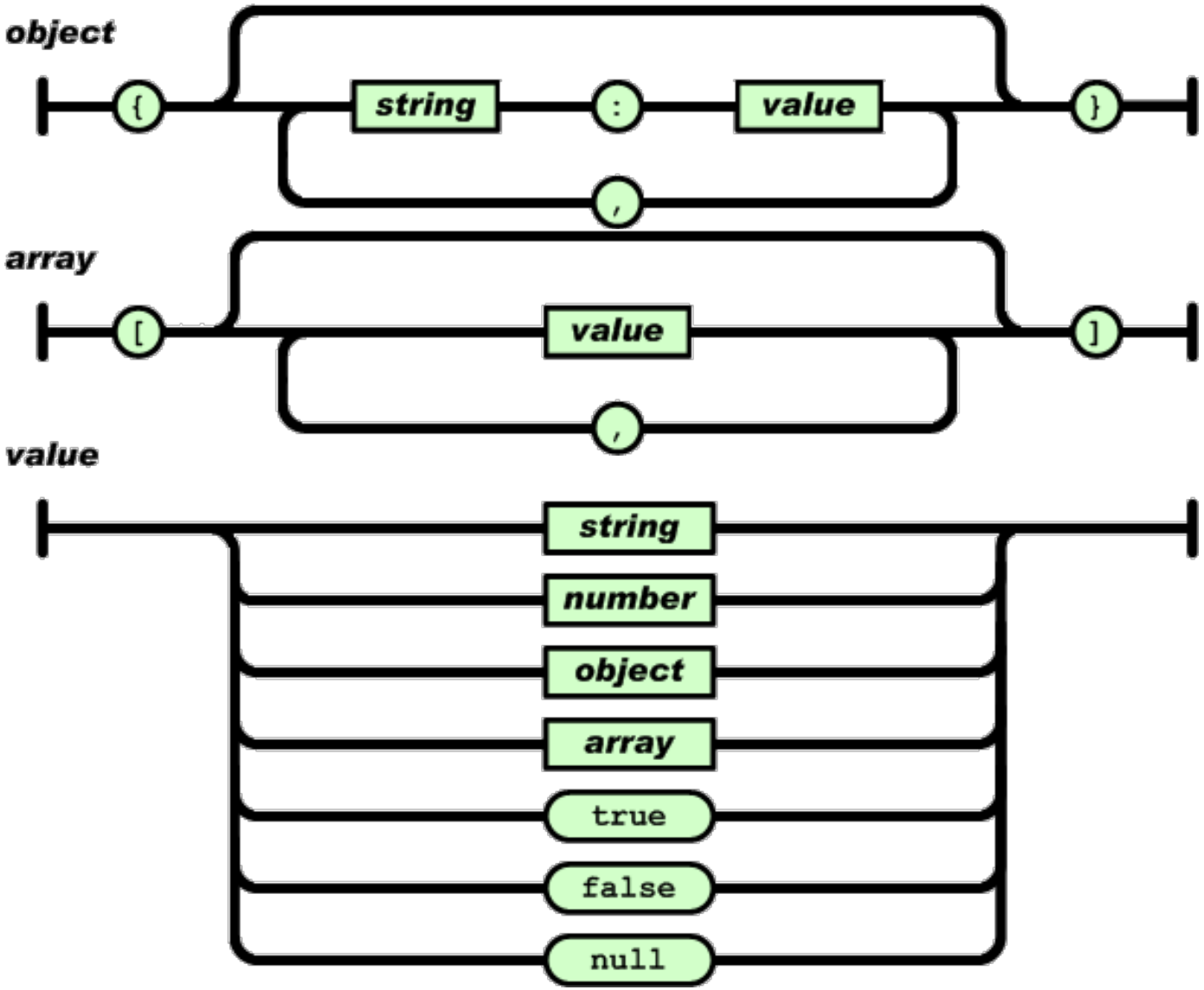
```
{ "name": "Mario",
        "surname": "Rossi",
        "active": true,
        "favoriteNumber": 42,
        "birthday": {
                "day": 1,
                "month": 1,
                "year": 2000
        },
        "languages": [ "it", "en" ]
}
```



