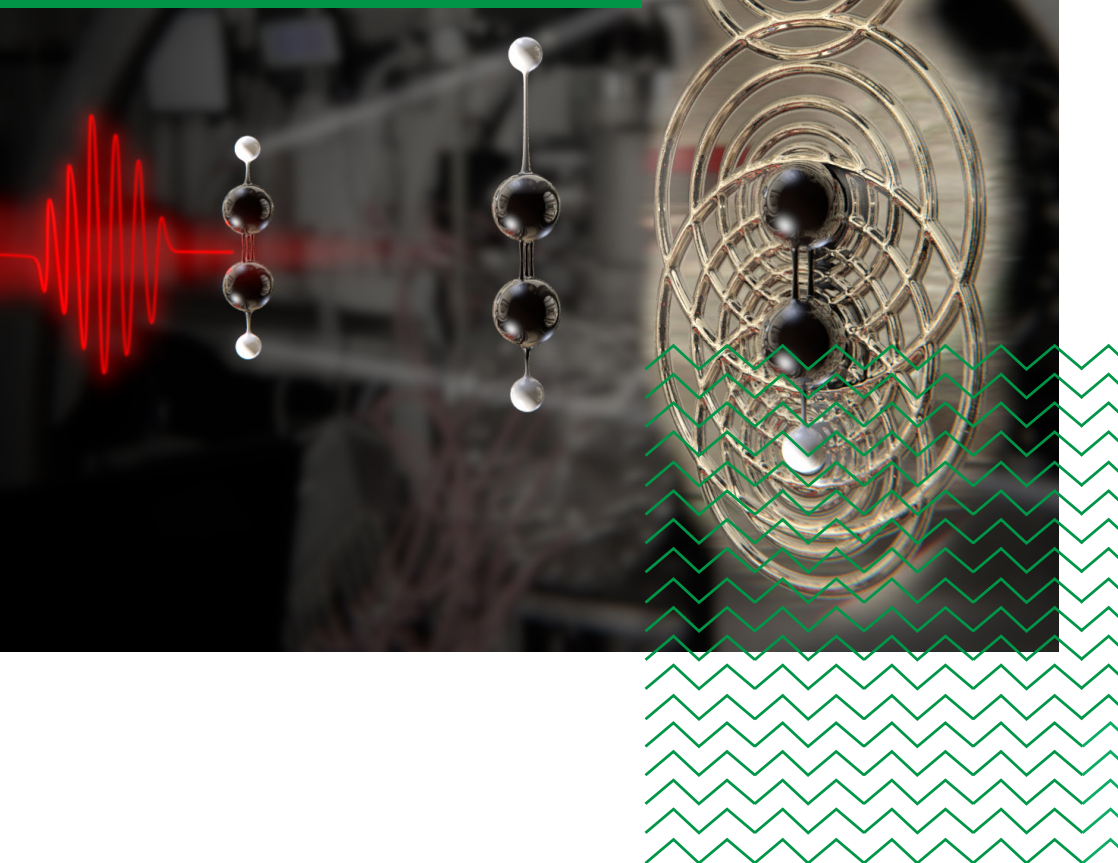

ICFO Schools on the Frontiers of Light

Attosecond science and extreme photonics

July 8 - 10th, 2019



Description

Attosecond pulses access the natural time scale of electronic motion, thus provide a first tool to study the dynamic behaviour of the quantum world. Not surprisingly, since the inception of attosecond pulse generation nearly two decades ago, the field has seen exponential growth and spectacular progress was made in studying the dynamics of atoms, molecules and solids. Presently, we are witnessing an amazing convergence of attosecond physics, ultrafast x-ray science and x-ray free-electron laser research to address fundamental problems across physics, chemistry and material science with revolutionary new tools and methodologies. Thus, the tremendous prospects and growth in these areas require the training of young scientists who will further advance these fields. The lectures of the ICFO School on Frontiers of Light will be held by renowned experts and pioneers of atomic and molecular physics, attosecond science, chemistry and solid state physics, who will cover the fundamentals as well as the cutting edge in both theory and experiment. Lectures and discussions will range from molecular imaging to high harmonic spectroscopy in solid state and to superconductivity.

Scientific Organising Committee is Prof. Jens Biegert (ICFO) , Prof. Maciej Lewenstein (ICFO) and Dr Robert Sewell (ICFO).

ICFO Schools on the Frontiers of Light aim at giving talented young researchers and students worldwide a first introduction to a thematic research area and a taste of an international research environment. Supported by the Ignacio Cirac Program Chair and the Fundació Catalunya - La Pedrera, ICFO Schools are open to a limited number of students, selected on the basis of academic merit.

