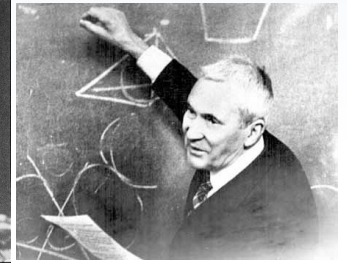
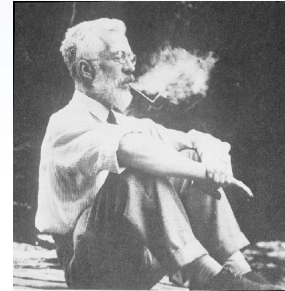
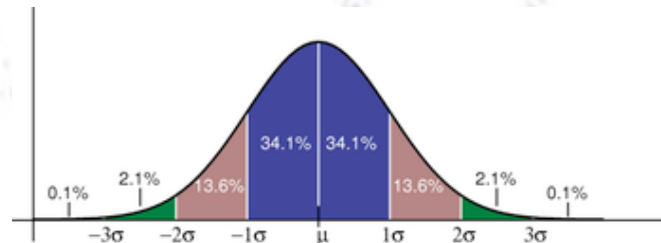


# Applied Statistics

## Reporting results & Significant digits



Troels C. Petersen (NBI)



*"Statistics is merely a quantisation of common sense"*

# Reporting results

When reporting measurements, the notation is typically:

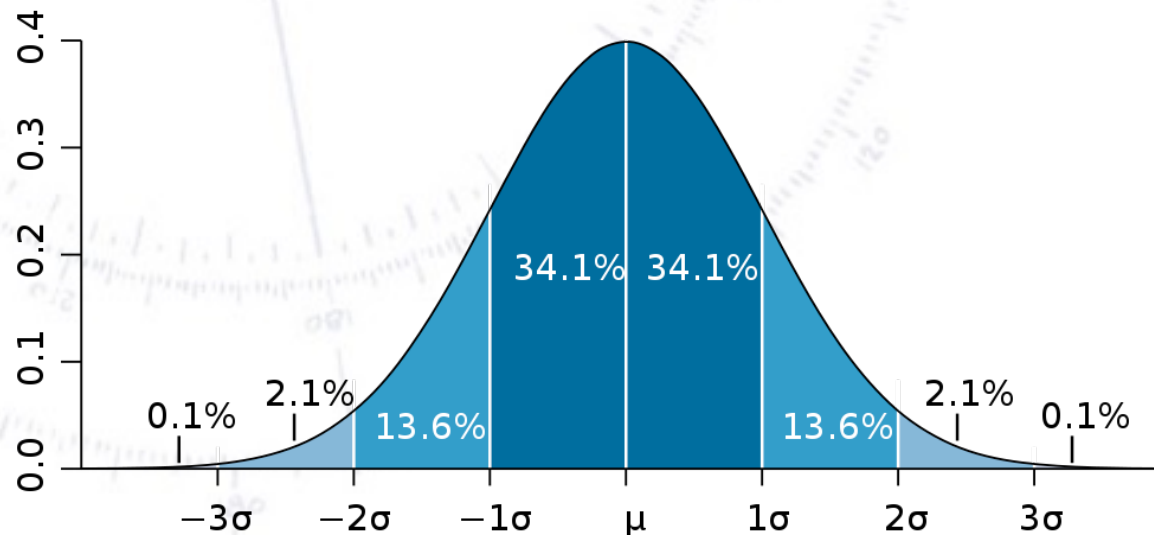
$$x = (0.24 \pm 0.05) \times 10^3 \text{ m}$$

This should be interpreted as:

*“with a mean of 0.24 km and a Gaussian uncertainty of 0.05 km”.*

This does **NOT** guaranty that  $x$  is within 0.19 km and 0.29 km!

Rather it says, that there is a 68% chance of being inside this range.



# Reporting results

When reporting measurements, the notation is typically:

$$x = (0.24 \pm 0.05) \times 10^3 \text{ m}$$

**The reason for not writing  $240 \pm 50 \text{ m}$**  is that one might think, that the uncertainty has been determined with two significant digits, which is most often not the case.

Sometimes, one can find the following reporting:

$$x = (0.24 \pm 0.05_{\text{stat}} \pm 0.07_{\text{syst}}) \times 10^3 \text{ m}$$

This tells the reader, that the statistical and systematic uncertainties have been kept apart, which allows for a better combination with other results (which might share some of the systematic uncertainty).

The good experimentalist gives an explained table of systematic uncertainties!

# Reporting results

The “uncertainty on the uncertainty” follows the approximate rule:

$$\sigma_{\sigma} = \frac{1}{\sqrt{2N - 2}}$$

Unless you have worked hard not only to reduce the uncertainty, but also to make it accurate, you should

***only quote one significant digit errors, when giving results!***

The (possible) exceptions are, if the first digit is a “1” (i.e.  $0.51 \pm 0.12$ ), or internally while you are working to reduce your uncertainties.

Using two significant digits for the error is then acceptable (in this course).