Datatypes:

- int, float
- Boolean
- String
- Arrays []
- Associative Arrays {}
- null

JSON


object
{
string
:
value
}
,
array
[
value
]
,
value
string
number
object
array
true
false
null

Parsing JSON in JavaScript

```
var text = '{ "name":"John", "birth":"1986-12-14", "city":"New York"}';
var obj = JSON.parse(text);
obj.birth = new Date(obj.birth);

document.getElementById("demo").innerHTML = obj.name + ", " +
obj.birth;
```

Argo (Parsing JSON in Java)

```
{
   "name": "Black Lace",
   "sales": 110921,
   "totalRoyalties": 10223.82,
   "singles": [
      "Superman", "Agadoo"
   ]
}
```

```
String secondSingle = new JdomParser().parse(jsonText)
    .getStringValue("singles", 1);
```

http://argo.sourceforge.net/index.html

AJAJ

```
var my_JSON_object;
var url=" https://mdn.github.io/learning-
area/javascript/oojs/json/superheroes.json"
var xhttp = new XMLHttpRequest();
xhttp.open("GET", url, true);
xhttp.responseType = "json";
xhttp.onreadystatechange = function () {
  var done = 4, ok = 200;
  if (this.readyState === done && this.status === ok)
  {
    my_JSON_object = this.response;
  }
};
xhttp.send();}
```

An example

https://mdn.github.io/learning-area/javascript/oojs/json/superheroes.json


```
{
  "squadName" : "Super Hero Squad",
  "homeTown" : "Metro City",
  "formed" : 2016,
  "secretBase" : "Super tower",
  "active" : true,
  "members" : [
    {
      "name" : "Molecule Man",
      "age" : 29,
      "secretIdentity" : "Dan Jukes",
      "powers" : [
        "Radiation resistance",
        "Turning tiny",
        "Radiation blast"
      ]
    },
    {
      "name" : "Madame Uppercut",
      "age" : 39,
      "secretIdentity" : "Jane Wilson",
      "powers" : [
        "Million tonne punch",
        "Damage resistance",
        "Superhuman reflexes"
      ]
    },
    {
      "name" : "Eternal Flame",
      "age" : 1000000,
      "secretIdentity" : "Unknown",
      "powers" : [
        "Immortality",
        "Heat Immunity",
        "Inferno",
        "Teleportation",
        "Interdimensional travel"
      ]
    }
  ]
}
```

