

Ruby Explorations I

Mark Keane...CSI...UCD



De Basics

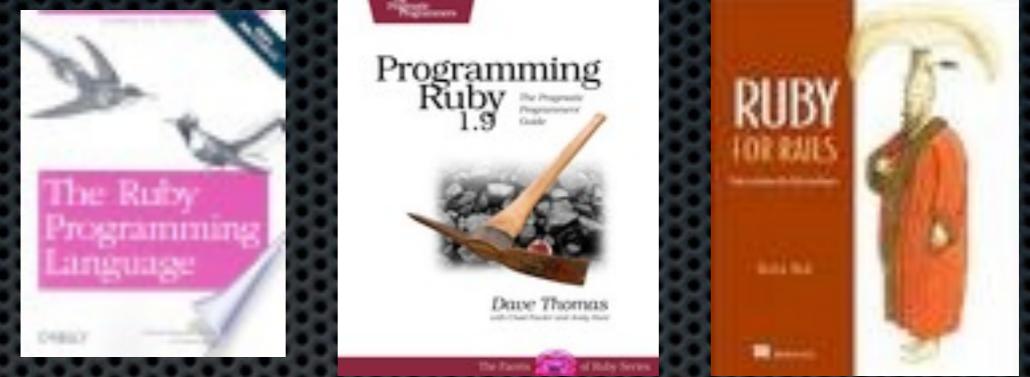
Part I: History, Environment and Progs

I N T H E
B E G I N N I N G ...
W A S T H E
C O M M A N D L I N E
* * *

RubyLect2n.progs — -bash — 105×29

```
[MacBook-Air-2:RubyLect2n.progs user$  
MacBook-Air-2:RubyLect2n.progs user$ ruby -v  
[ruby 2.3.1p112 (2016-04-26 revision 54768) [x86_64-darwin15]  
[MacBook-Air-2:RubyLect2n.progs user$ ruby test.rb  
hi there big boy !  
MacBook-Air-2:RubyLect2n.progs user$ irb -v  
irb 0.9.6(09/06/30)  
MacBook-Air-2:RubyLect2n.progs user$ irb  
irb(main):001:0> puts $LOAD_PATH  
/opt/local/lib/ruby2.3/gems/2.3.0/gems/did_you_mean-1.0.0/lib  
/opt/local/lib/ruby2.3/site_ruby/2.3.0  
/opt/local/lib/ruby2.3/site_ruby/2.3.0/x86_64-darwin15  
/opt/local/lib/ruby2.3/site_ruby  
/opt/local/lib/ruby2.3/vendor_ruby/2.3.0  
/opt/local/lib/ruby2.3/vendor_ruby/2.3.0/x86_64-darwin15  
/opt/local/lib/ruby2.3/vendor_ruby  
/opt/local/lib/ruby2.3/2.3.0  
/opt/local/lib/ruby2.3/2.3.0/x86_64-darwin15  
=> nil  
[irb(main):002:0> ruby test.rb  
[ArgumentError: wrong number of arguments (given 0, expected 2..3)  
    from (irb):2:in `test'  
    from (irb):2  
    from /opt/local/bin/irb:11:in `<main>'  
irb(main):003:0> quit  
MacBook-Air-2:RubyLect2n.progs user$ ruby test.rb  
hi there big boy !  
[MacBook-Air-2:RubyLect2n.progs user$  
MacBook-Air-2:RubyLect2n.progs user$ ]
```

