THE TITLE OF THE BOOK

AUTHOR NAME

Invalid Date

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# Preface

This is a Quarto book, generated using the sipbs-compbiol-book-template GitHub template.

The index.qmd file provides this Preface page, which is intended as a frontispiece with brief introductory information about the book and its contents and scope and, maybe, its authors. To change the main text and content you see here (the content in the middle section of the page), you need to edit the index.qmd file.

* To learn more about writing Quarto books, visit <https://quarto.org/docs/books>.

|  |
| --- |
| Tip |
| To put links into Quarto pages, use the structure:  [Text to be displayed](URL of the link)  For example, [this link](https://www.youtube.com/watch?v=dQw4w9WgXcQ) is written as  [this link](https://www.youtube.com/watch?v=dQw4w9WgXcQ) |

## How this page is structured

### Section headers

Section headers are written in [Markdown](#markdown) using hash/pound signs:

## This is a (level two) section header.  
### This is a (level three) section header

* To learn more about sections and headers, see this [quick guide to Markdown basics](https://quarto.org/docs/authoring/markdown-basics.html).

|  |
| --- |
| Changing title and author information, or the cover image (click to expand) |
| The book title, author, date, and cover image are specified in the \_quarto.yml. To change this information, edit that file, and re-render the page.  book:  title: "THE TITLE OF THE BOOK"  author: "AUTHOR NAME"  date: "DD/MM/YY"  cover-image: sipbs\_compbio\_800.png |

### Callout blocks

Callout blocks, like the ones above, are highlighted regions of the document which carry a title, icon and colour, which may indicate the kind of information the callout contains. For example:

|  |
| --- |
| Warning |
| This is a warning block. To insert a block like this, use:  ::: { .callout-warning } The text of the callout goes here ::: |

|  |
| --- |
| Caution (click to expand) |
| This is a caution block, which is collapsible when rendered as HTML/webpage but appears in full in the Word document. To make a callout collapsible, use collapse="true" as in the example below. This places a dropdown icon to the right of the title bar, which controls expansion.  ::: { .callout-caution collapse="true" title="Caution (click to expand)"} This is a collapsible caution block. The callout content goes here. :::  Notice also that the title of the callout is specified between the curly braces as title="Caution (click to expand)". |

You can learn more about callout blocks in the [Quarto documentation](https://quarto.org/docs/authoring/callouts.html).

# 1. Introduction

The Introduction page is intended as a short introduction to the book.

Like most Quarto books, this is a book created from markdown and executable code.

This kind of book is an example of literate programming - the intertwining of nicely-formatted text and images, and executable code. For example, the R code cell below executes and produces output when the book is compiled:

1 + 1

[1] 2

But the R code cell below does not:

summary(cars)

See Knuth (1984) for additional discussion of literate programming.

# 2. Early Section Topic

This .qmd file represents some topic-related text. We use the {#sec-REFERENCE} option to make it cross-referenceable elsewhere in the text.

# 3. Interactive Multiple Choice Questions

This page demonstrates the setup of an [naquiz multiple-choice quiz](https://nareal.github.io/naquiz/example.html). The advantage of this extension is that we don’t need to use a Shiny server.

* [naquiz repository](https://github.com/nareal/naquiz)
* [naquiz examples and documentation](https://nareal.github.io/naquiz/example.html)

## 3.1 Multiple Choice Questions

### 3.1.1 Basic MCQ

A simple naquiz example looks something like the question below to the reader (click the Markdown tab to see how to write the markdown for it).

## Appearance

Bill Gates was the founder of:

Apple

Microsoft

Facebook

Google

## Markdown

:::::{.question}  
Bill Gates was the founder of:  
  
::::{.choices}  
  
:::{.choice}  
Apple  
:::   
  
:::{.choice .correct-choice}  
Microsoft  
:::  
  
:::{.choice}  
Facebook   
:::  
  
:::{.choice}  
Google   
:::  
  
::::  
:::::

|  |
| --- |
| Caution |
| The nested colon dividers and their counts can look confusing on the page, and missed/extra colons can break the layout of your page.   * The {.question} divider gets **five** colons. * The {.choices} divider that surrounds the choices presented to the reader gets **four** colons. * Each individual {.choice} divider gets **three** colons. |

It presents a series of *radio buttons* from which the reader can choose one option. On clicking the option, the reader receives very basic feedback: a red cross (incorrect) or green tick (correct).