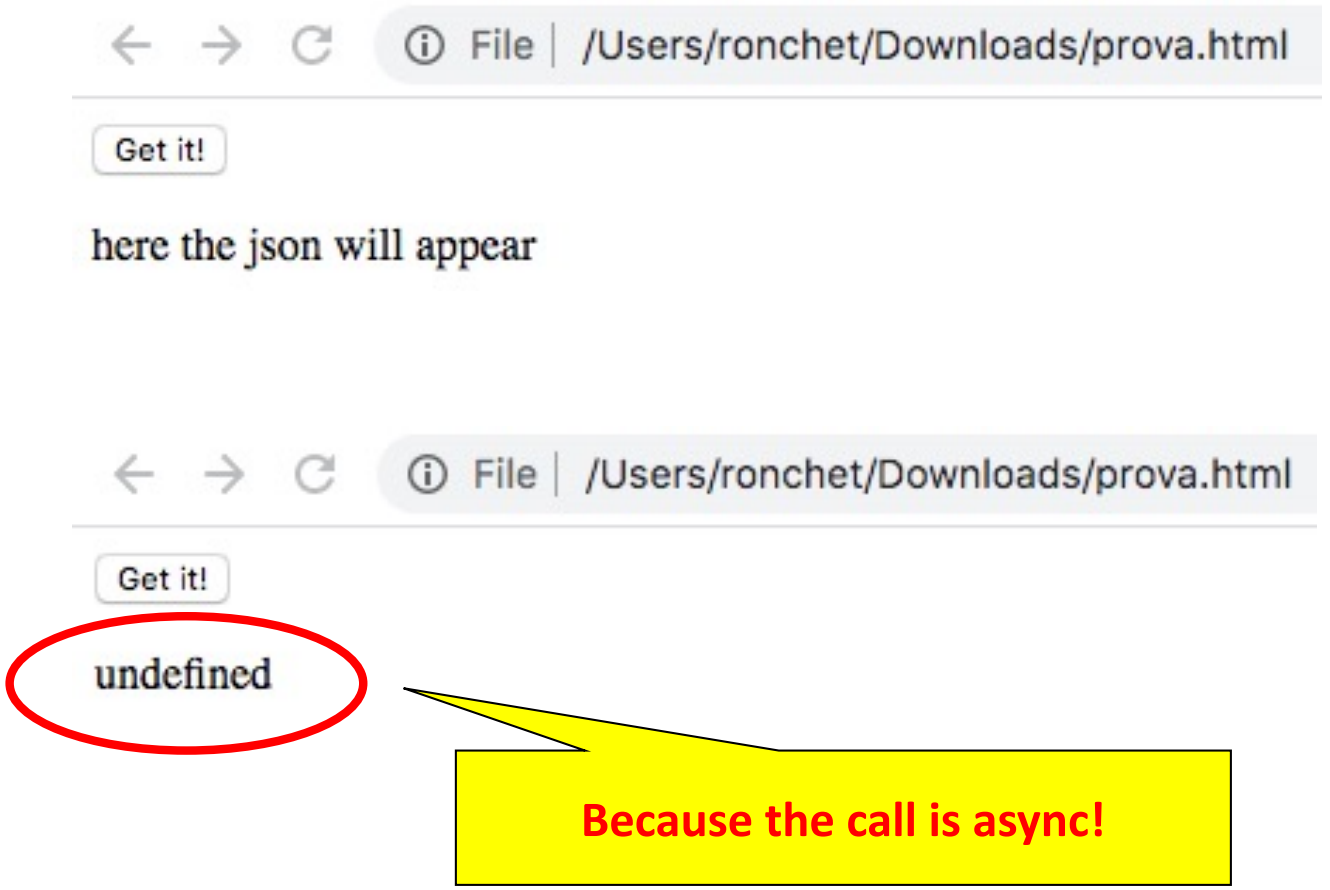
The traps of asynchronous computing 1A

```
<script>
  function getJson() {
    var my_JSON_object;
    var url="https://mdn.github.io/learning-
       area/javascript/oojs/json/superheroes.json"
    var xhttp = new XMLHttpRequest();
    xhttp.open("GET", url, true);
    xhttp.responseType = "json";
    xhttp.onreadystatechange = function () {
       var done = 4, ok = 200;
       if (this.readyState === done && this.status === ok){
          my_JSON_object = this.response;
       }
    };
    xhttp.send();
    return my_JSON_object;
  }
</script>
```


The traps of asynchronous computing 1B

```
<!DOCTYPE html>
<head>
    <title>AJAJ Demo</title>
    <script>…</script>
</head>
  <body>
    <form>
     <input type="BUTTON" onClick=
       'document.getElementById("myPar").innerHTML=getJson();'>
    </form>
    <p id="myPar">here the json will appear</p>
  </body>
</html>
```

