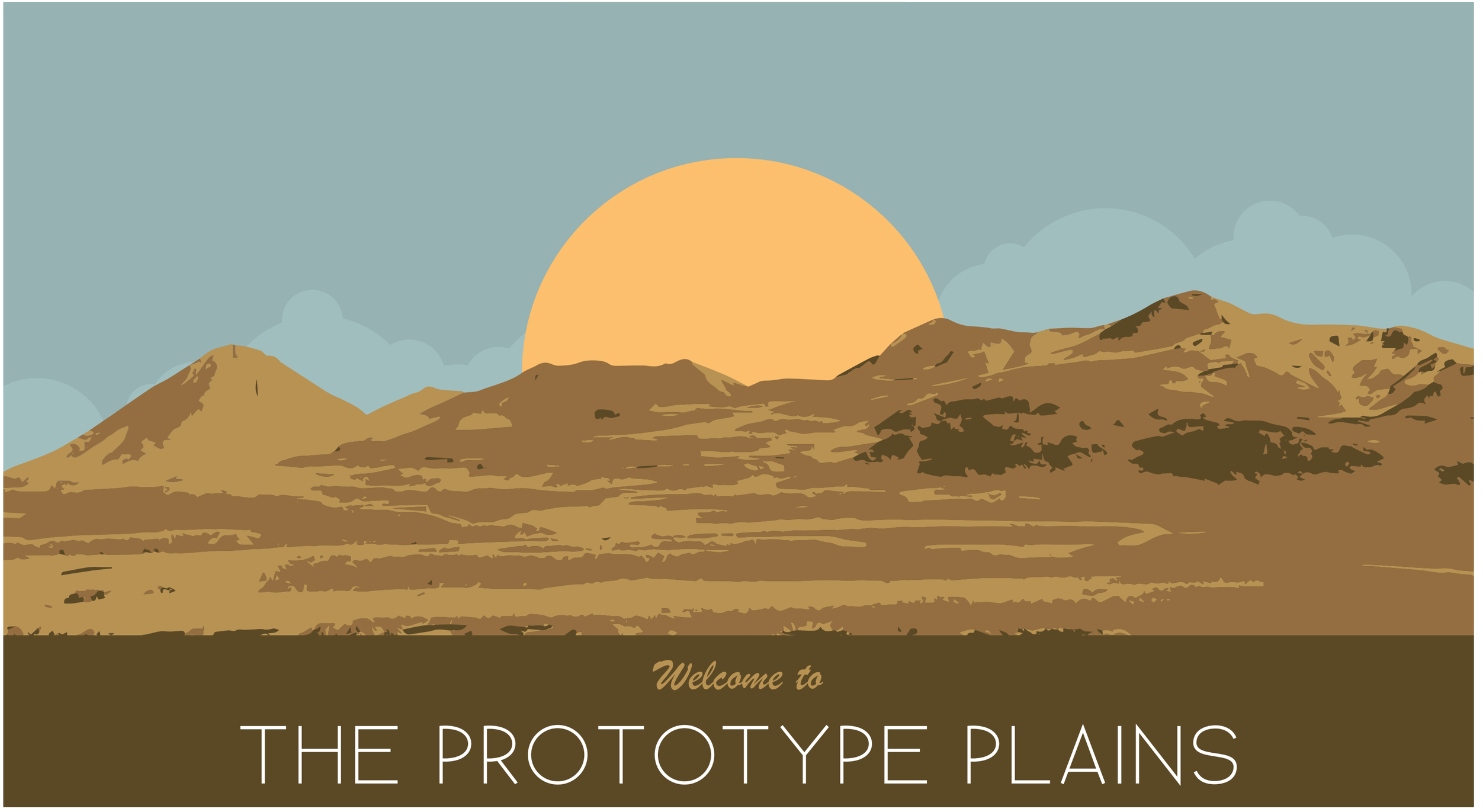

Welcome to
THE PROTOTYPE PLAINS

USEFUL PROPERTIES IN THE OBJECT PROTOTYPE

We've seen a few properties inherited from the Object.prototype...let's test a few more.

```
var x = 4;
var y = "4";
```

```
x.valueOf();
```

→ 4

```
y.valueOf();
```

→ "4"

The "value" in `valueOf()` isn't looking for numbers necessarily, but instead returns whatever primitive type is associated with the object.

```
x.valueOf() == y.valueOf();
```

→ true

Be careful! The `==` tries to help us out by using "type coercion," which turns a number contained within a string into an actual number. Here, the `"4"` we got back from `y.valueOf()` became `4` when the `==` examined it.

USEFUL PROPERTIES IN THE OBJECT PROTOTYPE

We've seen a few properties inherited from the Object.prototype...let's test a few more.

```
var x = 4;
var y = "4";
```

```
x.valueOf();
```

→ 4

```
y.valueOf();
```

→ "4"

The "value" in `valueOf()` isn't looking for numbers necessarily, but instead returns whatever primitive type is associated with the object.

```
x.valueOf() == y.valueOf();
```

→ true

```
x.valueOf() === y.valueOf();
```

→ false

The `===` operator does NOT ignore the type of the value, and gives us a more detailed interpretation of equality. JavaScript experts often prefer this comparator exclusively over `==` for this reason.

USEFUL PROPERTIES IN THE OBJECT PROTOTYPE

We've seen a few properties inherited from the Object.prototype...let's test a few more.

```
var x = 4;
var y = "4";
```

```
var a = [ 3, "blind", "mice" ];
```

```
var b = new Number(6);
```

```
x.valueOf();
```

