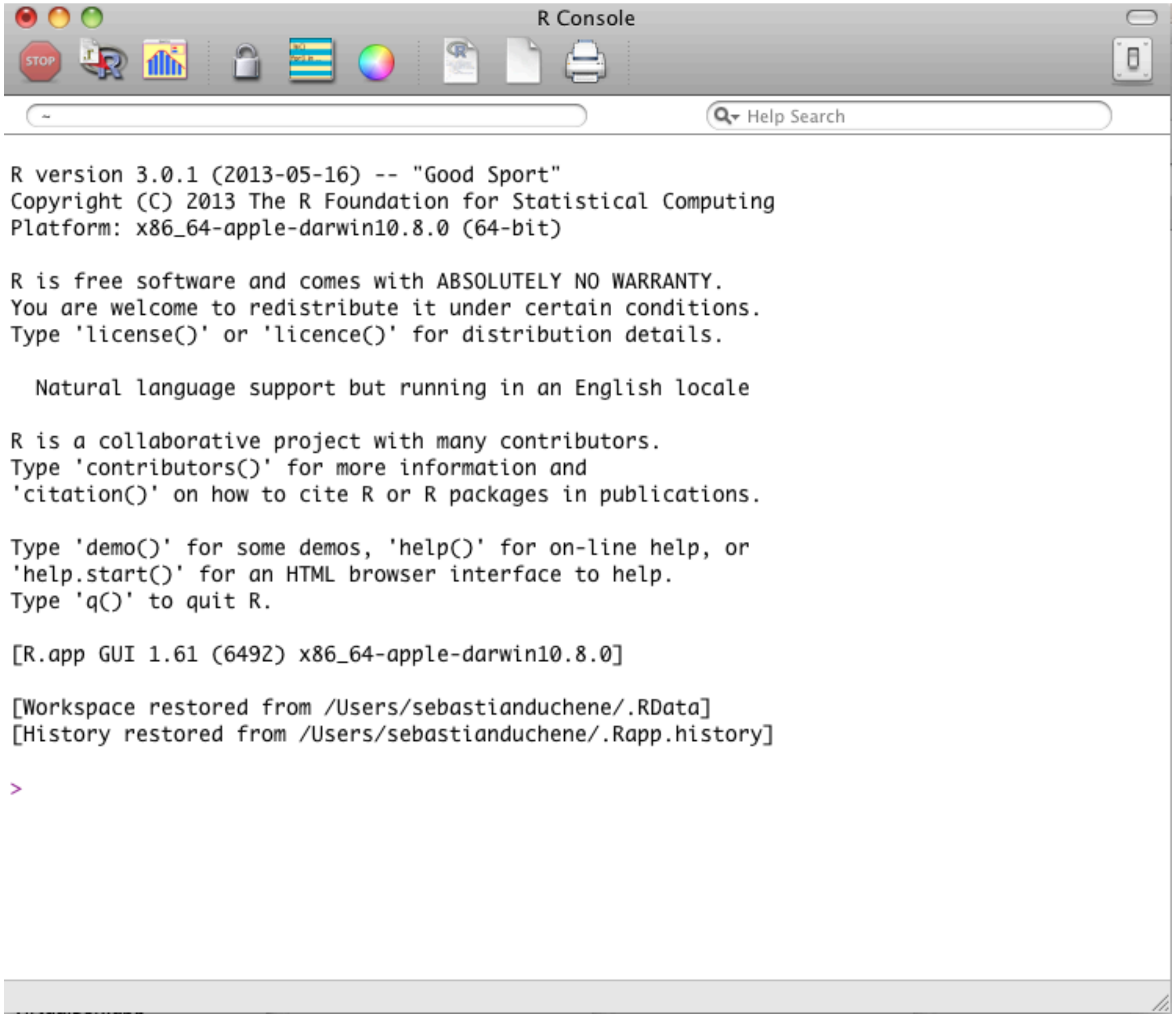
Syntax and Objects

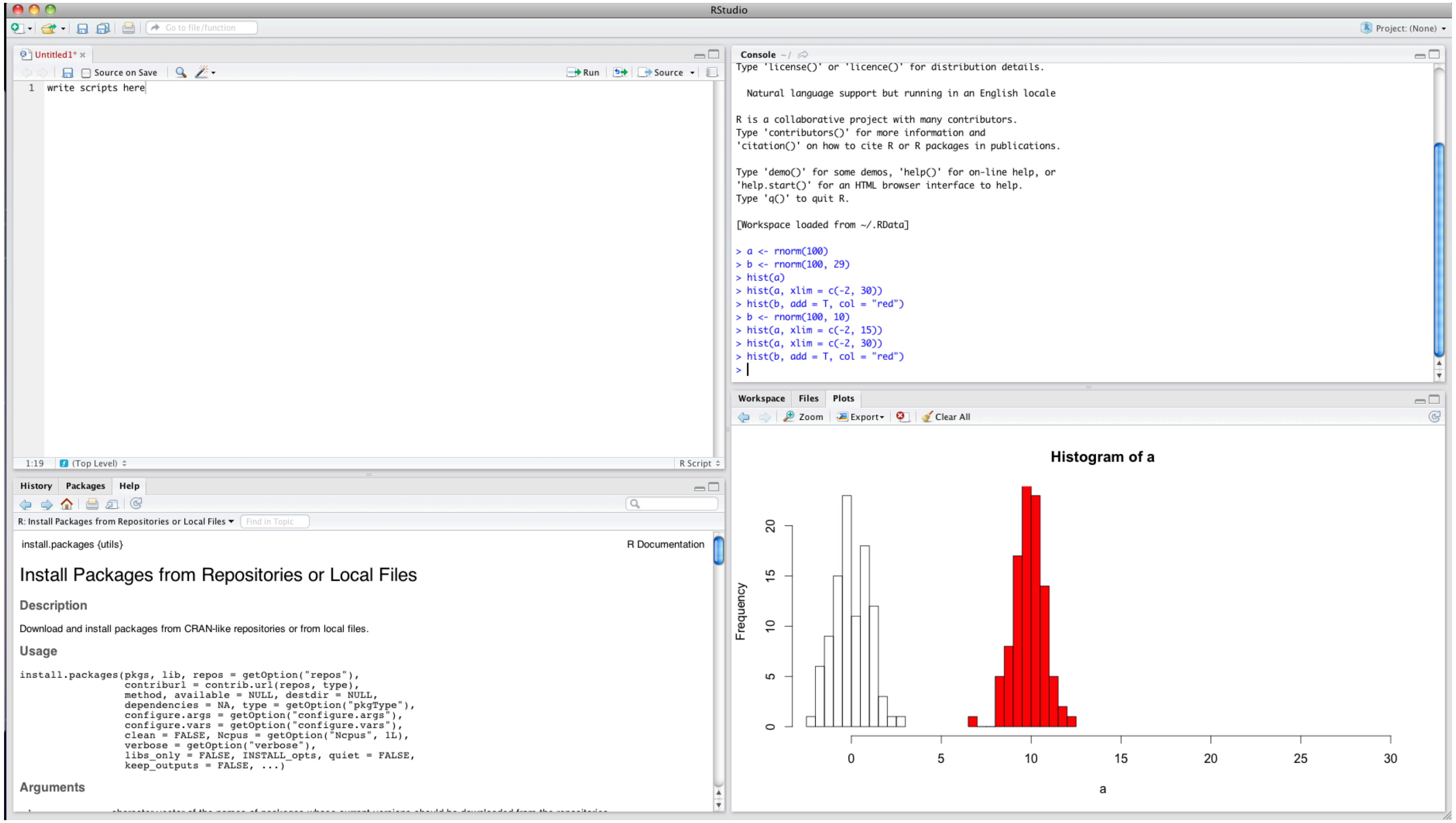
Sebastian Duchene
University of Sydney

The R console



```
R version 3.0.1 (2013-05-16) -- "Good Sport"
Copyright (C) 2013 The R Foundation for Statistical Computing
Platform: x86_64-apple-darwin10.8.0 (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.

  Natural language support but running in an English locale

R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

[R.app GUI 1.61 (6492) x86_64-apple-darwin10.8.0]

[Workspace restored from /Users/sebastianduchene/.RData]
[History restored from /Users/sebastianduchene/.Rapp.history]

>
```

