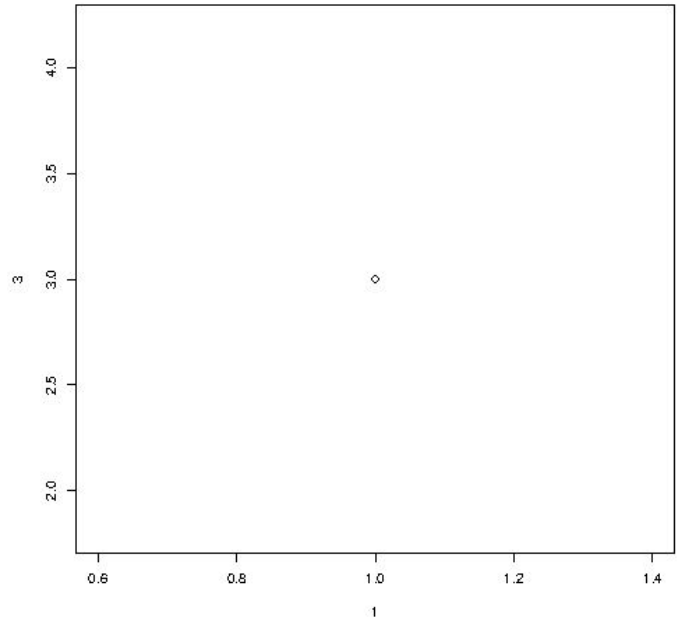
Part V - Base graphics in R (some tips)

the base function to create graphics is plot() it simply creates a Cartesian plane where you can plot your data.

```
>plot(1,3)
```

or

```
>plot(x,y)
```



EXERCISE:

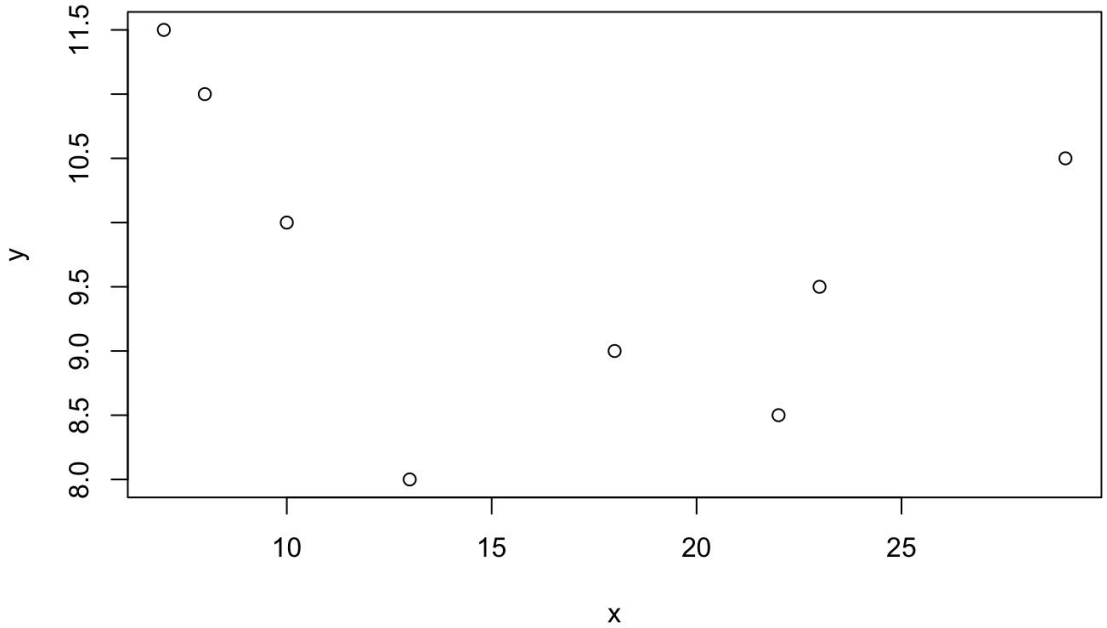
Substitute x and y with colname_2 and colname_3 vectors

from the *df* object.

