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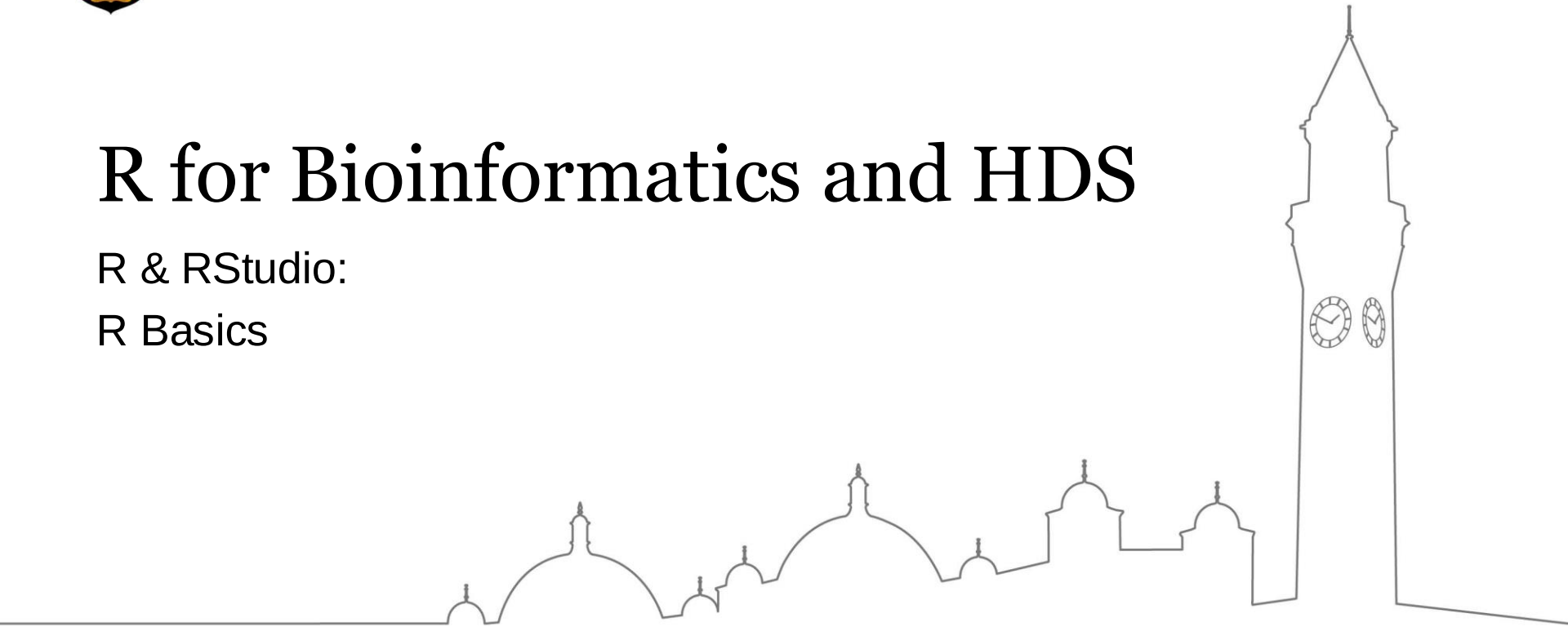
R for Bioinformatics and HDS

R & RStudio:

R Basics



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Course Structure

- Introduction to R & RStudio
- Syntax, Comments, Variables, Data Types and Operators
- Conditions, Loops, Functions and Data Structures
- Working with Data frames

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Where to type our commands?

- On the console panel we we want to run a command ”on fly”.

  On the left side of your console panel, there is the “**>**” symbol that is called “prompt”. Type your command and click “**enter**” to submit it.

- On the script panel in case to keep your commands in a script file.

  Type each command in a new line and use the “**run**” option to execute them.

  (More instructions later)

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R as a calculator

- The simplest thing you could do with R is to do arithmetic:

```
100 + 1
```

- R will print out the answer, with a preceding [1]. Don't worry about this for now, we'll explain that later. For now, think of it as indicating output.

```
[1] 101
```

R as a fancy calculator

- You can make more complicated calculations:

```
3 + 5 * (2 ^ 2)      # if you forget some rules, this might help
```

- The text after each line of code is called a “comment”. Anything that follows the hash (or octothorpe) symbol # is ignored by R when it executes code.

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Types of Data

- R supports many different types of data with the most important:
  - Integer (e.g., 10)
  - Float point of numbers (e.g., 10.25)
  - Character e.g., “B”)
  - String (e.g., “Bioinformatics”)
  - Logical (TRUE or FALSE)

What is a variable?

- Variables are objects in R that you can use to store values. It can consist of a single value, basic or complex arithmetic operations, or even be more complex such as a column in a data matrix or a data frame.

- The **assignment** to a variable can be done in 2 different but equivalent ways, using either the “**<-**“ or **“=”** operators.

