



Molecular Ultrafast
Science And Technology

National Center of Competence in Research

The National Centres of Competence in Research (NCCR) are a research instrument of the Swiss National Science Foundation

About NCCR MUST

The NCCR MUST (Molecular Ultrafast Science and Technology) is an interdisciplinary research program launched by the Swiss National Science Foundation in 2010. It brings together 19 Swiss research groups working in Ultrafast Science across the fields of physics and chemistry. Our themes are:

- Watching atoms and electrons in molecules and solids at work
- Observing the fastest processes in nature
- Controlling atomic and electronic motion

MUST scientists create new experimental and theoretical tools and to apply them to unravel the fastest processes in the physics and chemistry of natural and manmade matter. Experimental tools rely on ever-shorter sources of electromagnetic radiation, be it ultraviolet, visible, infrared or even bursts of X-rays. Currently, we are witnessing further huge steps forward in these technologies. New sources of femtosecond X-ray pulses, such as the slicing scheme at synchrotrons, or the X-ray free electron laser (XFEL), are built or planned - one of them at the PSI (SwissFEL). Electron diffraction reaches ultrafast time scales, techniques similar to NMR are extended into the IR and UV/VIS spectrum, attosecond pulses of light bring us to the time scales of electron motion, and intense THz pulses allow for direct excitation of structural modes. Improved, and even novel, theoretical tools emerge from constantly growing computational capabilities, which in turn enable us to tackle previously unsolved problems.

In Switzerland every modern aspect of Ultrafast Science is covered by the MUST network and Swiss researchers are among the leaders in the field. The research goals of MUST include examining the structural dynamics of the building blocks in nature, and how changes in structure are related to function. Moreover, MUST will shed light on the role of electrons, specifically the rearrangement of the electron density during changes in structure. MUST will also try to measure how fast electrons are transported within molecules to tackle problems related to electron transport.

Such science is fundamental in nature but relates strongly to a number of major challenges which our society faces. A detailed understanding of the structural dynamics of molecules will help developing alternative sources of energy, synthesizing complex drugs, or designing electronics in the post-Moore's law era.

The NCCR MUST network is developing outreach projects to promote science in schools, and activities to promote the recruitment, retention and advancement of women in science. An example of our outreach program is the Pendulum Clock experiment, developed by Martin Huppert and David Stapfer, Ultrafast Spectroscopy and Attosecond Science (Hans Jakob Wörner group), ETH Zurich. The movie was made by Esther Rusterholz.

Aktualisieren Sie bitte Ihr Flash-Plugin, um den Moviclip anschauen zu können.

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SWISS NATIONAL SCIENCE FOUNDATION

JLP-HPT H3 | Auguste-Piccard-Hof 1 | 8093 Zurich | **E-Mail** | +41 44 633 36 02

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