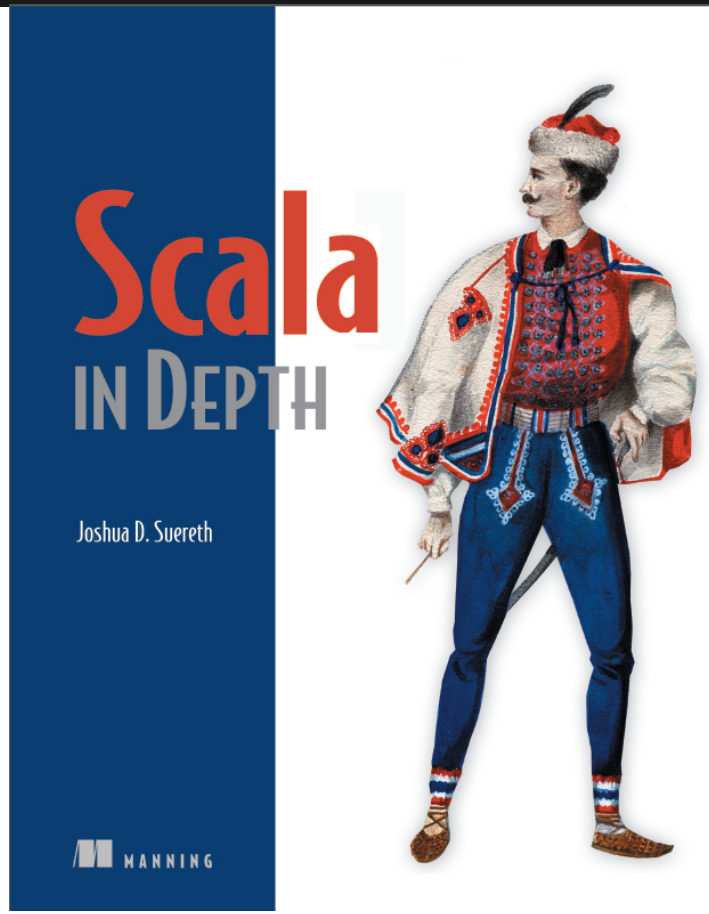
Effective Scala

J. Suereth

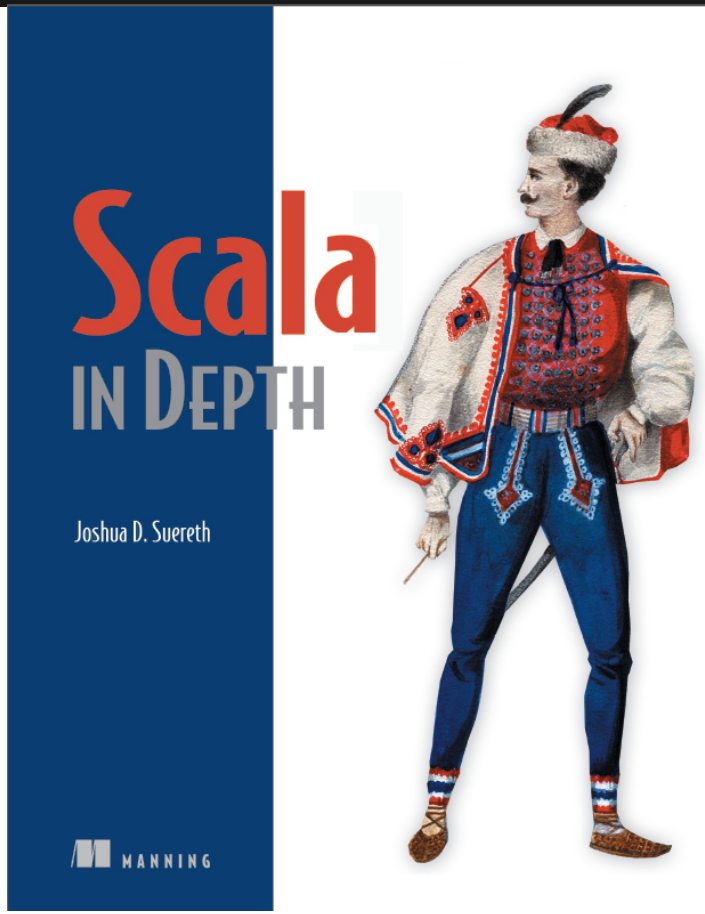
Who am I?

