

Scala

Language Tour

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m.map { t => val (s, i) = t; (s, i+1) }
```

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```

<insert mental “record scratch” here>

Craig Tataryn



 @craiger

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- The Basement Coders Podcast



- - basementcoders.com



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- - basementcoders.com

- Winnipeg Functional Programming Group

- **wfPG** - wfpkg.ca



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- 

- grindsoftware.com

What is Scala?

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- Combines Functional & Object Oriented

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- Dynamic-like Syntax in a Static Language

What is Scala?

- Combines Functional & Object Oriented
- Interop with Java
- Dynamic-like Syntax in a Static Language
- Easy to start playing with (REPL)

Let's Start Variables & Classes

```
m.map { t => val (s, i) = t; (s, i+1) }
```

```
m.map { t => val (s, i) = t; (s, i+1) }
```

<insert mental “record scratch” here>

Declaring a Class



```
public class Person {  
    public String name;  
  
    public Person(String name) {  
        this.name = name;  
    }  
  
    public String getName() {  
        return this.name;  
    }  
  
    public void setName(String name) {  
        this.name = name;  
    }  
}
```



```
class Person(var name:String)
```



Function Definitions

```
def savePerson(p: Person): ID = {  
    dao.save(p)  
}
```

Function Definitions

Start of
Function
Declaration

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Function Definitions

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Function
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Parameter
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Function Definitions

Start of
Function
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Function
Name

Parameter
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Parameter
Type

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def savePerson(p: Person): ID = {  
    dao.save(p)  
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Function Definitions

Start of Function Declaration	Function Name	Parameter Name	Parameter Type	Function Return Type
def	savePerson	p	Person	ID
				= {
				dao.save(p)
				}

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<code>def</code>	<code>savePerson</code>	<code>p</code>	<code>Person</code>	<code>ID</code>
	<code>dao.save(p)</code>			<code>{</code>
	<code>}</code>			Start of Function Definition

Function Definitions

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	<code>def savePerson</code>	<code>(p:</code>	<code>Person)</code>	<code>: ID = {</code>
				<code>dao.save(p)</code>
				<code>}</code>
				Start of Function Definition

Things to note:

- Last expression is return value
- if more than one?
- = sign, the ; of Scala!
- : is used just like in variable declaration

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					=
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					}
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Function Definitions

Start of Function Declaration	Function Name	Parameter Name	Parameter Type	Function Return Type
<code>def</code>	<code>savePerson</code>	<code>p</code>	<code>Person</code>	<code>ID</code>
		<code>:</code>	<code>:</code>	<code>= {</code>
	<code>dao.save(p)</code>			
	<code>}</code>			<code>Start of Function Definition</code>

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- : is used just like in variable declaration

v.s. Java

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- Same file, multiple classes

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v.s. Java

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- Static members

Objects

Objects vs Classes



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- We tend to think of



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 - Objects as instances



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Objects vs Classes

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- In Scala
 - `object` is a static template
 - `class` is an instance templates



Traits

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- Like an interface in Java



Traits

- Like an interface in Java
- Like an abstract class in Java



Traits

- Like an interface in Java
- Like an abstract class in Java
- Ability to “Mixin” traits



Operators



Looping

Control Structures

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Control Structures

- The if statement, nothing new here
- Looping
 - while/do-while
 - for comprehensions
 - Higher-Order List functions (foreach)

For Comprehensions



For Comprehensions



```
List<Employee> fullTime = new ArrayList<Employee>();  
for (emp : empList) {  
    if (emp.status == Consts.FULL_TIME)  
        fullTime.add(emp);  
}
```

For Comprehensions



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List<Employee> fullTime = new ArrayList<Employee>();  
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```
val fullTime = new ListBuffer[Int]  
for (emp <- empList) {  
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        fullTime += emp  
}
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For Comprehensions



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val fullTime = new ListBuffer[Int]  
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```
val fullTime = for (emp <- empList  
    if emp.status == Consts.FULL_TIME) yield emp
```


Functions

Functions

Functions

- Functions are “kind of a big deal”

