

R Assignment #0:

Introduction to the R Environment

(Due Sept 6 - by email)

BIOL 6090

David Hyrenbach
Khyrenba@gmail.com

Tasks - Assignment #0

1. Get R and R Studio to run
2. Familiarize yourself with R
(help, history, workspace)
3. Familiarize yourself with R Studio
4. Run Swirl and start familiarizing yourself with R syntax and functions

Learning Objectives - Assignment #0

By the end of this exercise you should be able to:

Install the R and R Studio software packages

Understand what the various R windows do

Download and install the swirl package for R

Execute basic arithmetic operations in R

Why R ?

Powerful, Versatile, Dynamic, Free !!!



BUT...

Feels like drinking water from a fire hose !!!



Why This Class ?

Work together to master the software !



Downloading R

<http://www.r-project.org/>

Getting Started:

- R is a free software environment for statistical computing and graphics. It compiles and runs on a wide variety of UNIX platforms, Windows and MacOS. **To download R, please choose your preferred CRAN mirror.**
- If you have questions about R like how to download and install the software, or what the license terms are, please read our [answers to frequently asked questions](#) before you send an email.



[About R](#)
[What is R?](#)
[Contributors](#)
[Screenshots](#)
[What's new?](#)

[Download, Packages](#)
[CRAN](#)

[R Project](#)
[Foundation](#)
[Members & Donors](#)
[Mailing Lists](#)
[Bug Tracking](#)
[Developer Page](#)
[Conferences](#)
[Search](#)

CRAN Mirrors

The Comprehensive R Archive Network is available at the following URLs, please choose a location close to you. Some statistics on the status of the mirrors can be found here: [main page](#), [windows release](#), [windows old release](#).

0-Cloud

<http://cran.rstudio.com/>

Rstudio, automatic redirection to servers worldwide

Argentina

<http://mirror.fcaglp.unlp.edu.ar/CRAN/>

Universidad Nacional de La Plata

Australia

<http://cran.csiro.au/>

CSIRO

<http://cran.ms.unimelb.edu.au/>

University of Melbourne

Austria

<http://cran.at.r-project.org/>

Wirtschaftsuniversitaet Wien

Belgium

<http://www.freeststatistics.org/cran/>

K.U.Leuven Association

Brazil

<http://nbcgib.uesc.br/mirrors/cran/>

Center for Comp. Biol. at Universidade Estadual de Santa Cruz

<http://cran-r.c3sl.ufpr.br/>

Universidade Federal do Parana

<http://cran.fiocruz.br/>

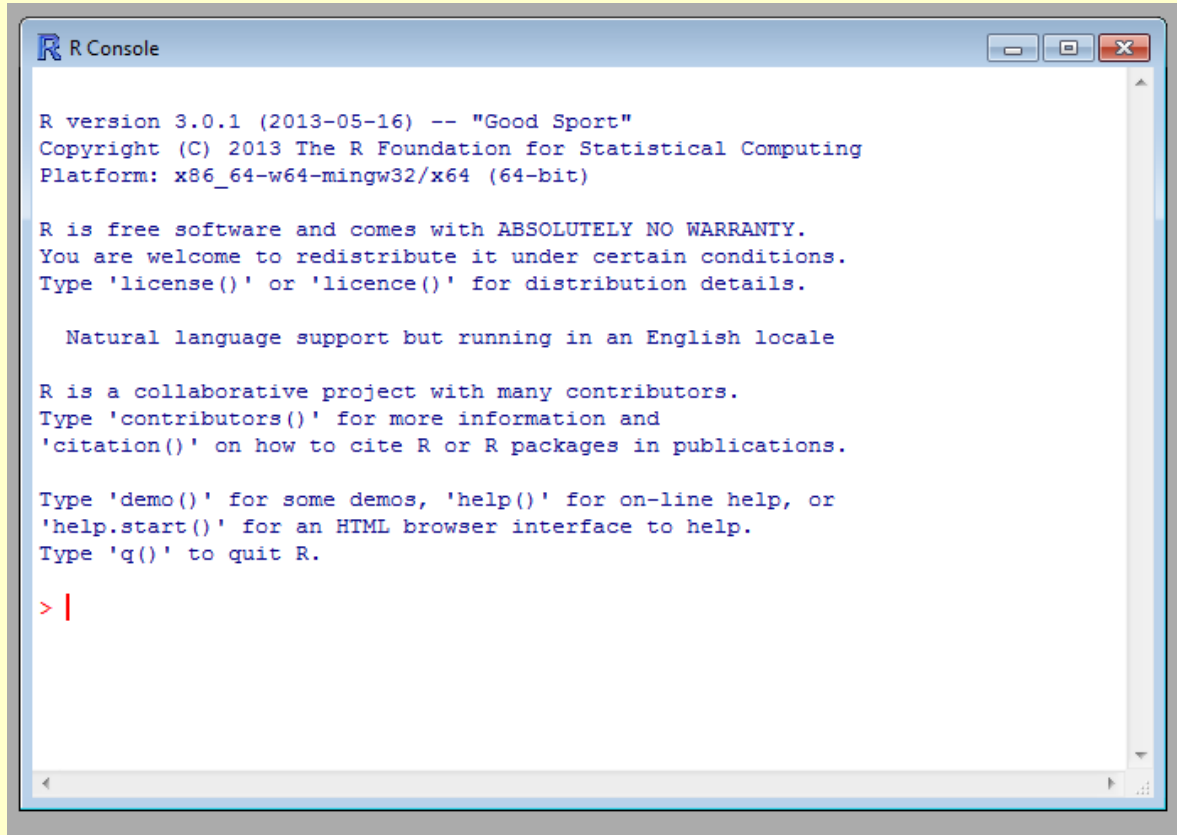
Oswaldo Cruz Foundation, Rio de Janeiro

<http://www.vps.fmvz.usp.br/CRAN/>

University of Sao Paulo, Sao Paulo

Exploring the R Windows

FOUR WINDOWS - **Console:** Editor: Quartz: Help:



```
R Console

R version 3.0.1 (2013-05-16) -- "Good Sport"
Copyright (C) 2013 The R Foundation for Statistical Computing
Platform: x86_64-w64-mingw32/x64 (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.

> |
```

