

科目名 ナノテクノロジー特別講義 I (1 単位)

Subject : Advanced Nanotechnology I (one credit)

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科目番号 Syllabus Code : 02BQ207, 01BF291, 01BG089, 01BC306

Towards Optical Nanoscopy: Advancing Laser Microscopy

By Thorben Cordes (Zernike Institute, University of Groningen, the Netherlands)

Course description:

I introduce various kinds of optical methods to realize nanoscale resolution. I discuss about resolution and contrast, various kinds of microscopic methods, such as fluorescence microscopy, confocal and non-linear microscopy, dynamical fluorescence imaging, single-molecule detection, resonance energy transfer. Then, I discuss various kinds of super-resolution microscopies.

Outline:

- 1) Introduction to Microscopy: Resolution and Contrast
- 2) Fluorescence and Microscopy
- 3) Confocal and non-linear Microscopy
- 4) Dynamic fluorescence imaging: Time-lapse, FCS, FRAP
- 5) Single-molecule detection: biophysics and localization with a paper discussion: Rotary motors and step-wise rotation observed by fluorescence (Science 1997)
- 6) The nanoscopic ruler: Förster resonance energy transfer with a paper discussion: Guoridis et al., Mechanisms of membrane transporters (NSMB 2015)
- 7) Super-resolution microscopy I: STED, RESOLFT und SIM
- 8) Super-resolution microscopy II: STORM, PALM and PAINT with a paper discussion: Vaughan et al., Caged fluorophores and nm-resolution
- 9) Nanoassemblies for calibration of super-resolution: SMCP and Origami
- 10) Analysis of super-resolution data (interactive computer tutorial on STORM)

Grading:

Attendance more than 70%, home work and/or final exam

(If the students in Osaka University who encounter any difficulty of 70% attendance due to the overlap with other ordinary lectures, please consult the coordinator.)

Textbook:

No textbook required, we shall follow the Lecture Notes which will be posted on the course Web page.

Prerequisite:

Knowledge on electromagnetism, classical and quantum optics, and biochemistry is advantages