551-0108-00L Grundlagen der Biologie II: Pflanzenbiologie

Spring semester 2018 Tuesday, 8-10 AM HG E 7

Instructors: **Wilhelm Gruissem** (wgruissem@ethz.ch)
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20.02.2018 W. Gruissem Reproductive development: fertilization, embryo and seed development

Female reproductive development: meiosis, mitosis, ovule cell types
Male reproductive development: meiosis, mitosis, pollen cell types
Pollen tube growth and fertilization, compatibility systems
Embryo development: first divisions, meristem anlagen
Seed development: endosperm, aleurone, seed coat, dehydration

27.02.2018 W. Gruissem Functional plant morphology and anatomy: cell wall, cell expansion, vasculature

Primary cell wall components and synthesis, cellulose synthase, cytoskeleton
Cell plate formation and vesicle transport
Plasmodesmata
Cell expansion and vacuole function, secondary cell wall, wood
Xylem and phloem differentiation

06.03.2018 W. Gruissem Shoot development: seedling germination, meristems, leaf initiation and development

Signals triggering germination and mobilization of metabolites
Transition from heterotrophic to autotrophic growth
Shoot apical meristem function and regulation
Leaf initiation and spiral growth pattern
Establishment of leaf polarity

13.03.2018 W. Gruissem Root development: meristem, lateral root initiation, root hair differentiation

Organization and regulation of the root apical meristem
Differentiation of root tissues involving cell-cell communication
Initiation of lateral root growth
Cell-cell communication during root hair differentiation
Building the endodermis and Casparian Strip

20.03.2018	**S. Zeeman**	**Photosynthesis: organization of the photosynthetic apparatus**
		Solar radiation as the source of energy for plants Light capture by the photosynthetic apparatus Organization of the chloroplast Chlorophyll pigments and excitation Structural organization of the photosystems Function/dynamics of the photosynthetic electron transport chai
27.03.2018	**S. Zeeman**	**Carbon fixation and photorespiration**
		The Calvin cycle and measuring gas exchange The oxygenation reaction of Rubisco Photorespiratory pathway C4 plants CAM plants
03.04.2018		**Spring Break**
10.04.2018	**S. Zeeman**	**Carbohydrate metabolism and respiration**
		The pathway of sucrose biosynthesis Partitioning between sucrose and starch Starch biosynthesis and degradation Alternative carbon storage products the 3 pathways of respiration (glycolysis, TCA and OPPP)
17.04.2018	**S. Zeeman**	**Lipid biosynthesis**
		Storage of oils in plants Fatty acid biosynthesis Production of triacylglycerols Lipid degradation and β-oxidation The glyoxylate cycle and gluconeogenesis
24.04.2018	**O. Voinnet**	**Plant hormones I**
		Overview and biochemical origins in plant and animals Main plant hormone classes and their functions Gibberellic acid and cell elongation: physiology, biogenesis and signalling Abscisic acid: physiology, biogenesis and signalling
01.05.2018		**Holiday**
08.05.2018	**O. Voinnet**	**Plant hormones II**
		Auxin and growth control: physiology, biogenesis, transport and signalling Cytokinins and growth control: biogenesis and antagonisms to auxin function; two-component signalling

Crown gall induction by *Agrobacterium tumefaciens*
Ethylene, fruit ripening and leaf senescence: molecular mode of action and ways to manipulate it
Salicylic acid: biogenesis and roles in plant innate immunity
Jasmonic acid: biogenesis, roles against herbivores, signalling

15.05.2018 O. Voinnet Plant biotic stress

Why study plant pathogens and their attack strategies?
Necrotrophic fungi and host selective toxins
Biotrophic fungi: example of *Magnaporthe grisea* in rice
Bacterial pathogens, PAMP-triggered immunity
The particular case of Agrobacterium
Plant virus: diversity, diseases and infection, replication and movement
Plant pathogenic nematodes

22.05.2018 O. Voinnet Plant abiotic stress

Overview of abiotic stress factors
Resistance, adaptation and acclimation
Reactive oxygen species (ROS): classes, biogenesis and harmful consequences for plant cells
Water deficit stress
Freezing stress
Flooding and oxygen deficit
Ozone stress
Heat stress

29.05.2018 W. Gruissem Flowering: photoreceptors, circadian control, vernalization, floral meristem

Photoreceptors and molecular mechanisms of light perception
Function of circadian control in the induction of flowering
Vernalization control of flowering
Organization of the floral meristem
Flower development

Recommended Textbook

A.M. Smith, G. Coupland, L. Dolan, N. Harberd, J. Jones, C. Martin, R. Sablowski and A. Amey

Plant Biology

Garland Science, Taylor & Francis Group
ISBN 978-0-8153-4025-6

Further Reading

B.B. Buchanan, W. Gruissem and R.L. Jones

Biochemistry and Molecular Biology of Plants

Wiley Blackwell
ISBN 978-0-4707-1421-8

Lecture Handouts

Will be provided as PDFs before the lectures