→ 4

```
y.valueOf();
```

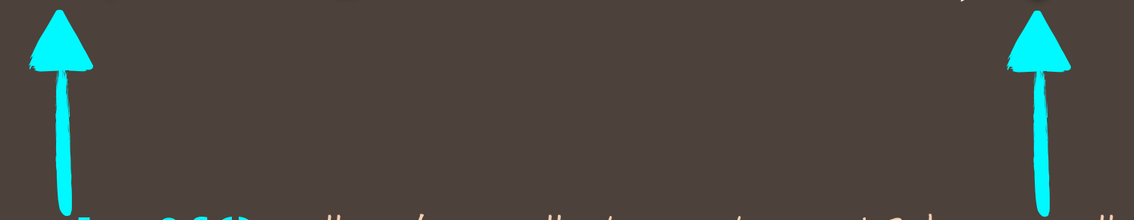
→ "4"

```
a.valueOf();
```

→ [3, "blind", "mice"]

```
b.valueOf();
```

→ 6



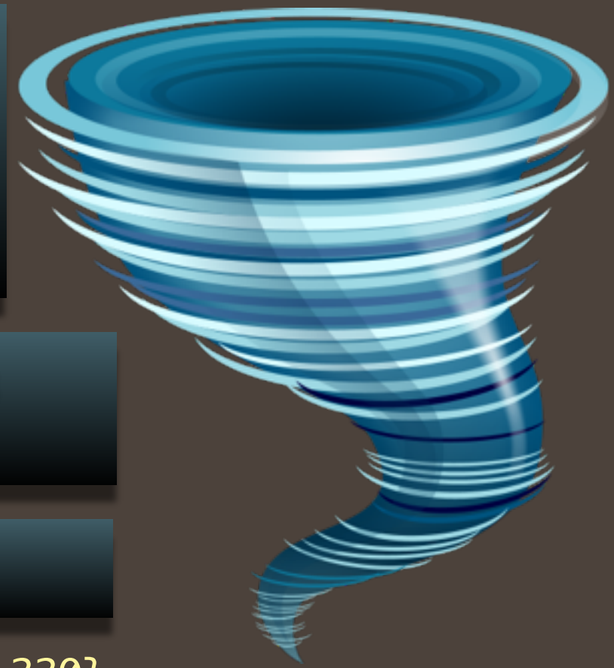
Most `valueOf()` calls, when called on ordinary JS types, will not produce anything different than you might expect when just logging out the Object. Don't worry, it gets more interesting...

VALUEOF( ) ON CUSTOM OBJECTS

What happens when we call valueOf( ) on an object we make ourselves?

```
var Tornado = function (category, affectedAreas, windGust) {
    this.category = category;
    this.affectedAreas = affectedAreas;
    this.windGust = windGust;
};
```

Constructors can be function expressions, too!



```
var cities = [ ["Kansas City", 464310], ["Topeka", 127939], ["Lenexa", 49398] ];
var twister = new Tornado( "F5", cities, 220 );
```

```
twister.valueOf();
```

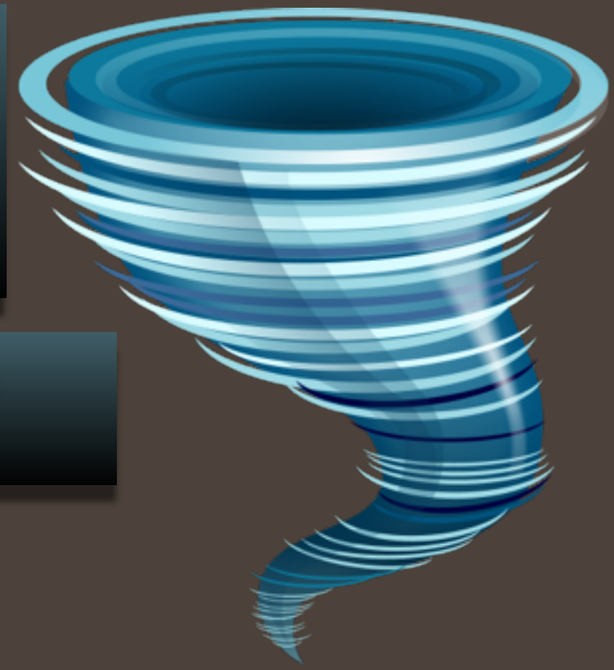
→ Tornado {category: "F5", affectedAreas: Array[3], windGust: 220}

The valueOf() function for custom Objects just defaults to a list of their properties, just like logging them out.

OVERRIDING PROTOTYPAL PROPERTIES

Many situations require special functionality that's different from the first available property

```
var Tornado = function (category, affectedAreas, windGust) {
    this.category = category;
    this.affectedAreas = affectedAreas;
    this.windGust = windGust;
};
```



```
var cities = [ ["Kansas City", 464310], ["Topeka", 127939], ["Lenexa", 49398] ];
var twister = new Tornado( "F5", cities, 220 );
```

```
Tornado.prototype.valueOf = function( ) {
   var sum = 0;
   for (var i = 0; i < this.affectedAreas.length; i++) {
       sum += this.affectedAreas[i][1];
   }
   return sum;
};
```

When overriding the property, we want to modify the Tornado prototype rather than the Object prototype! We only want to change `valueOf()` for Tornado's, not all Objects!

OVERRIDING PROTOTYPAL PROPERTIES

Many situations require special functionality that's different from the first available property

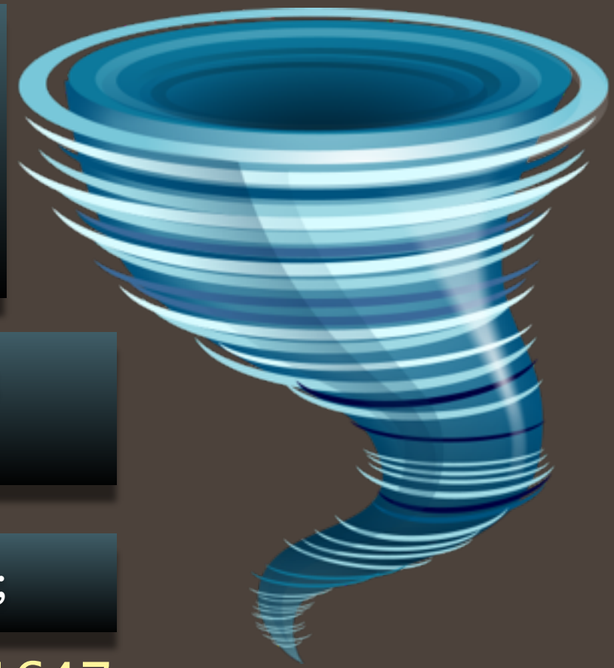
```
var Tornado = function (category, affectedAreas, windGust) {
    this.category = category;
    this.affectedAreas = affectedAreas;
    this.windGust = windGust;
};
```

```
var cities = [ ["Kansas City", 464310], ["Topeka", 127939], ["Lenexa", 49398] ];
var twister = new Tornado( "F5", cities, 220 );
```

```
Tornado.prototype.valueOf = function( ) {
   var sum = 0;
   for (var i = 0; i < this.affectedAreas.length; i++) {
       sum += this.affectedAreas[i][1];
   }
   return sum;
};
```

```
twister.valueOf();
```

