

Craig Tataryn



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- The Basement Coders Podcast



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- - basementcoders.com

- Winnipeg Functional Programming Group

- **wfPG** - wfpj.ca



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- grindsoftware.com

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Scala

What is Scala?

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- Combines Functional & Object Oriented

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- Interop with Java

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- Interop with Java
- 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) }
```

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```

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


Function Definitions

Start of
Function
Declaration

Function
Name

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

Start of
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Declaration

Function
Name

Parameter
Name

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

Function Definitions

Start of
Function
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Function
Name

Parameter
Name

Parameter
Type

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

Function Definitions

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

Function Definitions

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

Function Definitions

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

Function Definitions

Start of Function Declaration	Function Name	Parameter Name	Parameter Type	Function Return Type
def	savePerson	p	Person	ID = {
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Function Definitions

Start of Function Declaration	Function Name	Parameter Name	Parameter Type	Function Return Type	
	def	savePerson	(p: Person)	:	ID
					= {
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					Start of Function Definition

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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>

Things to note:

- Last expression is return value
- if more than one?
- `=` sign, the `;` of Scala!

- `:` is used just like in variable declaration

v.s. Java

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- Same file, multiple classes

v.s. Java

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- Constructor Chaining

v.s. Java

- Same file, multiple classes
- Constructor Chaining
- 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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 - Classes as templates



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Objects vs Classes

- We tend to think of
 - Objects as instances
 - Classes as templates
- In Scala
 - `object` is a static template
 - `class` is an instance templates



Traits

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Traits

- 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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- The if statement, nothing new here

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 - while/do-while

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 - for comprehensions

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



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



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

For Comprehensions



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val fullTime = new ListBuffer[Int]  
for (emp <- empList) {  
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        fullTime += emp  
}
```



```
val fullTime = for (emp <- empList  
    if emp.status == Consts.FULL_TIME) yield emp
```

Functions

Functions

Functions

- Functions are “kind of a big deal”

Functions

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- Higher Order

Functions

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- First-class Types

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 - number & types of parameters
 - 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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 - Takes a single parameter of type Int
 - Returns a value of Type Int
- It's implementation is as follows

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add_one is:

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 - Takes a single parameter of type Int
 - Returns a value of Type Int
- It's implementation is as follows
 - The parameter will be named x
 - It will return $x + 1$

Function Types

Best described by showing Function literals

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add_one is:

- A function which
 - Takes a single parameter of type Int
 - Returns a value of Type Int
- It's implementation is as follows
 - The parameter will be named x
 - It will return x + 1

map

map

- Not Map

map

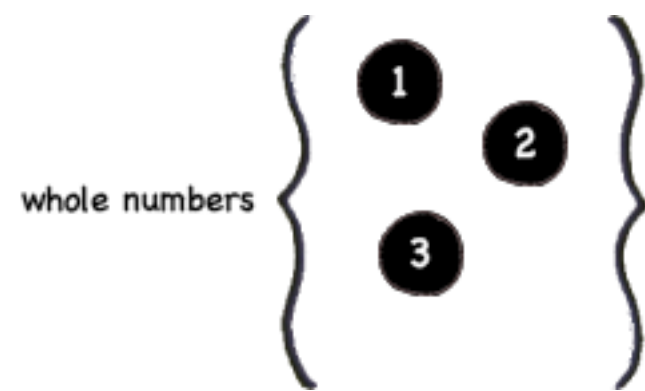
- Not Map
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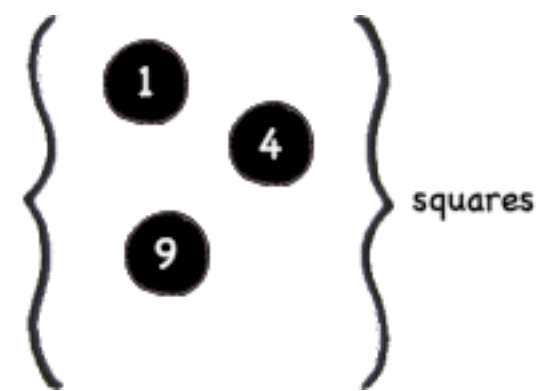
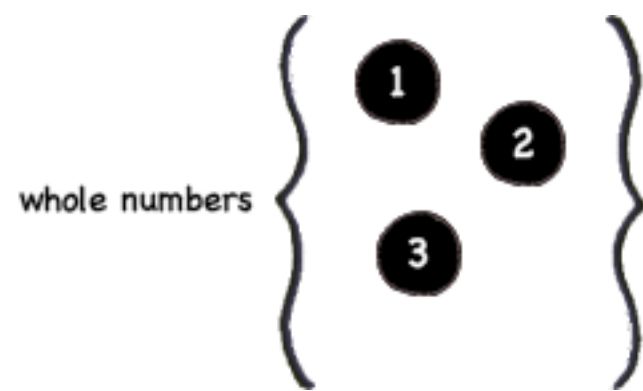
map