Lecturers



Kenneth Schafer

Louisiana State University

Kenneth Schafer is the Ball Family Distinguished Professor of Physics at Louisiana State University. He has worked in strong field physics and attosecond science for more than two decades. His research emphasizes high performance computing, and theory done in close collaboration with ultrafast AMO experiments. He leads a multi-university theory/experiment consortium on the study of attosecond molecular charge migration. One of his main interests is attosecond transient absorption and the reshaping of ultrafast XUV radiation in strong fields. He is a Fellow of the American Physical Society and the Optical Society of America. He was a Fulbright Fellow at the Niels Bohr Institute and was awarded an Honorary Doctorate by Lund University, Sweden for his service to attosecond science.



Olga Smirnova

Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy

After her PhD in Physics at the Moscow State University in 2000, Olga Smirnova worked as Assistant Professor at the Moscow State University. She received the Lise-Meitner Fellowship of the Austrian Science Foundation and in 2003 moved to the Vienna Technical University, where she started her work in the field of attosecond physics. In 2005 she joined the National Research Council of Canada, and in 2006 was promoted to the tenured Research Officer position. In January 2009, she received Leibniz Competition Award of the Leibniz Association to start her research group at the Max-Born Institute (MBI), Berlin. In 2010, she received the Karl Scheel Prize of Physical Society of Berlin for her work on high harmonic spectroscopy. She received her tenured position at the MBI in September 2011, where she currently heads the Strong Field Theory Group. She also holds Full Professorship at the Berlin Technical University since 2016.



Misha Ivanov

Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy

Misha Ivanov is a head of Theory Department at the Max Born Institute for Nonlinear Optics in Berlin, Germany, and a Professor of Physics at the Humboldt University Berlin and the Imperial College London. His research interests include attosecond and strong field physics in atoms, molecules, dense gases, and solids, and the control of nonlinear matter response with light.



Stephen R. Leone

Departments of Chemistry and Physics and Lawrence Berkeley National Laboratory University of California, Berkeley.

Prof. Leone holds the John R. Thomas Endowed Chair in Physical Chemistry and

is Professor of Chemistry and Physics at the University of California, Berkeley and faculty principal investigator at Lawrence Berkeley National Laboratory. His research interests are ultrafast and attosecond laser investigations of atomic, molecular, and solid state dynamics in the XUV and X-ray. His group developed attosecond transient absorption together with Ferenc Krausz and extended the methodology to attosecond transient reflectivity, attosecond transient diffraction, and attosecond four-wave mixing. His laboratories explore electronic and vibrational superpositions, curve crossing dynamics and conical intersections, ring opening processes, photofragmentation, and singlet-to-triplet transitions, semiconductor band gap physics, polaron formation, charge transfer processes in solids, and phase changes in materials. He is a member of National Academy of Sciences and Fellow of the American Academy of Arts and Sciences and a recent recipient of the Ahmed Zewail Award of the American Chemical Society, the Irving Langmuir Award of the American Physical Society, and the Polanyi Medal of the Gas Kinetics Division of the Royal Society of Chemistry.



Giulio Vampa

Stanford PULSE Institute

Giulio received a PhD in Physics from the University of Ottawa in 2016 and is currently a postdoctoral scholar at the Stanford PULSE Institute. He is interested in the fundamentals

and applications of strong-field interactions in solids. His research encompasses strong-field physics, condensed matter physics and nanophotonics.



Hamed Merdji

Lasers, Interactions and Dynamics Laboratory, CEA

Hamed Merdji is Research Director at the LIDYL Laboratory, CEA Saclay. He leads the Ultrafast NanoPhotonics group dedicated to ultrafast lensless imaging and

more recently to the development of petahertz electronics in semiconductors and dielectrics (www.petacon.fr). He has opened a new lab facility, NanoLight dedicated to HHG in crystals generated by few optical cycles, CEP stable, mid-infrared lasers. Main applications of the lab will focus on elucidating attosecond electron dynamics in semiconductors and dielectrics using techniques such as electron/photon correlations and attosecond nanoscale imaging.



Jochen Küpper

Center for Free-Electron Laser Science, Hamburg

Jochen Küpper has pioneered methods to strongly control complex molecules in the gas phase, including the spatial separation of molecular species

and advanced methods of fixing these in space. These samples are exploited in experiments ranging from chemical reactivity studies to the atomic resolution imaging of ultrafast chemical dynamics. Recently, he has initiated the development of comparable methods for biological and artificial nanoparticles. Based on our own theory developments related to the molecular control, we have proposed novel approaches toward the creation, investigation, and control of molecular chirality. Jochen Küpper has a joined call as a group leader at Deutsches Elektronen-Synchrotron DESY and a professor of physics at Universität Hamburg; he is also a professor of chemistry and a principal investigator of the cluster of excellence 'Advanced Imaging of Matter' at Universität Hamburg.