The R console



```
write scripts here
```

```
Type 'license()' or 'licence()' for distribution details.

  Natural language support but running in an English locale

R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

[Workspace loaded from ~/.RData]

> a <- rnorm(100)
> b <- rnorm(100, 29)
> hist(a)
> hist(a, xlim = c(-2, 30))
> hist(b, add = T, col = "red")
> b <- rnorm(100, 10)
> hist(a, xlim = c(-2, 15))
> hist(a, xlim = c(-2, 30))
> hist(b, add = T, col = "red")
> 
```

install.packages {utils} R Documentation

Install Packages from Repositories or Local Files

Description

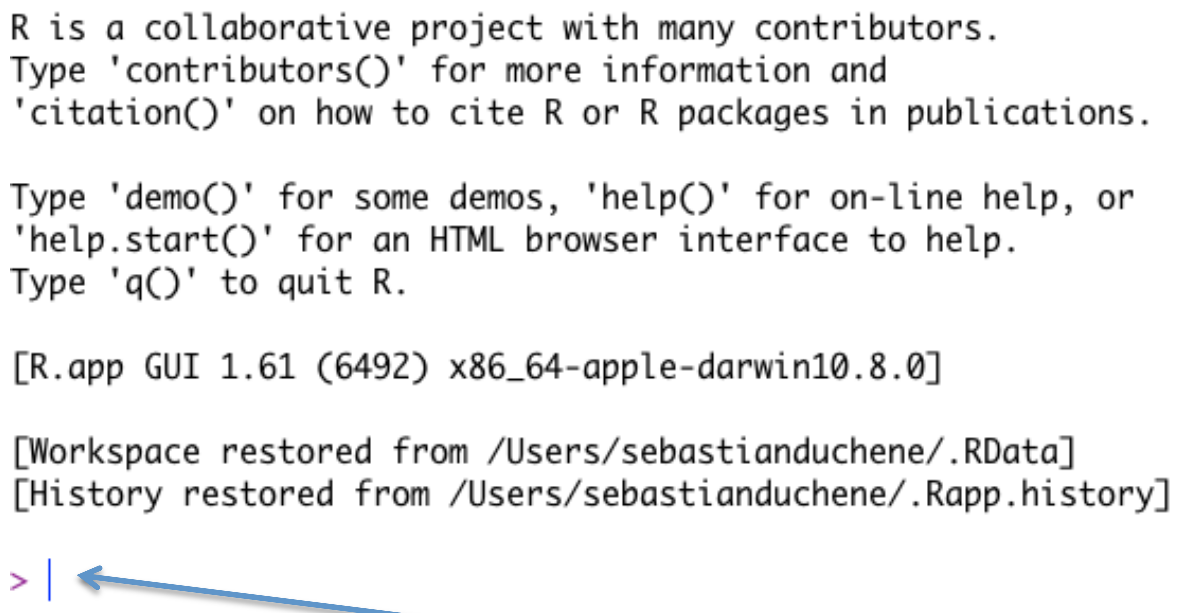
Download and install packages from CRAN-like repositories or from local files.