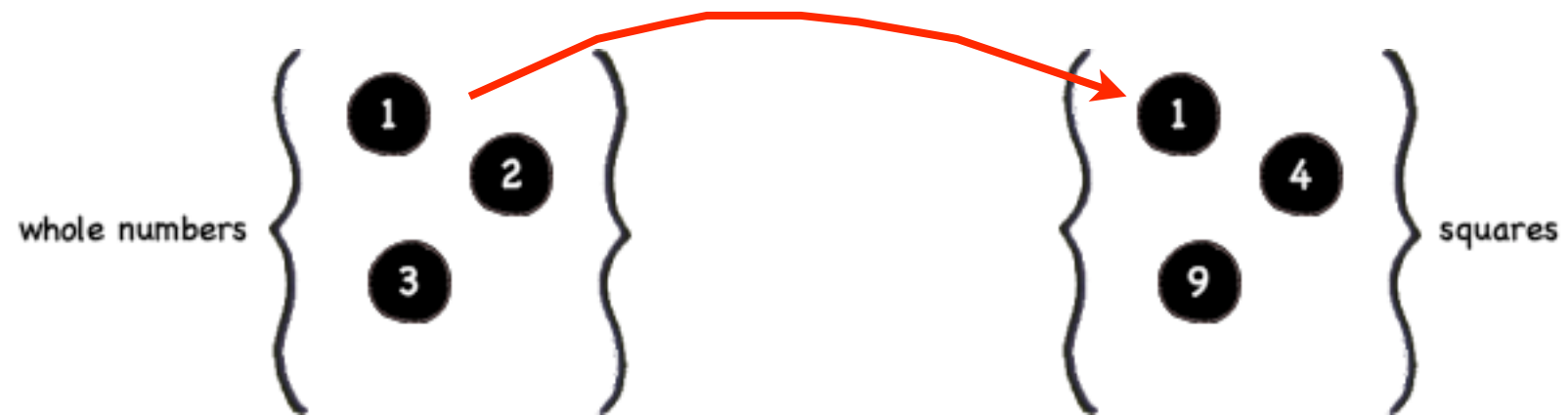
- Not Map
- A higher-order function
- Name is from Maths

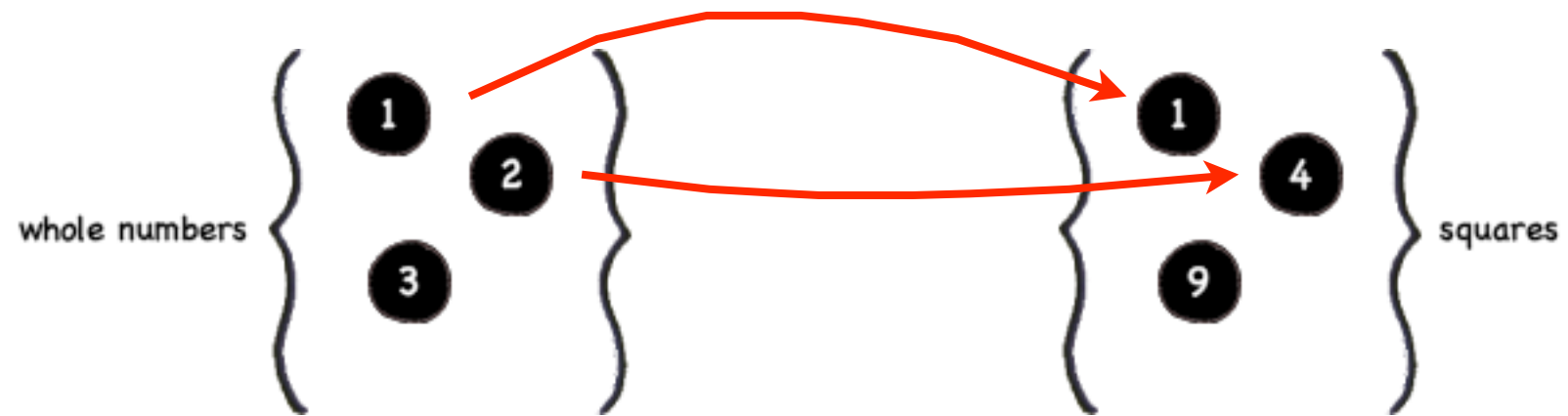
“map an element from one set to another”

