Craig Tataryn

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- The Basement Coders Podcast
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- Winnipeg Functional Programming Group
  - WfPG - wfpg.ca

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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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- 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

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

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Function Name

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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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v.s. Java

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- Same file, multiple classes

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- Same file, multiple classes
- 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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  - object is a static template

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- In Scala
  - object is a static template
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*

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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  - 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);
}
```

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For Comprehensions

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List<Employee> fullTime = new ArrayList<Employee>();
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```
val fullTime = new ListBuffer[Int]
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      fullTime += emp
}
```

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For Comprehensions

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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”

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- 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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- It's implementation is as follows
  - The parameter will be named x
  - It will return `x + 1`

map

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- Not Map

map

- Not Map
- A higher-order function

map

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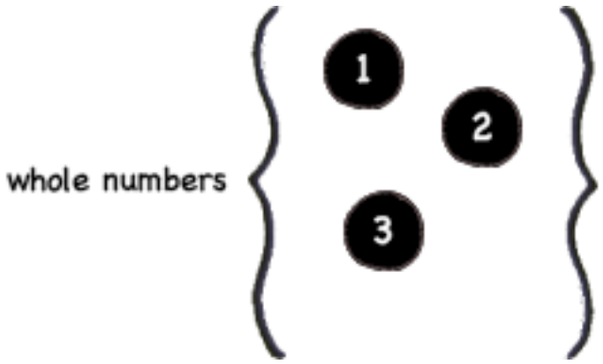
- A higher-order function
- Name is from Maths

"map an element from one set to another"

*


whole numbers
1
2
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whole numbers
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squares
1
4
9