Usage

```
install.packages(pkgs, lib, repos = getOption("repos"),
                 contriburl = contrib.url(repos, type),
                 method, available = NULL, destdir = NULL,
                 dependencies = NA, type = getOption("pkgType"),
                 configure.args = getOption("configure.args"),
                 configure.vars = getOption("configure.vars"),
                 clean = FALSE, Ncpus = getOption("Ncpus", 1L),
                 verbose = getOption("verbose"),
                 libs_only = FALSE, INSTALL_opts, quiet = FALSE,
                 keep_outputs = FALSE, ...)
```

Arguments

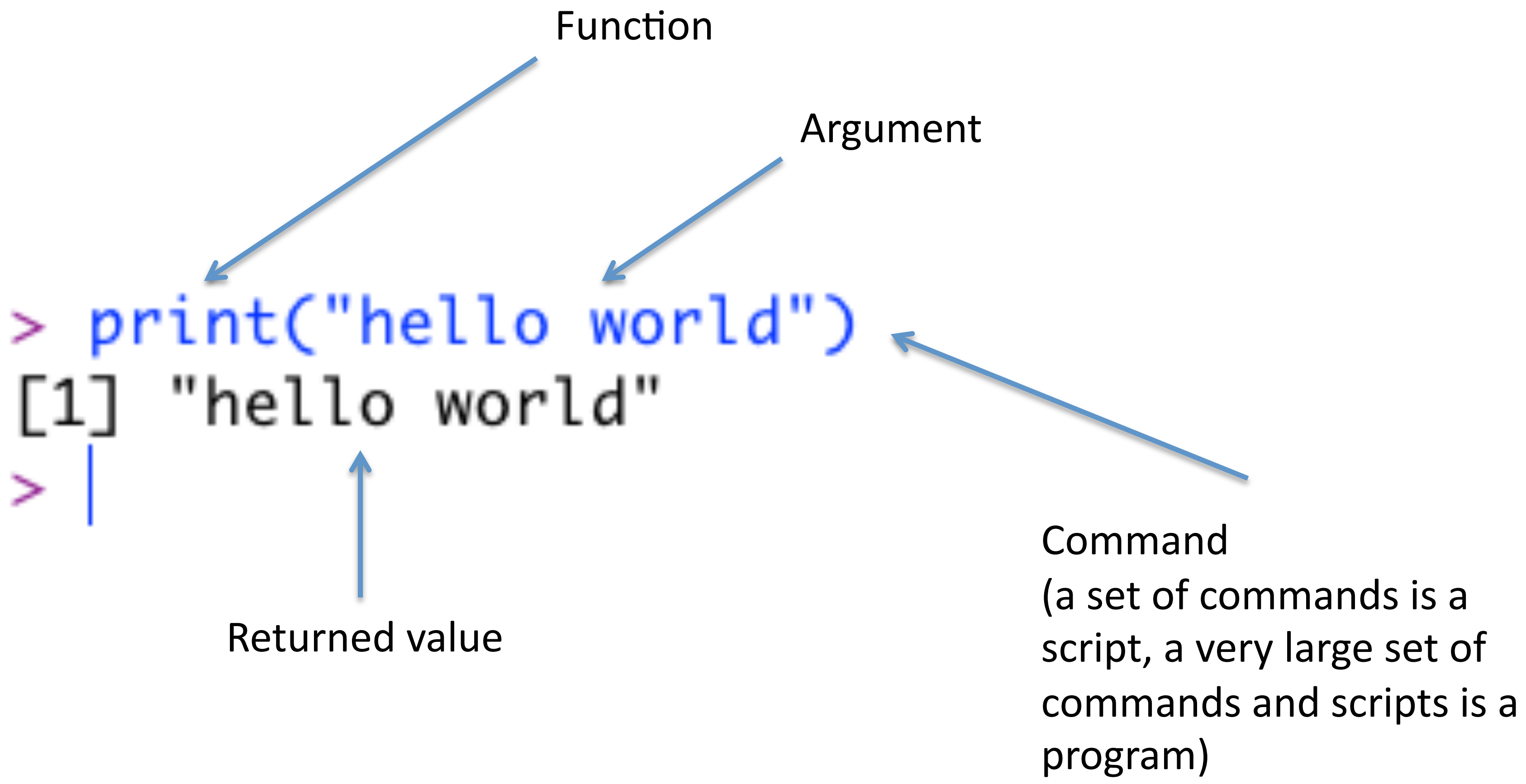
The R console



```
R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

[R.app GUI 1.61 (6492) x86_64-apple-darwin10.8.0]

[Workspace restored from /Users/sebastianduchene/.RData]
[History restored from /Users/sebastianduchene/.Rapp.history]

> |
```