- Software Engineer
- Blogger
- Author
- Big Nerd



Who am I?

- Software Engineer
- Blogger
- Author
- Big Nerd
- Unicorn Expert (Klout)



What is Effective Scala?

Optimising your use of the Scala programming language to solve real world problems without explosions, broken thumbs or bullet wounds.

The Basics

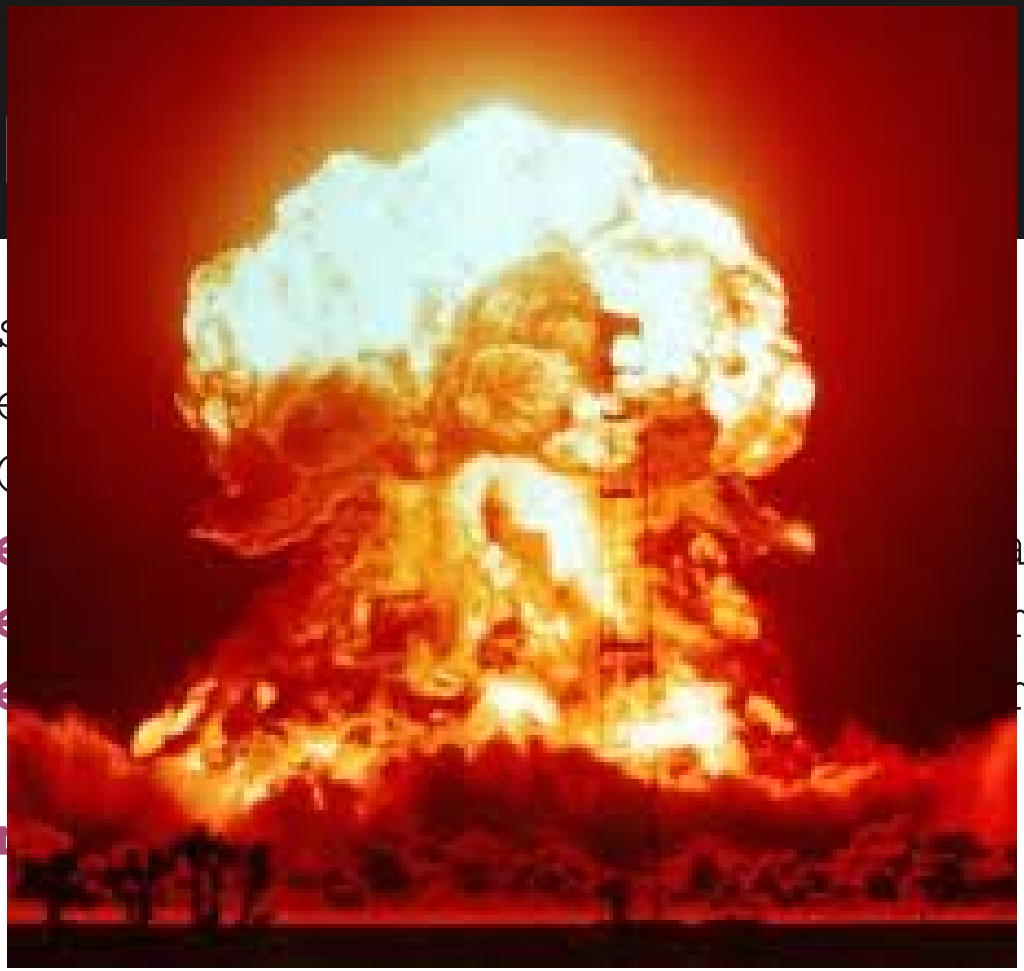
Write expressions,
not statements

Statements

```
def errMsg(errorCode: Int): String = {
    var result: String = _
    errorCode match {
      case 1 => result = "Network Failure"
      case 2 => result = "I/O Failure"
      case _ => result = "Unknown Error"
    }
    return result;
}
```