Program

Monday 8th

09:00 - 09:45	Registration
09:45 - 10:00	Welcome
10:00 - 11:00	Lecture - Misha Ivanov <i>Bound states of a free electron and their manifestations: from atoms to dense gases</i>
11:00 - 11:30	Coffee break
11:30 - 12:30	Seminar - Misha Ivanov <i>Strong-field spectroscopy of phase transitions in solids</i>
12:30 - 13:30	Lunch
13:30 - 14:30	Lecture - Olga Smirnova <i>Strong field physics in chiral matter</i>

14:30 - 15:00	Coffee break
15:00 - 16:00	Seminar - Olga Smirnova <i>Synthetic chiral light for extremely efficient laser-controlled chiral discrimination</i>
16:00 - 16:30	Coffee break
16:30 - 17:30	Lecture - Hamed Merdji <i>Lensless Imaging using atto/femtosecond coherent X-ray sources</i>
17:30 - 19:00	Poster session -Nest Hall

Tuesday 9th

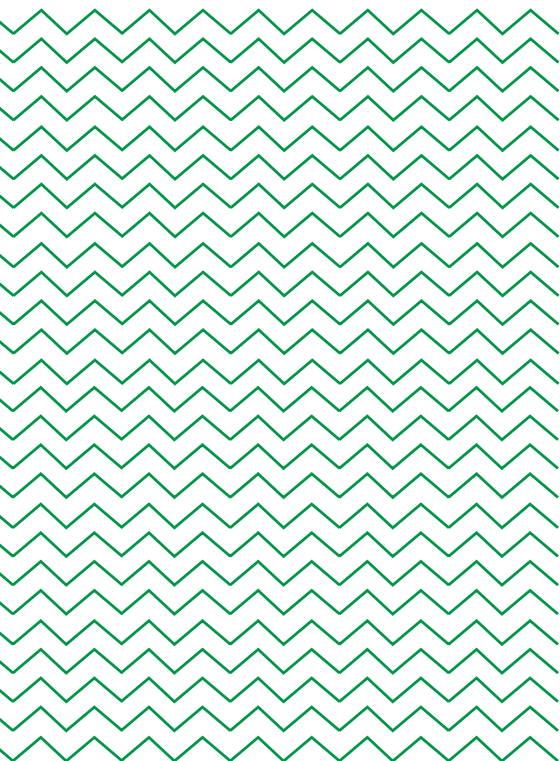
10:00 - 11:00	Lecture - Kenneth Schafer <i>Attosecond pulses in space and time</i>
11:00 - 11:30	Coffee Break
11:30 - 12:30	Seminar - Kenneth Schafer <i>Opto-optical modulation of XUV light</i>
12:30 - 13:30	Lunch
13:30 - 14:30	Lecture - Jochen Küpper <i>Imaging molecules with high energy photons and strong laser fields</i>

14:30 - 15:00	Coffee break
15:00 - 16:00	Seminar - Jochen Küpper <i>Imaging molecules with high energy photons and strong laser fields</i>
16:00 - 16:30	Coffee break
16:30 - 17:30	Seminar - Hamed Merdji <i>Lensless Imaging using atto/femtosecond coherent X-ray sources</i>
17:30 - 19:00	Lab Tours
19:00	Bus departs ICFO for restaurant
20:00	School dinner Xup Xup restaurant, Barcelona

Wednesday 10th

10:00 - 11:00	Lecture - Stephen R. Leone <i>An Attosecond X-Ray Revolution in Solid-State Dynamics</i>
11:00 - 11:30	Coffee break
11:30 - 12:30	Seminar - Stephen R. Leone <i>Attosecond Electron Dynamics in Solids</i>
12:30 - 13:30	Lunch
13:30 - 14:30	Lecture - Giulio Vampa <i>Solid-state high-harmonic generation as we know it</i>
14:30 - 15:00	Coffee break
15:00 - 16:00	Seminar - Giulio Vampa <i>Nano-scale control of solid-state high-harmonics</i>
16:00 - 16:30	Coffee Break
16:30 - 17:30	Round Table Discussion Moderators: Jens Biegert & Maciej Lewenstein <i>The future of Attosecond Science</i>

Lectures and Seminars will be held in the Auditorium.



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