### 3.1.2 Add a “clear answer” button

The naquiz MCQs can be decorated with useful buttons for reader interaction. The example below has a “Clear Answer” button, which unchecks the reader’s selected answer.

## Appearance

Bill Gates was the founder of:

Apple

Microsoft

Facebook

Google

## Markdown

:::::{.question}  
Bill Gates was the founder of:  
  
::::{.choices}  
  
:::{.choice}  
Apple  
:::   
  
:::{.choice .correct-choice}  
Microsoft  
:::  
  
:::{.choice}  
Facebook   
:::  
  
:::{.choice}  
Google   
:::  
  
:::{.button-clear title="Clear answer" button-class="btn btn-xs"}  
:::  
  
::::  
:::::

|  |
| --- |
| Important |
| The button to clear reader answers needs to be linked with the available choices, and so is placed **inside the {.choices} division** of the MCQ. |

### 3.1.3 Add a “hint” button

The example below includes a “hint” button, which the reader can use to get a clue to the answer.

## Appearance

Bill Gates was the founder of:

Apple

Microsoft

Facebook

Google

The company name starts with an ‘M’…

## Markdown

:::::{.question}  
Bill Gates was the founder of:  
  
::::{.choices}  
  
:::{.choice}  
Apple  
:::   
  
:::{.choice .correct-choice}  
Microsoft  
:::  
  
:::{.choice}  
Facebook   
:::  
  
:::{.choice}  
Google   
:::  
  
:::{.button-clear title="Clear answer" button-class="btn btn-xs"}  
:::  
  
::::  
  
::::{.btn-group}  
:::{.button-hint title="Show hint" button-class="btn btn-xs"}  
The company name starts with an 'M'...  
:::  
::::  
  
:::::

|  |
| --- |
| Important |
| We can place additional buttons within a *button group* divider, specified as ::::{.btn-group}, *inside* the question divider (the five colons :::::).  Here, we have linked a {.button-hint} that, when clicked, expands to show the hint text. |

### 3.1.4 Add an “answer” button

We can add a further button to provide students with the answer we’d like them to read, directly.

## Appearance

Bill Gates was the founder of:

Apple

Microsoft

Facebook

Google

The company name starts with an ‘M’…

Bill Gates and Paul Allen founded Microsoft on April 4, 1975.

## Markdown

:::::{.question}  
Bill Gates was the founder of:  
  
::::{.choices}  
  
:::{.choice}  
Apple  
:::   
  
:::{.choice .correct-choice}  
Microsoft  
:::  
  
:::{.choice}  
Facebook   
:::  
  
:::{.choice}  
Google   
:::  
  
:::{.button-clear title="Clear answer" button-class="btn btn-xs"}  
:::  
  
::::  
  
::::{.btn-group}  
:::{.button-hint title="Show hint" button-class="btn btn-xs"}  
The company name starts with an 'M'...  
:::  
::::  
  
:::{.button-answer title="Show Answer" button-class="btn btn-xs"}  
Bill Gates and Paul Allen founded Microsoft on April 4, 1975.  
:::  
:::::

|  |
| --- |
| Important |
| We can place more than one button in the *button group* divider. Here, we have linked a {.button-answer} that, when clicked, expands to show the hint text. |

### 3.1.5 Placing an MCQ in a custom callout

We have created a custom callout called callout-question which can be used to make MCQ stand out a bit more, with a consistent visual style.