State

```
def errMs                                    = {
    var re
    error(
      case                                   ailure"
      case                                   re"
      case                                   rror"
    }
    return
}
```



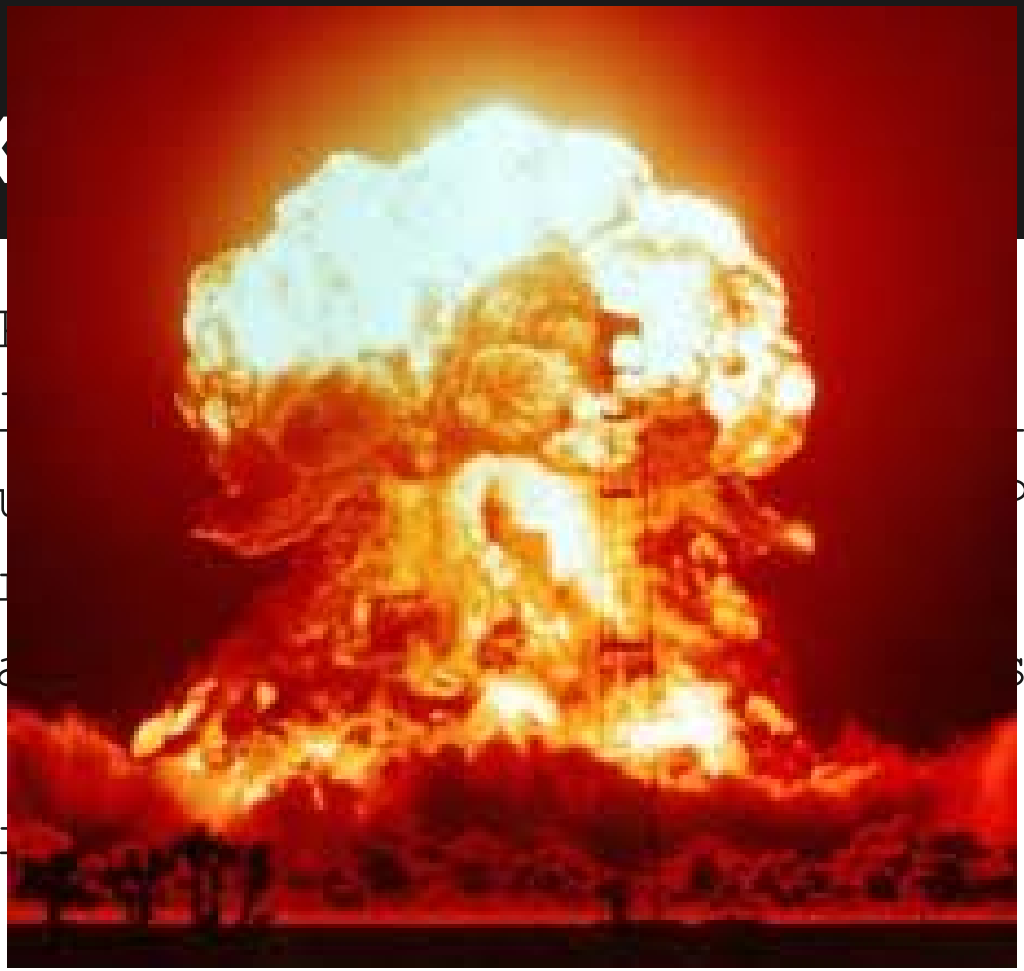
Expression!

```
def errMsg(errorCode: Int): String =
    errorCode match {
      case 1 => "Network Failure"
      case 2 => "I/O Failure"
      case _ => "Unknown Error"
    }
```