Base graphics in R

Exercise Solution:

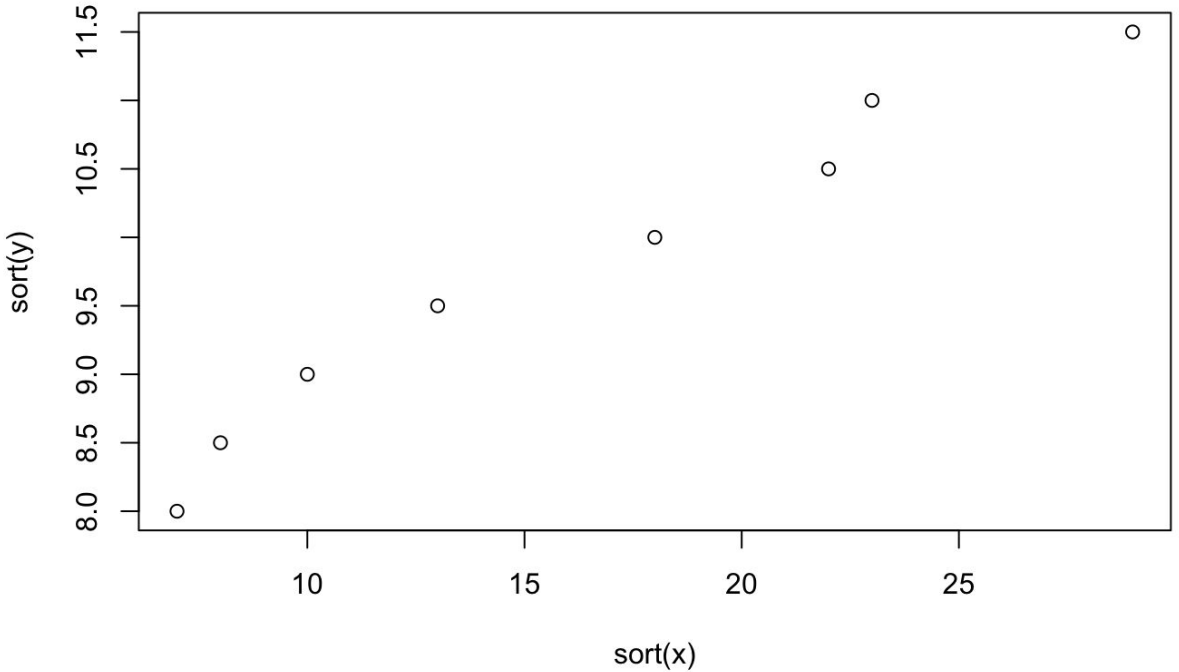
```
> x = df$colname_2

> y = df$colname_3

> plot(x,y)
```



Base graphics in R

you can modify vectors directly before plotting to ameliorate the graphical output

