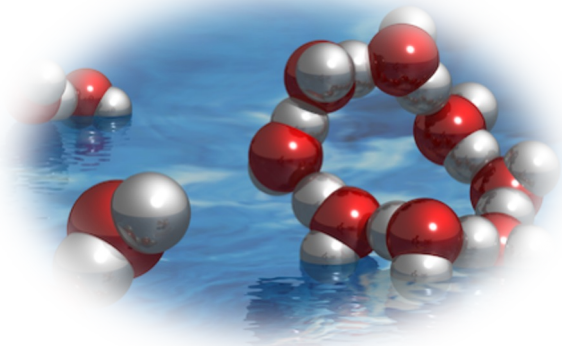


Chemical and Bio-Molecular Physics

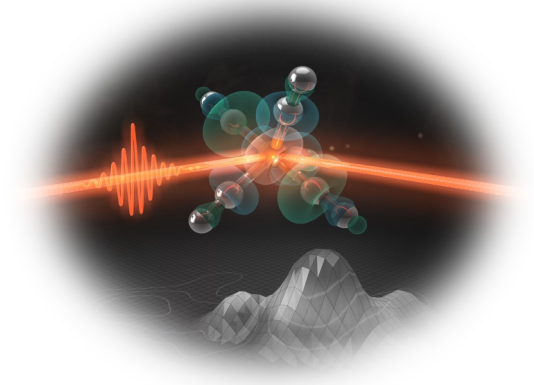
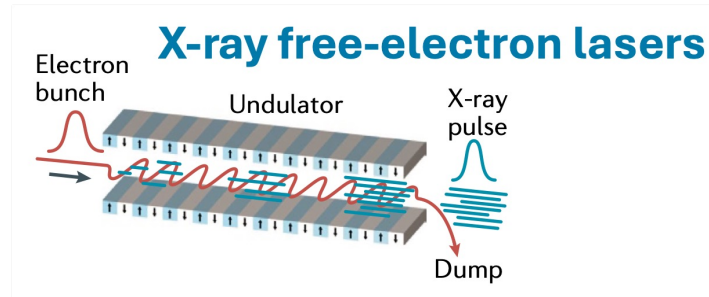
Staff (2024):

- Program professor (PAP): Philippe Wernet
- Faculty members: Olle Björneholm, Carl Caleman, Jan-Erik Rubensson, Johan Söderström, Nicusor Timneanu (Hans Ågren, Joseph Nordgren, senior Profs.)
- Ph.D. students: 8 (present: Pamela Svensson)
- Postdocs: 5 (present: Victoria Kabanova)
- Researchers: 3 (Marta Berholts, Marcus Agåker, present: Raphael Jay)
- Research engineers: 1 (present: Robert Stefanuik)





Research focus



Address fundamental properties and ultrafast processes in atoms, molecules, chemical systems, and proteins with X-ray scattering and spectroscopy at X-ray Free-Electron Lasers (XFELs), synchrotrons, in the lab, reveal how electrons and nuclei move and interact, explain how properties and function emerge.

Main Research Areas		% of program	FTE Faculty	Type
1	Biophysics	40%	2.5	Basic
2	Chemical Physics and Dynamics	26%	1	Basic
3	Atomic, Molecular and Optical Physics	17%	2.5	Basic
4	Light-matter Interactions (Quantum Chemistry)	17%	0.5	Basic

KoF24 report, Table 3.1

Chemical and Bio-Molecular Physics



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Key enablers for research



- Our expertise in X-ray methodology (division: X-ray Photon Science)
 - Invent and develop new methods, concepts, and instruments for ultrafast X-ray spectroscopy scattering, push boundaries, in what can be done, what we know, how we understand things
- Our access to X-ray free-electron lasers and synchrotrons (European XFEL, MAX IV)
 - Unprecedented X-ray source properties enable our broad and novel X-ray science, within our program, our international networks and interdisciplinary collaborations at the facilities
- Our scientific diversity and interdisciplinarity
 - Reveal fundamentally new information (atomic, molecular, chemical, and biological systems), with breadth and depth, with spectroscopy and scattering, with experiment and theory
- Our innovative spirit and curiosity
 - See things for first time, with new instruments, explore new paths, reveal new insight

Program priorities

(KoF24 report summary, Chapters 8-10)

Prio 1 (program): Attosecond non-linear X-ray science – “New dimensions to ESCA”

Explore new science in atomic, molecular, and optical physics, chemistry, catalysis, and biology using the unprecedented attosecond X-ray pulse properties at X-ray free-electron lasers (European XFEL)

Prio 2 (department): Instrumentation development platform

Keep and develop highly specialized expert personnel for the development of complex instrumentation to enable new science in advanced analysis with X-rays and lasers (*departmental priority*)

Prio 3 (faculty): Ultrafast X-rays for advanced analysis at UU (a graduate school and UL/BUL recruitments)

Demonstrate the impact of advanced analysis of matter and materials with short X-ray pulses for atomic resolution in space and time (with the combined use of the European XFEL and MAX IV)