Be expressive

```
def findPeopleIn(city: String,
    people: Seq[People]): Set[People] =
  val found = new mutable.HashSet[People]
  for(person <- people) {
    for(address <- person.addresses) {
      if(address.city == city)
        found.put(person)
    }
  }
  return found
}
```

Be ex



```
def findI
    peopl                                    e] =
  val fou                                  eople]
  for(pe
    for(a                                  s) {
      if
        }
    }
  return found
}
```

Be Expressive

```
def findPeopleIn(city: String,
    people: Seq[People]): Set[People] =
  for {
    person <- people.toSet[People]
    address <- person.addresses
    if address.city == city
  } yield person
```

The Basics

Use the REPL

The Basics

Stay Immutable

Immutability

- Safe to share across threads
  - No locking
- Safe to hash on attributes
- Easier equality
- Safe to share internal state with other objects
- Co/Contra-variance

Using Immutability

Doesn't mean lack of mutation.

```
def foo: Seq[A] = {
  val a = new ArrayBuffer[Int]
  fillArray(a)
  a.toSeq
}
```

The Basics

Use Option

Option

```
def authenticateSession(
    session: HttpSession,
    username: Option[String],
    password: Option[Array[Char]]) =
  for {
    u <- username
    p <- password
    if canAuthenticate(u, p)
    privileges <- privilegesFor.get(u)
  } injectPrivs(session, privileges)
```

Option

```
def authen                    on(
    session: H
    username: Opt
    password: Option[          ]) =
  for {
    u <- username
    p <- password
    if canAuthenticate(u, p)
    privileges <- privilegesFor.get(
  } injectPrivs(session, privileges)
```

NPE NOT 4 ME

Style

You know it when you got it

Scala ain't Java

Scala ain't Ruby

Scala ain't Haskell

Object Orientation

Use def for abstract members

abstract defs

```
trait Foo {
  def bar: String
}

class NewFoo extends Foo {
  override val bar = "ZOMG"
}
```

OO

Annotate non-trivial return types for public methods.

Annotate Return Types

```
object Foo {
  def name: Option[String] = ...
}
```

OO

Composition can use Inheritance

Composition + Inheritance

```
trait Logger {
  ...
}
trait HasLogger {
  def logger: Logger
}
trait HasAwesomeLogger {
  lazy val logger = new AwesomeLogger
}
```

Implicits

Limit the scope of implicits

What are implicits?

```
implicit val pool: Executor =
  Executors.newCachedThreadPool()

def determinant(m: Matrix)(implicit ctx:
Executor): Double = ...
```

```
determinant(m)
```

vs.

```
determinant(m)(pool)
```

Implicit Scope

- First look in current scope
  - Implicits defined in current scope (1)
  - Explicit imports (2)
  - wildcard imports (3)
- Parts of the type of implicit value being looked up and their companion objects
  - Companion objects of the type
  - Companion objects of type arguments of types
  - Outer objects for nested types
  - Other dimensions

