

# *Graphic Design with ggplot2*

**Concepts of the {ggplot2} Package Pt. 2:**

Solution Exercise 1

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# Exercise 1

- Have a look at the following visualization of the cumulative time that cosmo- and astronauts have spent in outer space. The data also contains information on the year of their first and last travel, respectively.
- Together with your group, discuss which layers and modifications are needed to create such a chart with `{ggplot2}`.
  - Note down the aesthetics, geometries, and scales used for each element of this graphic.
  - What is the coordinate system? Have any adjustments been made?
  - Which theme was used and how was it modified?

# Layers

- **geom\_point()**
  - `aes(x = id, y = hours, size = hours)`
- **geom\_linerange()**
  - `aes(x = id, ymin = 0, ymax = hours, color = hours, alpha = hours)`
- **geom\_point()**
  - `aes(x = id, y = 0), shape = 15, color = "#808080"`
- **geom\_text()**
  - `aes(x = id, y = 0, label = year), size = 4.5, hjust = 1.2`
- **geom\_text()**
  - `aes(x = id, y = hours, label = max), size = 3.9, vjust = -.35`

# Scales

- **scale\_x\_continuous()**
  - limits = c(-300, NA), expand = c(0, 0)
- **scale\_y\_continuous()**
  - limits = c(0, 230000), expand = c(0, 0)
- **scale\_color\_distiller()**
  - palette = "YlGnBu", direction = -1
- **scale\_size()**
  - range = c(.001, 3)
- **scale\_alpha()**
  - range = c(.33, .95)

# Coordinate System

- `coord_polar()`
  - `theta = "y"`

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# Theme

- `theme_void()`

- `legend.position = "none"`
  - `plot.background = element_rect(fill = "black")`
  - `plot.margin = margin(-70, -70, -70, -70)`
  - `plot.caption = element_text(hjust = .5, margin = margin(-100, 0, 100, 0), ...)`

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  - `plot.margin = margin(-70, -70, -70, -70)`
  - `plot.caption = element_text(...)`

# Title

- `2 x annotate(geom = "text", x = -300, y = 0, ...)`

# Data Prep

```
1 library(tidyverse)
2
3 df_astro <- readr::read_csv(
4   'https://raw.githubusercontent.com/rfordatascience/tidytuesday/master/data/2020/2020-07-14/astrona
5 )
6
7 df_missions <-
8   df_astro %>%
9   group_by(name) %>%
10  summarize(
11    hours = sum(hours_mission),
12    year = min(year_of_mission),
13    max_year = max(year_of_mission)
14  ) %>%
15  ungroup() %>%
16  mutate(year = -year) %>%
17  arrange(year) %>%
18  mutate(id = row_number())
```

# Code Pt. 1

```
1 # install.packages("scico")
2
3 g1 <-
4   ggplot(df_missions, aes(x = id, y = hours, color = hours))
5   ) +
6   ## curves
7   geom_linerange(aes(ymin = 0, ymax = hours, alpha = hours), size = .25) +
8   ## baseline
9   geom_point(aes(y = 0), shape = 15, size = .1, color = "#808080") +
10  ## points
11  geom_point(aes(y = hours, size = hours)) +
12  ## turn into circular
13  coord_polar(theta = "y", start = 0, clip = "off") +
14  ## add axis spacings
15  scale_x_continuous(limits = c(-300, NA), expand = c(0, 0)) +
16  scale_y_continuous(limits = c(0, 23000), expand = c(0, 0)) +
17  ## change colors, transparencies, and bubble sizes
18  scale_color_distiller(palette = "YlGnBu", direction = -1) +
19  scale_size(range = c(.001, 3)) +
```

# Data Prep Labels

```
1 df_labs <-  
2   df_missions %>%  
3   filter(year %in% -c(1961, 197:201*10, 2019)) %>%  
4   group_by(year) %>%  
5   filter(id == min(id))  
6  
7 df_max <-  
8   df_missions %>%  
9   arrange(-hours) %>%  
10  slice(1) %>%  
11  mutate(  
12    first_name = str_remove(name, ".*, " ),  
13    last_name = str_remove(name, "(?=<),.*" ),  
14    label = paste("Between", abs(year), "and", max_year, ",\n", first_name, last_name, "has spent\n" )  
15  )
```

# Code Pt. 2

```
1 g2 <-
2   g1 +
3     ## labels years
4     geom_text(
5       data = df_labs, aes(y = 0, label = abs(year)),
6       family = "Roboto Condensed", fontface = "bold", color = "#808080",
7       size = 4.5, hjust = 1.2
8     ) +
9     ## label max
10    geom_text(
11      data = df_max, aes(label = label),
12      family = "Roboto Condensed", size = 3.9, vjust = -.35
13    ) +
14    ## title shadow
15    annotate(
16      geom = "text", x = -300, y = 0, label = "Travelling to\nOuter Space",
17      family = "Boska", fontface = "bold", lineheight = .9,
18      size = 20, color = "white", hjust = .57, vjust = .45, alpha = .25
19    ) +
```



# Code with Special Extensions

```
1 # install.packages("ggforce")
2 # install.packages("scico")
3 # devtools::install_github("coolbutuseless/ggblur")
4
5 g_ext <-
6   ggplot(df_missions, aes(x = id, y = hours, color = hours)) +
7     ## geom_link() from {ggforce} to draw smooth curves
8     ggforce::geom_link(aes(xend = id, yend = 0, alpha = hours), size = .25, n = 300) +
9     geom_point(aes(y = 0), shape = 15, size = .1, color = "#808080") +
10    ##geom_point_blur() from {ggblur} to add points with gradual fading
11    ggblur::geom_point_blur(aes(size = hours, blur_size = hours), blur_steps = 25) +
12    geom_text(
13      data = df_labs, aes(y = 0, label = abs(year)),
14      family = "Roboto Condensed", fontface = "bold", color = "#808080",
15      size = 4.5, hjust = 1.2
16    ) +
17    geom_text(
18      data = df_max, aes(label = label),
19      family = "Roboto Condensed", size = 3.9, vjust = -.35
```