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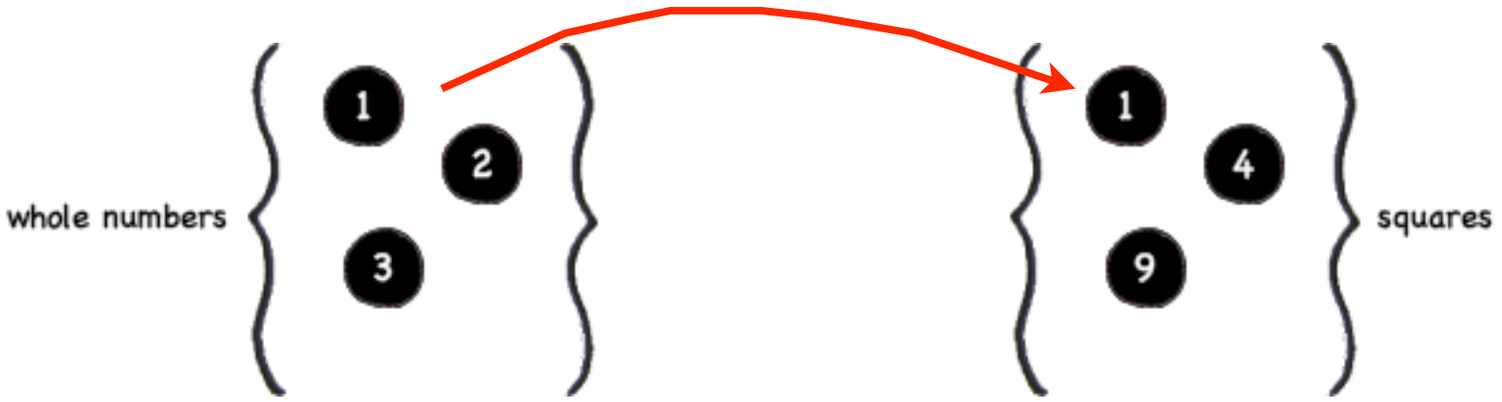
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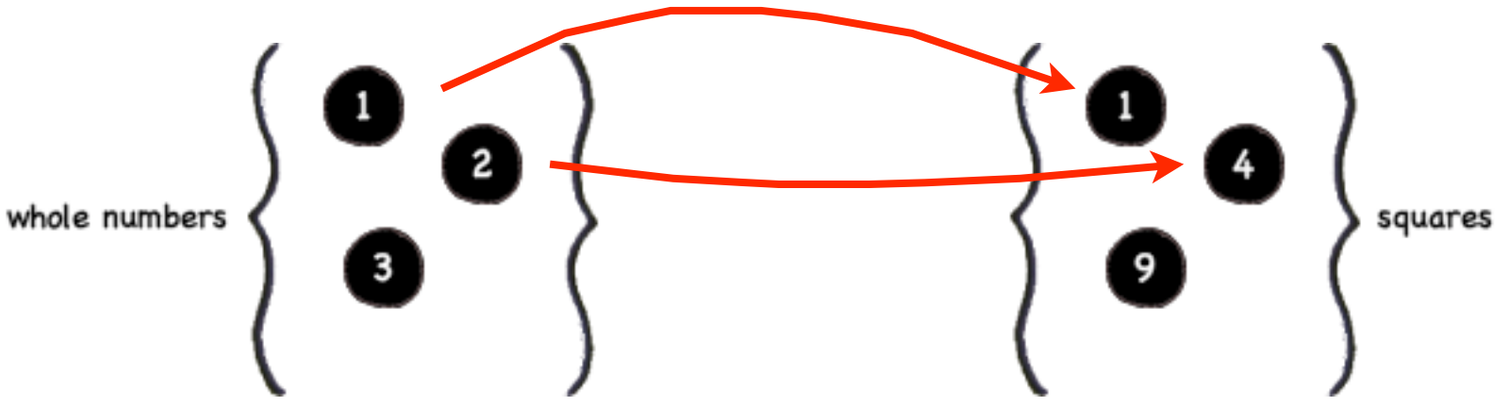
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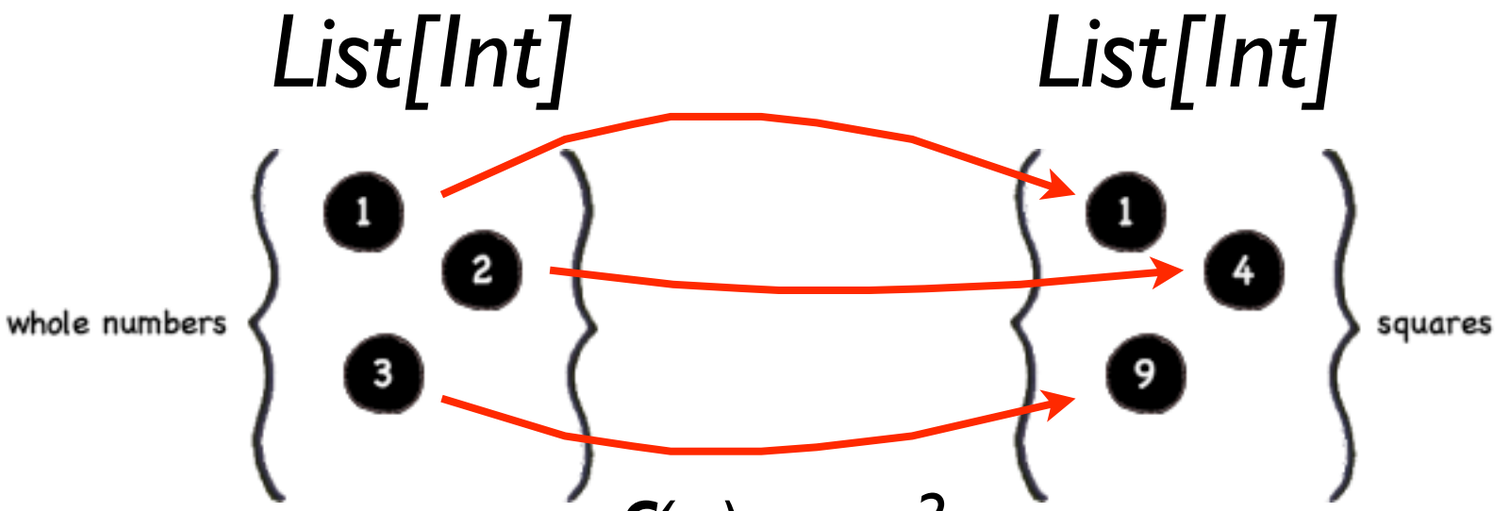