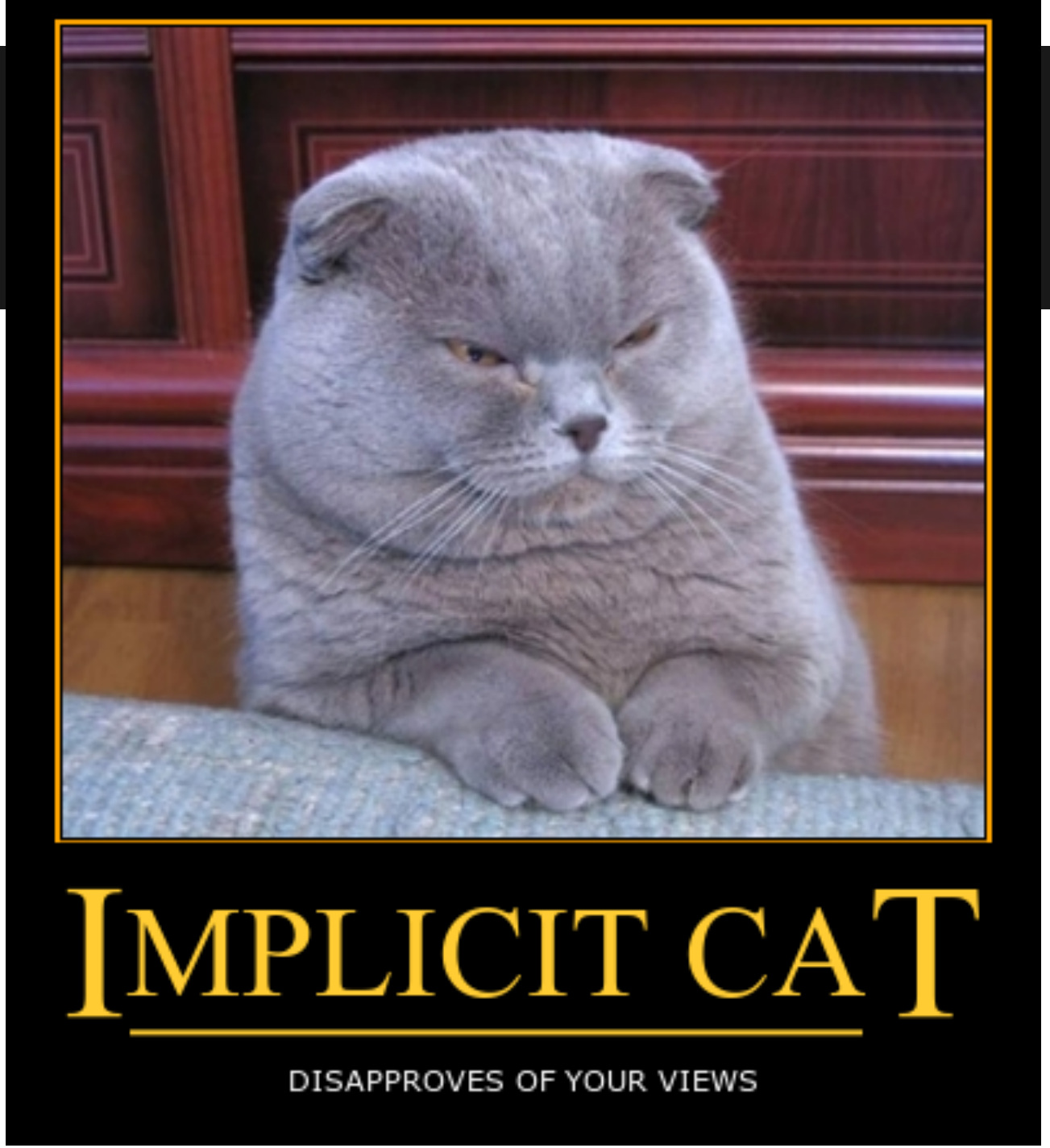
Implicit Scope (Parts)

```
trait Logger { ... }
object Logger {
  implicit object DefaultLogger
    extends Logger { ... }

  def log(msg: String)(implicit l: Logger) =
    l.log(msg)
}

Logger.log("Foo")
```

Imp



Implicits

Use for type constraints and type traits

Implicit type constraints

```
import java.nio.ByteBuffer

class Buffer[T] {
 def toJByteBuffer(
    implicit ev: T <:< Byte): ByteBuffer
}
```

Type traits

```
trait Encodable[T] {
  def encode(t: T): Array[Byte]
  def decode(buf: ByteBuffer): T
}

object Encodable {
  def encode[T: Encodable](t: T) =
    implicitly[Encodable[T]].encode(t)
}
```

Type traits, default implementation

```
object Encodable {
  implicit object IntEncodable
    extends Encodable[Int] { ... }

  implicit def tupleEncodable[A,B](
     implicit ea: Encodable[A],
     eb: Encodable[B]
  ): Encodable[(A,B)] = ...

}
```