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Using variables

- Assigning a variable

```
weight_kg <- 65.0
```

- Making calculations with a variable

```
2.2 * weight_kg
```

- Displaying variables

```
print(weight_kg)
```

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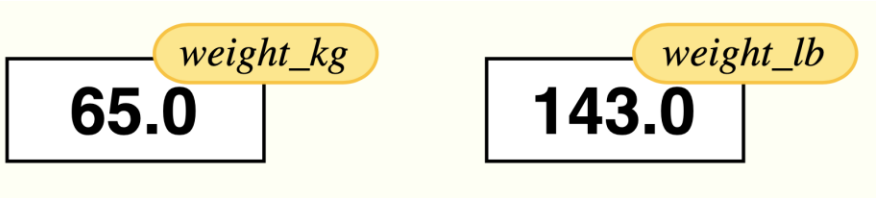
Variables as **sticky notes**!

- A variable is analogous to a sticky note with a name written on it: assigning a value to a variable is like putting that sticky note on a particular value.

```
# There are 2.2 pounds per kilogram
weight_lb <- 2.2 * weight_kg
```



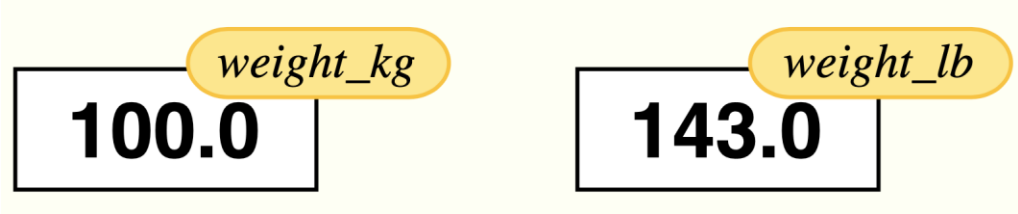
Variables as **sticky notes**!

- Let's now change the weight_kg:

```
weight_kg <- 100
```

- What will be the value of the `weight_lb`???

- Since **weight_lb** doesn't "remember" where its value comes from, it is not updated when we change **weight_kg**.



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What name can a variable has?

A variable can have a short name (like x and y) or a more descriptive name (age, mass, volume).

Rules for R variables are:

- A variable name must start with a letter and can be a combination of letters, digits, period(.) and underscore(_). If it starts with period(.), it cannot be followed by a digit.
- A variable name cannot start with a number or underscore (_)
- Variable names are case-sensitive (age, Age and AGE are three different variables)
- Reserved words cannot be used as variables (TRUE, FALSE, NULL, if...)

What will be the value?

```
mass <- 47.5
age <- 122

mass <- mass * 2.0
age <- age - 20
```

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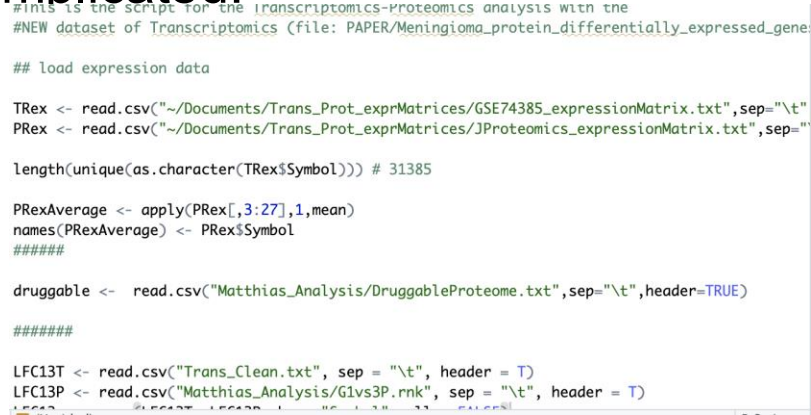
Console is great, but scripting is much better!

- You can use the R script that you have created to:
  - Store your commands
  - Put some comments (free-text lines that start with “#”)
  - Re-use it!

- An R script can be simple, or… quite complicated!