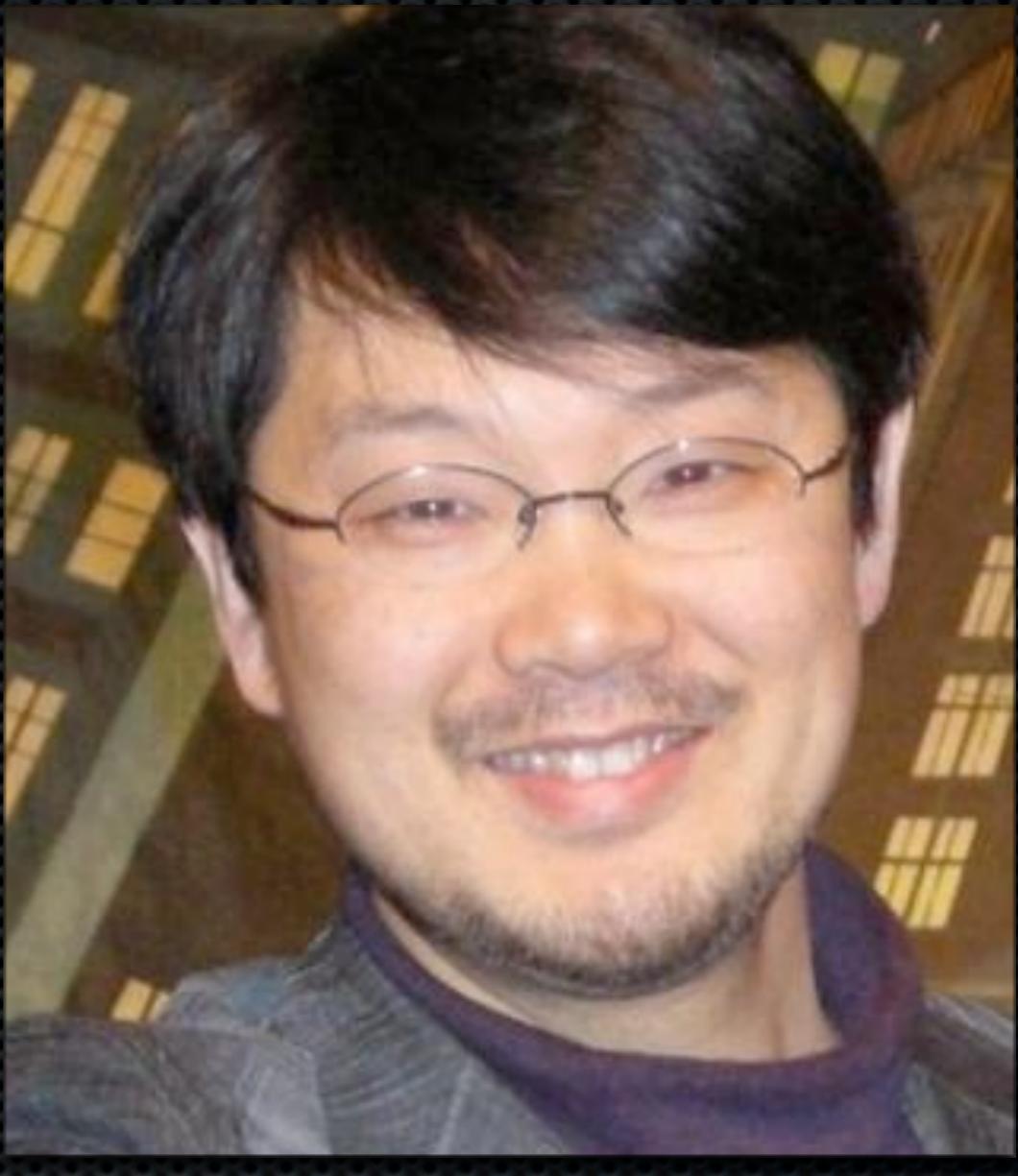
Done !



- <http://www.ruby-lang.org/en/downloads/>
- <http://rubyosx.rubyforge.org> one-click installer for OSX
- directions for Windows, MacOSX (bundled) and Linux
(see Thomas , 2009, chapter 1)
- **get Ruby 2.3.1 (latest stable version)**
 - Most basic, use a text editor to write files, a cshell to run files and navigate directories
 - ▶ `ruby finename.rb` [runs the file called *filename*]
 - ▶ `irb` [gets you the interactive version]
<http://www.ruby-doc.org/core/>

Ruby History

- created by Yukihiro Matsumoto in 1993
- a language balancing functional and imperative programming
- Tubular Bells of programming...



Flanagan, D & Matsumoto, Y. (2008).
The Ruby Programming Language. O'Reilly.