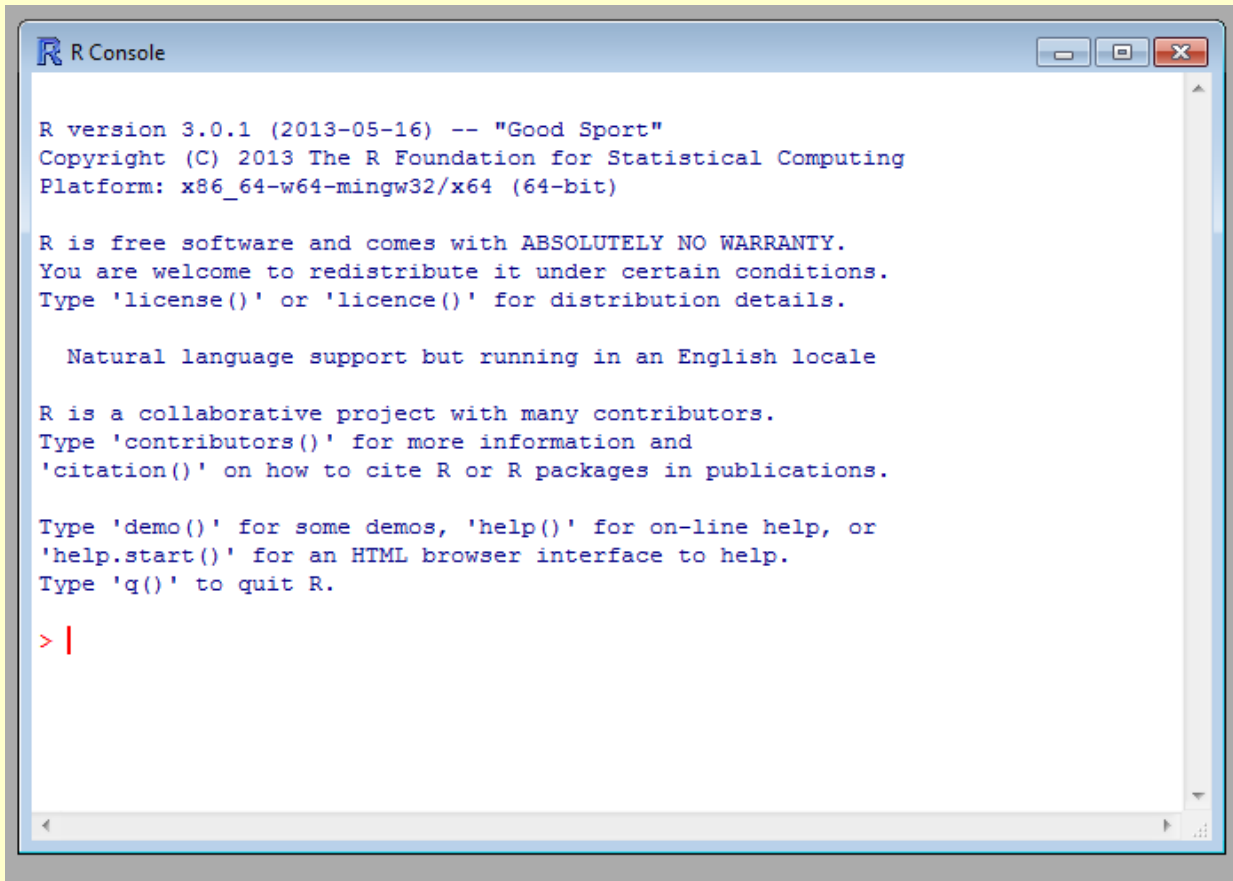
Type 'demo()' for some demos,

Type 'help()' for on-line help, or 'help.start()' for an HTML browser interface to help.

Type 'q()' to quit.

NOTE: Functions always include objects in brackets. If they are not needed, include empty brackets (e.g. "()")

Exploring the R Console



```
R Console

R version 3.0.1 (2013-05-16) -- "Good Sport"
Copyright (C) 2013 The R Foundation for Statistical Computing
Platform: x86_64-w64-mingw32/x64 (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.

> |
```

You can copy
and paste
commands into
console window

Pressing ENTER
executes the
command

Type 'q()' to quit.

NOTE: The console records all commands / actions in R
(whether they are typed into it or via scripts / GUIs)

Exploring the R Console



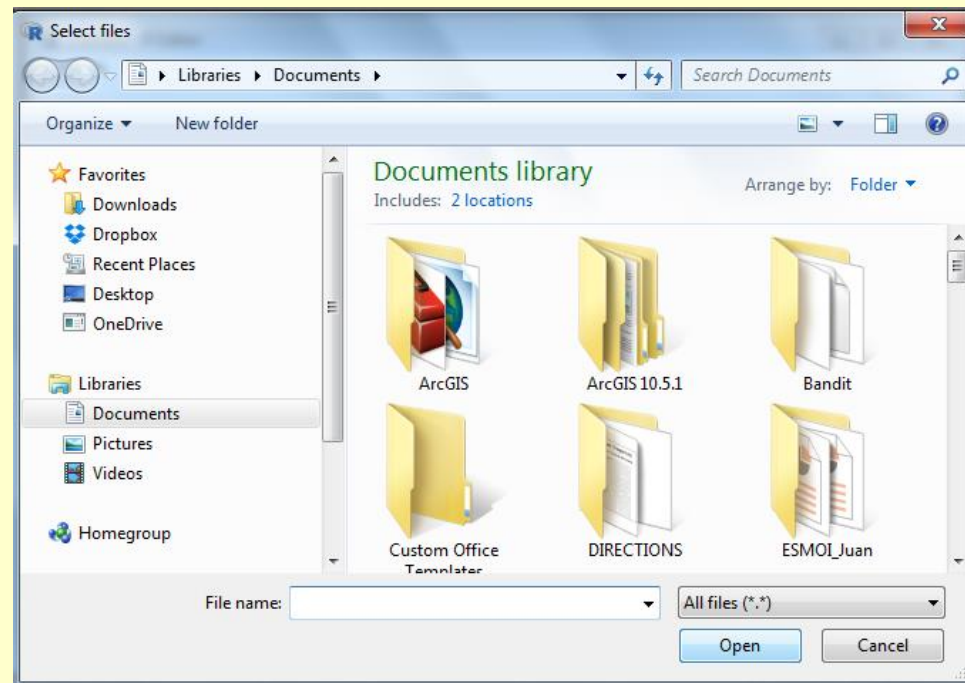
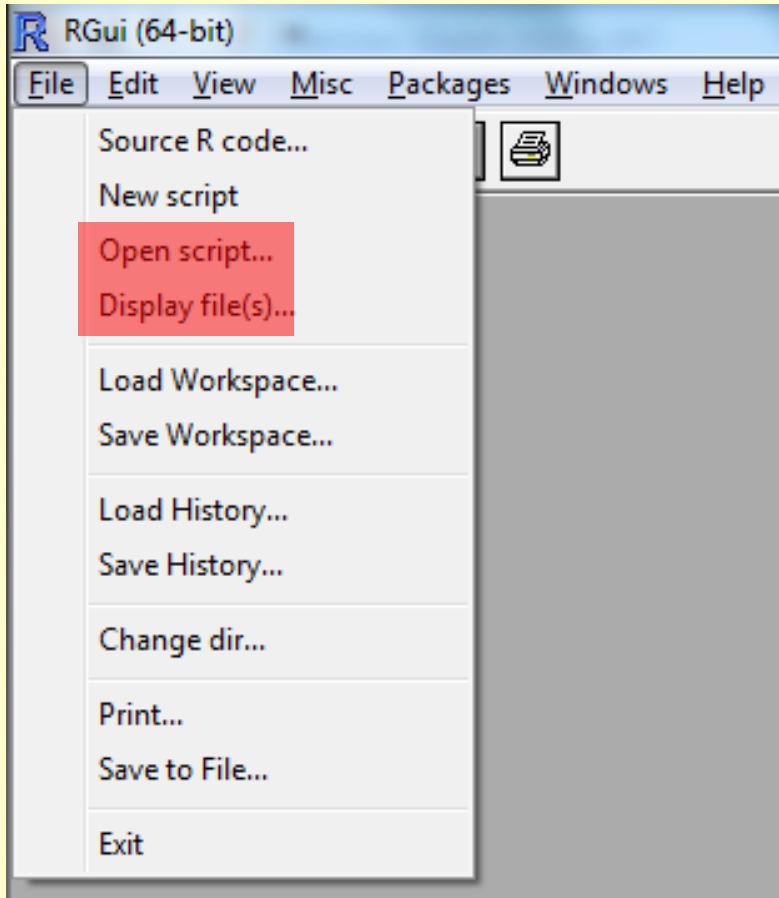
NOTE: Console provides limited GUI capabilities:

- Open / Save Workspace
- Open Script
- Copy / Paste Text
- Stop Computations (for infinite loops...)
- Print Output

Exploring the R Windows

FOUR WINDOWS - Console: **Editor**: Quartz: Help:

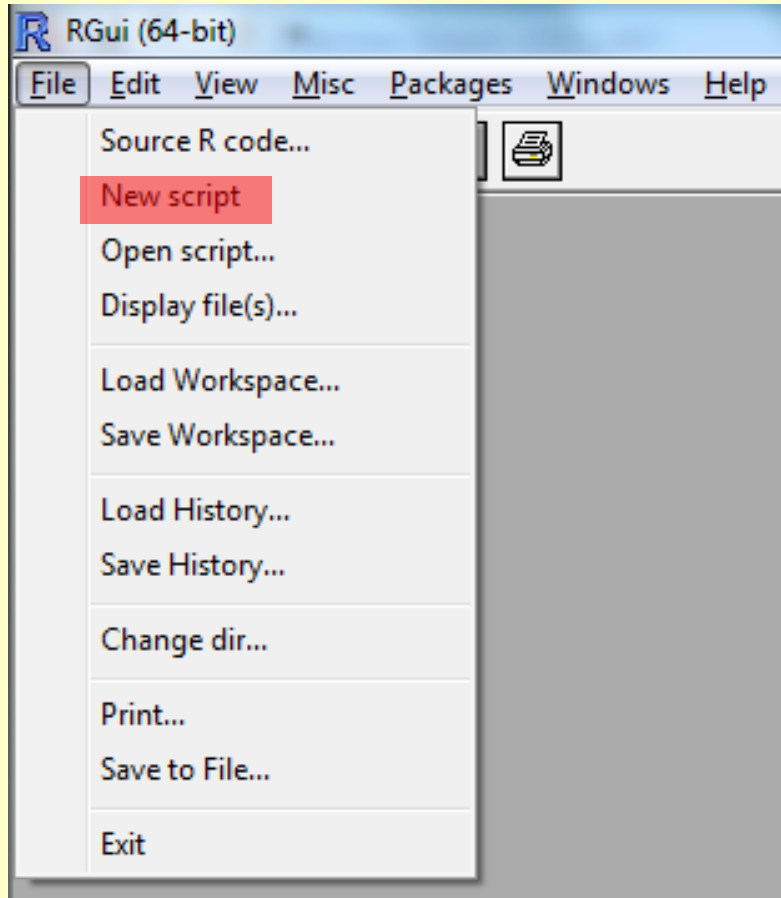
Open "select file" window
to locate existing scripts



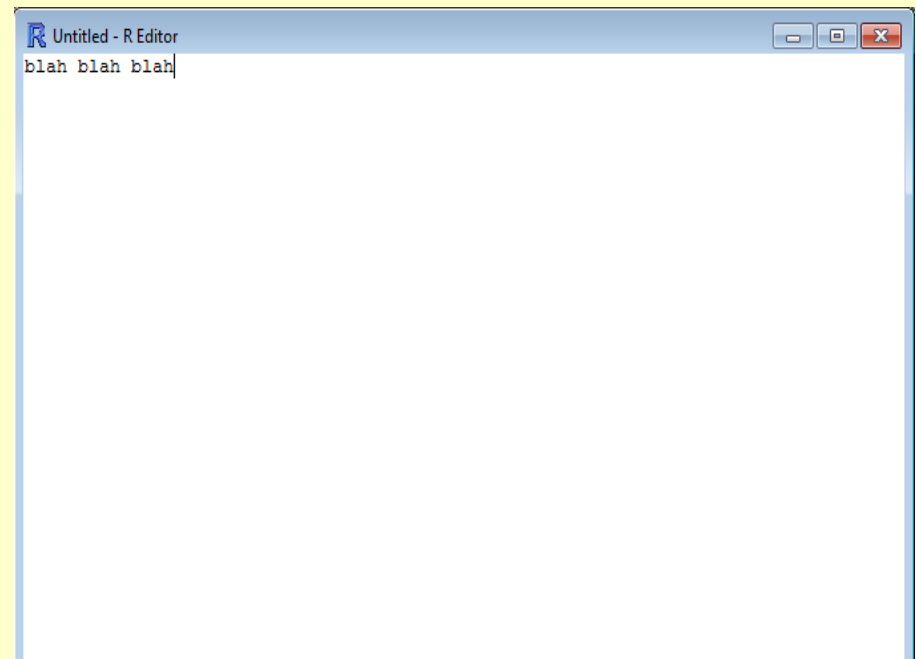
NOTE: Packages developed to improve editor functionality

Exploring the R Windows

FOUR WINDOWS - Console: **Editor**: Quartz: Help:



Opens new script window
User can create new script



NOTE: Packages developed to improve editor functionality

Creating a Script

R C:\Program Files\R\R-3.0.1\coursera\mycode.R - R Editor

```
firstfunction <- function() {  
  x <- rnorm(100)  
  mean(x)  
}  
  
secondfunction <- function(x) {  
  x + rnorm(length(x))  
}
```

To Save Script:

Save as "mycode.R"

(make sure you add ".R")

NOTE:

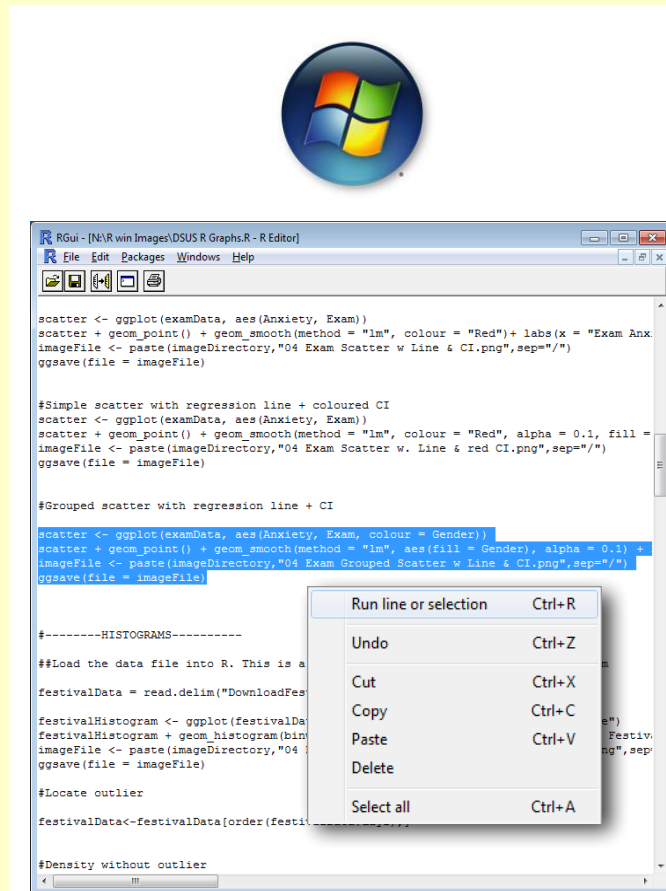
What happens if () is added or omitted after a function?

```
> firstfunction()  
[1] 0.00479348
```

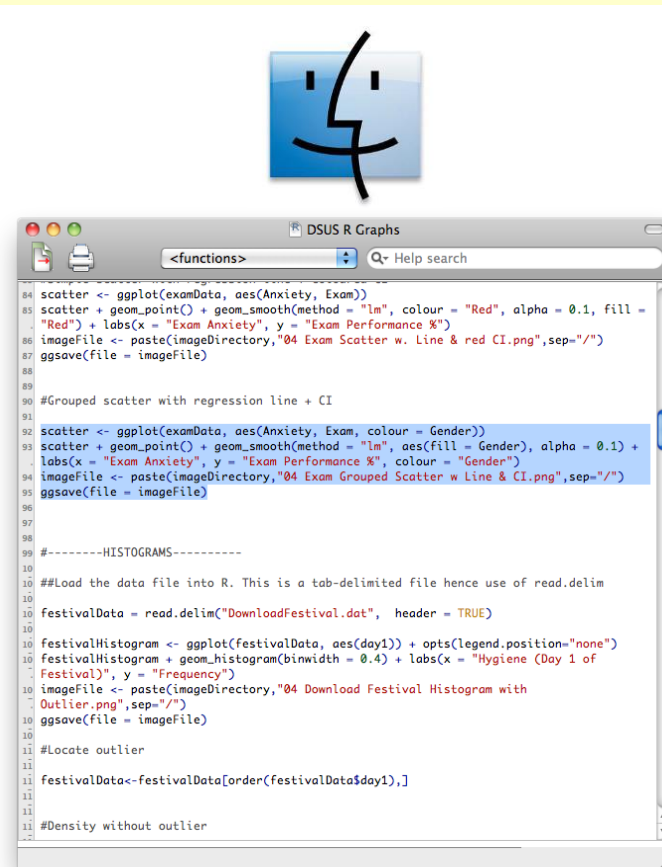
```
> firstfunction  
function() {  
  x <- rnorm(100)  
  mean(x)  
}
```