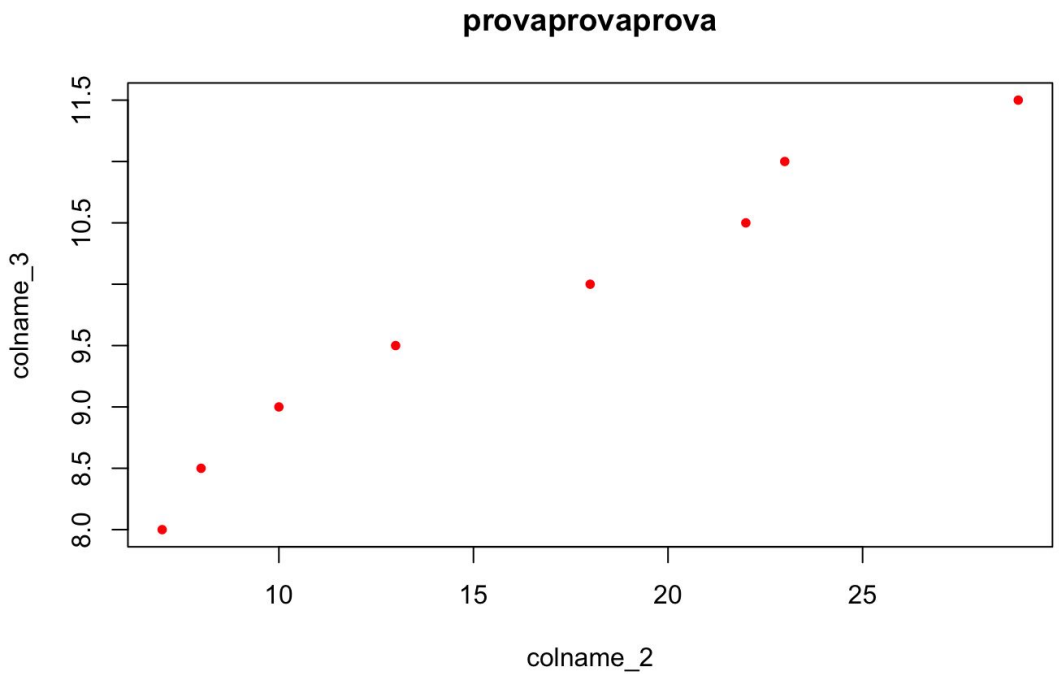
```
> plot(sort(y)~sort(x))
```



Base graphics in R

Plots can be modified in many different ways (most of Radvance program)

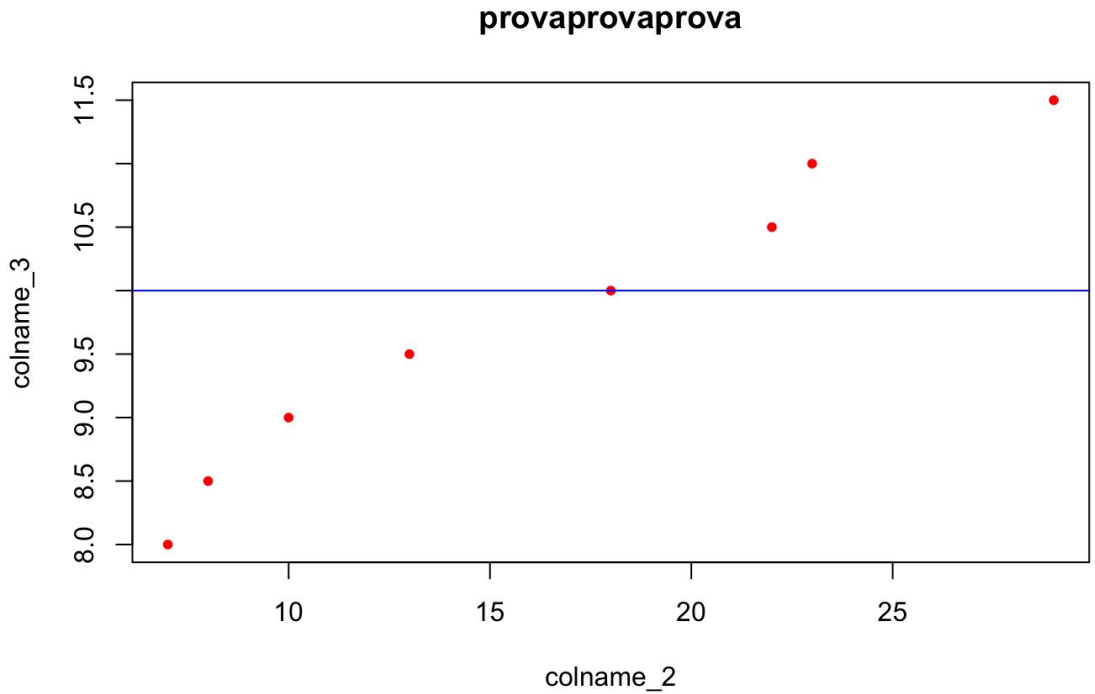
```
> plot(sort(y)~sort(x),
      col = "red",
      pch = 20,
      main = "provaprovaprova",
      ylab = "colname_3",
      xlab = "colname_2")
```