→ 641647

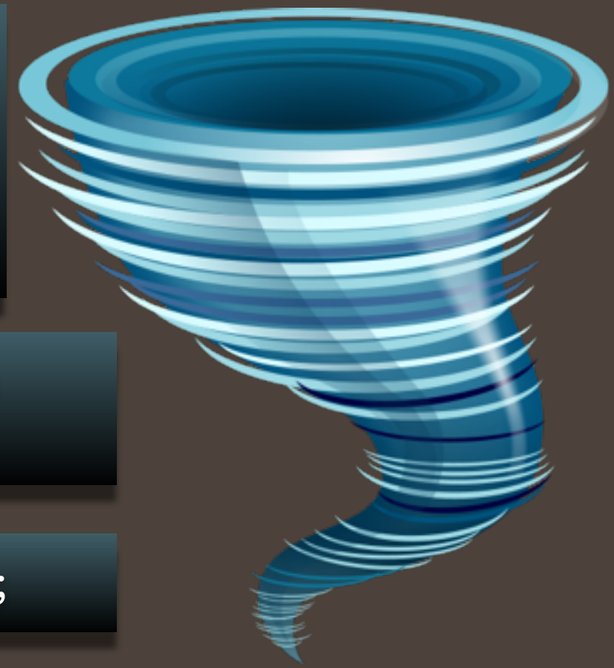


This `valueOf` is found in the Tornado prototype, which comes before the Object prototype in the chain. Thus, the Object prototype's `valueOf` has been effectively overridden, since it will never be found in the search.

OUR VALUE WILL EVEN UPDATE AS CITIES UPDATES

Each Tornado's 'affectedAreas' property can be updated outside the object with no loss of accuracy.

```
var Tornado = function (category, affectedAreas, windGust) {
    this.category = category;
    this.affectedAreas = affectedAreas;
    this.windGust = windGust;
};
```



```
var cities = [ ["Kansas City", 464310], ["Topeka", 127939], ["Lenexa", 49398] ];
var twister = new Tornado( "F5", cities, 220 );
```

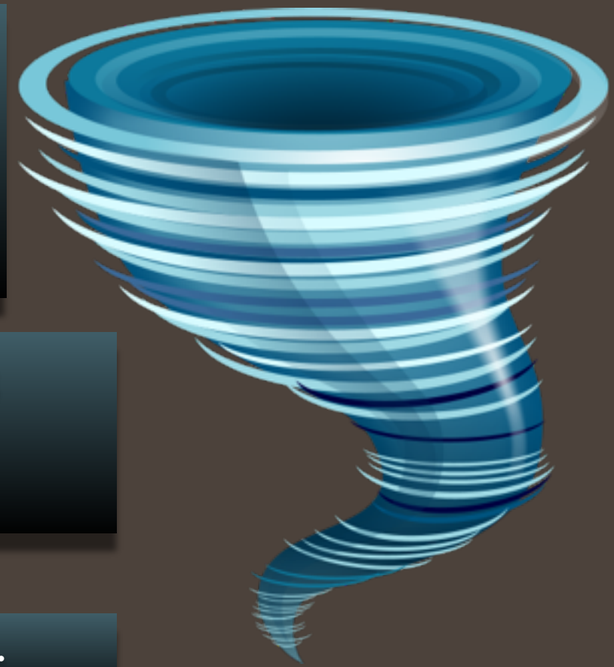
```
Tornado.prototype.valueOf = function( ) {
   var sum = 0;
   for (var i = 0; i < this.affectedAreas.length; i++) {
       sum += this.affectedAreas[i][1];
   }
   return sum;
};
```

```
twister.valueOf();
```

OUR VALUE WILL EVEN UPDATE AS CITIES UPDATES

Each Tornado's 'affectedAreas' property can be updated outside the object with no loss of accuracy.

```
var Tornado = function (category, affectedAreas, windGust) {
    this.category = category;
    this.affectedAreas = affectedAreas;
    this.windGust = windGust;
};
```



```
var cities = [ ["Kansas City", 464310], ["Topeka", 127939], ["Lenexa", 49398] ];
var twister = new Tornado( "F5", cities, 220 );
cities.push( ["Olathe", 130045] );
```

```
Tornado.prototype.valueOf = function( ) {
   var sum = 0;
   for (var i = 0; i < this.affectedAreas.length; i++) {
       sum += this.affectedAreas[i][1];
   }
   return sum;
};
```

```
twister.valueOf();
```

→ 771692

Since the cities array was passed by reference, we'll get an updated value each time an affected area is added to the list.

ANOTHER USEFUL PROTOTYPAL PROPERTY IS TOSTRING( )

Default responses for Object's toString method are often uninteresting...but overriding it is cool!

```
var x = 4;
var y = "4";
```

```
var a = [ 3, "blind", "mice" ];
```

```
x.toString();
```

→ "4"

```
y.toString();
```

→ "4"

```
a.toString();
```

→ "3,blind,mice"

A call to toString on an Array will just string-ify and concatenate all the contents, separating each entry by a comma without any whitespace. Overriding toString in the Array prototype is often desirable.

ANOTHER USEFUL PROTOTYPAL PROPERTY IS TOSTRING( )

Default responses for Object's toString method are often uninteresting...but overriding it is cool!

```
var x = 4;
var y = "4";
```

```
x.toString();
```

→ "4"

```
y.toString();
```

→ "4"

```
var a = [ 3, "blind", "mice" ];
```

```
a.toString();
```

→ "3,blind,mice"

```
var double = function ( param ){
    return param *2;
};
```

```
double.toString();
```

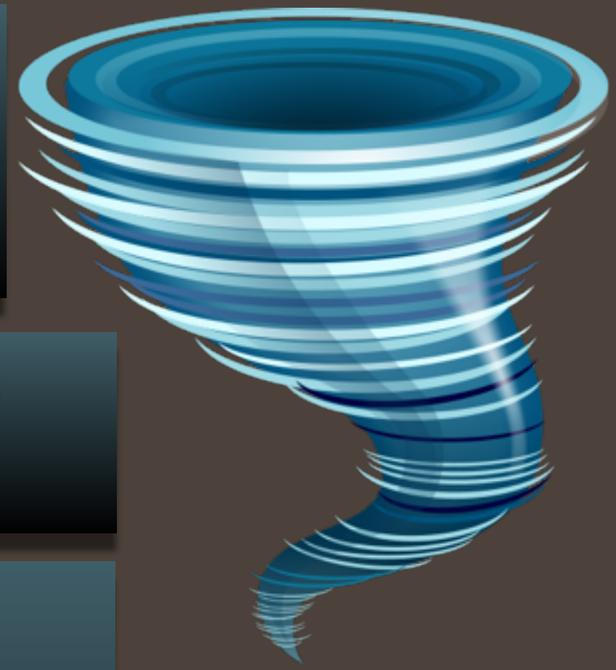
→ "function (param){
    return param *2;
}"

toString on a function can be pretty cool, if you ever need to concatenate a function into a formatted printout.

