Announcement

New Focus Subject Epigenetic's for Master students in Biology and Biochemistry

Epigenetic Principles and the Human Genome

Lecture 54249, 2SWS, WS26/27

Starting - 20.10.2026 Tuesdays 18:00 s.t. -19:30 - **H52**

The lecture provides a fundamental insight into the structural and functional organisation of the human genome and the mechanisms that drive the development from a specialized cell into 10.000's of different cell types using the same information for all cells.

Chromatin and Nuclear Architecture

Seminar 54211, 2SWS, WS26/27

The seminar with current topics on Epigenetics accomanies the lecture

Methods in Epigenetics: Applications and Data Interpretation

Lecture 54249, 2SWS, SS27

This course introduces key experimental and computational methods used in modern epigenetics, with a particular focus on their applications, experimental design, and data interpretation.

Lab Courses

Epigenetic Mechanisms - Prof. Längst - 54194

Analysis of next-generation-sequencing data - Dr. Schwartz - 54251

Organizers: Prof. Gernot Längst, Dr. Uwe Schwartz
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Epigenetic Principles and the Human Genome

Overview to the Core Topics

Module 1: Genome Organization & Chromatin Architecture

01 · Human Genome Architecture: 3.2 Gb scale, 1.5% coding paradox, isochores & regulatory DNA

02 · The Repetitive Genome: Transposons, satellites & heterochromatin

03 · Chromatin Structure: Orgnisation and Nucleosome core biophysics

04 · Histone Variants: CENP-A (kinetochores), H3.3 (active turnover), H2A.Z (promoters)

Module 2: The Epigenetic Language & Remodelers

05 · Histone Post-translational modifications, Readers, Writers and Eraser; Oncohistones

06 · ATP-Dependent Remodelers: SWI/SNF, ISWI, CHD - molecular motors and their mechanisms

07 · DNA Methylation Dynamics: 5mC maintenance, TET-mediated active demethylation & CpG islands

Module 3: Transcription Factors & Chromatin Dynamics

08 · Transcription Factors: Base vs. shape reading; Pioneer factors (FOXA1)

09 · Epigenomic Profiling: Principles of ATAC-seq, ChIP-seq, and targeted CUT&RUN

10 · Transcription Elongation: Pol II pausing, navigating the nucleosome barrier

11 · Chromatin-Associated RNA: Enhancer RNAs (eRNAs), R-loops, and Triple Helices

Module 4: 3D Genome & Epigenome Engineering

12 · 3D Genome Architecture: Cohesin loop extrusion, CTCF boundaries, TADs & super-enhancers

13 · Viral Chromatin and human host cell infection: Adenovirus