

Standing Committees for:

- Life, Earth and Environmental Sciences (LESC)
- Physical and Engineering Sciences (PESC)

ESF Exploratory Workshop on

Computational Approaches to the Role of Epigenetic Marks in Transcription Regulation

Basel, Switzerland, 17 - 19 October 2007

Convened by:

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The European Science Foundation (ESF) is an association of 76 Member Organisations devoted to scientific research in 30 European countries. The Mission of ESF is to provide a common platform for its Member Organisations in order to advance European research and to explore new directions for research at the European level. Through its activities, the ESF serves the needs of the European research community in a global context.

The main objectives of ESF for the years 2006-2010 as defined by its current *Strategic Plan* are to promote Science Strategy and Science Synergy, paving the way for initiatives across disciplinary and geographic boundaries in the European Research Area (ERA).

The Exploratory Workshops scheme is one of the key instruments of the Science Strategy “pillar”. Each year, ESF supports approximately 50 Exploratory Workshops across all scientific domains. The focus of the scheme is on workshops aiming to explore an emerging and/or innovative field of research or research infrastructure, also of interdisciplinary character. Workshops are expected to open up new directions in research or new domains. It is expected that a workshop will conclude with plans for specific follow-up research activities and/or collaborative actions or other specific outputs either within the frame of ESF (e.g. prepare the ground to develop a [Forward Look](#), a [Research Networking Programme](#) or a [EUROCORES](#) proposal; publication of a Policy Briefing...) or for submission to the EU 7th Framework Programme or to other European or international funding organisations.

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Main Objectives of the Workshop:

In recent years experimental approaches to epigenetics, e.g. such as are being pursued within the Epigenomics Network of Excellence, have generated much experimental data which elucidate how chromatin affects transcription regulation. The aim of this workshop is to bring together leading experimentalists in this field with theoretical researchers that are interested in computational modeling and analysis of the role of epigenetic marks in gene regulation in order to explore the possibility of combined experimental and computational approaches to the role of epigenetic marks in transcription regulation.

Suggested questions for discussion sessions during the workshop:

In addition to the talks, we will have two discussion sessions (one each day) that will be organized around a set of 'fundamental questions' about the role of epigenetic marks in transcriptional regulation. Some example questions that could be part of the discussion are:

- In development cell fates are often correlated with particular changes in the state of the chromatin that appear 'irreversible'. What combination of experimental and computational approaches could be used to investigate how irreversible these changes are, and if so, what the mechanistic basis of this irreversibility is?

- Where transcription factors can bind to their cognate sites depend on which regions of the chromatin are accessible. At the same time, which regions of the chromatin are accessible depends on where transcription factors have bound, since many bound transcription factors recruit chromatin modifying enzymes. Are there situations in which the behavior of the system can be best described as the chromatin state driving TF binding or the TF binding driving the chromatin state, or is it always essential to model this as a dynamic interplay between the two processes. By what combination of experimental and theoretical approaches can we distinguish these three possibilities?
- On the one hand it has been suggested that epigenetic marks form an epigenetic 'code' that plays an essential role in transcription regulation, while on the other hand some recent results have suggested that in many cases the main role of epigenetic marks is to 'amplify' existing regulatory pathways and make them more robust. What combinations of experimental and computational approaches could be used to investigate in which situations epigenetic marks act mainly to solidify regulatory pathways and in which cases are they an integral 'information carrying' part of the regulatory pathways?
- What combination of computational and experimental approaches could be used to identify what determines the spread of epigenetic marks along the chromatin, and what sets the boundaries between domains with different epigenetic marks?
- How important are noncoding RNAs for epigenetics and transcriptional silencing?

PRELIMINARY PROGRAMME

Each talk is 30 minutes + 10 minutes of discussion.

Wednesday 17 October 2007

Evening Arrival

Thursday 18 October 2007

08.45-09.00	Welcome and introduction <i>Presentation of the European Science Foundation (ESF)</i> Session I: Epigenetic regulation by Polycomb proteins
09.00-09.40	Renato Paro (Zürich / CH) D-BSSE, ETH-Zurich <i>Epigenetic profiles of ON/OFF gene expression states</i>
09.40-10.20	Ana Pombo (London / UK) MRC Clinical Sciences Centre <i>Poised transcription complexes in epigenetics and genome organisation</i>
10.20-10.30	<i>Break</i>
10.30-11.10	Marc Rehmsmeier (Bielefeld / DE) CeBiTec, Universitaet Bielefeld <i>Evolutionary plasticity of regulatory DNA</i>
11.10-11.50	TBA
12.00-13.00	<i>Lunch</i> Session II: Modeling chromatin state and dynamics
13.30-14.10	Dieter Heermann (Heidelberg / DE) Ruprecht-Karls-Universität Heidelberg <i>Polymer Models for Chromosomes</i>
14.10-14.50	Eran Segal (Tel Aviv / IL) Weizmann Institute <i>Quantitative models for chromatin structure</i>
14.50-15.00	<i>Break</i>

