

FEMTO 12



The Hamburg Conference on Femtochemistry

*Frontiers of ultrafast phenomena
in physics, chemistry, and biology*

HAMBURG, GERMANY

12th to 17th July, 2015

www.femto12.org





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Committees

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Hans Behringer (CUI)
Matthias Kreuzeder (DESY)
Terry Mullins (CFEL, DESY)
Barbora Vagovič (CFEL, DESY)

Welcome

Dear Colleagues,

Welcome to Hamburg, welcome to the Campus Bahrenfeld of DESY and Universität Hamburg, welcome to the Hamburg Centre for Ultrafast Imaging and the Center for Free-Electron Laser Science, for the 12th International Conference on Femtochemistry.

The series of Femtochemistry Conferences is unique in many aspects. It has the tradition of insightful and inspiring presentations of the latest developments in femtochemistry and femtobiology, paired with friendly, yet detailed, discussions. This year's program features nearly 40 invited talks as well as seven selected *hot topic* contributions, allowing for a fresh look at the newest developments in the field. 150 contributed posters and about 250 participants will allow for detailed discussion of all aspects of femtochemistry. We wish to encourage further exchange of ideas, bridging traditional boundaries, by dedicated *Discussion Sessions* at the end of the day. Here, chairpersons have the interesting challenge to summarize the day in a few minutes as well as to steer the hopefully lively and enthusiastic discussions into fruitful directions.

We are proud to present the *Leuchtturm* lecture by Nobel Laureate Ahmed Zewail. His public scientific lecture "Light and Enlightenment" on Monday evening will surely provide an insightful and stimulating overview of the field as well as its route into the future. It is open to all participants of the conference as well as the scientific public in Hamburg and Northern Germany. We anticipate this to also provide a wide dissemination of FEMTO12 and femtochemistry in general, far beyond its traditional boundaries.

In UNESCO's *International Year of Light* and twenty-two years after its inception in Berlin, this successful and stimulating conference series returns to Germany. This closes a circle, but hopefully only to open new ones. With the many opportunities on campus, the unique large-scale facilities of DESY and the excellent collaborative research centers, Hamburg is now pushing the frontiers of ultrafast science. We hope that the environment on campus and the conference will inspire each other beyond the next frontiers in femtochemistry – including the recording of the "molecular movie", propelling structural biology to single molecules, and light-induced material properties.

I am looking forward to an enjoyable and fruitful conference and wish you a fantastic and memorable stay at FEMTO12 and in Hamburg.



Dear Colleagues,

Welcome to Hamburg and welcome to the 12th International Conference on Femtochemistry!

The Center for Free-Electron-Laser Science (CFEL) and the Hamburg Centre for Ultrafast Imaging (CUI) are proud to be co-organisers and co-hosts of FEMTO12. During the past two decades the biennial Femtochemistry conference series has gained a highly regarded scientific reputation as an international platform where cutting edge concepts and research as well as new frontiers are discussed. Femtochemistry itself has opened up new directions and is exploring ultrafast processes in condensed matter and nano systems, in liquids and solutions, at interfaces and surfaces and in recent times more and more in molecular biology. This spirit of bridging of traditional fields and opening up new research directions in photon science is at the very heart of the two collaborative research centres CFEL and CUI. CFEL is a joint enterprise of DESY, the Max Planck Society and the University of Hamburg; CUI is a Cluster of Excellence at the University of Hamburg with its partners DESY, the Max Planck Society, the European Molecular Biology Laboratory and the European XFEL GmbH. Both initiatives bring together a variety of technologies and methodologies to investigate and understand dynamics in quantum physics, molecular biology and nano science.

We hope that you enjoy your stay in Hamburg and wish you a stimulating and successful conference!



Prof. Dr. Klaus Sengstock

Spokesperson of the Cluster of Excellence
The Hamburg Centre for Ultrafast Imaging



Prof. Dr. Robin Santra

Chairman of the Management Board
Center for Free-Electron Laser Science

Program

SUNDAY 12th JULY, 2015

18:00 – 20:00 Registration (CFEL Foyer, building 99)

18:30 – 20:00 Reception (CFEL Foyer, building 99)

MONDAY 13th JULY, 2015

08:45 – 09:15 Opening session - DESY Auditorium / Hörsaal

Session: Ultrafast Electron Diffraction - DESY Auditorium / Hörsaal

Chair: Jörn Manz

09:20 – 09:55 R. J. Dwayne Miller (Max-Planck-Institut für Struktur und Dynamik der Materie, Hamburg, Germany)