LET'S OVERRIDE TOSTRING( ) IN OUR TORNADO PROTOTYPE

We want a good representation of the data to come back when we call toString( ) on a Tornado Object

```
var Tornado = function (category, affectedAreas, windGust) {
    this.category = category;
    this.affectedAreas = affectedAreas;
    this.windGust = windGust;
}
```

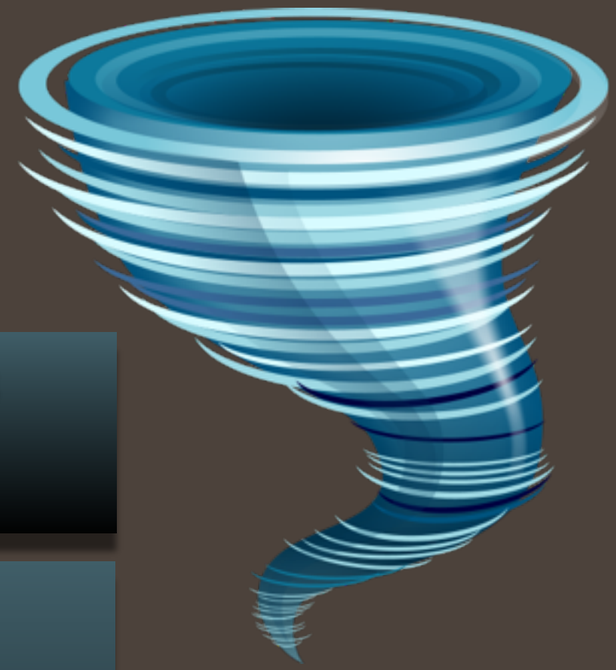


```
var cities = [ ["Kansas City", 464310], ["Topeka", 127939], ["Lenexa", 49398] ];
var twister = new Tornado( "F5", cities, 220 );
cities.push( ["Olathe", 130045] );
```

```
Tornado.prototype.toString = function( ) {
   var list = "";
   for (var i = 0; i < this.affectedAreas.length; i++) {
       if (i < this.affectedAreas.length - 1) {
           list = list + this.affectedAreas[i][0] + ", ";
       } else {
           list = list + "and " + this.affectedAreas[i][0]; }
   }
   return "This tornado has been classified as an " + this.category +
          ", with wind gusts up to " + this.windGust + "mph. Affected areas are: " +
          list + ", potentially affecting a population of " + this.valueOf() + ".";
}
```

LET'S OVERRIDE TOSTRING( ) IN OUR TORNADO PROTOTYPE

We want a good representation of the data to come back when we call toString( ) on a Tornado Object



```
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var twister = new Tornado( "F5", cities, 220 );
cities.push( ["Olathe", 130045] );
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```
Tornado.prototype.toString = function( ) {
   var list = "";
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   }
   return "This tornado has been classified as an " + this.category +
          ", with wind gusts up to " + this.windGust + "mph. Affected areas are: " +
          list + ", potentially affecting a population of " + this.valueOf() + ".";
}
```

LET'S OVERRIDE TOSTRING( ) IN OUR TORNADO PROTOTYPE

We want a good representation of the data to come back when we call toString( ) on a Tornado Object

```
var cities = [ ["Kansas City", 464310], ["Topeka", 127939], ["Lenexa", 49398] ];
var twister = new Tornado( "F5", cities, 220 );
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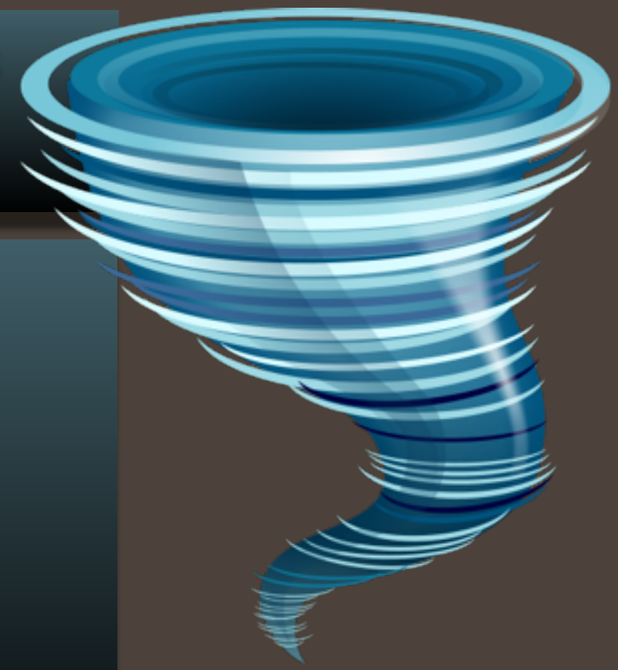

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       if (i < this.affectedAreas.length - 1) {
           list = list + this.affectedAreas[i][0] + ", ";
       } else {
           list = list + "and " + this.affectedAreas[i][0]; }
   }
   return "This tornado has been classified as an " + this.category +
          ", with wind gusts up to " + this.windGust + "mph. Affected areas are: " +
          list + ", potentially affecting a population of " + this.valueOf() + ".";
}
```

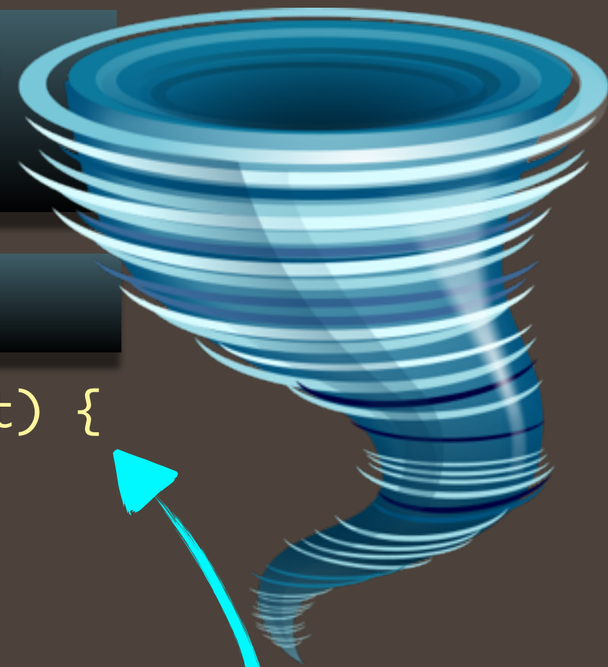
```
twister.toString();
```

→ "This tornado has been classified as an F5, with wind gusts up to 220mph. Affected areas are: Kansas City, Topeka, Lenexa, and Olathe, potentially affecting a population of 771692."

