

Gene expression, epigenetics and disease



Cancer,
Stem cells &
Developmental
biology



February 6th – 17th, 2017 (2 week course, 3.0 ECTS)

Organizers: prof.dr. Wouter de Laat (Hubrecht Institute) and
prof.dr. Marc Timmers (Center for Molecular Medicine, UMC Utrecht)

Venue: STR2.106 Stratenum, Universiteitsweg 100

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 to pass. There are no exceptions at all (except completely unforeseen circumstances).

Registration: Please register online on the csnd website: <http://www.csnd.nl/> (courses). CSND students have priority in registration until 3 weeks before the course. Maximum participation (Master + PhD students) is 25, so please register in time. Applicants will be notified of their acceptance 3 weeks in advance.

Description of content: Regulation of gene expression is pivotal for the understanding of developmental programs, cellular homeostasis and many disease states including cancer, immune diseases and metabolic disorders. The gene transcription process is critically linked to regulation of chromatin. Epigenetic mechanisms such as histone modifications can transmit active/inactive states of a gene through cellular divisions. The study of transcription and chromatin regulation has received a great impetus through the availability of whole genome sequences, which sparked novel applications of high-throughput sequencing technologies. Integration of biochemistry, molecular biology, genomics, proteomics and cell biology approaches can now provide 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, but 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.

The covered topics are: nuclear organization, genome/gene organization, the pol II transcription machinery, chromatin regulation, epigenetics, regulation through small and long non-coding RNAs. Many techniques will be explained, including classical assays used to investigate transcription, as well as high-throughput genomic approaches and systems biology analyses. When you are only superficially interested in mechanisms of gene expression/epigenetics, 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 (inter)national scientists (9-11 different instructors in total). The course is ideal to become acquainted with top labs working in gene expression control. The course is intense and challenging and requires full attention throughout the full 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 bachelor programs such as Biomolecular Sciences taught from textbooks like Molecular Biology of the Cell ("Alberts") or Genes ("Lewin"). In previous years this course was rated very highly (8.2-8.7).