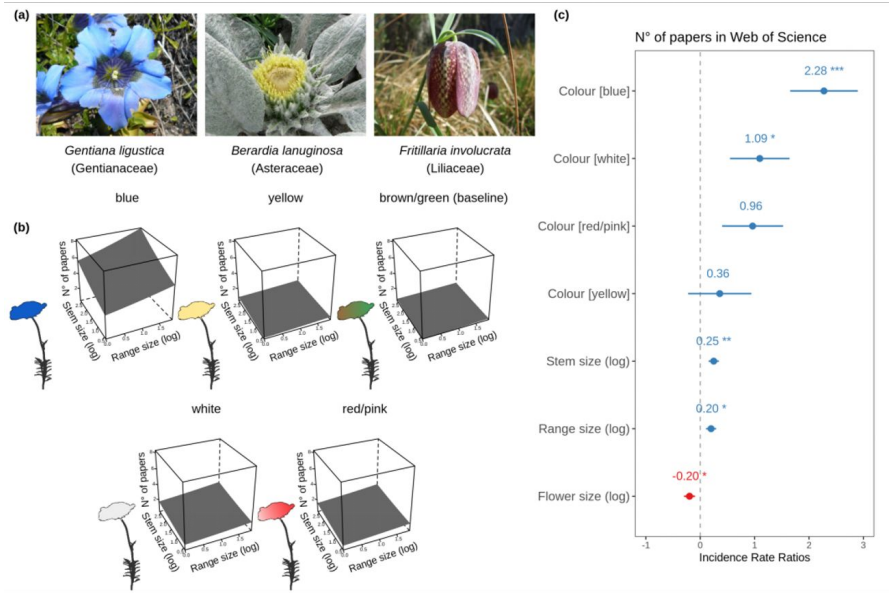
Base graphics in R

plots() is a canvas on which you can draw secondary elements, such as lines and legends

```
> plot(sort(y)~sort(x),
      col = "red",
      pch = 20,
      main = "provaprovaprova",
      ylab = "colname_3",
      xlab = "colname_2")
> abline(10,0, color = “blue”)
```



benefits of scientific graphics in R



PROS

1. **Understanding**: steep learning curve
2. **Efficiency**: display different information in small space.
3. **Location**: it integrates mapping directly in graphs
4. **Cost**: R is free country to many other graphic tools

CONS

1. **Time**: especially first times could be time-consuming
2. **Distraction**: you can build complex and fancy graphics-rich reports and charts, focusing more on the form than the function.