FINDING AN OBJECT'S CONSTRUCTOR AND PROTOTYPE

Some inherited properties provide ways to find an Object's nearest prototype ancestor

```
var cities = [ ["Kansas City", 464310], ["Topeka", 127939], ["Lenexa", 49398] ];
var twister = new Tornado( "F5", cities, 220 );
cities.push( ["Olathe", 130045] );
```



```
twister.constructor;
```

```
→ function (category, affectedAreas, windGust) {
      this.category = category;
      this.affectedAreas = affectedAreas;
      this.windGust = windGust;
  }
```

```
twister.constructor.prototype;
```

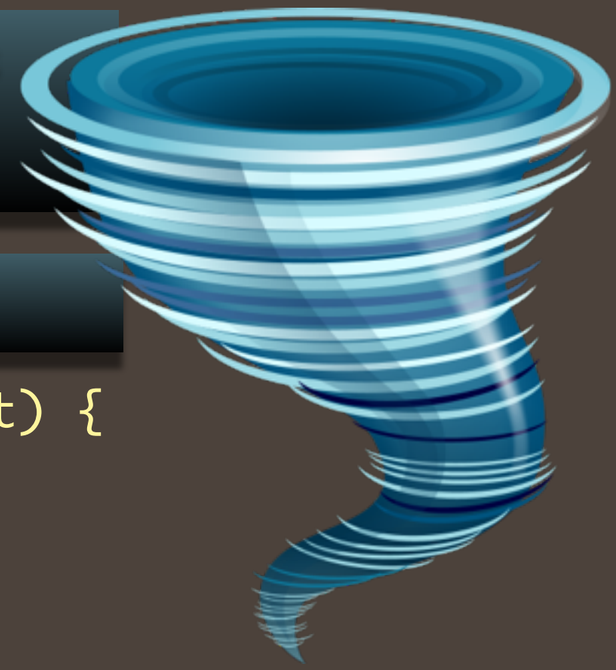
```
→ Object {valueOf: function, toString: function}
```

Remember that if a prototype Object is defined for a specific class, it will always be a property of the class's constructor, which is just another function Object.

FINDING AN OBJECT'S CONSTRUCTOR AND PROTOTYPE

Some inherited properties provide ways to find an Object's nearest prototype ancestor

```
var cities = [ ["Kansas City", 464310], ["Topeka", 127939], ["Lenexa", 49398] ];
var twister = new Tornado( "F5", cities, 220 );
cities.push( ["Olathe", 130045] );
```



```
twister.constructor;
```

```
→ function (category, affectedAreas, windGust) {
      this.category = category;
      this.affectedAreas = affectedAreas;
      this.windGust = windGust;
  }
```

```
twister.constructor.prototype;
```

```
→ Object {valueOf: function, toString: function}
```

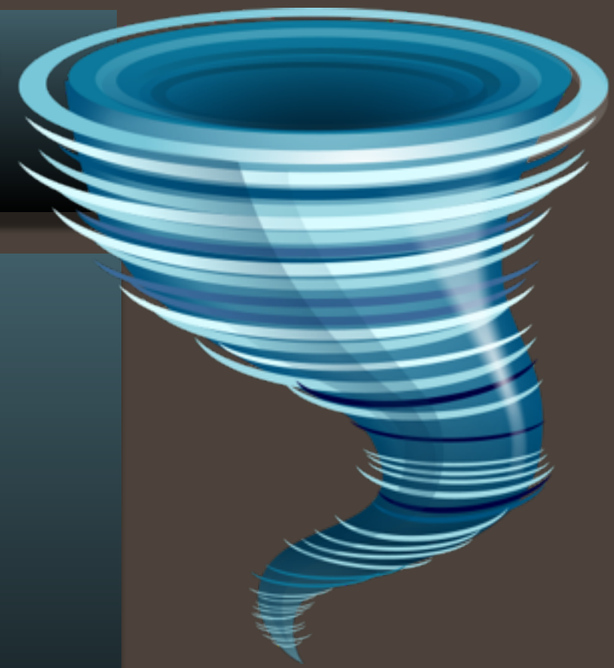
```
twister.__proto__;
```

```
→ Object {valueOf: function, toString: function}
```

HASOWNPROPERTY( ) HELPS IDENTIFY PROPERTY LOCATION

Searching prototype chains for potential overridden properties becomes easy with this function

```
var cities = [ ["Kansas City", 464310], ["Topeka", 127939], ["Lenexa", 49398] ];
var twister = new Tornado( "F5", cities, 220 );
cities.push( ["Olathe", 130045] );
```



```
Object.prototype.findOwnerOfProperty  = function ( propName ) {



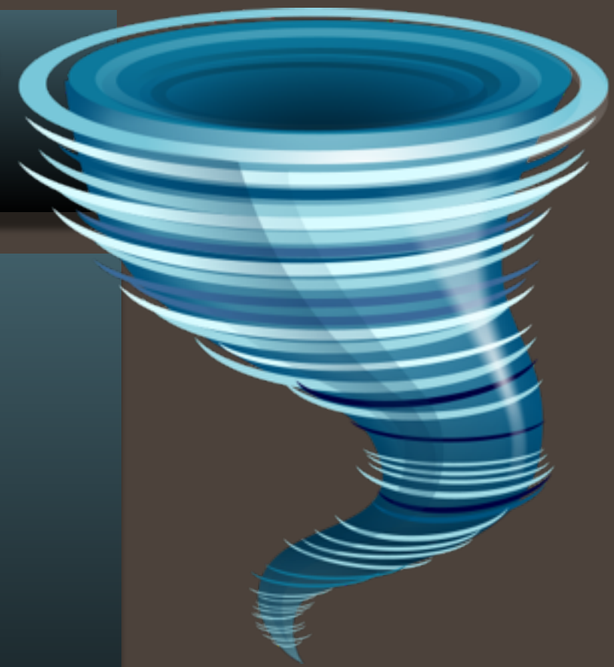
};
```

We'll build the function directly on the Object prototype so that every object we ever make can use the function!