Type Traits - external impls

```
trait TehAwesome { /* ucanthandlethis */ }

object TehAwesome {
  implicit object encoder
    extends Encodable[TehAwesome] {
    ...
  }
}
```

Type traits - Benefits

- External to class hierarchy
  - monkey patch on existing classes you don't control
- Overridable at call site
- Separate Abstractions
  - One class can have two implementations
  - Similar type-traits don't fight for method names.
- Can separate method arguments into roles

```
def synchronize[
    F: Source, T: Sink](
    from: F, to: T): (F,T) = ...
```

Type System

Preserve specific types

Preserve Specific Types

```
def foo(s: Seq[A]): Seq[A] = ?
```

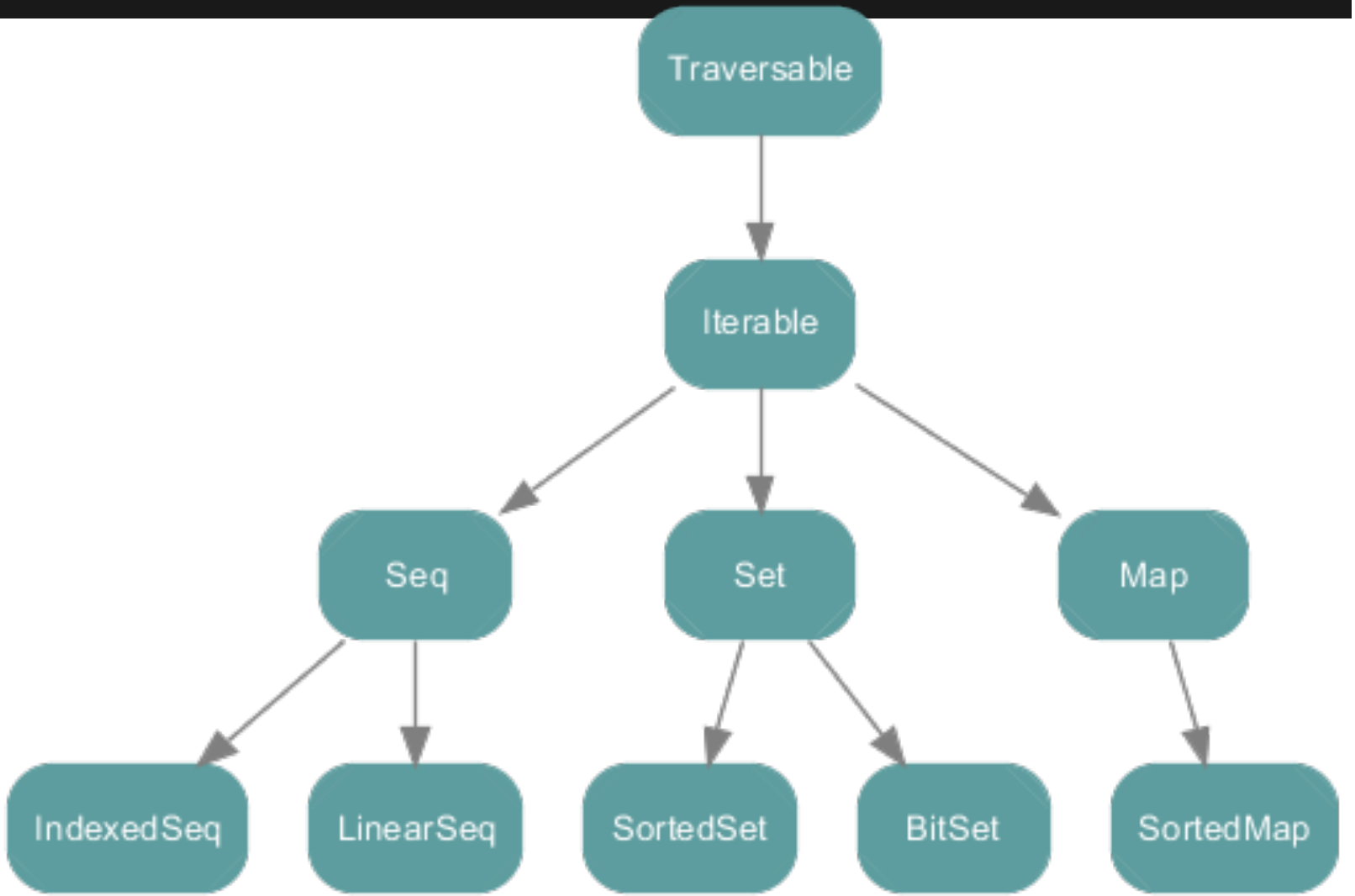
vs.

```
def foo[T <: Seq[A]](s: T): T = ?
```