The traps of asynchronous computing 1 out



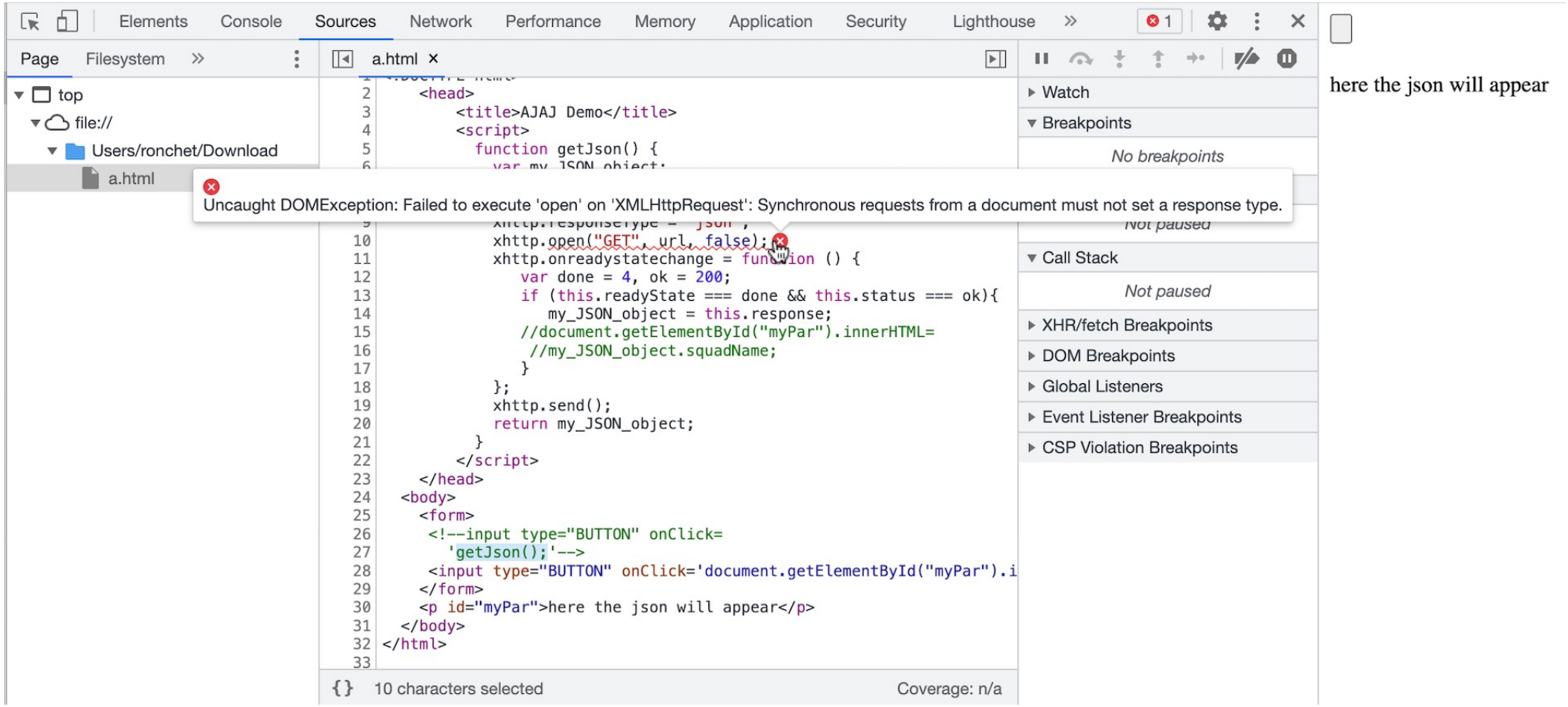
The traps of asynchronous computing 2A

```
<script>
  function getJson() {
    var my_JSON_object;
    var url="https://mdn.github.io/learning-
       area/javascript/oojs/json/superheroes.json"
    var xhttp = new XMLHttpRequest();
    xhttp.open("GET", url, false);
    xhttp.responseType = "json";
    xhttp.onreadystatechange = function () {
       var done = 4, ok = 200;
       if (this.readyState === done && this.status === ok){
          my_JSON_object = this.response;
       }
    };
    xhttp.send();
    return my_JSON_object;
  }
</script>
```