HASOWNPROPERTY( ) HELPS IDENTIFY PROPERTY LOCATION

Searching prototype chains for potential overridden properties becomes easy with this function

```
var cities = [ ["Kansas City", 464310], ["Topeka", 127939], ["Lenexa", 49398] ];
var twister = new Tornado( "F5", cities, 220 );
cities.push( ["Olathe", 130045] );
```



```
Object.prototype.findOwnerOfProperty  = function ( propName ) {
   var currentObject = this;



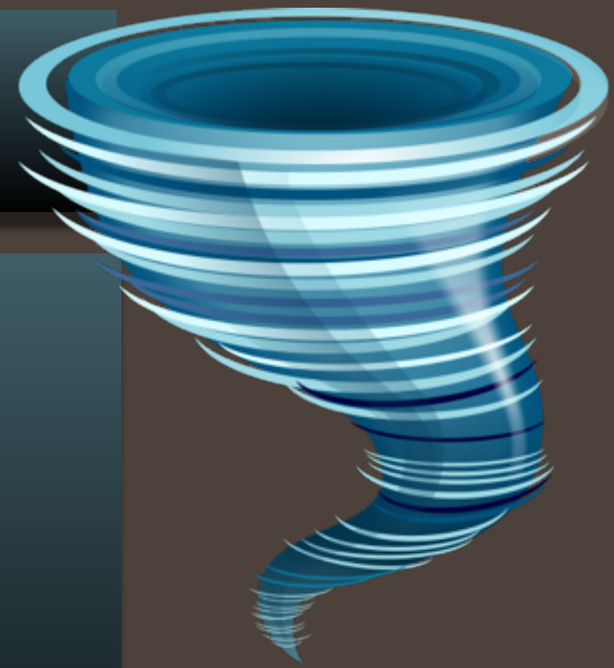
};
```

We'll start off looking for the property within the caller Object itself.

HASOWNPROPERTY( ) HELPS IDENTIFY PROPERTY LOCATION

Searching prototype chains for potential overridden properties becomes easy with this function

```
var cities = [ ["Kansas City", 464310], ["Topeka", 127939], ["Lenexa", 49398] ];
var twister = new Tornado( "F5", cities, 220 );
cities.push( ["Olathe", 130045] );
```



```
Object.prototype.findOwnerOfProperty  = function ( propName ) {
   var currentObject = this;
   while (currentObject !== null){



   }

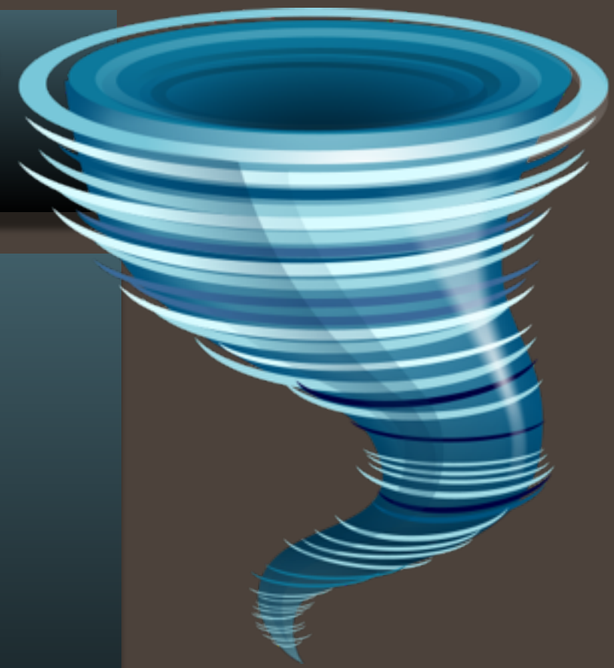
};
```

We'll keep searching the prototype chain until we've tried to go beyond the Object prototype...which has no prototype. Trying to access it would produce null.

HASOWNPROPERTY( ) HELPS IDENTIFY PROPERTY LOCATION

Searching prototype chains for potential overridden properties becomes easy with this function

```
var cities = [ ["Kansas City", 464310], ["Topeka", 127939], ["Lenexa", 49398] ];
var twister = new Tornado( "F5", cities, 220 );
cities.push( ["Olathe", 130045] );
```



```
Object.prototype.findOwnerOfProperty  = function ( propName ) {
   var currentObject = this;
   while (currentObject !== null){
      if (currentObject.hasOwnProperty(propName)) {
         return currentObject;
      }

   }

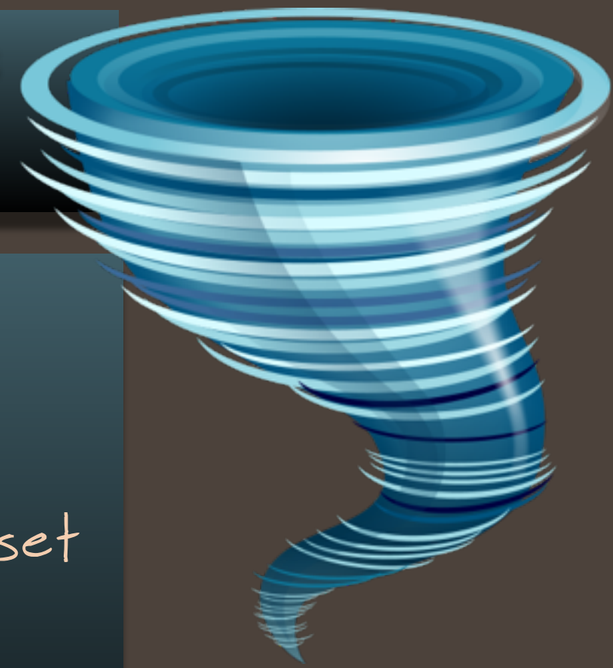
};
```

If the currently examined Object has the property, success! Return that Object.