Mapping atomic motions with ultrabright electrons: The chemists' Gedanken experiment enters the lab frame

09:55 – 10:30 Martin Centurion (University of Nebraska, Lincoln, USA)

Ultrafast electron diffractive imaging with sub-Ångstrom resolution

10:30 – 11:05 O. Jom Luiten (Technische Universiteit Eindhoven, The Netherlands)

Ultracold electron beams for ultrafast diffraction of macromolecules

11:10 – 11:40 *coffee break - FEMTO12 tent*

Session: Reaction Dynamics (gas phase) - DESY Auditorium / Hörsaal

Chair: Luis Bañares

- 11:45 – 12:20 Chengyin Wu (Peking University, China)
Imaging molecular dynamics with laser-driven Coulomb explosion technique
- 12:20 – 12:55 Regina de Vivie-Riedle (LMU München, Germany)
Molecular features in complex environment: cooperative team players during excited state bond cleavage
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13:00 – 14:10 *lunch - FEMTO12 tent*

Session: Reaction Dynamics (gas phase) - DESY Auditorium / Hörsaal

Chair: Tim Laarman

- 14:15 – 14:50 Ágnes Vibók (University of Debrecen, Hungary)
Direct signature of light-induced conical intersections
- 14:50 – 15:25 Henrik Stapelfeldt (Aarhus University, Denmark)
Rotational dynamics of molecules in He nanodroplets induced and probed by laser pulses
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15:30 – 15:50 Discussion - DESY Auditorium / Hörsaal

Chair: Markus Drescher

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- 15:50 – 16:20 *coffee break - FEMTO12 tent*
- 16:30 – 18:00 CFEL and DESY Tours - Tour meeting point**
- 18:00 – 18:20 *Refreshments & Pretzels - FEMTO 12 tent*
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- 18:30 – 19:30 Leuchtturm "Tower of Light" lecture - DESY Auditorium / Hörsaal**
Ahmed Zewail (Caltech, Pasadena, CA, USA)
Light and Enlightenment

TUESDAY 14th JULY, 2015

Session: Coherent Control - DESY Auditorium / Hörsaal

Chair: Marcos Dantus

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| 08:45 – 09:20 | Leticia González (Universität Wien, Austria)
<i>Chemical implications of spin</i> |
| 09:20 – 09:55 | Matthias Wollenhaupt (Carl von Ossietzky Universität Oldenburg, Germany)
<i>Coherent control of ultrafast electron dynamics</i> |
| 09:55 – 10:30 | Kenji Ohmori (National Institutes of Natural Sciences, Okazaki, Japan)
<i>Direct observation of ultrafast quantum many-body dynamics in a strongly-correlated ultracold Rydberg gas</i> |
| 10:30 – 11:05 | Niels E. Henriksen (Technical University of Denmark, Copenhagen, Denmark)
<i>Coherent control in the weak- and strong-field limits</i> |
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| 11:10 – 11:40 | <i>coffee break - FEMTO12 tent</i> |
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Session: Chemical Dynamics - DESY Auditorium / Hörsaal

Chair: Christian Bressler

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|---------------|---|
| 11:45 – 12:20 | Villy Sundström (Lund University, Sweden)
<i>Dynamics of electrons at work in solar energy conversion</i> |
| 12:20 – 12:55 | Stefan Lochbrunner (Universität Rostock, Germany)
<i>Electronic dynamics in photocatalytic and energy transporting systems</i> |
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| 13:00 – 14:10 | <i>lunch - FEMTO12 tent</i> |
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Session: Salvation Phenomena - DESY Auditorium / Hörsaal

Chair: Roseanne Sension

14:15 – 14:50 Bernd Abel (IOM Leipzig, Germany)
Ultrafast electron spectroscopy at liquid interfaces

14:50 – 15:25 Huib J. Bakker (FOM-AMOLF, Amsterdam, The Netherlands)
Water structure at hydrophobic surfaces probed with surface sum-frequency generation