Functions

- Functions are “kind of a big deal”
- Higher Order

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- First-class Types

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 - type of return value

Function Types

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Best described by showing Function literals

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val add_one: (Int) => Int = (x) => x + 1
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val add_one: (Int) => Int = (x) => x + 1
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 - Returns a value of Type Int
- It's implementation is as follows
 - The parameter will be named x
 - It will return $x + 1$

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 - The parameter will be named x
 - It will return x + 1

map

map

- Not Map

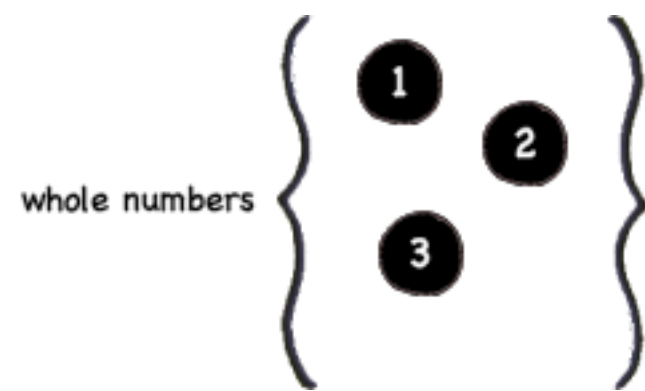
map

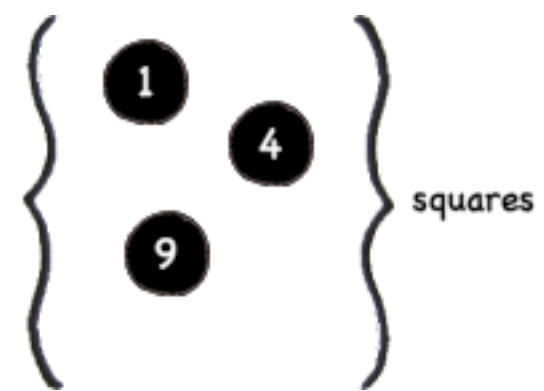
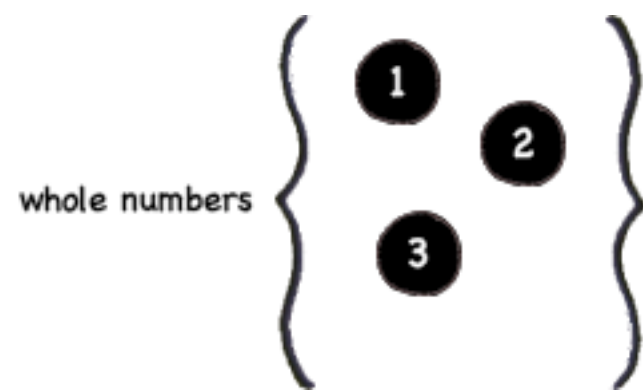
- Not Map
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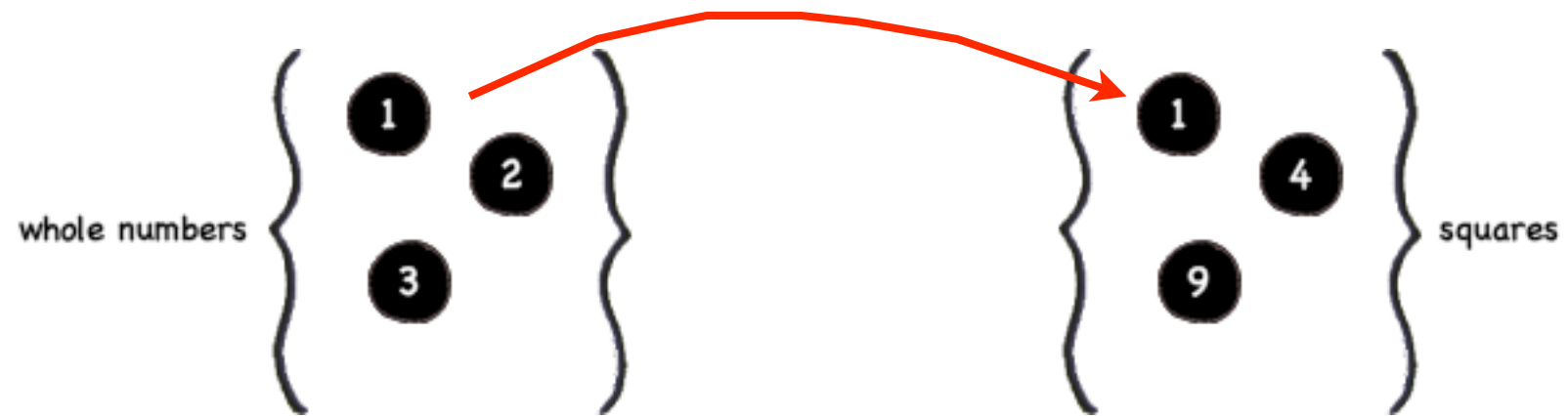
map

