CS 152: *Programming Language Paradigms*

# Ruby

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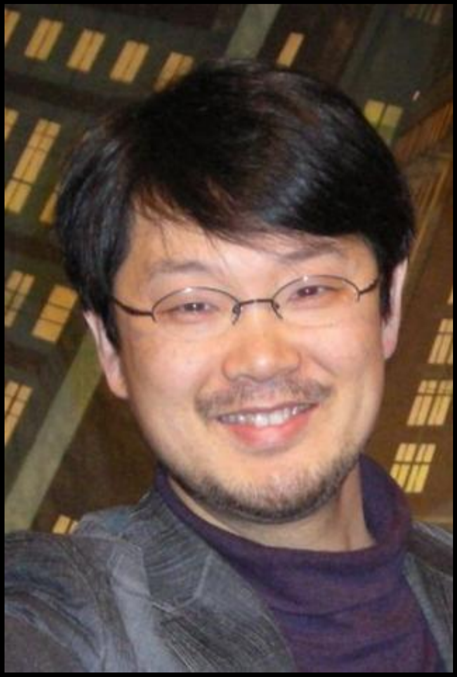
## Project, Part 3

# Introduction to Ruby



Created by
Yukihiro Matsumoto
(known as "Matz")

# Ruby influences

Smalltalk

- everything is an object
- blocks
- metaprogramming

Perl

- regular expressions
- function names

## Ruby on Rails

- Ruby's "killer app"
  - lightweight web framework
  - "convention over configuration"
- David Heinemeier Hansson (DHH)
  - initial framework was PHP
  - abandoned PHP for Ruby

## Hello World in Ruby

```ruby
puts 'Hello world!'
```

## Working with data structures

```
a = [1,2,3]
m = {'a'=>"Apple",
   'b'=>"Banana",
   'c'=>"Cantalope"}
puts a[0]
puts m['a']
```

# Ruby is object-oriented

"I was talking with my colleague about the possibility of an object-oriented scripting language. [...] I knew Python then. But I didn't like it, because I didn't think it was a true object-oriented language — OO features appeared to be add-on to the language. As a language maniac and OO fan for 15 years, **I really wanted a genuine object-oriented, easy-to-use scripting language.** I looked for but couldn't find one. So I decided to make it." --Matz 1999

```
class Person
  def initialize name # Constructor
    @name = name
  end

  def name            # Getter
    return @name
  end

  def name= newName   # Setter
    @name = newName
  end

  def say_hi          # Method
    puts "Hello, my name is #{@name}."
  end
end
```

The @ indicates an object's field

The = in the method name (by convention) indicates assignment

## Generating getters and setters

Powerful metaprogramming

```
class Person
  attr_accessor :name
  def initialize name # Constructor
    @name = name
  end
  def say_hi          # Method
    puts "Hello, my name is #{@name}."
  end
end
```

## Using a class in Ruby

```
p = Person.new "Joe"
puts "Name is #{p.name}"
p.say_hi
```

## Inheritance in Ruby

(in-class)

## Mixins

- Allow user to add features to a class
- Similar to interfaces in Java, but programmer can specify functionality.