Executing a Script

Executing commands from the R editor window



Ctrl + R



⌘ + ↵

Exploring R Windows

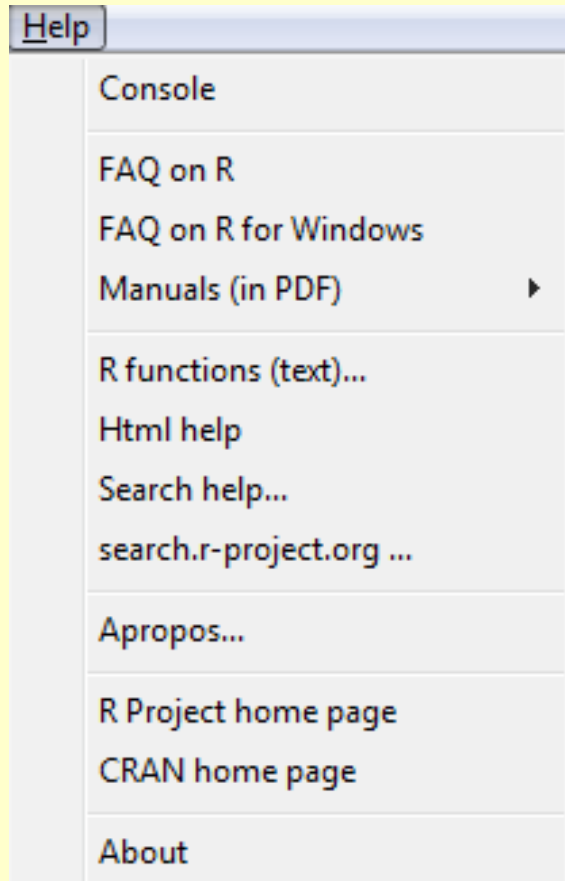
FOUR WINDOWS - Console: Editor: Quartz: Help:

If you produce any graphics, they will appear in the graphics window

In Macs, this is called the quartz window

Exploring R Windows

FOUR WINDOWS - Console: Editor: Quartz: **Help:**



Manuals - PDFs

Search HELP

Launch HELP web - site

> **help.start()**

starting httpd help server ... done

**If nothing happens, you should open
'<http://127.0.0.1:31376/doc/html/index.html>' yourself**

Exploring R - Help

<http://127.0.0.1:31376/doc/html/index.html>

Statistical Data Analysis



Manuals

[An Introduction to R](#)
[Writing R Extensions](#)
[R Data Import/Export](#)

[The R Language Definition](#)
[R Installation and Administration](#)
[R Internals](#)

Reference

[Packages](#)

[Search Engine & Keywords](#)

Miscellaneous Material

[About R](#)
[License](#)
[NEWS](#)

[Authors](#)
[Frequently Asked Questions](#)
[User Manuals](#)

[Resources](#)
[Thanks](#)
[Technical papers](#)

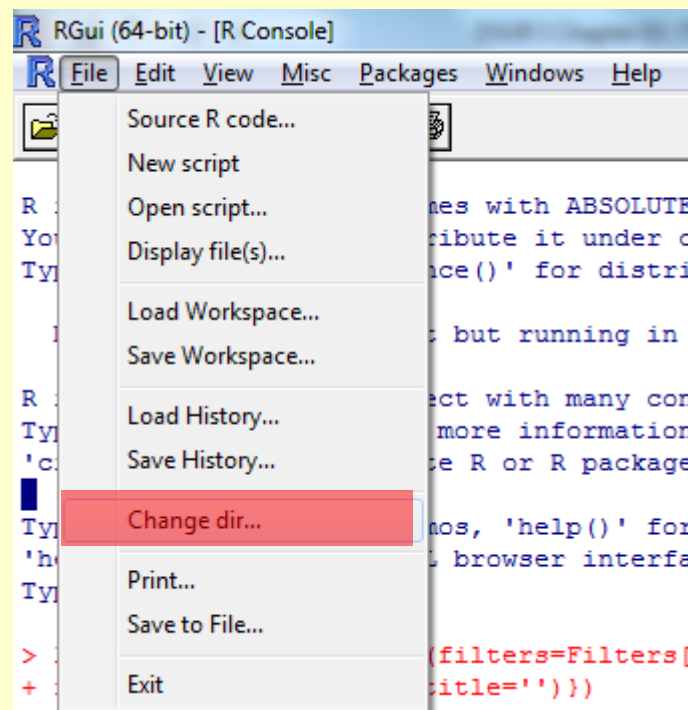
Material specific to the Windows port

[CHANGES up to R 2.15.0](#)

[Windows FAQ](#)

Setting Working Directory

- Create a folder (in usual way you do in Windows or MacOS) and place data files you will be using in that folder.
- When you start your session in R assign the working directory to the folder that you have just created.
- Files are read from / to the working directory

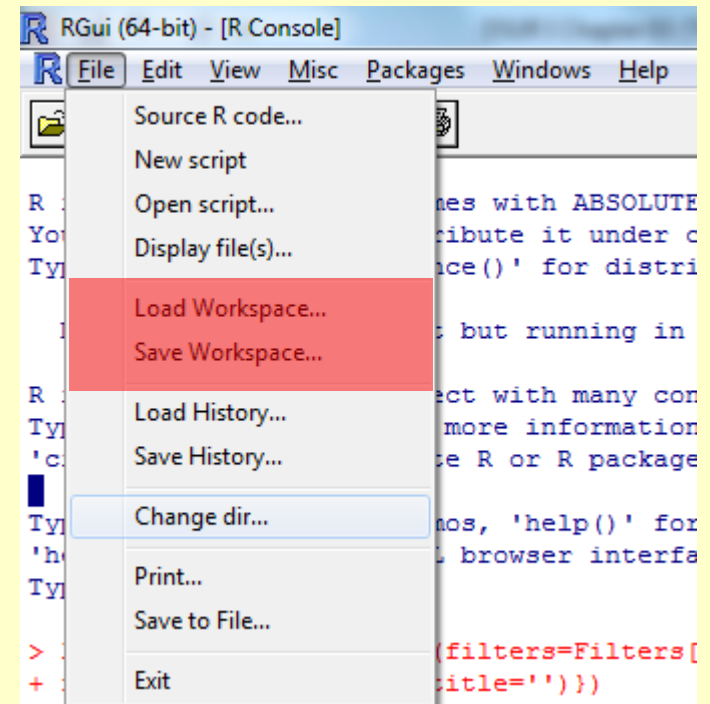


Managing the Working Directory

- Imagine you have a folder in 'C:/Documents' called 'Data' and within that folder you created a sub-folder called 'R Book Examples', where you have placed some data files.
- Set the working directory using `setwd()`:
 - > `setwd("C:/Documents/Data/R Book Examples")`
- Find working directory using `getwd()`:
 - > `getwd()`
 - > `"C:/Documents/Data/R Book Examples"`
- To list the objects (datasets / functions) use `ls()`:
 - > `ls()`
 - > `x y file1.txt file2.txt`
- To list files in current working directory use `dir()`:
 - > `dir()`
 - > `function1.R function2.R`