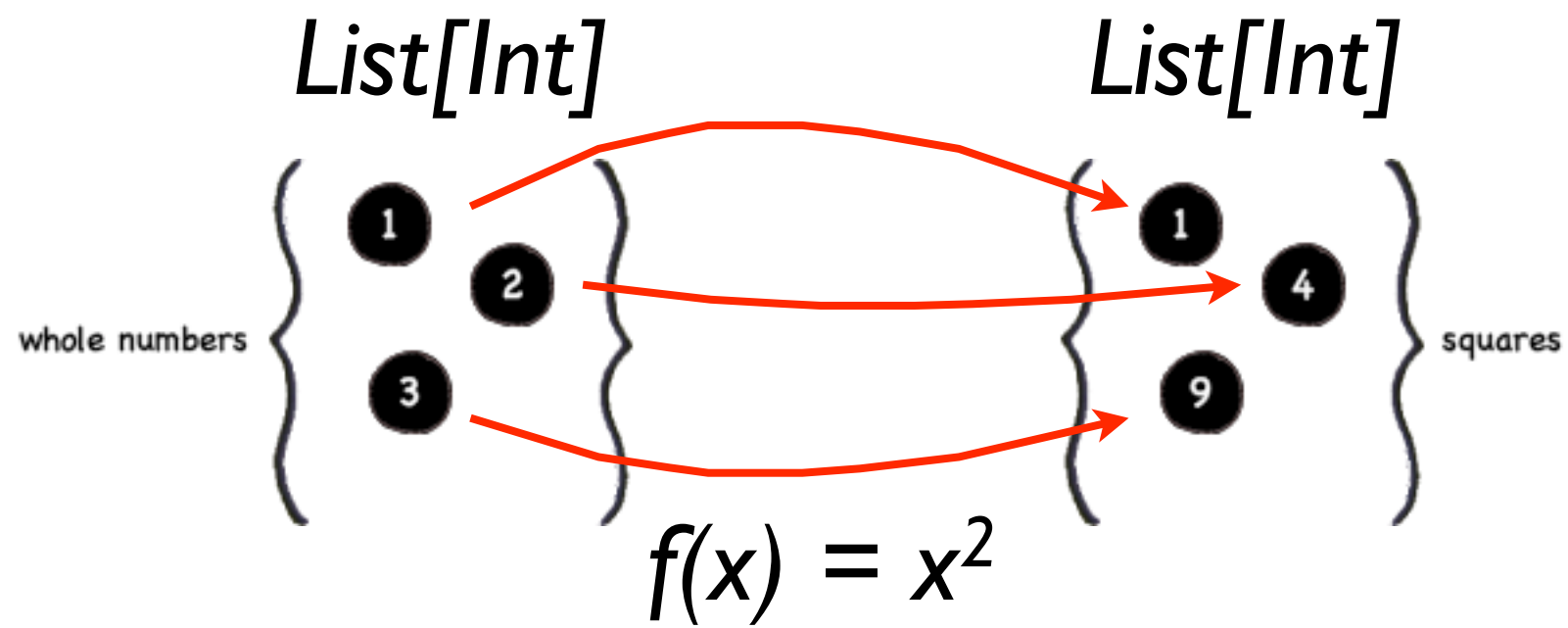


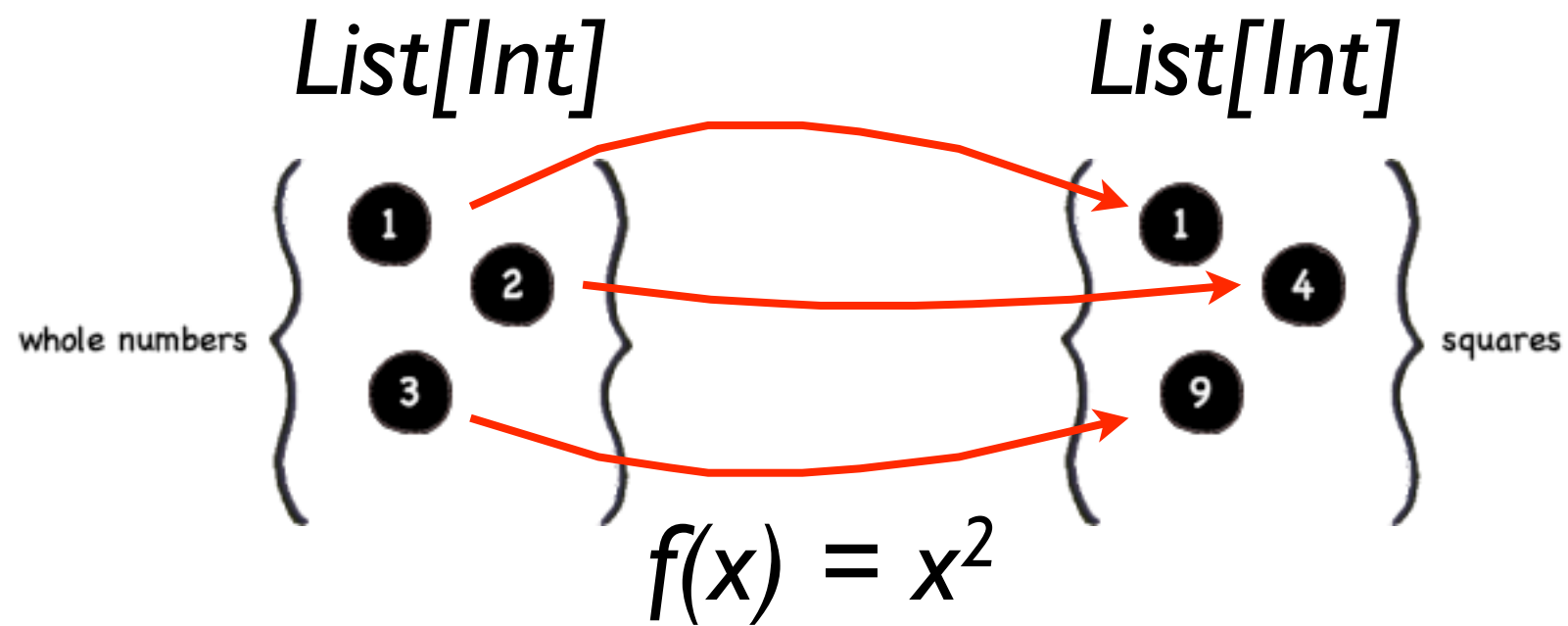












```
val squares = wholeNumbers map x => x * x
```

FP Paradigm Shift

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- With Collections you begin to see the power of Higher-Order functions

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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!")  
  case Person(_,_) => println("Who are you?")  
}
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}
```

You can do:

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


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  def unapply(p: Person): (String, String) = {  
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  }  
}
```

Or:

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

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```
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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...

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) = ...
```

- Allows you to “fill in a parameter” at a later time
- Useful for stating locally-scoped default parameters

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


Closures

Scope Doggy-bag



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- Functions are usually able to access:



Scope Doggy-bag

- Functions are usually able to access:
 - their parameters



Scope Doggy-bag

- Functions are usually able to access:
 - their parameters
 - their enclosing/super class



Scope Doggy-bag

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



Closures



Closures

```
def deferTaxCalculate(emp: Employee): () => Double = {  
  val bracket = taxBracketMap(emp.salary)  
  reallySlowTaxCalculator(emp, bracket)  
}
```


Curried Functions

Curried Functions

- If you see a function call like this:
`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!
```


Type Conversion

- Implicit functions are typically used for Type Conversion
- Remember this example?

```
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`