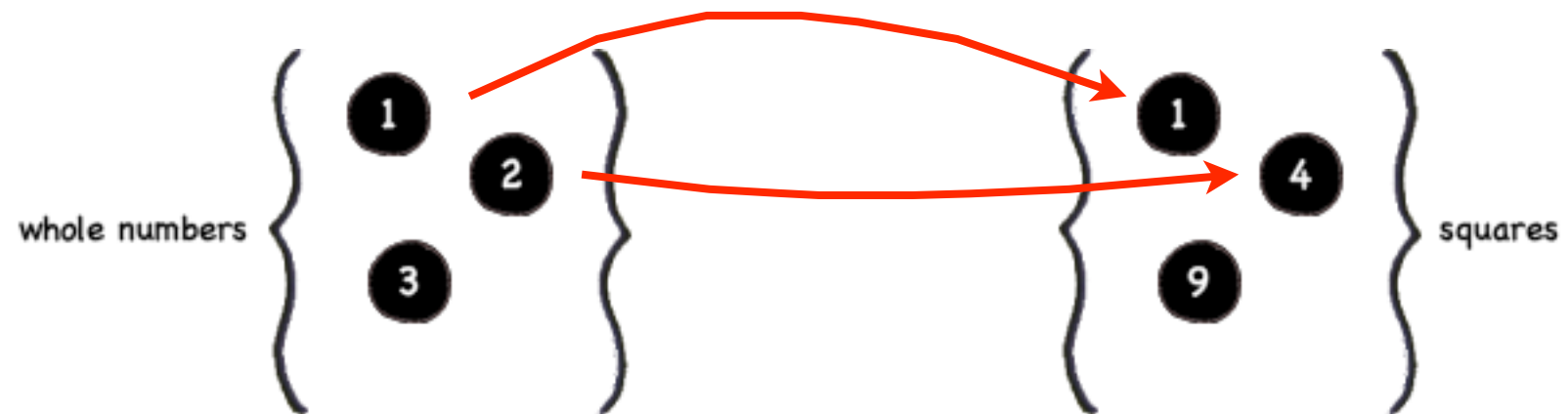
- Not Map
- A higher-order function
- Name is from Maths