Managing Workspaces

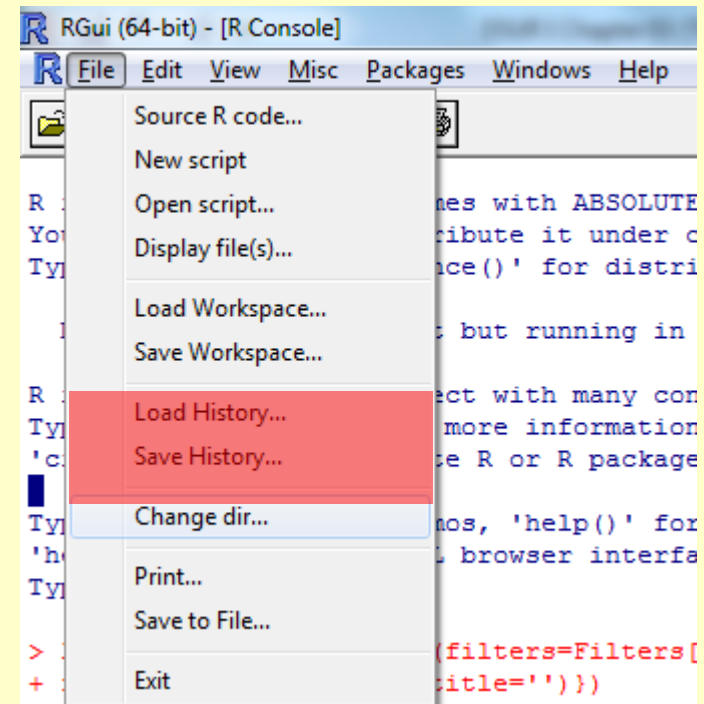
- When closing an R session, if you **Save Workspace**, all of the open objects and libraries will be saved.
- The next time you **Load Workspace**, they all will still be there... ready to go.
- You can save and restore multiple workspaces images.
- Workspace images are saved as "Rimage" (*.Rdata) files.



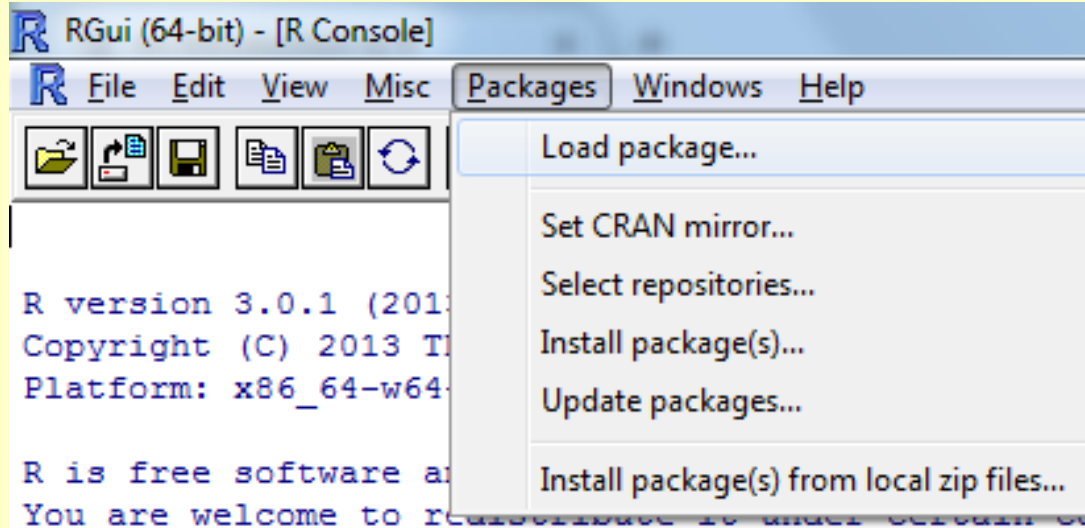
Managing Histories

- When closing an R session, if you **Save History**, all of the entries typed in the console will be saved.
- The next time you **Load History**, they all will still be there... ready to go. You will be able to retrieve them.

- You can save and restore multiple histories.
- Histories are saved as blank files (without suffix).
- If you add one, be consistent.



Installing Packages



Packages expand
functionality of R

Freely Available

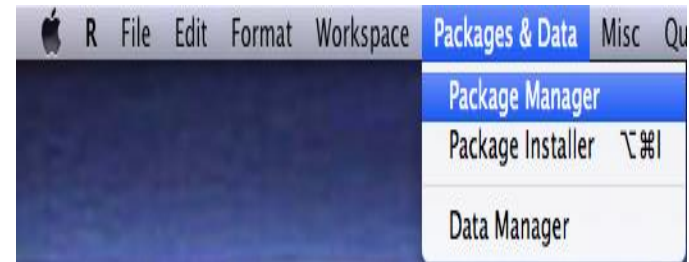
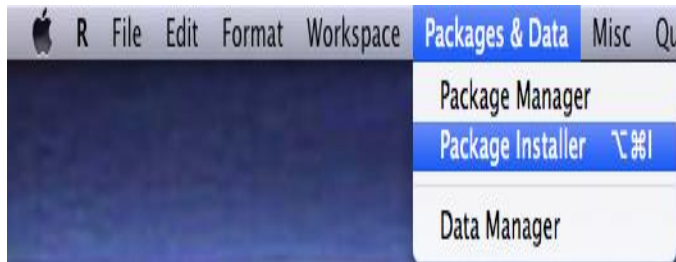
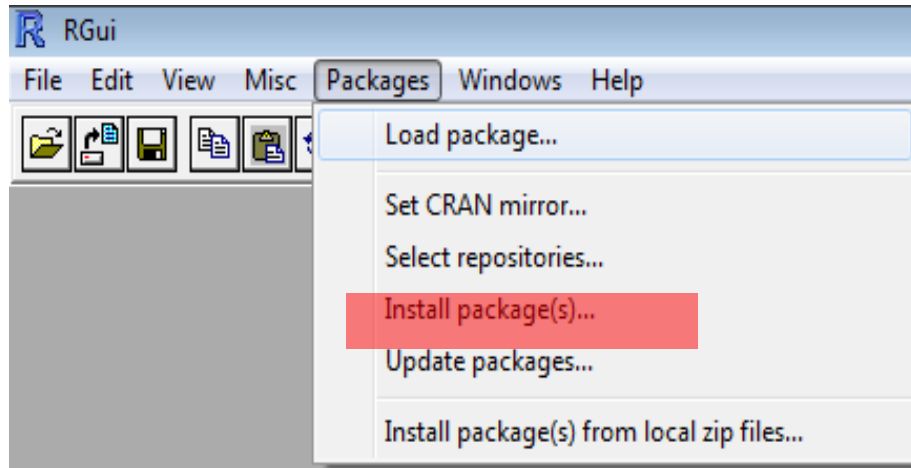
New Developments

LOADING: activating an installed package for use

INSTALLATION: acquiring package from CRAN site

UPDATING: acquiring newer versions of installed packages

Installing Packages



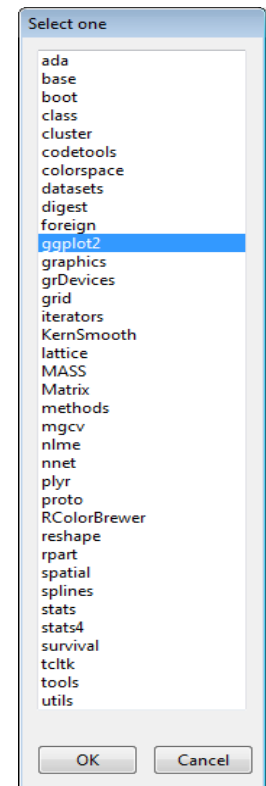
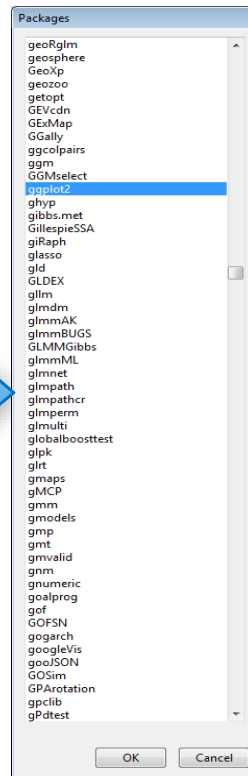
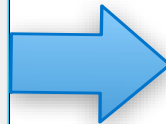
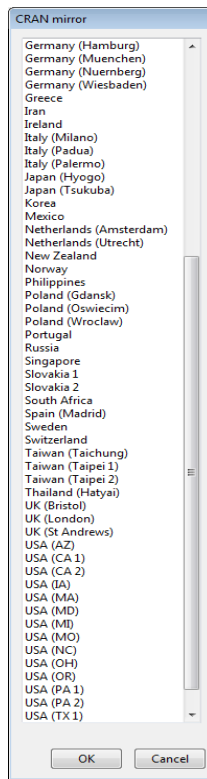
Installing Packages

