Biometry. Lecture 2

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January 13, 2012

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Outline

1 Questions and answers

2 Why we need statistics
- Tools
- Science

Outline

1. Questions and answers

2. Why we need statistics
   - Tools
   - Science

Previous final question: the answer

What is sampling?

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Previous final question: the answer

What is sampling?

- Taking few from many

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break:

Installing R; first steps

Sampling with R

```
> download.file("http://ashipunov.info/data/data.txt",
+ "data.txt")
> data <- scan("data.txt")

> sample(data, 15)
> sample(data, 15)
> sample(data, 15)
```

Be careful with lower/upper case, brackets and quotes!
Do not enter "more" (>) and "plus" (+) signs.
To repeat previous command, use "arrow up".

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Why we need statistics
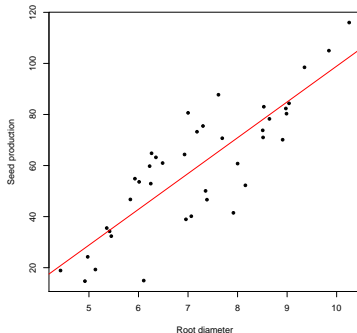## Tools

Data description

```
> data
 [1]  88  22  52  31  51  63  32  57  68  27  15  20  26
[14]   3  33   7  35  17  28  32   8  19  60  18  30 104
[27]   0  72  51  66  22  44  75  87  95  65  77  34  47
[40] 108   9 105  24  29  31  65  12  82
> summary(data)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
   0.00   22.00   33.50   44.71   65.25  108.00
> sd(data) # sd() is a standard deviation
[1] 29.36198
```
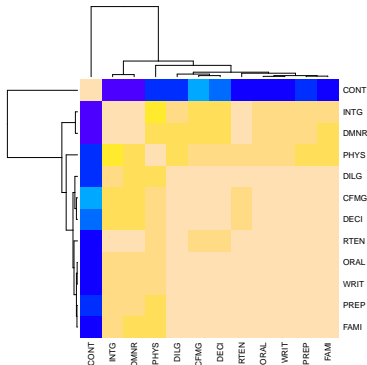
- Biologists need statistics to describe general features of data: central tendencies like mean or median, and ranges like variance or quantiles.
- This is a *descriptive statistics*.

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Relations

- Biologists need statistics to reveal and test relations, correlations an dependencies (linear and non-linear) within a data.
- This is an *inferential statistics*.
- The logic of inferential statistic reflects the logic of experimental science.

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Structure

- Biologists need statistics also to find structure in (usually large and complicated) data.

- This is a *data mining* which uses methods of *multivariate statistics*.

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Why we need statistics

Science

Research

- The special kind of statistics, *experimental design*, helps to plan experiments and coose a right strategy of sampling.
- Last but not least, statistical knowledge is essential for every research which includes:
    - Preparation of reports
    - Making reviews
    - Responding to reviews
- In general, inclusion of statistical part will make research or proposal more competitive

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Final question (2 points)

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How to sample 10 items from `data` object? Write R command.

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Summary: Why do we need statistics

- In all, scientisis who:
    - study data;
    - make samples;
    - plan and conduct experiments;
    - find relations;
    - mine data structure;
    - prepare reports
- need statistics as a universal research tool.

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For Further Reading

A. Shipunov.
Biometry [Electronic resource].
2012—onwards.
Mode of access: `http://ashipunov.info/shipunov/school/biol_299`

P. Dalgaard
Introductory Statistics with R. 2nd edition.
Springer, 2008.
Appendix A.

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