The prompt (commands)

Basic syntax



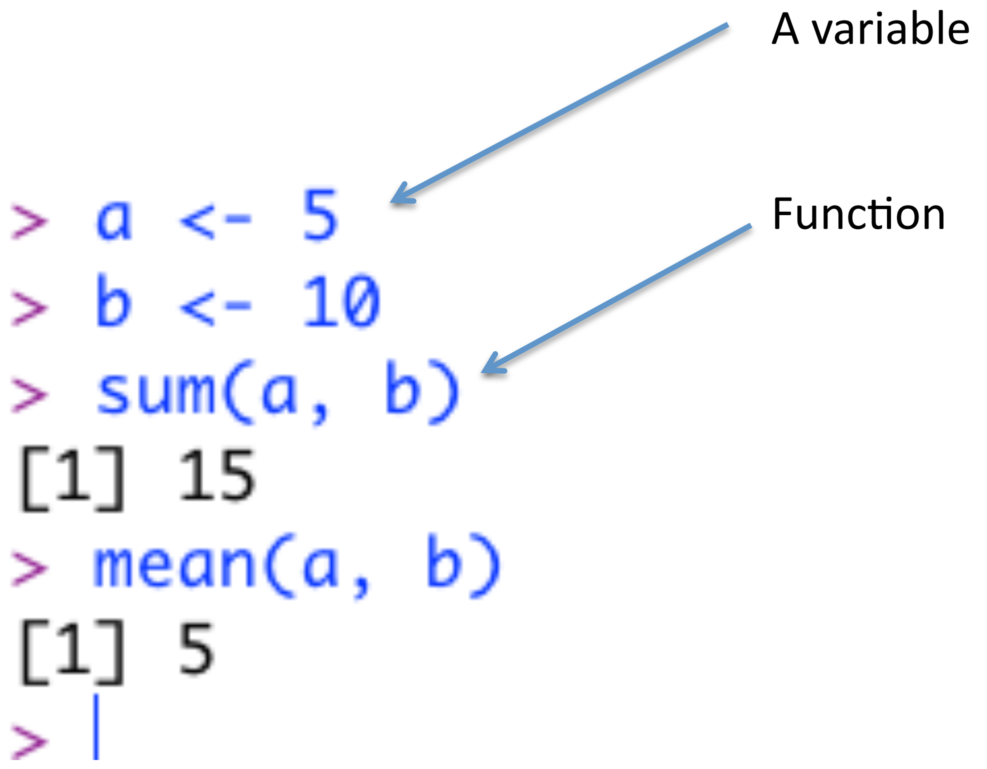
```
> print("hello world")
[1] "hello world"
> |
```

Function
Argument
Returned value
Command
(a set of commands is a script, a very large set of commands and scripts is a program)