First Time

Select CRAN site / packages

After That

Select packages



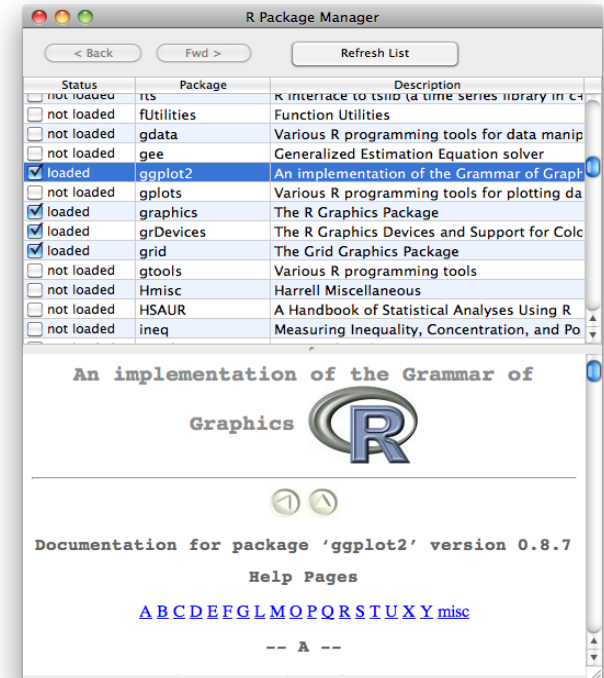
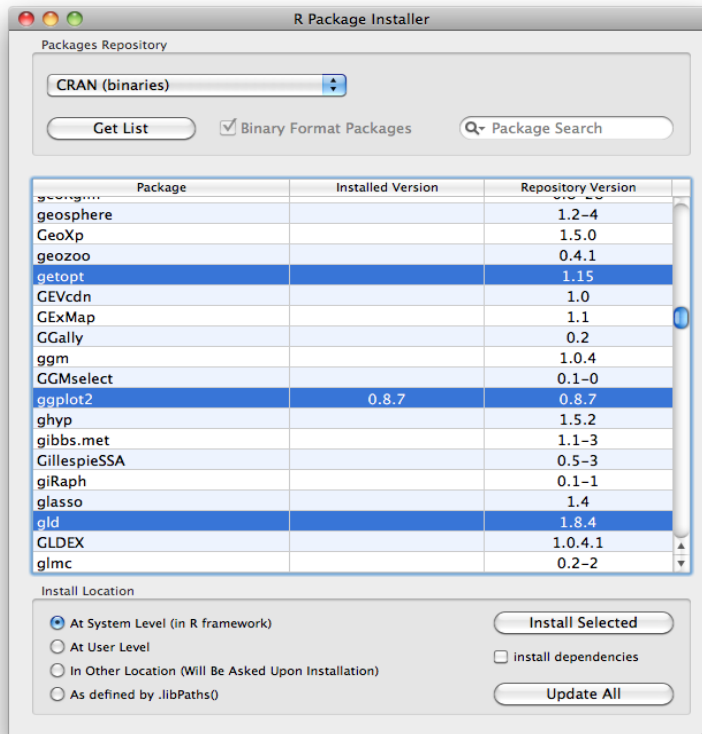
Installing Packages

First Time

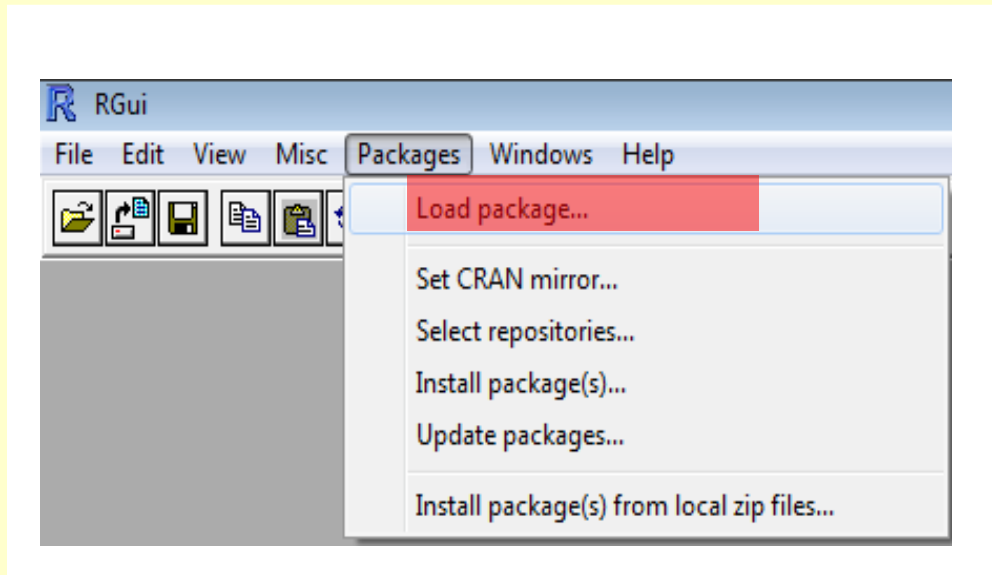
Select CRAN site / packages

After That

Select packages



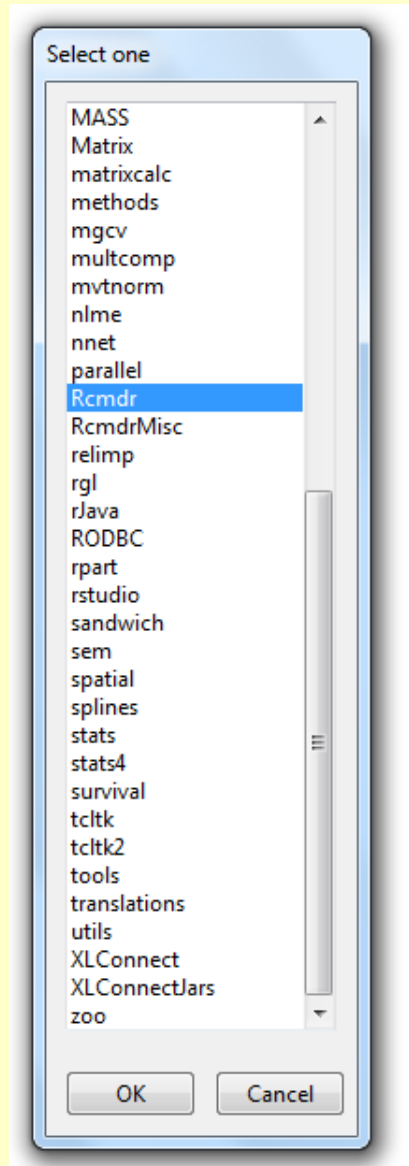
Loading Packages



Load packages -
to access list of installed packages

Select package and press OK

HINT - Or type: `library(PACKAGENAME)`



R Studio Free-ware

Download R Studio: (<http://www.rstudio.com/>)

Welcome to RStudio - Open source
and enterprise-ready professional
software for R

Download RStudio

Discover Shiny



NOTE: You can run R Studio, without first running R.
R studio will automatically open and run R.