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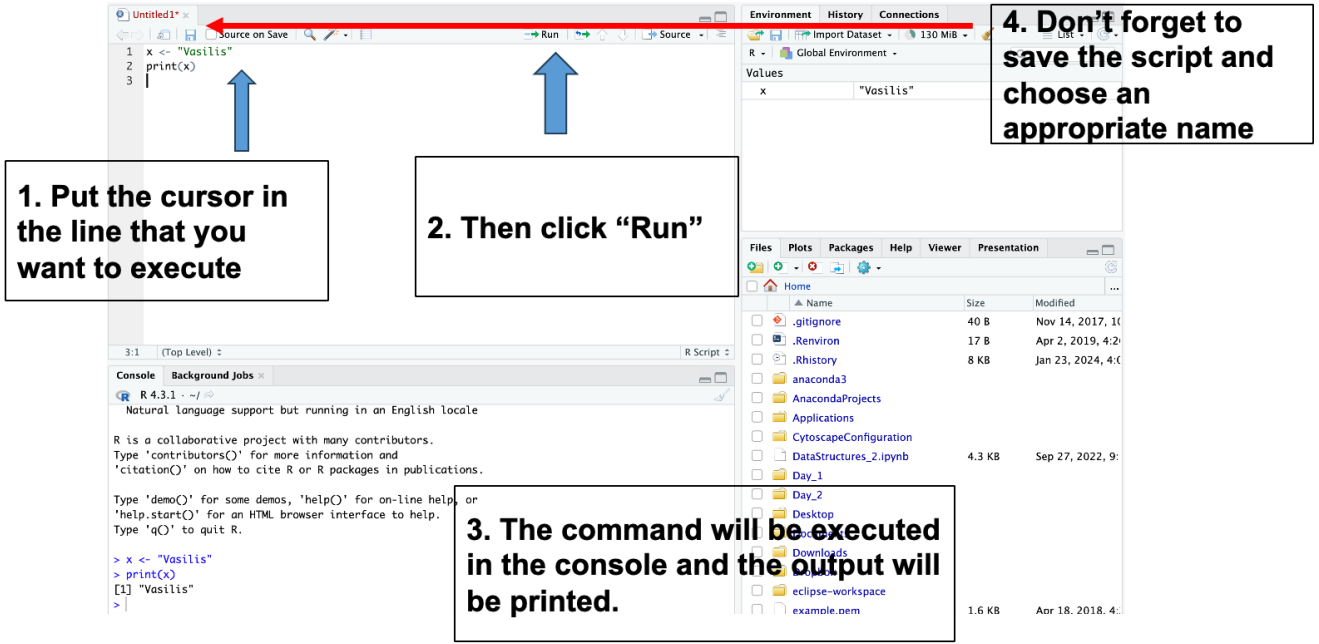
How to “run” the commands of a script?



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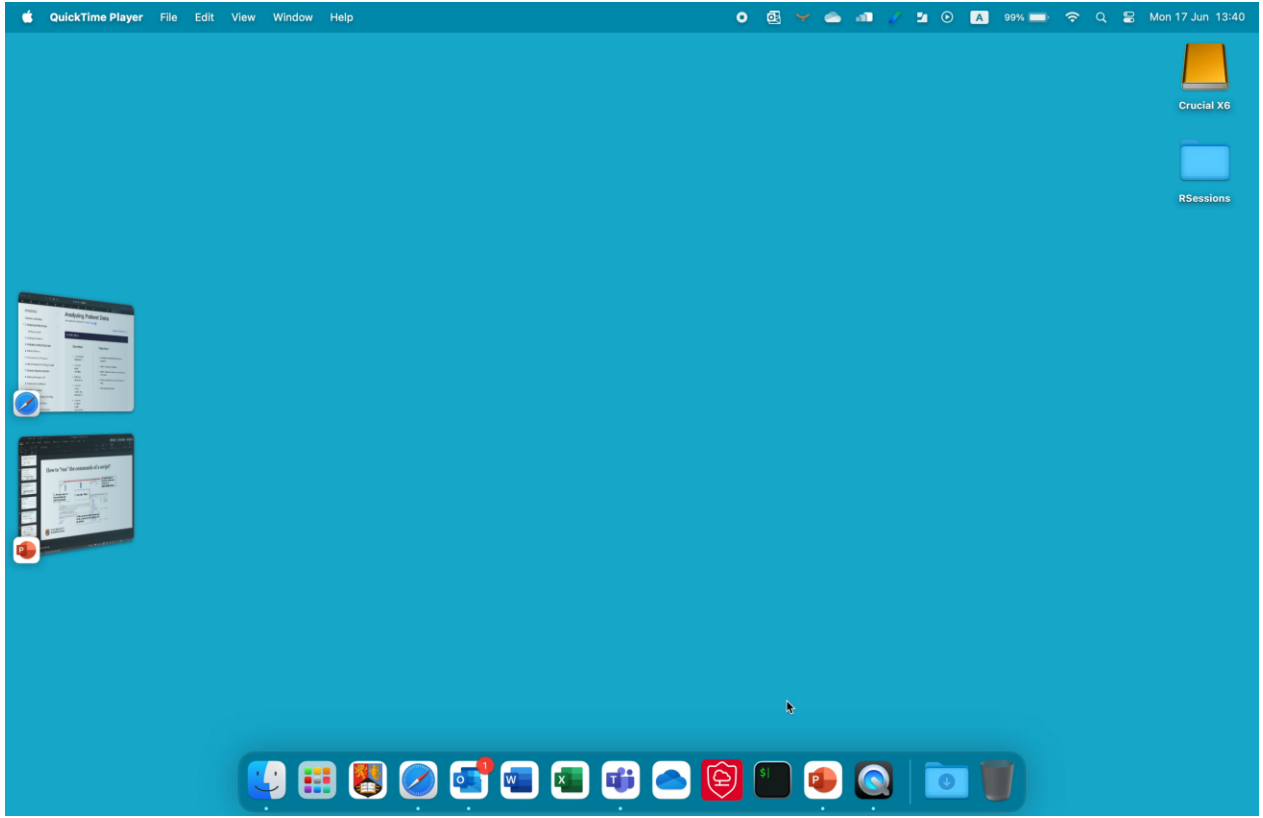

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