Aside on Programming

- imperative pg: computation is statements that change a program state; an algorithm with explicit steps or procedures (e.g. C, BASIC)
- declarative pg: logic of computation without flow of control, what the program should achieve not how it achieves (e.g. Prolog)
- functional pg: computation as the evaluation of mathematical functions avoiding state and mutable data (e.g. Scheme, Lisp)

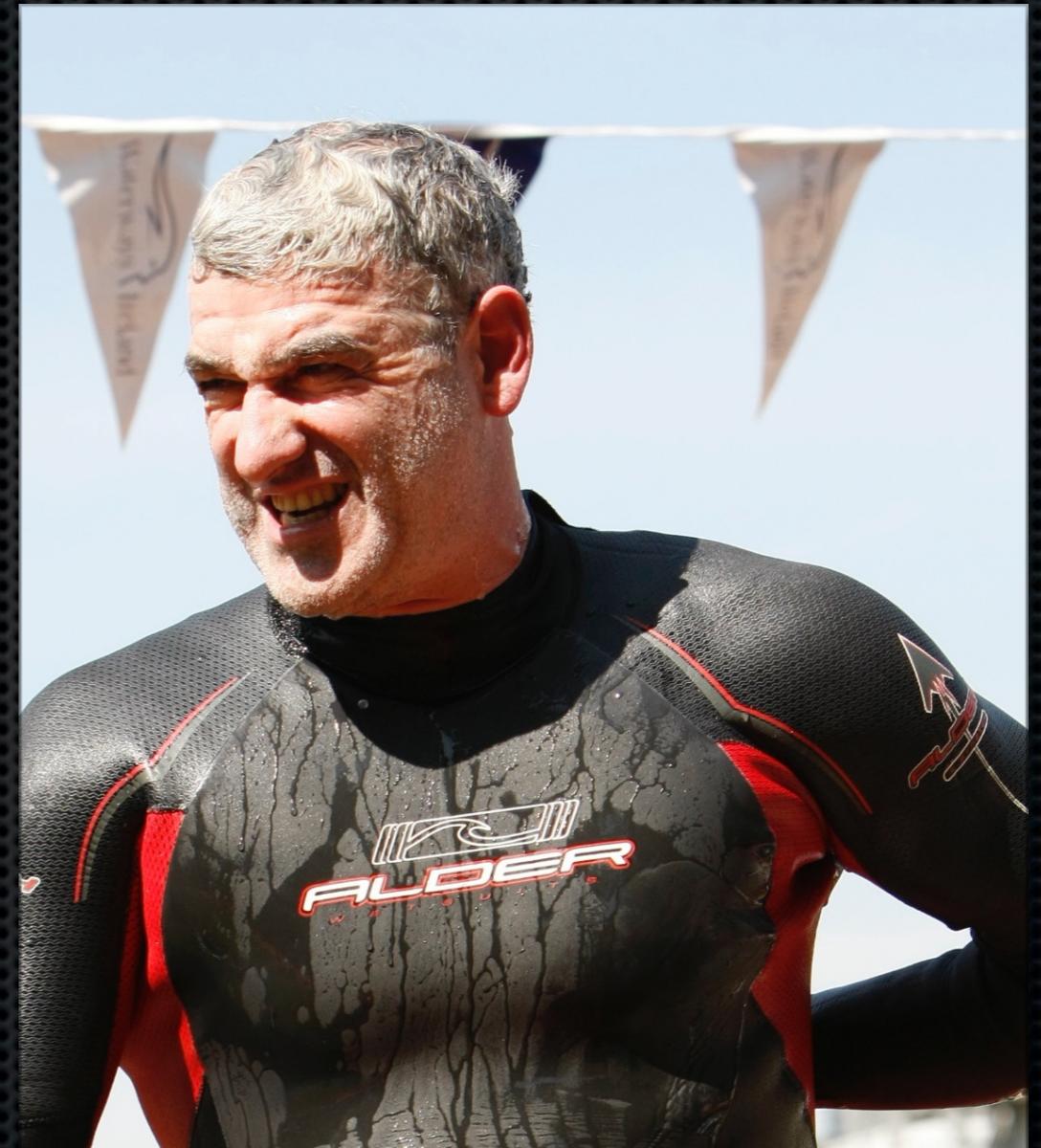
Ruby Precursors

- imperative languages were first (Fortran, Pascal, Basic, Algol, Ada, C)
- extended to have objects in OOP (**Smalltalk**-80, C++, Python, **Perl**, **Eiffel**); real-world analogy
- into the modern era with Java and Ruby...
- but, with another line from functional programming (many **LISP**-like features)

<http://www.ruby-doc.org/core/>

Me

- Chair of CS since 1998
- BA (Psych, UCD, '82),
- PhD (Psych, TCD, '87)
- Fellow TCD (1994)
- SFI (2004-07)
- VP Innovation (2007-09)
- Big Shot (-present)



http://en.wikipedia.org/wiki/Mark_Keane

My Puppy

- ✿ this is my puppy
- ✿ her name is ...



Ruby is Object-Oriented

- is a true OOP lang,
methods are invoked
on objects
- syntax used DOT (.)
operator
- these egs are the
purest cases

```
>> 43.class  
=> Fixnum  
  
>>"string".length  
=> 6  
  
>>"stri".length  
=> 4  
  
>> 5.to_s  
"5"
```

Ruby is Object-Oriented

- **43, “string”, “stri”** and **5** are all objects
- **class, length, to_s** are all methods
- everything is an *expression*; made up of an *object* and a *method*
- **every expression evaluates-to/returns a value**

```
>> 43.class  
=> Fixnum  
  
>> "string".length  
=> 6  
  