R Studio Overview

Explore the Multiple Windows

The screenshot shows the RStudio interface with three main panes:

- Source Editor:** Contains a data table with 10 observations of 3 variables (year, x, y).
- Environment Pane:** Shows the current environment with a data object named 'testdata_c' containing 10 observations of 3 variables.
- Console:** Displays the R version (3.0.1) and the output of the 'demo()' function, which provides information about R's license and contributors.

year	x	y
1	1	11
2	2	12
3	3	13
4	4	14
5	5	15
6	6	16
7	7	17
8	8	18
9	9	19
10	10	20

History:

The History pane shows the following code that was executed:

```
testdata_cvs <- read.csv("C:/Program Files/R/R-3.0.1/working/testdata_
View(testdata_cvs)
setwd("~/")
setwd("C:/Program Files/R/R-3.0.1/working")
library(Rcmdr)
```

Environment:
Global Variables / Package Functions

The Environment pane shows the global environment with the following variables:

Variable	Description
testdata_cvs	10 obs. of 3 variables

The Environment pane shows the Rcmdr package environment with the following functions:

Function	Description
Factors	function (names)
GrabFocus	function (value)
Logwindow	function ()
MacOSXP	function ()
MarkdownP	function ()
Message	function (message, type = c("note", "error", "w...)
Messageswindow	function ()
Numeric	function (names)
OKCancelHelp	function (window = top, helpsubject = NULL, mod...)
Outputwindow	function ()
RExcelSupported	function ()
RappP	function ()
RcmdrPager	function (file, header, title, delete.file)

R Studio Overview

User-friendly Console

Console ~/ ↻

```
R version 3.4.0 (2017-04-21) -- "You Stupid Darkness"  
Copyright (C) 2017 The R Foundation for Statistical Computing  
Platform: x86_64-w64-mingw32/x64 (64-bit)
```

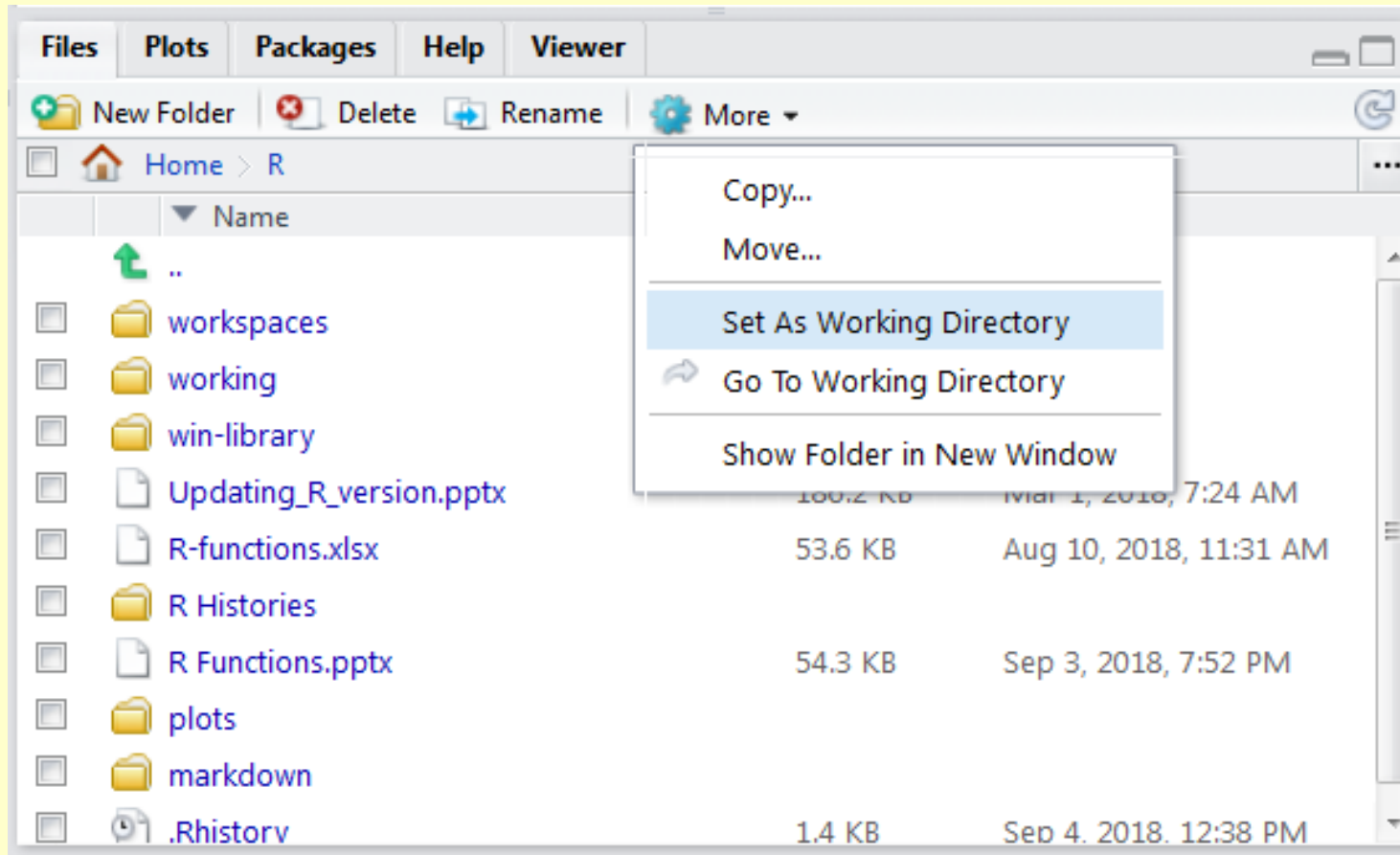
```
R is free software and comes with ABSOLUTELY NO WARRANTY.  
You are welcome to redistribute it under certain conditions.  
Type 'license()' or 'licence()' for distribution details.
```

```
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 Studio Overview

Setting and Going to your Working Directory

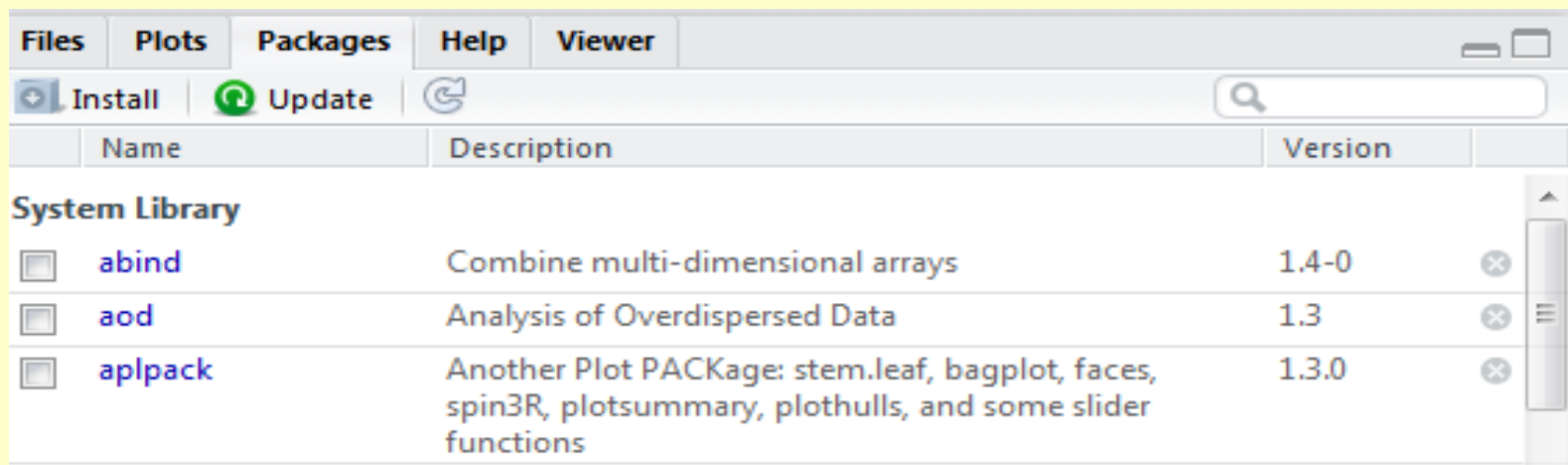
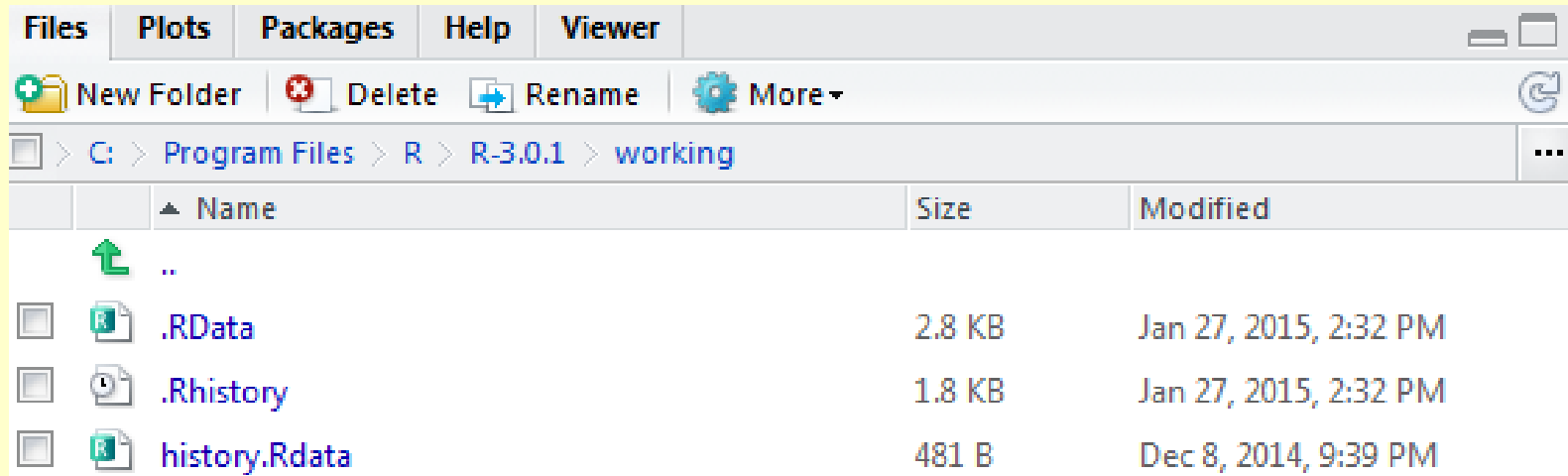


Set WD
by navigating
to a folder

Go to
your WD

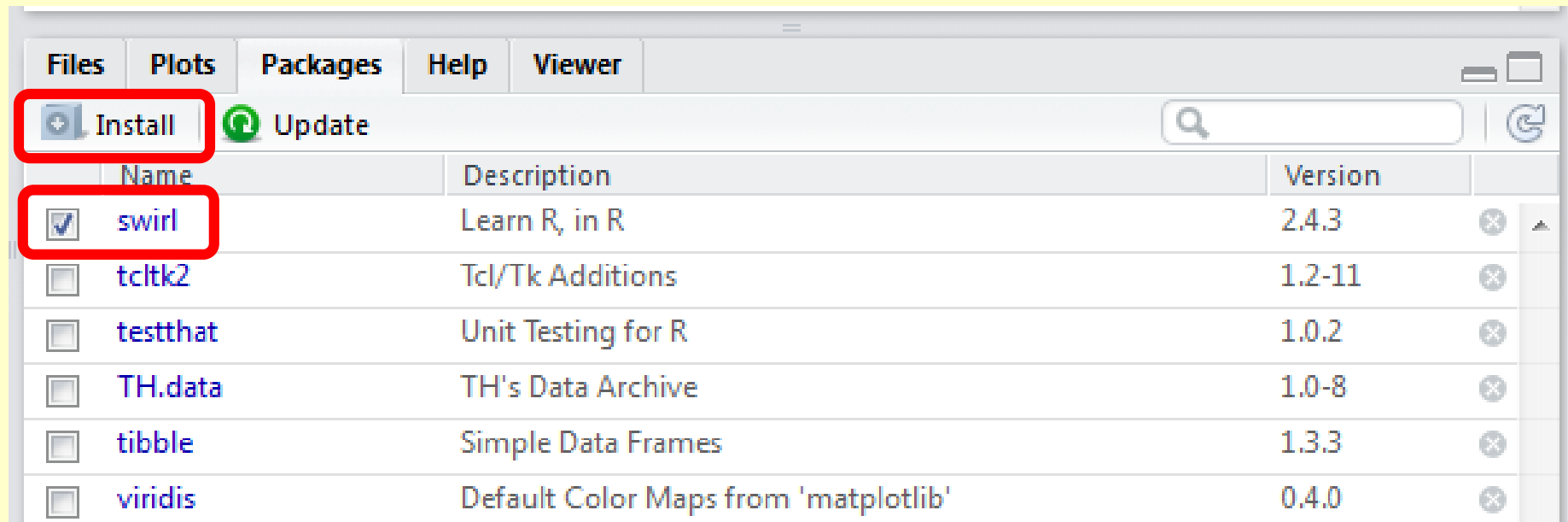
R Studio Overview

Accessing Files / Package Library / Help



Install "Swirl" Package

Install and Run Package Swirl using R Studio



| Type `swirl()` when you are ready to begin.