Collections

Know your collections

Know your collections



Know your collection API

seq, companion, seq, flatten, transpose, toString, isEmpty, map, exists, find, init, last, head, filter, slice, tail, ++, ++, headOption, drop, filterNot, flatMap, takeWhile, repr, newBuilder, forall, foreach, thisCollection, toCollection, parCombiner, view, view, copyToArray, hasDefiniteSize, ++:, ++:, collect, partition, groupBy, scan, scanLeft, scanRight, lastOption, sliceWithKnownDelta, sliceWithKnownBound, tails, inits, toTraversable, toIterator, withFilter, take, splitAt, dropWhile, span, stringPrefix, toStream, min, max, count, size, toArray, seq, sum, toList, mkString, mkString, mkString, toSet, foldLeft, foldRight, reduceLeft, reduceRight, toSeq, toIterable, copyToArray, copyToArray, reversed, nonEmpty, collectFirst, /:, :\, reduceLeftOption, reduceRightOption, reduce, reduceOption, fold, aggregate, product, maxBy, minBy, copyToBuffer, toIndexedSeq, toBuffer, toMap, addString, addString, addString, toSet, toSeq, toIterable, toTraversable, isTraversableAgain, toMap, /:\, size, groupBy, isTraversableAgain, min, max, count, toArray, seq, sum, toList, mkString, mkString, mkString, foldLeft, foldRight, reduceRight, copyToArray, copyToArray, nonEmpty, /:, :\, reduceLeftOption, reduceRightOption, reduce, reduceOption, fold, aggregate, product, maxBy, minBy, toIndexedSeq, toBuffer, seq, par, map, head, filter, slice, tail, ++, drop, filterNot, flatMap, takeWhile, repr, foreach, collect, partition, scan, scanLeft, scanRight, take, splitAt, dropWhile, span, stringPrefix, isEmpty, exists, find, forall, copyToArray, hasDefiniteSize, toIterator, toStream, parCombiner, size, foreach, isEmpty, head, flatten, newBuilder, foreach, transpose, genericBuilder, unzip, unzip3, isEmpty, exists, find, forall, foreach, copyToArray, hasDefiniteSize, toTraversable, isEmpty, iterator, zip, head, sameElements, zipAll, zipWithIndex, seq, isEmpty, first, iterator, exists, find, zip, zip, elements, head, slice, drop, takeWhile, forall, foreach, canEqual, sameElements, sameElements, foldRight, reduceRight, dropRight, thisCollection, toCollection, view, view, projection, toIterable, grouped, sliding, sliding, copyToArray, zipAll, zipAll, zipWithIndex, firstOption, take, takeRight, toStream, equals

Collections

Use Vector

Java Integration

Write interfaces in Java

Java Integration

Prefer Java primitives in APIs

Using primitive APIs

```
public interface Main {
  public int run(String[] args);
}
```

```
class ScalaMain extends Main {
  def run(args: Array[String]): Int =
    args.length
}
```