>> "stri".length  
=> 4  
  
>> 5.to_s  
"5"
```

Method Syntax I: DOT

- DOT means the message “`to_s`” is being sent to the number 5, 5 is the *receiver* of the message
- OR, the number 5 is being asked “convert yourself to a string”

```
>> 5.to_s  
=> "5"
```

```
>> "5".to_i  
=> 5
```

```
>> "mark".class  
=> String  
>> 5.class  
=> Fixnum
```

underscores
not hypens

fns
in lowercase

classes
start with
CAPS

Syntax II: Parameter Args

- **class** and **to_s** are like methods with a single, object arg using DOT
- other methods are written with arg-style
- ...or better use arg in brackets
- safer to assume brackets

extrapolate
String

```
>> 5.to_s  
=> "5"  
  
>> Float 5  
=> 5.0  
  
>> 5.Float  
NoMethodError: ...  
  
>> Float(5)  
=> 5.0  
  
>> String("5")  
=> "5"
```

kernel
methods
syntax

Syntax III: Dot + Parameters

something? is predicate

- ask object "dna" the message does it include "na"
- can have many args

0 1 2
m a g

- note, positions are counted off from zero

```
>> "dna".include?("na")
=> true

>> "dna".include?("we")
=> NoMethodError: ...

>> "dna".include?("we")
=> false

>> "mag".insert(3, "oooo")
=> "magoooo"

>> "mag".insert(2, "ooo")
=> "maoooog"
```

Say Hello to print...

- we will ignore **print** and use **puts** and **p**
- whoaaaaah Nelly !
- puts** sends args to screen with <cr>
- ...then it returns a value , namely **nil**

```
>> puts "hello"  
hello  
=> nil
```

```
>> puts("hello", "mo")  
hello  
mo  
=> nil
```

```
>> p "hello"  
"hello"  
=> "hello"
```



will
cause
bugs

\$stdout.puts("hello")

kernel
methods
syntax

try this with
no parenth..