Let us make it sync

The traps of asynchronous computing 2 out a

The traps of asynchronous computing 2 out b

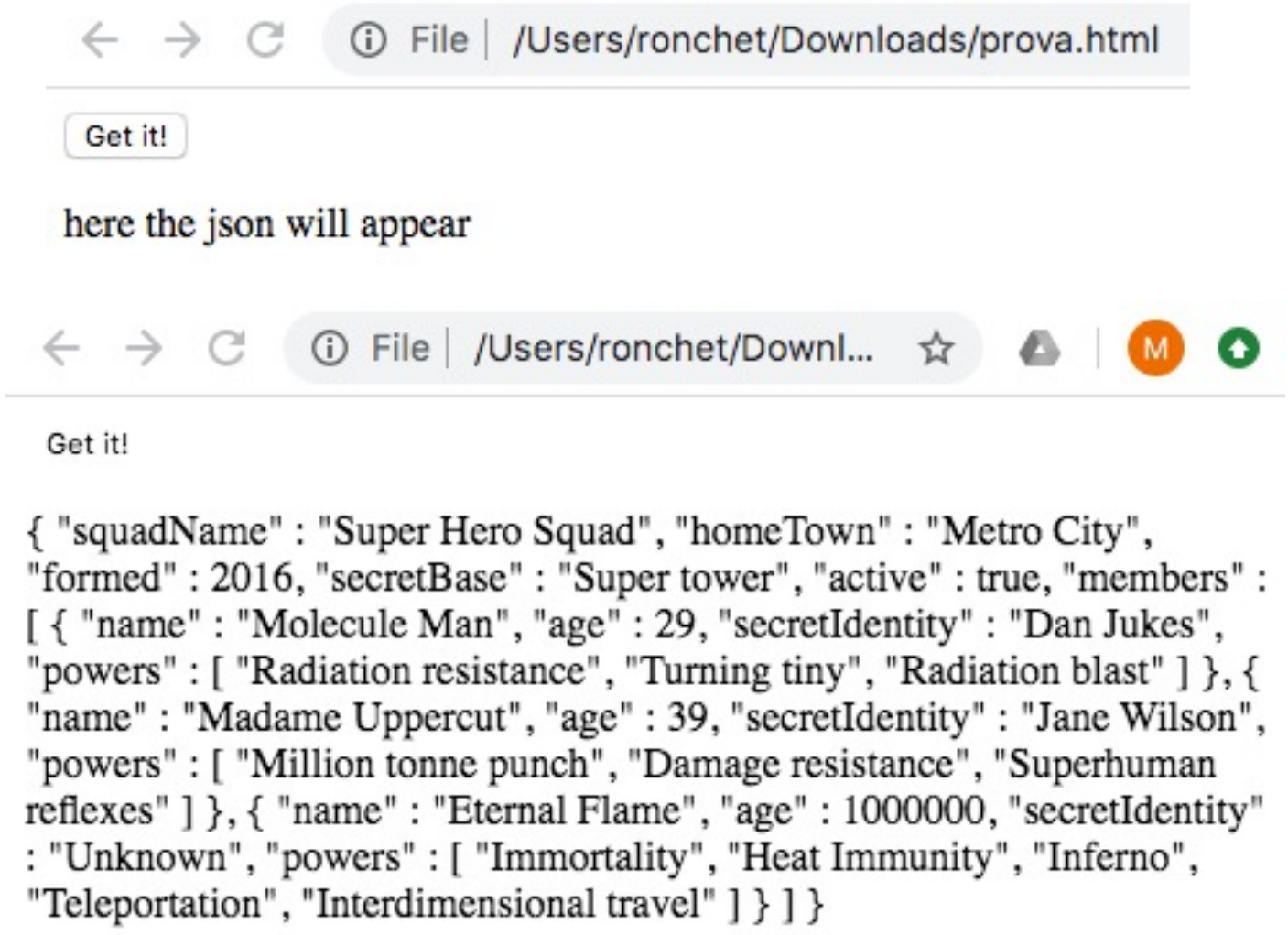


The traps of asynchronous computing 3A

```
<script>
  function getJson() {
    var my_JSON_object;
    var url="https://mdn.github.io/learning-
       area/javascript/oojs/json/superheroes.json"
    var xhttp = new XMLHttpRequest();
    xhttp.open("GET", url, false);
    //xhttp.responseType = "json";
    xhttp.onreadystatechange = function () {
       var done = 4, ok = 200;
       if (this.readyState === done && this.status === ok){
          my_JSON_object = this.response;
       }
    };
    xhttp.send();
    return my_JSON_object;
  }
</script>
```

Let's comment this line

The traps of asynchronous computing 3 out