```
> |
```

Run "Swirl": BasicBuildingBlocks

```
| Please choose a course, or type 0 to exit swirl.
```

- 1: R Programming
- 2: Take me to the swirl course repository!

```
selection: 1
```

```
| Please choose a lesson, or type 0 to return to course menu.
```

- | | |
|-----------------------------|------------------------|
| 1: Basic Building Blocks | 2: Workspace and Files |
| 3: Sequences of Numbers | 4: Vectors |
| 5: Missing Values | 6: Subsetting Vectors |
| 7: Matrices and Data Frames | 8: Logic |
| 9: Functions | 10: lapply and sapply |
| 11: vapply and tapply | 12: Looking at Data |
| 13: simulation | 14: Dates and Times |
| 15: Base Graphics | |

```
selection: 1
```

Run "Swirl": LookingAtData

| Please choose a course, or type 0 to exit swirl.

- 1: R Programming
- 2: Take me to the swirl course repository!

selection: 1

| Please choose a lesson, or type 0 to return to course menu.

- | | |
|-----------------------------|------------------------|
| 1: Basic Building Blocks | 2: Workspace and Files |
| 3: Sequences of Numbers | 4: Vectors |
| 5: Missing Values | 6: Subsetting Vectors |
| 7: Matrices and Data Frames | 8: Logic |
| 9: Functions | 10: lapply and sapply |
| 11: vapply and tapply | 12: Looking at Data |
| 13: Simulation | 14: Dates and Times |
| 15: Base Graphics | |

selection: 12

Instructions

1. Run Swirl (R programming / Basic Building Blocks) module.
2. Once you are done with the module, save the history of your session as "Swirl_Module1_YOURNAME.txt" (add ".txt" suffix).
3. Clear your history in Rstudio
4. Run Swirl (R programming / Looking at Data) module.

Instructions

5. Once you are done with the module, save the history of your session as "Swirl_Module12_YOURNAME.txt" (add ".txt" suffix)

6. Send me (khyrenba@gmail.com) your two history files , attached to an email, entitled "BIOL6090.R#0" by Sept 6

(THIS ASSIGNMENT IS NOT WORTH ANY POINTS - ITS FOR PRACTICE)