$f(x) = x^2$

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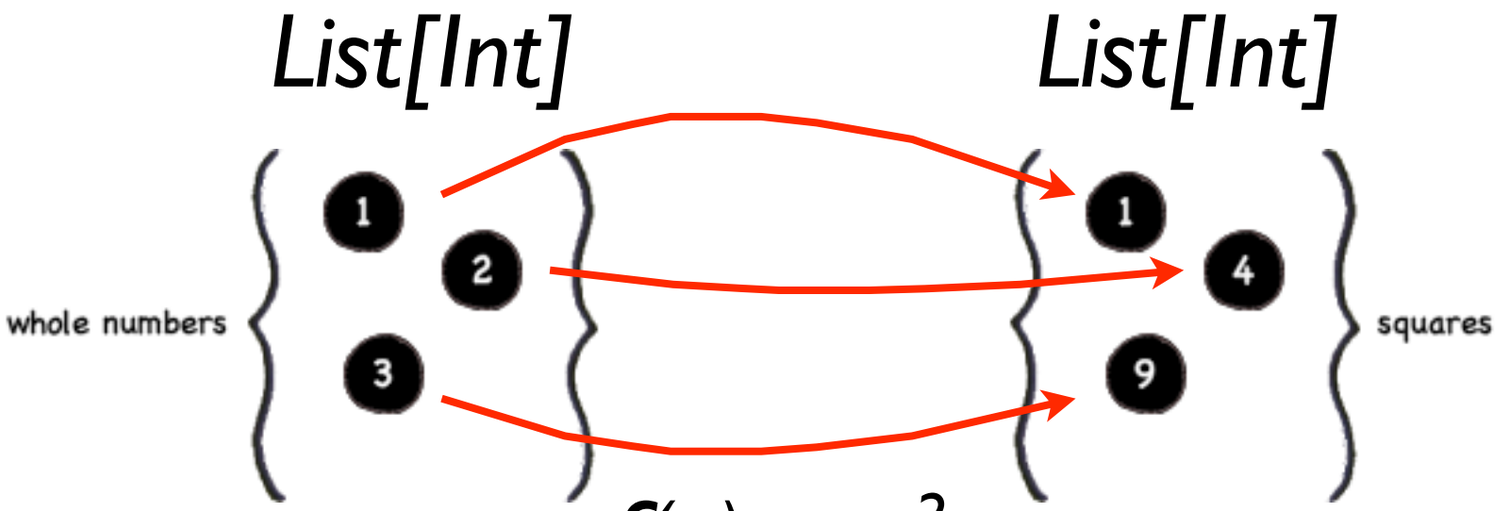

$f(x) = x^2$

```
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

*

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- The case and match keywords are comprehenders just like for

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- match comprehends *Partial Functions*

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case & match

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- 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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You can do:

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

Or:

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

Match on Foo

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Or:

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

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) = ...
```

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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

*

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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:
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  - 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

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- If you see a function call like this:
  `geoLocate(40.827873)(85.341797)`

Curried Functions

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- It was defined like this:

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def geoLocate(lat: Double)(lng: Double) = …
```

Curried Functions

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  `geoLocate(40.827873)(85.341797)`

- It was defined like this:
  ```
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  ```

- 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  //Bzzzzt!
```

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- Remember this example?

```
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str = 10  //Bzzzzt!

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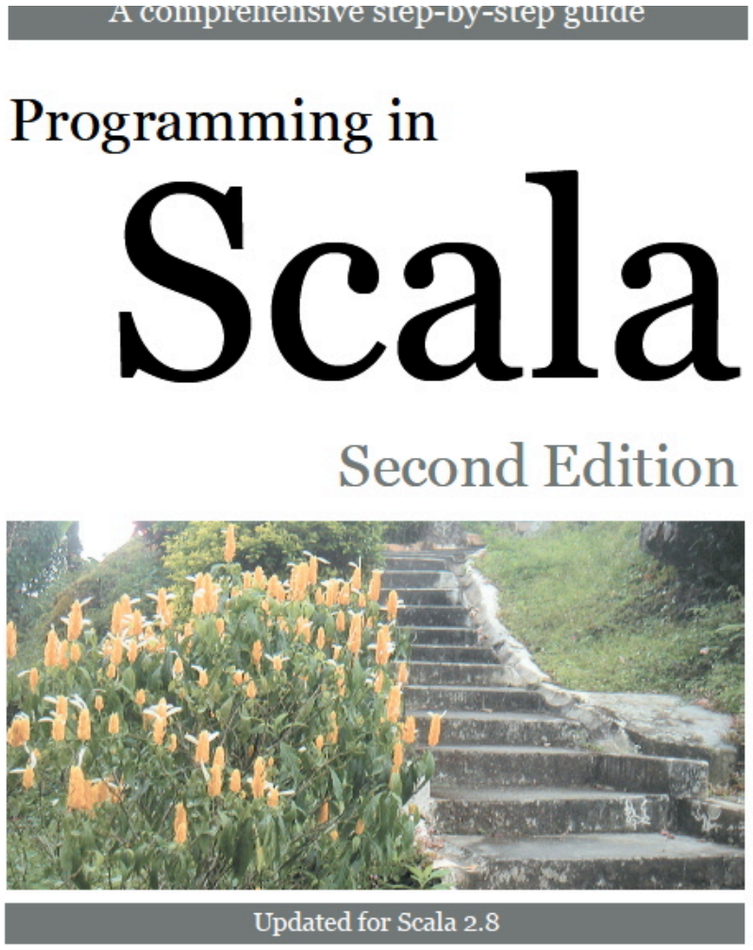

References

Where to start

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



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