The traps of asynchronous computing 4A

```
<script>
  function getJson() {
    var my_JSON_object;
    var url="https://mdn.github.io/learning-
       area/javascript/oojs/json/superheroes.json"
    var xhttp = new XMLHttpRequest();
    xhttp.open("GET", url, true);
    xhttp.responseType = "json";
    xhttp.onreadystatechange = function () {
       var done = 4, ok = 200;
       if (this.readyState === done && this.status === ok){
          my_JSON_object = this.response;
          document.getElementById("myPar").innerHTML=
             my_JSON_object.squadName;
       }
    };
    xhttp.send();
    return my_JSON_object;
  }
</script>
```

Let's make it async again

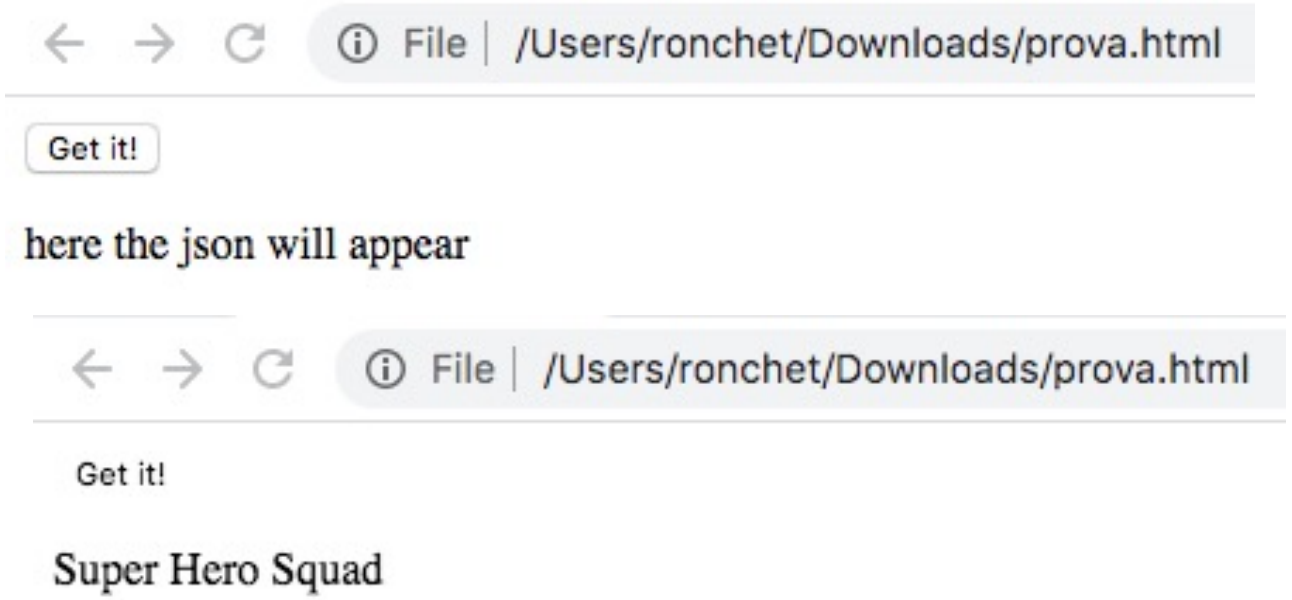
This is the right way of doing things!

