**Transcription, Epigenetics and early Development**

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

**Date**: July 12-23, 2021

**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**: Genevieve Almouzni (Institut Curie, Paris)
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Sebastian Arnold (Dept. of Pharmacology, Freiburg)
Susan Gasser (FMI, Basel)
Nicola Iovino (MPI, Freiburg)
Ana Pombo (MDC, Berlin)
Wolf Reik (Babraham Institute, Cambridge)
Marc Timmers (Dept. of Urology/DKTK, Freiburg)
Maria-Elena Torres-Padilla (LMU, Munich)
Peter Verrijzer (EMC, Rotterdam)

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 throughout is compulsory without exceptions.

Requirements: The course is aimed at Ph.D. researchers of the SGBM and Master students from Freiburg in their last year of study. The course is also open to Ph.D. and Master students from other programs (i.e. IMPRS graduate school, Molecular Medicine) and from similar programs outside of Freiburg. Participants should already have a basic understanding of cellular and molecular biology.

Registration: Please download the application form here, fill it out and send it back to sgbm-info@sgbm.uni-freiburg.de until latest May 31, 2021. SGBM fellows have priority in registration until 6 weeks before the course. The participation fee of € 100 is requested for external students. Maximum participation (Master + PhD fellows) is 25, so please register well ahead of the deadline. Successful applicants will be notified 4 weeks in advance.