



## Announcement

### Biological Sensing

Senior Professor Heinrich Hoerber

#### Description

In recent years autonomous robotics became an important technology with a very rapid development. Unfortunately, mainly driven by military applications like cruise missiles, but also unmanned ground vehicles. The latter is very much related to the area of autonomous driving, which is pushed by various large car manufacturers. The problems encountered are first of all related to the sensor systems used and the way incoming data are processed. Meanwhile people involved in the development of these systems start to think that safe autonomous driving only will be possible after the development of a visual system similar to our own. Along this line of thinking more and more people become aware that Nature has developed in more than 500 Million years a vast reservoir of sensors together with proper data processing, which provides all the necessary ingredients for future robotics, if well understood.

This seminar on Biological Sensing is aimed to provide the necessary information for a basic understanding of human senses. This includes some basic Cell Biology to know how structure and function is related. Furthermore, some insight into non-equilibrium thermodynamic aspects of chemical reaction kinetics and finally some measurement and information theoretical concepts to be able to compare natural systems with artificial ones. The main part will summarize the knowledge we have at the moment on tasting, smelling, touching, hearing and seeing and compare it to up-to-date artificial systems, with special emphasis beside data acquisition on data transfer and data processing.

#### Content

- Introduction to Cell Biology with focus on cellular structures and functions
- Introduction to non-equilibrium Thermodynamics with focus on reaction kinetics
- Introduction to Metrology and Information Theory
- Senses of taste and smell
- Senses of touching and hearing
- Sense of seeing

#### Literature

- Essential Cell Biology, 3rd edition, Alberts et al., Garland Science, New York / London 2009
- Physical Biology of the Cell, 2nd edition, Phillips et al., Garland Science, New York / London 2013
- The making of measure and the promise of sameness, E. Lugli, University of Chicago Press, Chicago / London 2019
- Information Theory, Inference and Learning Algorithms, D.J.C. McKay, Cambridge University Press, Cambridge UK 2004

#### Additional information

Lecture/Seminar (3 hours per week)

Examination: oral

4 ECTS

#### Lecturer

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