HASOWNPROPERTY( ) HELPS IDENTIFY PROPERTY LOCATION

Searching prototype chains for potential overridden properties becomes easy with this function

```
var cities = [ ["Kansas City", 464310], ["Topeka", 127939], ["Lenexa", 49398] ];
var twister = new Tornado( "F5", cities, 220 );
cities.push( ["Olathe", 130045] );
```



```
Object.prototype.findOwnerOfProperty  = function ( propName ) {
   var currentObject = this;
   while (currentObject !== null){
      if (currentObject.hasOwnProperty(propName)) {
         return currentObject;
      }
      else {
         currentObject = currentObject.__proto__;
      }
   }

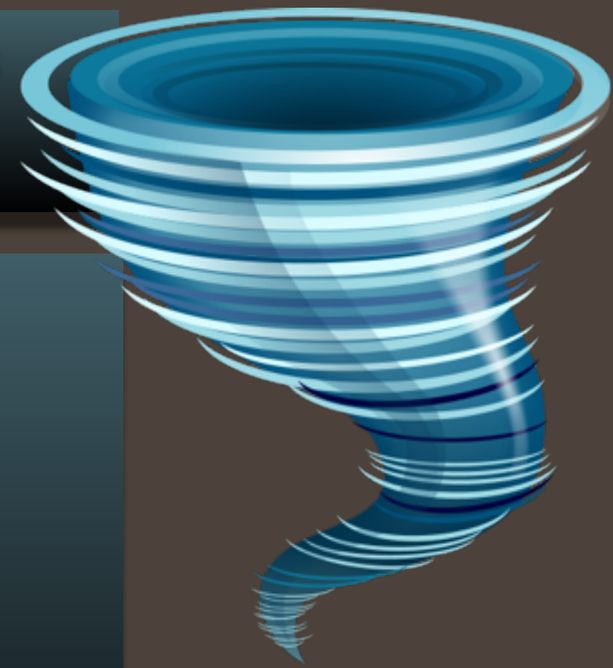
};
```

Otherwise, we set the currently examined Object to be the previously examined Object's prototype.

HASOWNPROPERTY( ) HELPS IDENTIFY PROPERTY LOCATION

Searching prototype chains for potential overridden properties becomes easy with this function

```
var cities = [ ["Kansas City", 464310], ["Topeka", 127939], ["Lenexa", 49398] ];
var twister = new Tornado( "F5", cities, 220 );
cities.push( ["Olathe", 130045] );
```



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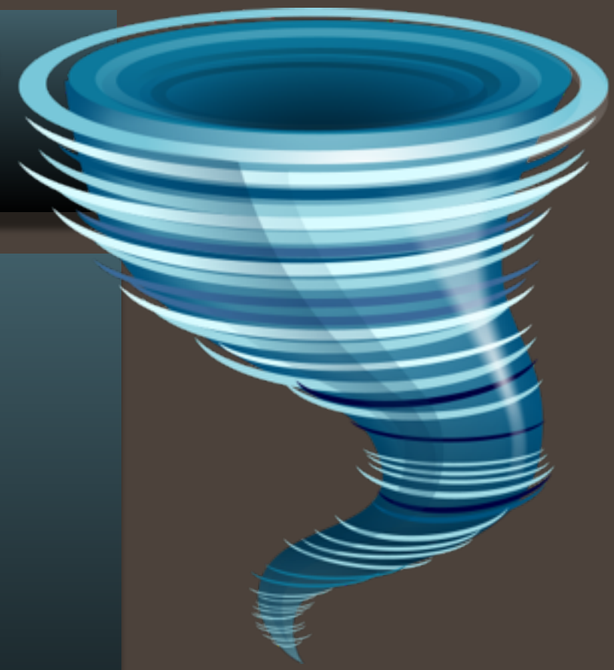
Object.prototype.findOwnerOfProperty  = function ( propName ) {
   var currentObject = this;
   while (currentObject !== null){
      if (currentObject.hasOwnProperty(propName)) {
         return currentObject;
      }
      else {
         currentObject = currentObject.__proto__;
      }
   }
   return "No property found!";
};
```

If the while loop exits, we know we didn't find the property, and should probably let ourselves know, right?

HASOWNPROPERTY( ) HELPS IDENTIFY PROPERTY LOCATION

Searching prototype chains for potential overridden properties becomes easy with this function

```
var cities = [ ["Kansas City", 464310], ["Topeka", 127939], ["Lenexa", 49398] ];
var twister = new Tornado( "F5", cities, 220 );
cities.push( ["Olathe", 130045] );
```



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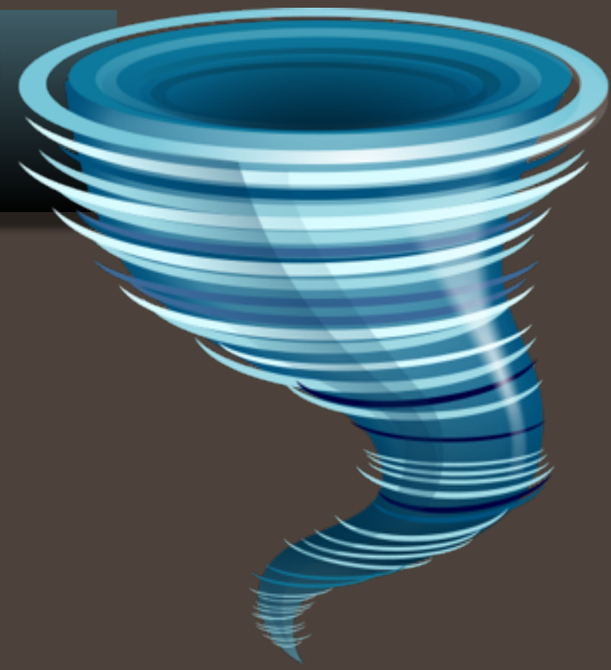
   var currentObject = this;
   while (currentObject !== null){
      if (currentObject.hasOwnProperty(propName)) {
         return currentObject;
      }
      else {
         currentObject = currentObject.__proto__;
      }
   }
   return "No property found!";
};
```

HASOWNPROPERTY( ) HELPS IDENTIFY PROPERTY LOCATION

Searching prototype chains for potential overridden properties becomes easy with this function

```
var cities = [ ["Kansas City", 464310], ["Topeka", 127939], ["Lenexa", 49398] ];
var twister = new Tornado( "F5", cities, 220 );
cities.push( ["Olathe", 130045] );
```



```
Object.prototype.findOwnerOfProperty  = function ( propName ) {
    var currentObject = this;
    while (currentObject !== null){
        if (currentObject.hasOwnProperty(propName)) {
            return currentObject;
        }
        else {
            currentObject = currentObject.__proto__;
        }
    }
    return "No property found!";
};
```

Searching for the valueOf() to which twister has access reveals the Tornado prototype as the owner. Thanks, hasOwnProperty()!