15.00-15.40	Arndt Benecke (Paris / FR) Institut des Hautes Etudes Scientifiques & Interdisciplinary Research Institute <i>Linking molecular mechanisms to the organism's physiology using transcriptomics</i>
15.40-16.20	David K Gifford (Cambridge / US) MIT <i>Chromatin changes and transcriptional regulation during motor neuron development</i>
16.20-16.30	<i>Break</i>
16.30-18.00	Discussion session
Evening	<i>Workshop dinner</i>

Friday 19 October 2007

Session III: Genome-wide mapping of chromatin modifications

09.00-09.40	Dirk Schübeler (Basel / CH) Friedrich Miescher Institute <i>Targets and function of DNA methylation in mammalian genomes</i>
09.40-10.20	Mathew A. Sloane / Florian M. Pauler / Denise Barlow (group Denise Barlow, Vienna / AT) Ce-M-M- Research Center for Molecular Medicine <i>A simple method to identify histone modifications spreading along mammalian chromosomes</i>
10.20-10.30	<i>Break</i>
10.30-11.10	Antoine Peters (Basel / CH) Friedrich Miescher Institute <i>Investigating epigenetic control of mouse pre-implantation development</i>
11.10-11.50	Bas van Steensel (Amsterdam / NL) Netherlands Cancer Institute <i>Chromatin domains in flies and humans</i>
12.00-13.00	<i>Lunch</i>
Session IV: Small RNAs	
13.30-14.10	Mihaela Zavolan (Basel / CH) Biozentrum Basel <i>Small RNAs in the regulation of mammalian gene expression</i>
14.10-14.50	Massimo Vergassola (Paris / FR) Pasteur Institute <i>Non-coding RNAs in bacteria</i>
14.50-15.00	<i>Break</i>

Session V: Epigenetics in yeast

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|-------------|---|
| 15.00-15.40 | Genevieve Thon (Copenhagen / DK)
Biocenter, University of Copenhagen
<i>Heterochromatin formation in fission yeast</i> |
| 15.40-16.20 | Susan Gasser (Basel / CH)
Friedrich Miescher Institute
<i>Spatial considerations in gene expression</i> |
| 16.20-16.30 | <i>Break</i> |
| 16.30-18.00 | Discussion & Planning of follow-up activities and collaborations |

Saturday 20 October 2007

Departure

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Objectives of the ESF Standing Committee for Life, Earth and Environmental Sciences (LESC)

The main objectives of the **ESF Standing Committee for Life, Earth and Environmental Sciences (LESC)** are:

1. to identify and promote emerging scientific topics and high quality science deserving special attention in Europe;
2. to manage a wide ranging portfolio of activities of the European Science Foundation;
3. to examine and report on issues of strategic scientific importance within its fields of competence.

This committee's sphere of activities comprises the broad field of life, earth and environmental sciences:

- Biology
- Biotechnology
- Agriculture
- Earth sciences
- Climate research
- Glaciology
- Oceanography
- Environmental sciences, etc.

ESF Standing Committees support a limited number of **Exploratory Workshops** each year. These workshops allow leading European scientists to explore novel ideas at the European level with the challenging aim to "*spearhead*" new and preferably interdisciplinary areas of research. Further details are available on the internet at <http://www.esf.org/workshops>.

One desirable outcome of an ESF Exploratory Workshop may be that participants submit **high quality proposals for further ESF activities** (such as "à la carte Programmes" or a EUROCORES initiative), or **research funding applications** for submission to the EU 7th Framework Programme or to other European or international funding organisations.

In the case of **ESF Programmes** ("*à la carte*" or [EUROCORES](#)), which are financed by, and coordinated through, the European Science Foundation, a draft proposal should be submitted to the LESC Secretariat for advice, to then subsequently undergo further external refereeing. If successful in obtaining LESC's scientific recommendation, the proposal will be submitted to ESF Member Organisations for funding on a voluntary basis. More details are available at <http://www.esf.org/research-areas/life-earth-and-environmental-sciences.html>.

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Objectives of the ESF Standing Committee for Physical and Engineering Sciences (PESC)

The **ESF Standing Committee for Physical and Engineering Sciences (PESC)** covers a broad number of fields from physics, chemistry, mathematics, informatics and computer sciences, to engineering, material and technical sciences. PESC has the following responsibilities and tasks:

- to develop scientific initiatives within the ESF operational framework;
- to make proposals for 'a la carte' scientific initiatives;
- to undertake studies on large research facilities and assist in the evaluations and assessments and other special reviews requested by Member Organisations;
- to provide specialist advice and input on a wide range of ESF actions and contribute to the development of the ESF science policy agenda and take a strategic view of the scientific area for which it has responsibility; and
- where appropriate, to work with other Committees and groups in promoting multidisciplinary and interdisciplinary activities.

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