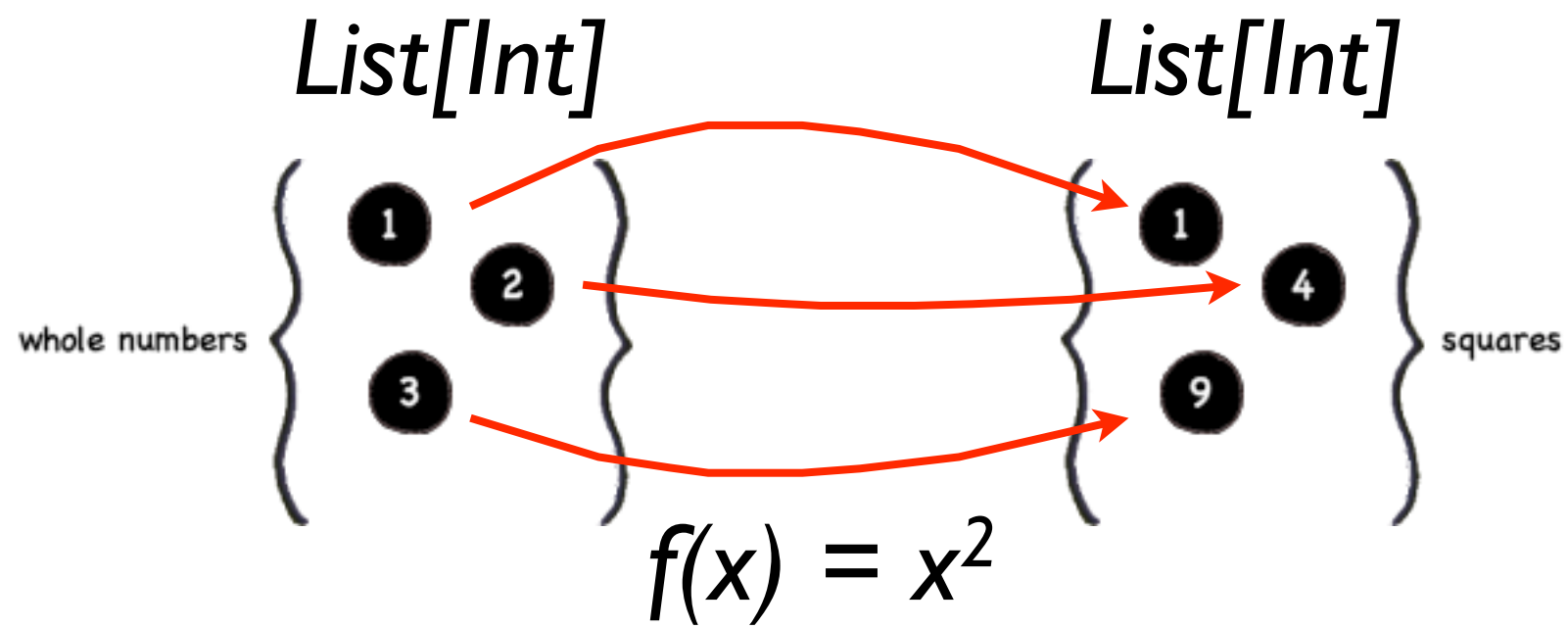
“map an element from one set to another”