Variables I: Local

= is used for variable assignment; **not** to be confused with == equality



will
cause
bugs

```
>> a = 1  
=> 1
```

```
>> b = 2  
=> 2
```

```
>> a + b  
=> 3
```

```
>> c = 2  
=> 2
```

```
>> c == b  
=> true
```

```
>> c = a  
=> 1
```

```
>> c  
=> 1
```

```
>> c += 4  
=> 5
```

+ operator
has own
syntax

a+(b)

lowercase
indicates
local

Variables II: Local

= is used for variable assignment; **not** to be confused with == equality



will cause bugs

what's odd about +

```
>> name = "mark"  
=> "mark"  
  
>> surname = "keane"  
=> "keane"  
  
>> name + surname  
=> "markkeane"  
  
>> name + " " + surname  
=> "mark keane"  
  
>> name2 = "mark"  
=> "mark"  
  
>> name2 == name  
=> true
```

lowercase indicates local

Variables: Global

capital
indicates
global

- ✿ best avoided but if you have to...
- ✿ access all areas...
- ✿ used for Constants

```
>> Currency = "dollars"
=> "dollars"

>> Solid = 56
=> 56

>> Solid = 45
(irb):42: warning: already
      initialized constant Solid
(irb):38: warning: previous
      definition of Solid was here
=> 45

>> Solid
=> 45
```

The Usual Types

- ❖ Strings
- ❖ Numbers
- ❖ Arrays
- ❖ Hash Tables
- ❖ Your own objs

symbols used
as hash keys

```
>> "mark".instance_of?(String)
=> true

>> "mark".instance_of?(Array)
=> false

>> ["a","b"].instance_of?(Array)
=> true

>> ["a","b","c"].length
=> 3

>> :mark.class
=> Symbol
```

underscores
not hypens

redo with
symbols

It's functional ...with an F

- Every function call returns a value, of last evaluated expression
- Results in most common bug

```
NoMethodError:  
undefined method  
'any_fun' for  
nil:NilClass
```



```
>> puts "hi mark"  
hi mark  
=> nil  
  
>> a = "foo"  
=> "foo"  
  
>> b = (puts a)  
foo  
=> nil  
  
>> a  
=> "foo"  
  
>> b  
=> nil
```

why?

what would
p do

Defining a function

- **def** is used to define a function
- we are doing it in **irb** which is awkward
- next, we will do it in a file which is nicer
- see how we include parameters
- some **nils** go to limbo

```
>> def hail_the_king
>> puts "king mark"
>> end
=> :hail_any_king
>> hail_the_king
king mark
=> nil

>> def hail_any_king(me)
>> puts "hail"
>> puts me
>> end
=> :hail_any_king

>> hail_any_king("sam")
hail
sam
=> nil
```

underscores
not hypens

parameter
for fn

me is local to
fn scope

From irb to ruby

- Create a file in a text editor of your choice
- start console
- run file using ruby

but double check what /usr/bin/ruby is?

shebang
comment

watch
quotes

```
#!/usr/bin/ruby -w

def hail_the_king
  puts "hail king mark"
end
```

king.rb

```
#!/usr/bin/ruby -w

def hail_the_king
  puts "hail king mark"
end
```

hail_the_king

king.rb

```
$ ruby king.rb
$ 
$ ruby king.rb
hail king mark
$ ./king.rb
hail king mark
$
```

where's
nil?

using
bash

REM Cycle

- Edit file
- Save file
- Re-run file using Ruby...



will
cause
bugs

```
#!/usr/bin/ruby -w
def hail_the_king
    puts "hail king marko"
end
hail_the_king
king.rb
```

```
$ ruby king.rb
$
$ ruby king.rb
hail king marko
$
```

A.D. Hacker “I am changing my file, saving it but I am getting same wrong answer when I run it ?”