graphical notes for scientific data plotting

Easy/natural color associations

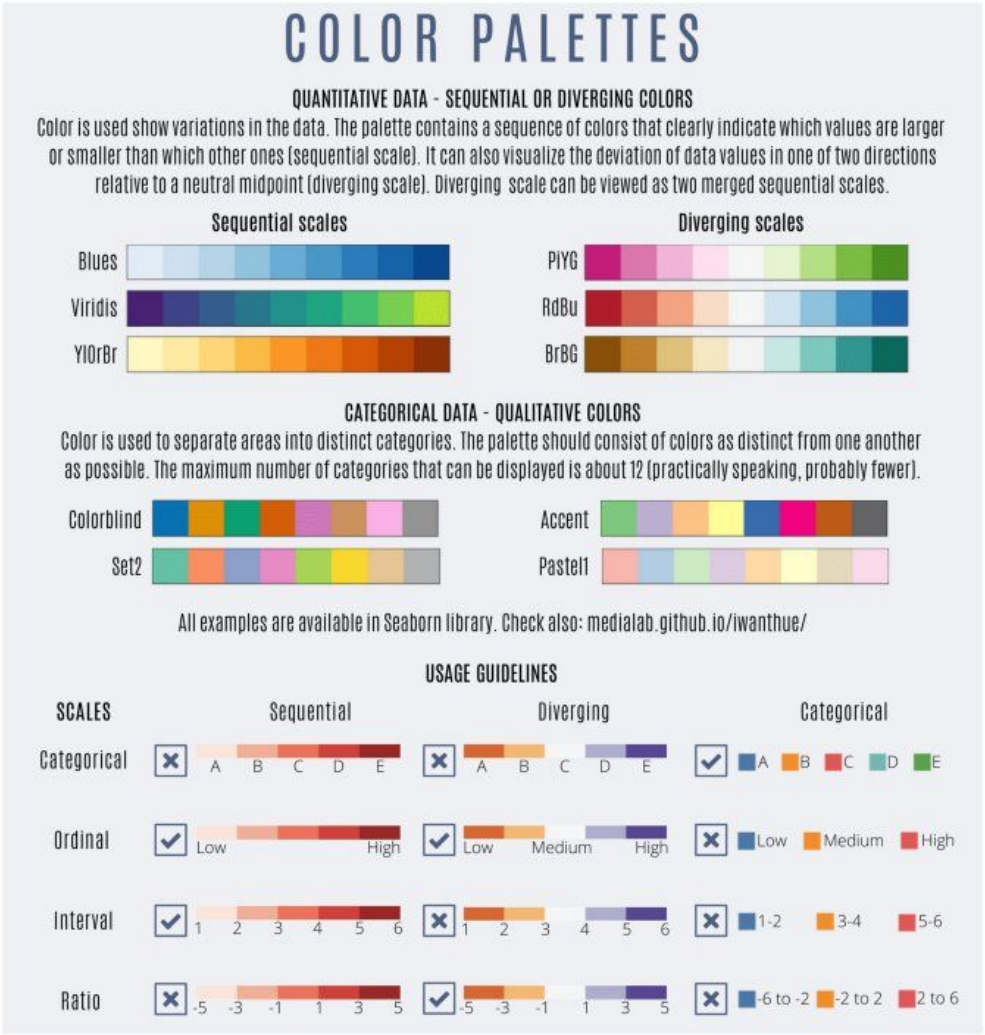
Use as few colors as you can

Use the same color for the same object through the whole report

Each part should be easy readable

No gradients for categories

Legends are gold as well as measure units



Colors are useful make your graphs readable, but they must be used in a “correct way”

Journals are increasingly asking for **color-blind** readable figures because
~8% of the global population is affected by colorblindness (mainly males)

there are many packages to create palettes on R:

the most famous = RColorBrewer

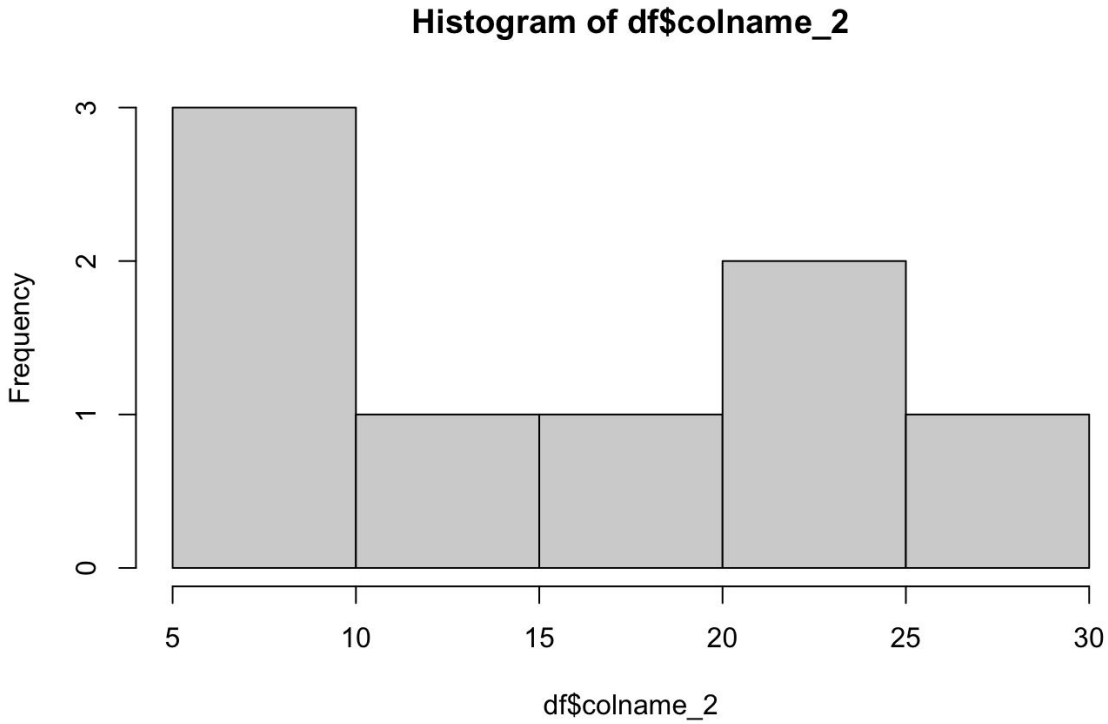
the most complete = paletteer

Additionally to colors there are shadings, line styles, point styles

main base graph functions - histograms

hist() is useful for visualize frequencies

```
> hist(df$colname_2)
```



main base graph functions - scatterplots

we already saw these guys before with the plot() function!

main base graph functions - boxplots

```
> str(df)
'data.frame': 8 obs. of  3 variables:
 $ colname_1: chr  "A" "A" "B" "B" ...
 $ colname_2: int  13 22 18 23 10 29 8 7
 $ colname_3: num  8 8.5 9 9.5 10 10.5 11 11.5
```