The traps of asynchronous computing 4B

```
<!DOCTYPE html>
<head>
    <title>AJAJ Demo</title>
    <script>…</script>
</head>
  <body>
    <form>
     <input type="BUTTON" onClick='getJson();'>
    </form>
    <p id="myPar">here the json will appear</p>
  </body>
</html>
```

This is the right way of doing things!

The traps of asynchronous computing 4 out



The traps of asynchronous computing 5A

```
<script>
  function getJson() {
    var my_JSON_object;
    var url="https://mdn.github.io/learning-
       area/javascript/oojs/json/superheroes.json"
    var xhttp = new XMLHttpRequest();
    xhttp.open("GET", url, true);
    //xhttp.responseType = "json";
    xhttp.onreadystatechange = function () {
       var done = 4, ok = 200;
       if (this.readyState === done && this.status === ok){
          my_JSON_object = this.response;
          document.getElementById("myPar".innerHTML=
             my_JSON_object.squadName;

       }
    };
    xhttp.send();
    return my_JSON_object;
  }
</script>
```

Let's comment this line

The traps of asynchronous computing 5 out

The JavaScript JSON object

The **JSON** object contains methods for parsing JSON text, and converting values to JSON. It can't be called or constructed, has two method properties:

- JSON.parse(*text*[, *reviver*]) Parse the string *text* as JSON, optionally transform the produced value and its properties, and return the value. Any violations of the JSON syntax, including those pertaining to the differences between JavaScript and JSON, cause a SyntaxError to be thrown. The *reviver* option allows for interpreting what the *replacer* has used to stand in for other datatypes.

JSON.parse

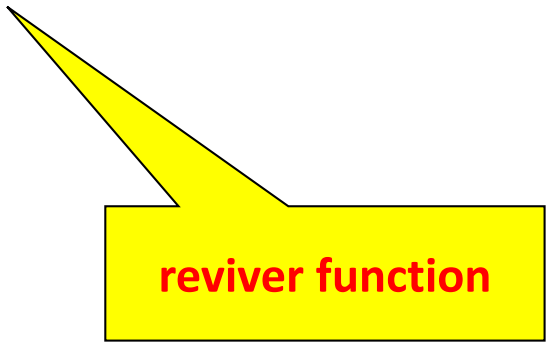
JSON string => JS data

```
const json = '{"result":true, "count":42}';
const obj = JSON.parse(json);

console.log(obj.count);   // expected output: 42

console.log(obj.result);  // expected output: true
```

JSON.parse with reviver function

JSON string => JS data

```
var text = '{ "name":"Dorothea Wierer",
              "birthDate":"1990-04-03",
              "city":"Brunico"}';

var obj = JSON.parse(text, function (key, value) {
  if (key == "birthDate") {
    return new Date(value);
  } else {
    return value;
  }
});
```



JSON.stringify

JS data => JSON string

JS_Object

JS_Array

JS_special types

JS_date

```
console.log(JSON.stringify({ x: 5, y: 6 }));
// expected output: "{"x":5,"y":6}"

console.log(JSON.stringify([new Number(3), new String('false'),
new Boolean(false)]));
// expected output: "[3,"false",false]"

console.log(JSON.stringify({ x: [10, undefined, function(){},
Symbol('')] }));
// expected output: "{"x":[10,null,null,null]}"

console.log(JSON.stringify(new Date(2006, 0, 2, 15, 4, 5)));
// expected output: ""2006-01-02T15:04:05.000Z""
```

The JSON.stringify() function will remove any functions from a JavaScript object, both the key and the value

Json Tutorial and reference

https://www.w3schools.com/js/js_json_intro.asp

https://developer.mozilla.org/en-US/docs/Learn/JavaScript/Objects/JSON

Q

What is the most modern way to write AJAX (AJAJ) queries?