TORNADO Prototype

```
twister.findOwnerOfProperty("valueOf");
```

→ Object {valueOf: function, toString: function}

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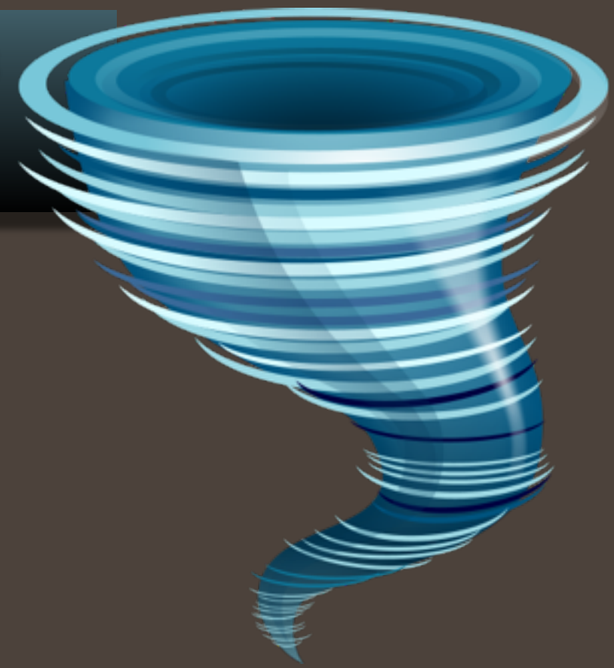

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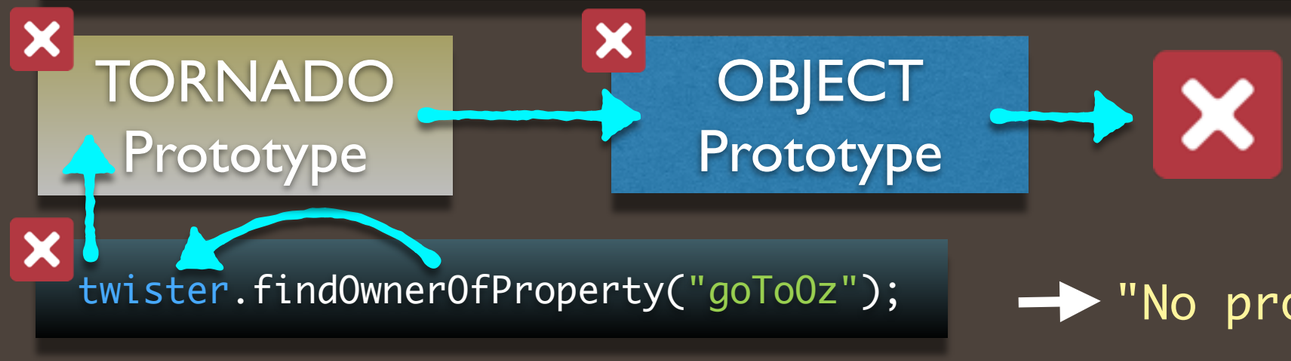
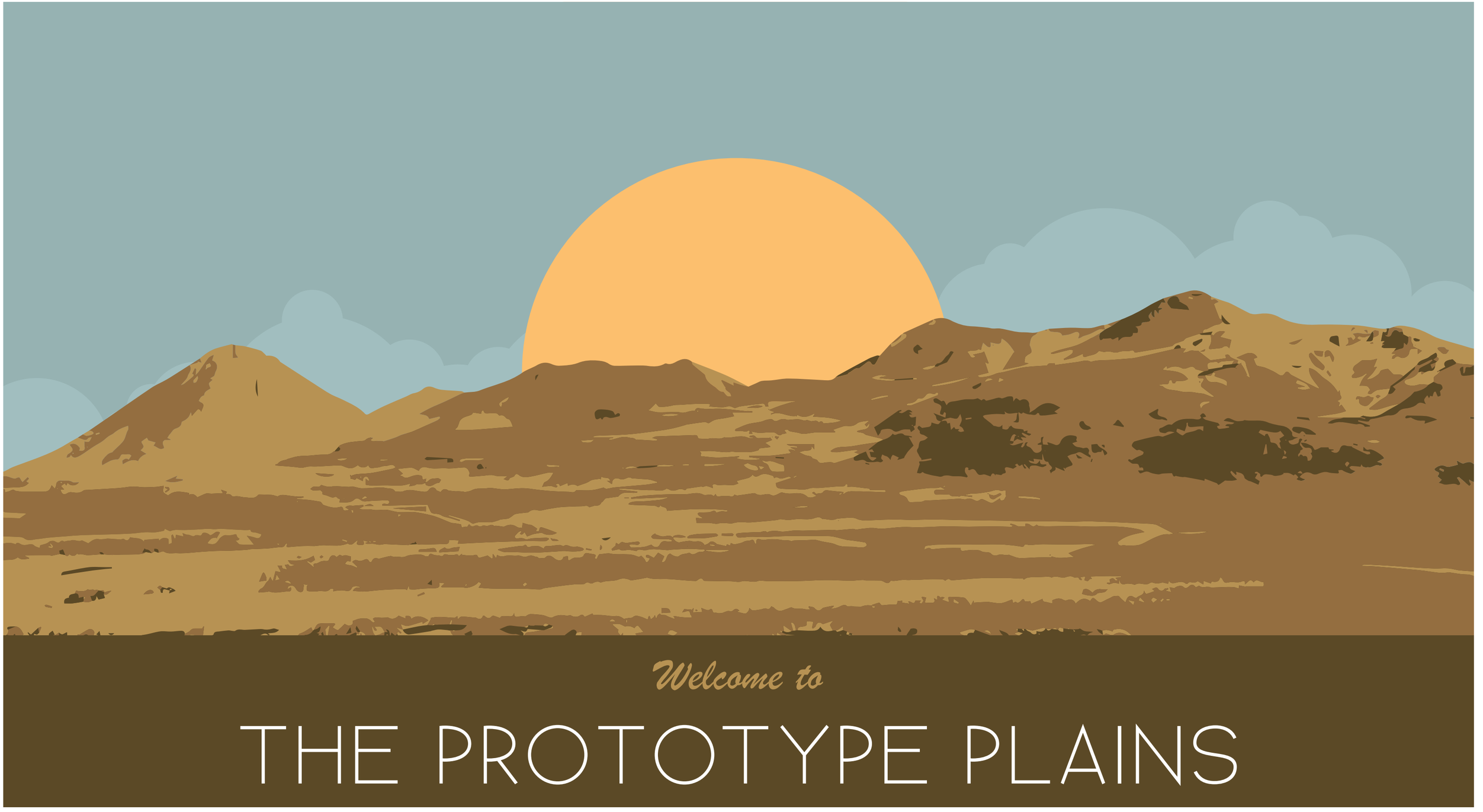


Trying to find the goToOz property reveals that none exists for this Tornado. Which sort of sucks.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