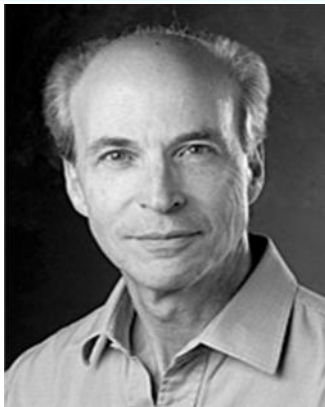


## Nobel Prize in Chemistry 2006



Roger D. Kornberg

The Nobel Prize in Chemistry 2006 was awarded to Roger D. Kornberg *"for his studies of the molecular basis of eukaryotic transcription"*.

### Information about winners:

**Roger D. Kornberg**  
Stanford University, CA, USA

### Summary of research work:

#### **A family story about life**

In order for our bodies to make use of the information stored in the genes, a copy must first be made and transferred to the outer parts of the cells. There it is used as an instruction for protein production – it is the proteins that in their turn actually construct the organism and its function. The copying process is called transcription. Roger Kornberg was the first to create an actual picture of how transcription works at a molecular level in the important group of organisms called eukaryotes (organisms whose cells have a well-defined nucleus). Mammals like ourselves are included in this group, as is ordinary yeast.

Transcription is necessary for all life. This makes the detailed description of the mechanism that Roger Kornberg provides exactly the kind of "most important chemical discovery" referred to by Alfred Nobel in his will. If transcription stops, genetic information is no longer transferred into the different parts of the body. Since these are then no longer

renewed, the organism dies within a few days. This is what happens in cases of poisoning by certain toadstools, like the death cap, since the toxin stops the transcription process. Understanding of how transcription works also has a fundamental medical importance. Disturbances in the transcription process are involved in many human illnesses such as cancer, heart disease and various kinds of inflammation.

The capacity of stem cells to develop into different types of specific cells with well-defined functions in different organs, is also linked to how the transcription is regulated. Understanding more about the transcription process is therefore important for the development of different therapeutic applications of stem cells.

Forty-seven years ago, the then twelve-year-old Roger Kornberg came to Stockholm to see his father, Arthur Kornberg, receive the Nobel Prize in Physiology or Medicine (1959) for his studies of how genetic information is transferred from one DNA-molecule to another. Kornberg senior had described how genetic information is transferred from a mother cell to its daughters. What Roger Kornberg himself has now done is to describe how the genetic information is copied from DNA into what is called messenger-RNA. The messenger-RNA carries the information out of the cell nucleus so that it can be used to construct the proteins.

Kornberg's contribution has culminated in his creation of detailed crystallographic pictures describing the transcription apparatus in full action in a eukaryotic cell. In his pictures (all of them created since 2000) we can see the new RNA-strand gradually developing, as well as the role of several other molecules necessary for the transcription process. The pictures are so detailed that separate atoms can be distinguished and this makes it possible to understand the mechanisms of transcription and how it is regulated.

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