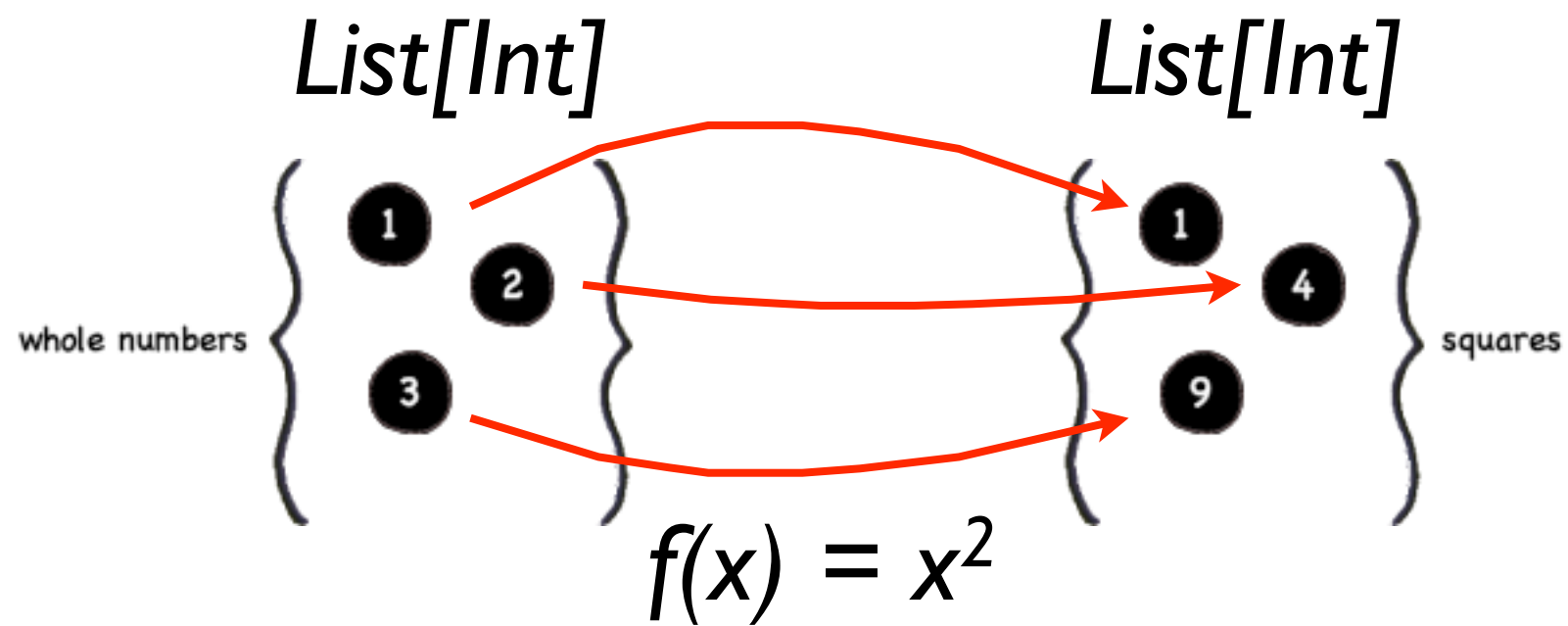












```
val squares = wholeNumbers map(x => x * x)
```

FP Paradigm Shift

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- You start viewing Data Structures as things you work **with**, not on.
- You pass functions to Lists, rather than Lists to functions

Pattern Matching

case & match



case & match

- The **case** and **match** keywords are comprehenders just like **for**

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- **match** comprehends *Partial Functions*



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- **case** statements generate *Partial Functions*



case & match

- The **case** and **match** keywords are comprehenders just like **for**
- **match** comprehends *Partial Functions*
- **case** statements generate *Partial Functions*
 - For several different types (*Strings, Ints, Regular Expressions, Types, Sequences, Foo...*)

Match on Foo

Match on Foo

In order to Allow:

```
var kid = Person("Mitch", "Tataryn")  
kid match {  
  case Person("Mitch", "Tataryn") => println("Hi Son!")  
  case Person("Lilja", "Tataryn") => println("Hi Daughter!")  
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}
```

You can do:

```
object Person {  
  def unapply(p: Person): (String, String) = {  
    (p.fname, p.lname)  
  }  
}
```

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```

Or:

```
case class Person(fname: String, lname: String)
```

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The Tuple

Use a Tuple if...



Use a Tuple if...

- Want to return more than one thing



Use a Tuple if...

- Want to return more than one thing
- Want to extract more than one thing



About Tuples in Scala

```
m.map { t => val (s, i) = t; (s, i+1) }
```

About Tuples in Scala

- Tuples are Fundamental
- You'll start to recognize their use everywhere

```
m.map { t => val (s, i) = t; (s, i+1) }
```

If we have Time...

by Name Parameters



- Gives you the ability to pass a code-block directly as a parameter

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- The code-block is “named” by the parameter inside the function

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Partially Applied Functions

- **Allows you to “fill in a parameter” at a later time**

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- Useful for stating locally-scoped default parameters

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```
def draw(widget: Widget, canv: Canvas) = ...
```

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- Useful for stating locally-scoped default parameters

```
def draw(widget: Widget, canv: Canvas) = ...  
.  
.  
.  
val myDraw = draw(_, myWindow.canvas)  
myDraw(myWidget)
```

Closures

Scope Doggy-bag



Scope Doggy-bag

- Functions are usually able to access:

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Scope Doggy-bag

- Functions are usually able to access:
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 - their enclosing/super class
- Closures add the ability to “take your scope with you”



Curried Functions

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`geoLocate(40.827873)(85.341797)`

Curried Functions

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- It was defined like this:
`def geoLocate(lat: Double)(lng: Double) = ...`

Curried Functions

- If you see a function call like this:
`geoLocate(40.827873)(85.341797)`
- It was defined like this:
`def geoLocate(lat: Double)(lng: Double) = ...`
- YouCurry non-curried functions
using `.curried`

Implicit Functions

Type Conversion

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- Implicit functions are typically used for Type Conversion

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- Remember this example?