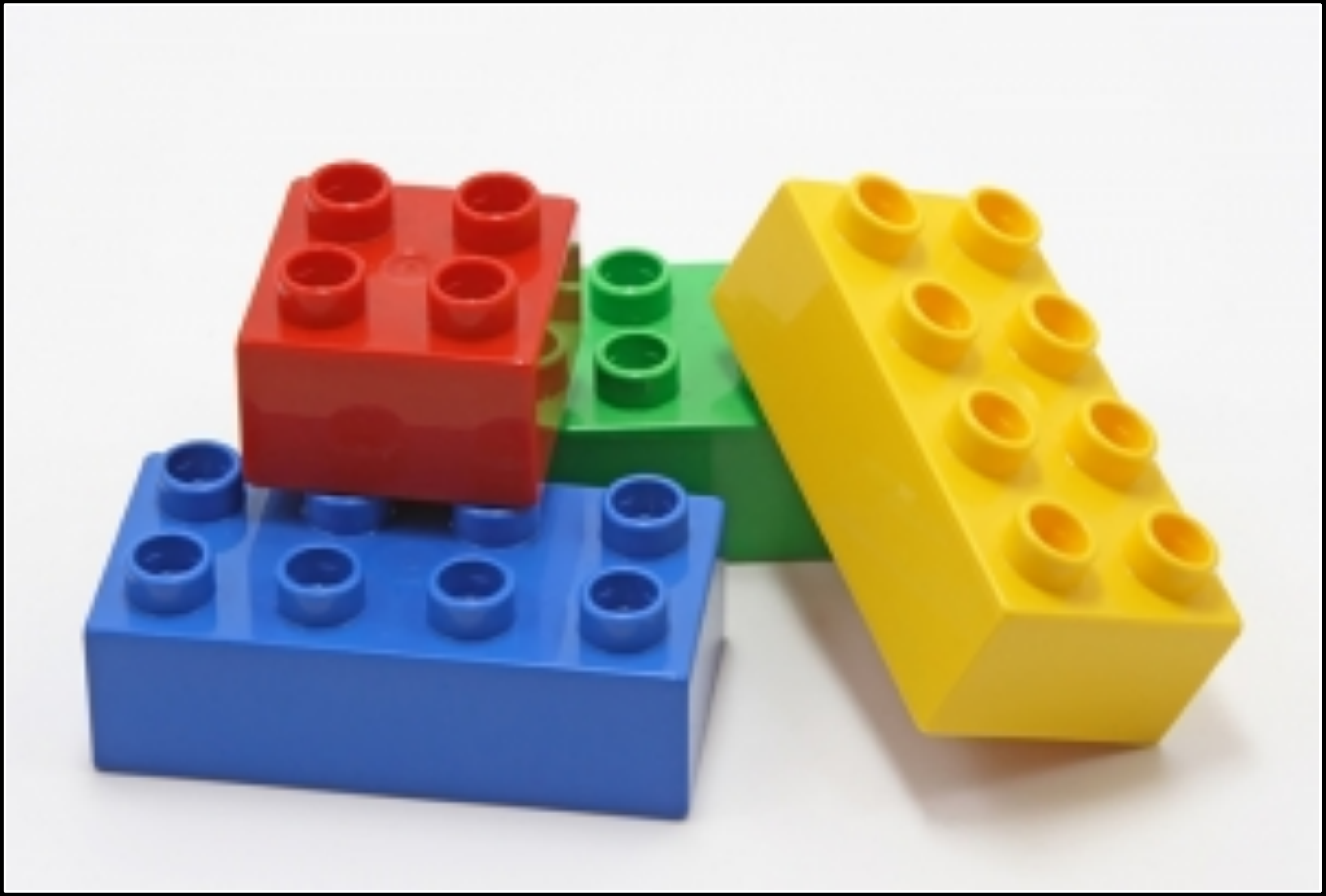
```
class Person
  include Comparable
end
```

```ruby
module RevString
  def to_rev_s
    to_s.reverse
  end
end

class Person # Re-opening class
  include RevString
  def to_s
    @name
  end
end

p.to_rev_s # p defined previously
```

## Blocks in Ruby



## Blocks in Ruby

- Superficially similar to blocks in other languages.
- Can create custom control structures.
- (We'll discuss in depth another day).

## File I/O Example

(in class)

## Dynamic code evaluation

## `eval`

- Executes dynamically
- Typically, `eval` takes a string:
  `eval "puts 2+3"`
- Popular feature
  - especially in JavaScript
    - Richards et al. *The Eval that Men Do*, 2011
- Source of security problems

## Additional Ruby `eval` methods

- `instance_eval`
  - –evaluates code within object body
- `class_eval`
  - –evaluates code within class body
- Take a string or a block of code
  - –block of code more secure

## String Processing

## Regular Expressions in Ruby

```
s = "Hi, I'm Larry; this is my" +
    " brother Darryl, and this" +
    " is my other brother Darryl."
s.sub(/Larry/,'Laurent')
puts s
s.sub!(/Larry/,'Laurent')
puts s
puts s.sub(/brother/, 'frère')
puts s.gsub(/brother/, 'frère')
```

# Regular Expression Symbols

- **`/./`** - Any character except a newline
- **`/\w/`** - A word character (`[a-zA-Z0-9_]`)
- **`/\W/`** - A non-word character (`[^a-zA-Z0-9_]`)
- **`/\d/`** - A digit character (`[0-9]`)
- **`/\D/`** - A non-digit character (`[^0-9]`)
- **`/\s/`** - A whitespace character: `/[ \t\r\n\f]/`
- **`/\S/`** - A non-whitespace char: `/[^ \t\r\n\f]/`
- **`*`** - Zero or more times
- **`+`** - One or more times
- **`?`** - Zero or one times (optional)

## References for Ruby

- "Programming Ruby: The Pragmatic Programmer's Guide", http://ruby-doc.com/docs/ProgrammingRuby/
- "Why's Guide to Ruby", http://mislav.uniqpath.com/poignant-guide/ (unusual, but entertaining reference).
- David Black, "Ruby for Rails", 2006.

## Lab: Eliza in Ruby

Use Ruby to model a psychiatrist.
[http://en.wikipedia.org/wiki/ELIZA](http://en.wikipedia.org/wiki/ELIZA)

Download eliza.rb from the course website and extend it. Note that if you call `ruby eliza.rb -test`, you will get some cases to consider.