## Appearance

|  |
| --- |
| Question |
| Bill Gates was the founder of:  Apple  Microsoft  Facebook  Google  The company name starts with an ‘M’…  Bill Gates and Paul Allen founded Microsoft on April 4, 1975. |

## Markdown

::: { .callout-question }  
  
:::::{.question}  
Bill Gates was the founder of:  
  
::::{.choices}  
  
:::{.choice}  
Apple  
:::   
  
:::{.choice .correct-choice}  
Microsoft  
:::  
  
:::{.choice}  
Facebook   
:::  
  
:::{.choice}  
Google   
:::  
  
:::{.button-clear title="Clear answer" button-class="btn btn-xs"}  
:::  
  
::::  
:::::  
  
::::{.btn-group}  
:::{.button-hint title="Show hint" button-class="btn btn-xs"}  
The company name starts with an 'M'...  
:::  
  
:::{.button-answer title="Show Answer" button-class="btn btn-xs"}  
Bill Gates and Paul Allen founded Microsoft on April 4, 1975.  
:::  
::::  
  
:::

# 4. WebR Playground

#| context: setup  
  
# Download reporter data  
download.file('https://raw.githubusercontent.com/sipbs-compbiol/BM214-Workshop-3/main/assets/data/reporter\_curves.csv', 'reporter\_curves.csv')  
  
library(ggplot2)  
library(palmerpenguins)  
library(tidyverse)

## 4.1 Introduction

This page provides a WebR cell for you to use as a playground to experiment with some example datasets. You can use this page to explore data management and visualisation in R.

## 4.2 Playground

# Use this WebR cell to experiment with some practice biological datasets

## 4.3 Things you can do

This WebR instance has three packages installed:

* ggplot2
* GGally
* tidyverse
* palmerpenguins

Open the callout boxes below to see some examples you can try in the code cell above.

|  |
| --- |
| Play with data from a GitHub repository |
| One of our [BM214 workshops](https://sipbs-compbiol.github.io/BM214-Workshop-3/) involves a WebR-supported interactive exercise involving simulated reporter curves. We preload this data in the setup cell (see source code), and you can interact with it below with the code:  data <- read.csv("reporter\_curves.csv") glimpse(data) |

|  |
| --- |
| Investigate Palmer’s Penguins |
| The penguins dataset contains data about three different species of penguins. Take a look at the format of the dataset:  glimpse(penguins)  You’ll see there are eight variables, including species, weight, sex, etc. - some of these variables are *categorical* (i.e. a category, like species), and others are *continuous* (i.e. numerical). You can see a visual overview of how the data is related using the plot() function:  plot(penguins)  We can visualise the number of penguins of each species in a bar chart:  fig <- ggplot(penguins, aes(species, fill=species)) +  geom\_bar() fig  And break this down in a facet plot, by sex:  fig <- ggplot(penguins, aes(species, fill=species)) +  geom\_bar() +  facet\_wrap(~sex) fig  We can make a box and whisker plot of penguin body mass by species:  fig <- ggplot(penguins, aes(x=species, y=body\_mass\_g, fill=species)) +  geom\_boxplot() fig  And plot the body mass for each sex side-by-side  fig <- ggplot(penguins, aes(x=species, y=body\_mass\_g, fill=sex)) +  geom\_boxplot() fig  We can investigate correlations, such as between body mass and flipper length:  fig <- ggplot(penguins, aes(x=body\_mass\_g, y=flipper\_length\_mm)) +  geom\_point() fig  We can colour datapoints by species:  fig <- ggplot(penguins, aes(x=body\_mass\_g, y=flipper\_length\_mm, colour=species)) +  geom\_point() fig  And fit a linear regression to each species separately:  fig <- ggplot(penguins, aes(x=body\_mass\_g, y=flipper\_length\_mm, colour=species)) +  geom\_point() +  geom\_smooth(method="lm") fig |

|  |
| --- |
| Note |
| R comes with a number of example datasets you can practice with, including:   * mtcars: fuel consumption and other statistic for 32 automobiles * Titanic: information on the fate of passengers on the fatal maiden voyage of the ocean liner *Titanic*   You can see a full list by running the command  library(help = "datasets") |

# References

Knuth, Donald E. 1984. “Literate Programming.” *Comput. J.* 27 (2): 97–111. <https://doi.org/10.1093/comjnl/27.2.97>.