```
var str = "Hello"  
str = 10 //Bzzzzzt!
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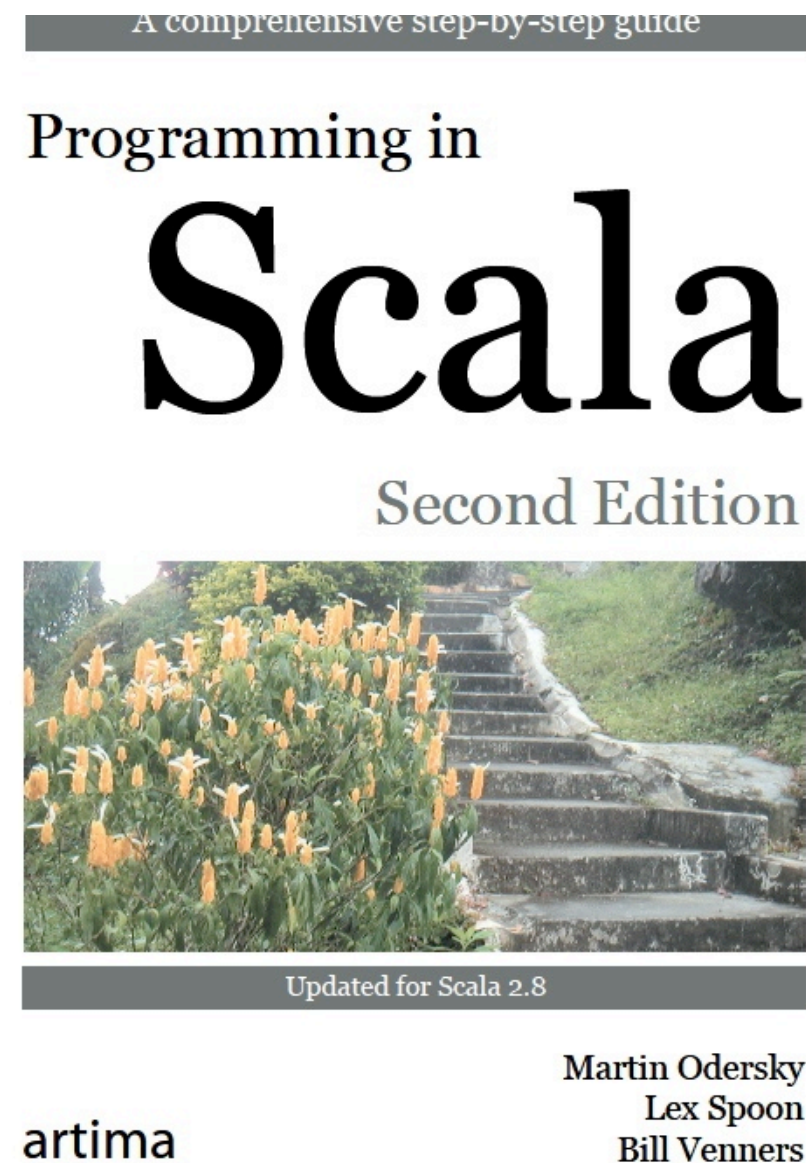
```
var str = "Hello"  
str = 10 //Bzzzzzt!
```

```
implicit def intToString(i: Int) {  
    i.toString  
}
```

References

Where to start

- Book
 - Programming **in** Scala (Artima)
 - Programming Scala (O'Reilly)
- StackOverflow.com
- scala-user mailing list



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`git://github.com/ctataryn/ScalaLangTour.git`