- What's wrong with this picture

```
$ .\king.rb
```

```
[$"/Library/Ruby/Site/2.0.0", "/Library/Ruby/Site/  
2.0.0/x86_64-darwin15", "/Library/Ruby/Site/2.0.0/  
universal-darwin15", "/Library/Ruby/Site", "/  
System/Library/Frameworks/Ruby.framework/Versions/  
2.0/usr/lib/ruby/vendor_ruby/2.0.0", "/System/  
Library/Frameworks/Ruby.framework/Versions/2.0/  
usr/lib/ruby/vendor_ruby/2.0.0/x86_64-darwin15",  
"/System/Library/Frameworks/Ruby.framework/  
Versions/2.0/usr/lib/ruby/vendor_ruby/2.0.0/  
universal-darwin15", "/System/Library/Frameworks/  
Ruby.framework/Versions/2.0/usr/lib/ruby/  
vendor_ruby", "/System/Library/Frameworks/  
Ruby.framework/Versions/2.0/usr/lib/ruby/2.0.0",  
"/System/Library/Frameworks/Ruby.framework/
```

```
#!/usr/bin/ruby -w
```

```
def hail_the_king  
  puts "hail king marko"  
end
```

```
print $LOAD_PATH  
hail_the_king
```

```
king.rb
```

- What's wrong with this picture

```
$ .\king.rb
```

```
$[ "/Library/Ruby/Site/2.0.0", "/Library/Ruby/Site/  
2.0.0/x86_64-darwin15", "/Library/Ruby/Site/2.0.0/  
universal-darwin15", "/Library/Ruby/Site", "/  
System/Library/Frameworks/Ruby.framework/Versions/  
2.0/usr/lib/ruby/vendor_ruby/2.0.0", "/System/  
Library/Frameworks/Ruby.framework/Versions/2.0/  
usr/lib/ruby/vendor_ruby/2.0.0/x86_64-darwin15",  
"/System/Library/Frameworks/Ruby.framework/  
Versions/2.0/usr/lib/ruby/vendor_ruby/2.0.0/  
universal-darwin15", "/System/Library/Frameworks/  
Ruby.framework/Versions/2.0/usr/lib/ruby/  
unwittingly loaded up old  
vendor_ruby', "/System/Library/Frameworks/  
Ruby.framework/Versions/2.0/usr/lib/ruby/2.0.0",  
"/System/Library/Frameworks/Ruby.framework/
```

```
#!/usr/bin/ruby -w
```

```
def hail_the_king  
  puts "hail king marko"  
end
```

```
print $LOAD_PATH  
hail_the_king
```

```
king.rb
```

✿ Oh...now I see !

```
#!/usr/bin/ruby -w
```

```
def hail_the_king  
    puts "hail king marko"  
end
```

```
print $LOAD_PATH  
hail_the_king
```

king.rb

```
$ ruby king.rb  
$/opt/local/lib/ruby2.3/gems/2.3.0/gems/  
did_you_mean-1.0.0/lib", "/opt/local/lib/ruby2.3/  
site_ruby/2.3.0", "/opt/local/lib/ruby2.3/  
site_ruby/2.3.0/x86_64-darwin15", "/opt/local/lib/  
ruby2.3/site_ruby", "/opt/local/lib/ruby2.3/  
vendor_ruby/2.3.0", "/opt/local/lib/ruby2.3/  
vendor_ruby/2.3.0/x86_64-darwin15", "/opt/local/  
lib/ruby2.3/vendor_ruby", "/opt/local/lib/  
ruby2.3/2.3.0", "/opt/local/lib/ruby2.3/2.3.0/  
x86_64-darwin15"]Versions/2.0/usr/lib/ruby/2.0.0/  
x86_64-darwin15", "/System/Library/Frameworks/  
Ruby.framework/Versions/2.0/usr/lib/ruby/2.0.0/  
universal-darwin15"-darwin15", "/System/Library/  
Frameworks/Ruby.framework/Versions/2.0/usr/lib/
```