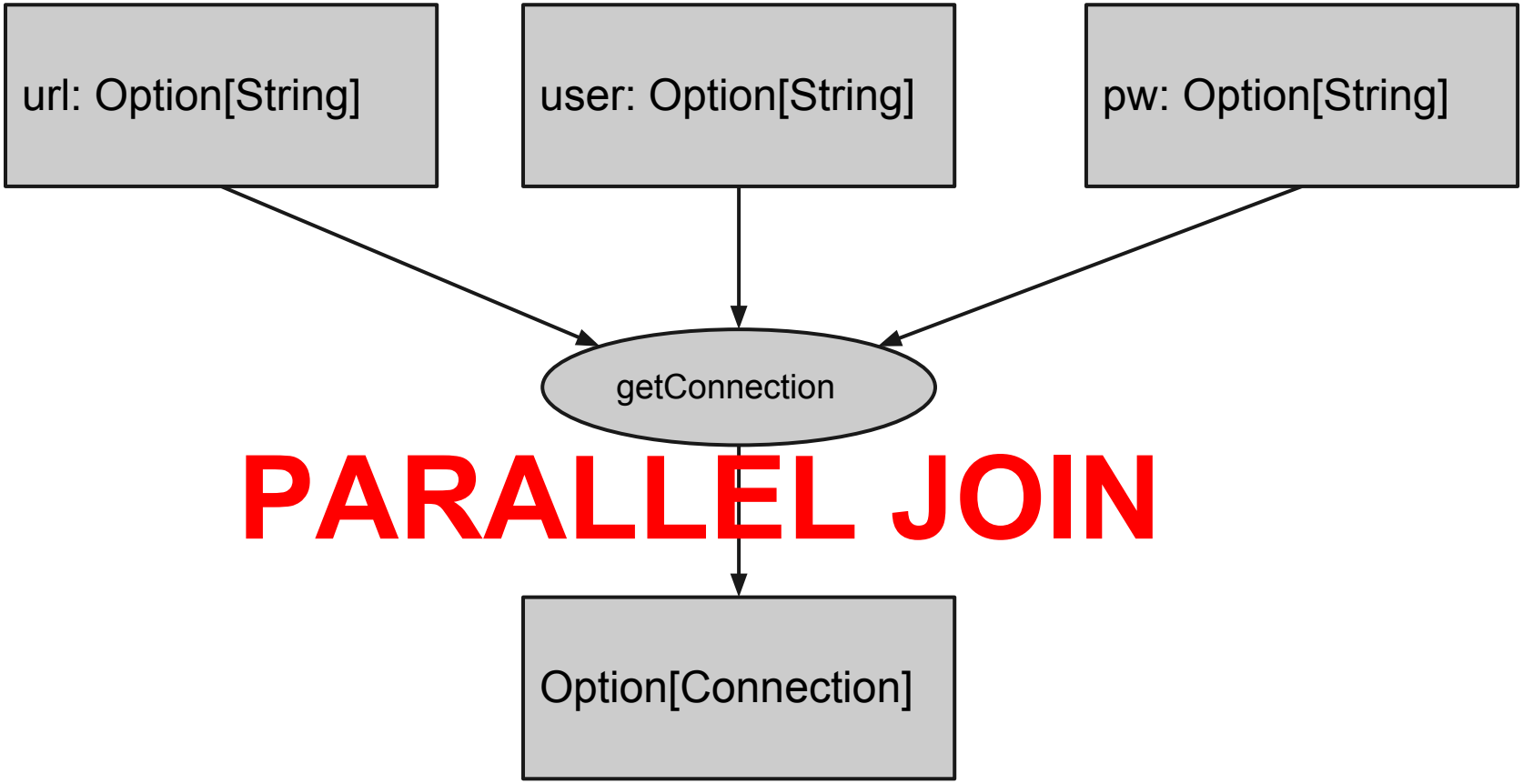
Functional Programming

Learn patterns from category thoery

Applicative Functors

```
def connection(
  url: Option[String],
  username: Option[String],
  password: Option[Array[Char]]
 ): Option[Connection] =
 (url |@| username |@| password) apply
       DriverManager.getConnection
```

Applicative Functors



Monads

```
for {
    input <- managed(new FileInput("in"))
    output <- managed(new FileOutput("out"))
} yield pipe(input) into output
```

Questions?

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