JS Promises

A **Promise** is a placeholder (proxy) for a value not known when the promise is created.

It allows you to associate handlers with an asynchronous action's eventual success value or failure reason.

In this way an asynchronous method returns a value like synchronous methods: it returns a *promise* to supply the value instead of returning the final value.

A very good tutorial: https://javascript.info/promise-basics

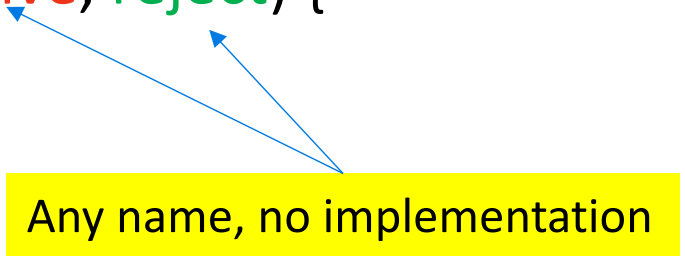
JS Promises

- A Promise is in one of these states:
- *pending*: initial state (neither fulfilled nor rejected).
- *fulfilled*: the operation was completed successfully.
- *rejected*: the operation failed.

JS Promises

Creating the Promise and evaluating it

```
let promise = new Promise(function(resolve, reject) {
    … some code…
    if (ok) {
        resolve(valueToBeReturned);
    } else {
        reject(new Error("message);
}
```



JS Request

```
promise.then(
  function(value) {doSomethingWithValue(value);}, //if fulfilled
  function(error) {doSomethingWithError(error);}  //if rejected
);
```


JS Promises: example

```
<!DOCTYPE html>
<html>
<body>
<h2>JavaScript Promise</h2>
<p id="demo"></p>

<script>
function myDisplayer(some) {
  document.getElementById("demo").innerHTML = some;
}
let myPromise = new Promise(function(myResolve, myReject) {
  let x = 0;
// some code (try to change x to 5)
  if (x == 0) {
    myResolve("OK");
  } else {
    myReject("Error");
  }
});
myPromise.then(
  function(value) {myDisplayer(value);},
  function(error) {myDisplayer(error);}
);
</script>
</body>
</html>
```

shorter syntax

```
myPromise.then(
  myDisplayer,
  myDisplayer
);
```

try it here:
https://www.w3schools.com/js/tryit.asp?filename=tryjs_promise2

JS Promises: example

```
<!DOCTYPE html>
<html>
<body>
<h2>JavaScript Promise</h2>
<p id="demo"></p>

<script>
function myDisplayer(some) {
  document.getElementById("demo").innerHTML = some;
}
let myPromise = new Promise(function(myResolve, myReject) {
  let x = 0;
// some code (try to change x to 5)
  if (x == 0) {
    myResolve("OK");
  } else {
    myReject("Error");
  }
});
myPromise.then(
  function(value) {myDisplayer(value);},
  function(error) {myDisplayer(error);}
);
</script>
</body>
</html>
```

```
  if (x == 0) {
    setTimeout(() => myResolve("OK"), 2000);
  } else {
    setTimeout(() => myReject("Error"), 1000);
  }
});
```

with delay

try it here:
https://www.w3schools.com/js/tryit.asp?filename=tryjs_promise2

JS fetch

```
<!DOCTYPE html>
<html>
<body>
<p id="demo">Fetch a file to change this text.</p>
<script>
let file = "fetch_info.txt"
fetch (file)
.then(x => x.text())
.then(y => document.getElementById("demo").innerHTML = y);
</script>
</body>
</html>
```

JS fetch

fetch takes a Request object (may have headers)

fetch returns a Promise that resolve to a Response object

Response has methods:

- text() returns a Promise that resolves to a string
- json() returns a Promise that resolves to a Json object
- blob() returns a Promise that resolves to a Blob object