Variable names

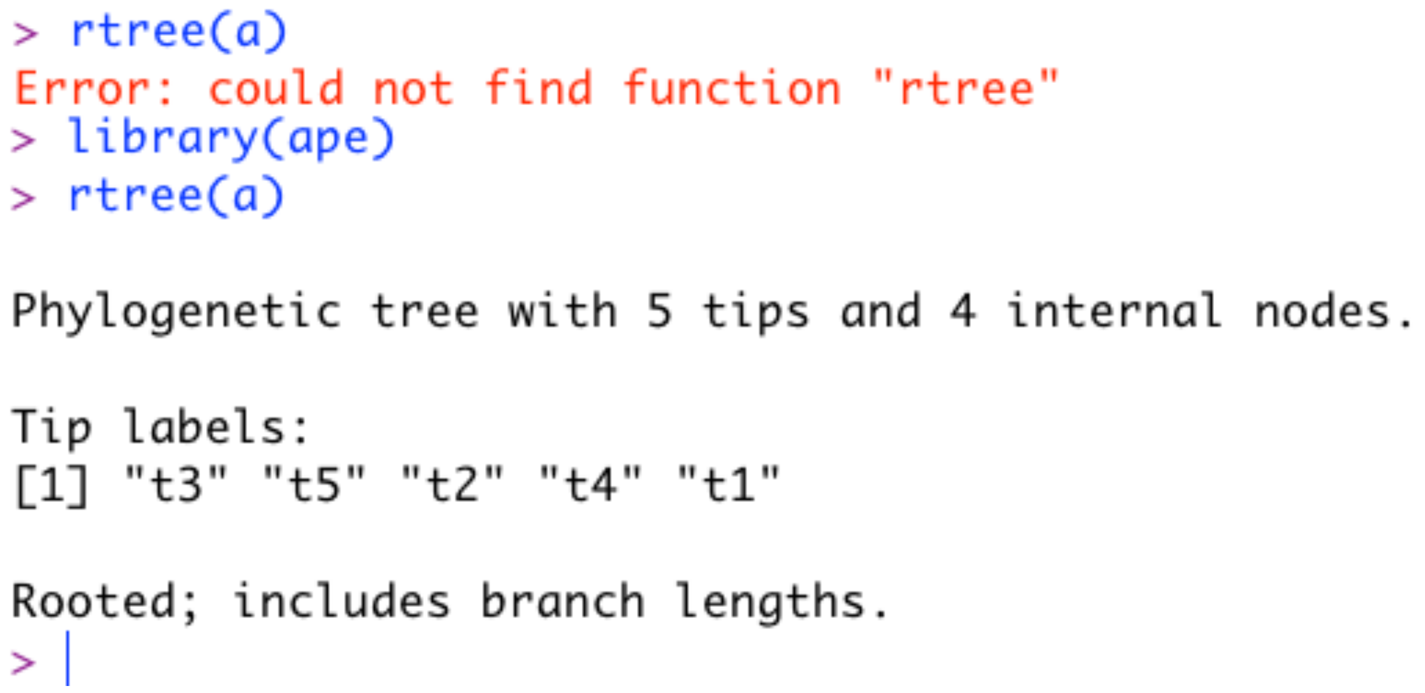
- No spaces, use underscore (_), dot (.) ,or SomethingLikeThis
- No + or – signs

Basic syntax



```
> a <- 5
> b <- 10
> sum(a, b)
[1] 15
> mean(a, b)
[1] 5
> |
```

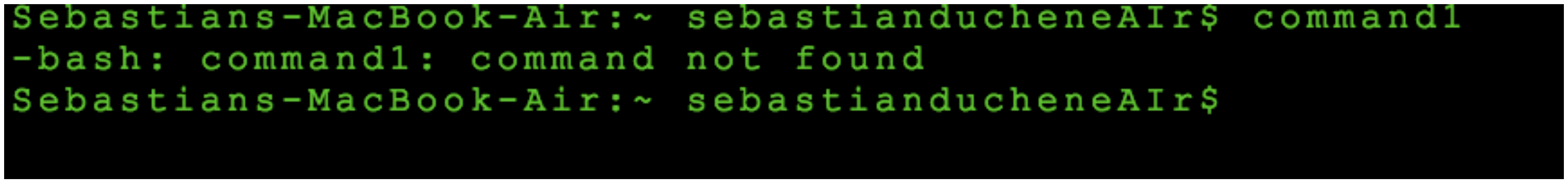
Packages



```
> rtree(a)
Error: could not find function "rtree"
> library(ape)
> rtree(a)

Phylogenetic tree with 5 tips and 4 internal nodes.

Tip labels:
[1] "t3" "t5" "t2" "t4" "t1"

Rooted; includes branch lengths.
> |
```

