

Organizers: Prof. Sebastian Arnold, Department of Pharmacology and Prof. Marc Timmers, Department of Urology/DKTK (Freiburg)

Date: July 4-15, 2022

Location: Library, Institute of Experimental and Clinical Pharmacology, Albertstr. 25

Description of content: Regulation of gene expression and of chromatin function is pivotal for the understanding of (early) development programs, cellular homeostasis and many disease states. The transcription process is critically linked to the regulation of chromatin function. Epigenetic mechanisms such as histone modifications can transmit active/inactive states of a gene through cellular divisions, which are particularly relevant during early mammalian development. The study of transcription, chromatin regulation and early development received a great impetus through the availability of whole genome sequences, which sparked development of many novel high-throughput sequencing technologies. Integration of biochemistry, molecular biology, genomics, proteomics and cell biology now provides unprecedented insight into transcription and chromatin regulation in health and disease.

This course will teach the crucial concepts of regulation of gene expression, with a focus on the process of transcription at the molecular level, and also including concepts derived from cellular, developmental and disease states. Epigenetics, chromatin and genome organization will be taught, as well as state-of-the-art strategies and techniques in the field of gene regulation and genome research, all with a reference to human disease and development.

The covered topics are: genome/gene organization, pol II transcription initiation/elongation, chromatin remodeling, chromatin modifications, epigenetic inheritance, nuclear organization, early vertebrate embryonic development, signals and pathways, cell lineage specification, pluripotency, germ cells and genomic imprinting. Many techniques will be explained, including classical assays used to investigate transcription, as well as high-throughput genomic approaches and systems biology analyses. If you are only superficially interested in the mechanisms of gene expression, epigenetics and development, this course is not suitable for you.

Course outline: The course consists of a combination of lectures, exercises, literature and discussions and closes with a written exam. A large part is taught by leading scientists (9-10 different instructors in total) working in gene expression, chromatin control and early development. The course is intense and challenging and requires full attention throughout its entire duration. Although many basic molecular principles will be reintroduced, the course is only suited for students with a basic molecular understanding of gene expression and chromatin through Biomolecular Sciences bachelor programs taught from textbooks like Molecular Biology of the Cell ("Alberts") or Genes ("Lewin").

Instructors:

Tugce Aktas (MPI, Berlin)

Ibrahim Cisse (MPI, Freiburg)
Sandra Hake (University of Giessen)
Anna Pombo (MDC, Berlin)
Yang Shi (Ludwig Institute, London)
Dirk Schübeler (FMI, Basel)
Nadine Vastenhouw (University of Lausanne)

Schedule: The course is full-time (9-17 h). A detailed schedule will be sent two weeks prior to the course. Following the entire course (without any exception) is compulsory to pass.

Requirements: The course is aimed at PhD students of the SGBM and of the IMPRS-Freiburg program in their year 1/2 and Master students from Freiburg. Students should have a basic understanding of cellular and molecular biology. The course is also open to PhD and Master students from other programs (e.g. Molecular Medicine) and from similar programs outside of Freiburg. In special cases B.Sc. students and post-docs can be admitted.

Registration: Please download the application form [here](#) , fill it out and send it back to sgbm-info@sgbm.uni-freiburg.de until latest June 1, 2022.

SGBM fellows have priority in registration until 6 weeks before the course. The course is free for students from the University of Freiburg, the Medical Center-University of Freiburg, the Max-Planck Institute of Immunobiology and Epigenetics and the International Epigenetics course at the Curie-Institute in Paris. For other students a participation fee of € 100 is requested. Maximum participation (Master + PhD students) is 25, so please register well ahead of the deadline of June 1, 2022. Successful applicants will be notified 4 weeks in advance.