Boxplots are useful to see a variable response to a specific factor ... than you need to verify that you actually have a factor!

main base graph functions - boxplots

```
> boxplot(df$colname_2 ~ as.factor(df$colname_1), main = "box1")
```

Factors must be in the second argument

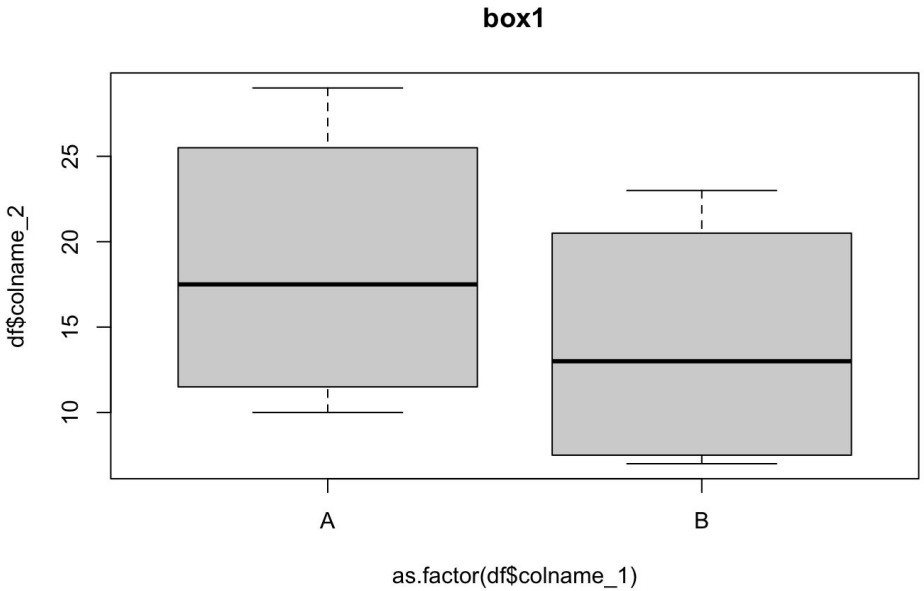
you can see multiple plots using the function

```
> par(mfrow=c(plots x row,plots x col))
```

Exercise:

Visualize the two possible boxplot from df

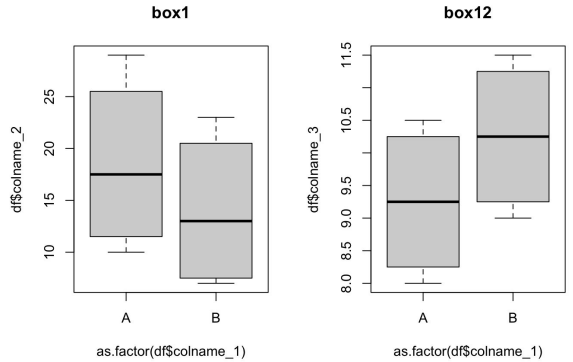
in a single image.



main base graph functions - boxplots

Solution:

```
> par(mfrow=c(1,2))

> boxplot(df$colname_2 ~ as.factor(df$colname_1), main = "box1")

> boxplot(df$colname_3 ~ as.factor(df$colname_1), main = "box2")
```



Saving figures

Find your-own way, but remember that:

- export tool from Rstudio dependents on the resolution of your screen.
- figure sizes will depend from the plot window size (by default in Rstudio)
- you can avoid this steps saving images by using the command line (specific functions)
- journals want high resolutions figures (usually 300 dpi), exporting *.pdf figures you save vectorial figures corresponding to infinite dpi!
- post-edit figure as few as you can
- post-edit figures with appropriate softwares (NO POWERPOINT WTF!)

PhD Toolbox - Get ready for Stream 2!

- Working with **lists**
- More advanced stuff on graphics (**ggplot2**)
- composite graphs panels (**gridExtra**, ...)
- Exporting figures
- **Plotting Maps using R**

Aula 1

Tuesday March 7	**h 9-13**	**(sede di Viale Mattioli 25 - Botanical Garden)**
Wednesday March 8	**h 9-13**	**(sede di Viale Mattioli 25 - Botanical Garden)**
Friday March 19	**h 9-13**	**(sede di Viale Mattioli 25 - Botanical Garden)**