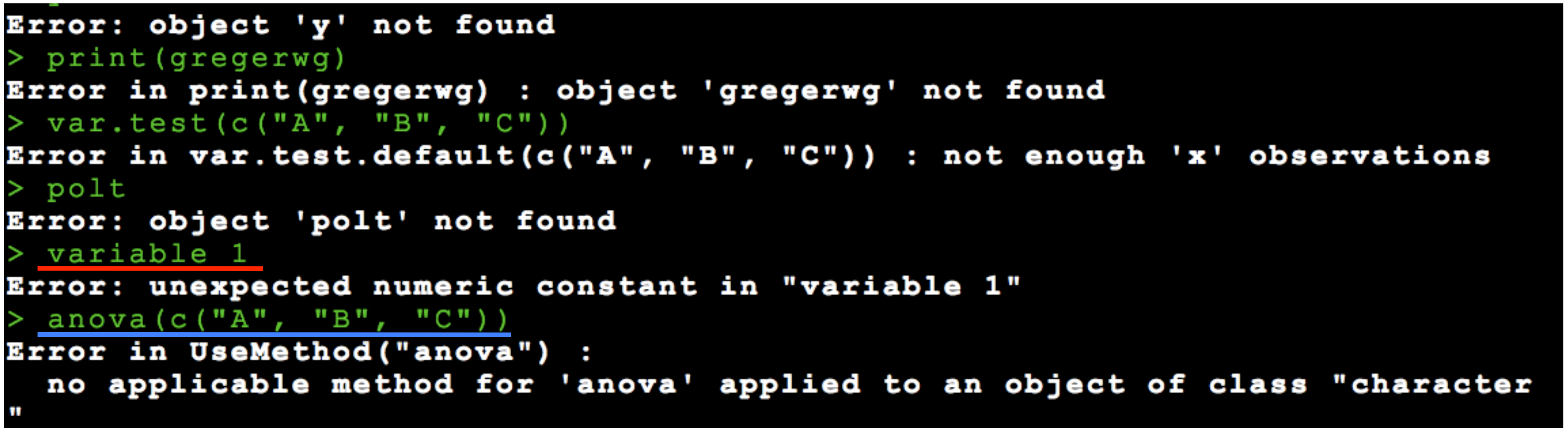
Available from the Comprehensive R Archive Network (CRAN) website

A note on syntax, programming and the command line…


```
Sebastians-MacBook-Air:~ sebastianducheneAIr$ command1
-bash: command1: command not found
Sebastians-MacBook-Air:~ sebastianducheneAIr$
```

Syntax and *semantics* can be capricious

Errors are **no** reason to panic


```
Error: object 'y' not found
> print(gregerwg)
Error in print(gregerwg) : object 'gregerwg' not found
> var.test(c("A", "B", "C"))
Error in var.test.default(c("A", "B", "C")) : not enough 'x' observations
> polt
Error: object 'polt' not found
> variable 1
Error: unexpected numeric constant in "variable 1"
> anova(c("A", "B", "C"))
Error in UseMethod("anova") :
  no applicable method for 'anova' applied to an object of class "character
"
```

Tutorial 1: Types in R

- Numeric
- NA, NaN
- Strings

We learned…

- We can store objects in R:
  - numbers, text, or missing data
- We use <- for assignment in R
- Use quotes to tell R that our data is text
- We can add comments to our code by using #

Tutorial 2: Vectors, matrices, data frames, and indexing

- Vectors
- Matrices and arrays
- Data frames
- Sorting

We learned…

- We can use more complex structures to store data:
  - vector()
  - matirx()
  - **data.frame()**
  - array()

- Objects have classes which can be modified (not always)

- We can access portions of the data by indexing
- We can sort the data with the sort functions

- Operations
  - B + A
  - B / A

- Functions

```
> My_function(arg1 = A, arg2 = B) # Can return values
```

Class examples in etherpad

Tutorial 3: Operations in R

- Operations on single variables
- Operations on several variables
- Concatenating vectors and matrices

We learned…

- We can perform many mathematical operations in R

- There are many functions to summarize data in R

- Functions return elements of different classes (not always).

Tutorial 4: Getting help in R

- help(“item”)
- ?help
- ??”function for help”
- args(“function”)
- apropos(“function”)
- The example() function
- Online help

We learned…

- There are many ways to find help in R
  - If there is good documentation, we can get help from the prompt
  - Online resources are a good starting point if documentation is insufficient