Teasers

What ruby does **irb** use?

```
markkean% irb -v  
irb 0.9.6(09/06/30)
```

```
markkean% irb1.8 -v  
irb 0.9.5(05/04/13)
```

```
markkean% irb conf  
/opt/local/lib/ruby2.3/2.3.0/irb/magic-file.rb:8:in `initialize': No such file or directory @ rb_sysopen - conf (Errno::ENOENT)  
from /opt/local/lib/ruby2.3/2.3.0/irb/magic-file.rb:8:in `open'  
from /opt/local/lib/ruby2.3/2.3.0/irb/magic-file.rb:8:in `open'  
from /opt/local/lib/ruby2.3/2.3.0/irb/input-method.rb:101:in `initialize'  
from /opt/local/lib/ruby2.3/2.3.0/irb/context.rb:85:in `new'  
from /opt/local/lib/ruby2.3/2.3.0/irb/context.rb:85:in `initialize'  
from /opt/local/lib/ruby2.3/2.3.0/irb.rb:426:in `new'  
from /opt/local/lib/ruby2.3/2.3.0/irb.rb:426:in `initialize'  
from /opt/local/lib/ruby2.3/2.3.0/irb.rb:381:in `new'  
from /opt/local/lib/ruby2.3/2.3.0/irb.rb:381:in `start'  
from /opt/local/bin/irb:11:in `<main>'
```

```
markkean% irb1.9 conf  
/opt/local/lib/ruby1.9/1.9.1/irb/magic-file.rb:7:in `initialize': No such file or directory - conf (Errno::ENOENT)  
from /opt/local/lib/ruby1.9/1.9.1/irb/magic-file.rb:7:in `open'  
from /opt/local/lib/ruby1.9/1.9.1/irb/magic-file.rb:7:in `open'  
from /opt/local/lib/ruby1.9/1.9.1/irb/input-method.rb:77:in `initialize'  
from /opt/local/lib/ruby1.9/1.9.1/irb/context.rb:79:in `new'  
from /opt/local/lib/ruby1.9/1.9.1/irb/context.rb:79:in `initialize'  
from /opt/local/lib/ruby1.9/1.9.1/irb.rb:91:in `new'  
from /opt/local/lib/ruby1.9/1.9.1/irb.rb:91:in `initialize'  
from /opt/local/lib/ruby1.9/1.9.1/irb.rb:56:in `new'  
from /opt/local/lib/ruby1.9/1.9.1/irb.rb:56:in `start'  
from /opt/local/bin/irb1.9:12:in `<main>'
```

```
markkean%
```

uses different path
variables

Geek Crap I: Search Paths

- Move along, there is nothing to see here....
- Ruby uses many environmental variables to store search paths and the like... under the bonnet

MacBook-Air-2\$ ruby -e 'puts \$LOAD_PATH'

```
/opt/local/lib/ruby2.3/gems/2.3.0/gems/did_you_mean-1.0.0/lib  
/opt/local/lib/ruby2.3/site_ruby/2.3.0  
/opt/local/lib/ruby2.3/site_ruby/2.3.0/x86_64-darwin15  
/opt/local/lib/ruby2.3/site_ruby  
/opt/local/lib/ruby2.3/vendor_ruby/2.3.0  
/opt/local/lib/ruby2.3/vendor_ruby/2.3.0/x86_64-darwin15  
/opt/local/lib/ruby2.3/vendor_ruby  
/opt/local/lib/ruby2.3/2.3.0  
/opt/local/lib/ruby2.3/2.3.0/x86_64-darwin15
```

REM:

Geek Crap II: Search Paths

- BUT...if I check my other version of Ruby

```
[Mouseking6-3:~] markkean% ruby1.8 -e 'puts $LOAD_PATH'
```

```
/Library/Ruby/Site/1.8  
/Library/Ruby/Site/1.8/powerpc-darwin9.0  
/Library/Ruby/Site/1.8/universal-darwin9.0  
/Library/Ruby/Site  
/System/Library/Frameworks/Ruby.framework/Versions/1.8/usr/lib/ruby/1.8  
/System/Library/Frameworks/Ruby.framework/Versions/1.8/usr/lib/ruby/1.8/powerpc-darwin9.0  
/System/Library/Frameworks/Ruby.framework/Versions/1.8/usr/lib/ruby/1.8/universal-darwin9.0
```

REM:

The story so far ...

- function syntax
- variables
 - Using ***irb***
 - Using ***ruby***
- equality
- basic functions
- defining functions

Now, U Try It ...Prac 1

- start practical here and work through
- take big problems to class hour later in week
- practical needs to be turned in by end of class hour; with your name on it
- practical will form part of the continuous assessment of the course