15:30 – 15:50 Discussion - DESY Auditorium / Hörsaal

Chair: Wilfried Wurth

15:50 – 16:20 *coffee break - FEMTO12 tent*

16:30 – 19:00 Poster session 1 - FEMTO12 tent

WEDNESDAY 15th JULY, 2015

Session: Hot Topic - DESY Auditorium / Hörsaal

Chair: Franz Kärtner

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|---------------|---|
| 08:45 – 09:05 | Taro Sekikawa (Hokkaido University, Sapporo, Japan)
<i>Ring-opening dynamics of 1,3-cyclohexadiene studied by time-resolved molecular orbital spectroscopy</i> |
| 09:05 – 09:25 | Heide Ibrahim (INRS, Varennes, QC, Canada)
<i>Tabletop imaging of structural evolutions in chemical reactions</i> |
| 09:25 – 09:45 | Andrew Attar (University of California, Berkeley, CA, USA)
<i>Probing transition states in photodissociation reactions by femtosecond XUV transient absorption</i> |
| 09:45 – 10:05 | Marlene Adrian (Universität Kassel, Germany)
<i>Lattice dynamics in few-layer molybdenum disulfide investigated by ultrafast electron diffraction</i> |
| 10:05 – 10:25 | Jan Wahl (Goethe-Universität Frankfurt am Main, Germany)
<i>Vibrationally coherent transfer in an electronically decoupled DTE-BODIPY dyad investigated by pump-probe experiments and theoretical modeling</i> |
| 10:25 – 10:45 | Annemarie Huijser (University of Twente, Enschede, The Netherlands)
<i>A new photophysical insight into high turn over numbers for H₂ generation in Ru(II)-polypyridine-Pt(II) photocatalytic complexes</i> |
| 10:45 – 11:05 | Jukka Aumanen (University of Jyväskylä, Finland)
<i>Nonlinear photo-oxidation and femtosecond FWM imaging of graphene</i> |
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- 11:10 – 11:40 *coffee break - FEMTO12 tent*

Session: Reaction Dynamics (solution) - DESY Auditorium / Hörsaal

Chair: Oriol Vendrell

- 11:45 – 12:20 Tobias Brixner (Universität Würzburg, Germany)
Sensitive Ultrafast Spectroscopy
- 12:20 – 12:55 Kevin Kubarych (University of Michigan, MI, USA)
Ultrafast dynamics of carbon dioxide reduction photocatalysts studied with equilibrium and transient two-dimensional infrared spectroscopy

13:00 – 14:10 *lunch - FEMTO12 tent*

Session: Reaction Dynamics (solution) - DESY Auditorium / Hörsaal

Chair: Nils Huse

- 14:15 – 14:50 Toshinori Suzuki (Kyoto University, Japan)
Electronic Dynamics in Aqueous Solutions Studied by Ultrafast UV Photoemission and XAS Spectroscopy
- 14:50 – 15:25 Philippe Wernet (Helmholtz-Zentrum Berlin, Germany)
Orbital-specific mapping of the ligand exchange dynamics of $\text{Fe}(\text{CO})_5$ in solution

15:30 – 15:50 Discussion - DESY Auditorium / Hörsaal

Chair: Simone Techert

15:50 – 16:20 *coffee break - FEMTO12 tent*

16:30 – 18:30 **Social Program - Guided Boat Tour to Hamburg Harbour**

19:00 – 22:30 **Conference Dinner**
Restaurant *Altonaer Kassepeicher*
Große Elbstraße 279, 22767 Hamburg

THURSDAY 16th JULY, 2015

Session: Ultrafast Electron Dynamics - DESY Auditorium / Hörsaal

Chair: Volker Engel

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| 08:45 – 09:20 | Hans Jakob Wörner (ETH Zürich, Switzerland)
<i>Measurement and control of attosecond charge migration</i> |
| 09:20 – 09:55 | Fernando Martín (Universidad Autonoma de Madrid, Spain)
<i>Deciphering attosecond molecular dynamics with pump-probe schemes</i> |
| 09:55 – 10:30 | Francesca Calegari (IFN - CNR, Milano, Italy)
<i>Investigation of XUV-induced ultrafast electron dynamics in complex molecules</i> |
| 10:30 – 11:05 | Artem Rudenko (Kansas State University, Manhattan, USA)
<i>Electron transfer between the fragments of a dissociating molecule</i> |
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| 11:10 – 11:40 | <i>coffee break - FEMTO12 tent</i> |
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Session: Biochemistry - DESY Auditorium / Hörsaal

Chair: Dongping Zhong

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| 11:45 – 12:20 | Thomas Elsaesser (Max-Born-Institut, Berlin, Germany)
<i>Hydration of phospholipids and the DNA backbone studied by femtosecond 2D-infrared spectroscopy</i> |
| 12:20 – 12:55 | Damien Laage (École Normale Supérieure, Paris, France)
<i>Water dynamics in the vicinity of proteins and DNA</i> |
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| 13:00 – 14:10 | <i>lunch - FEMTO12 tent</i> |
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Session: Biology - DESY Auditorium / Hörsaal

Chair: Arwen Pearson

- 14:15 – 14:50 Philip Anfinrud (National Institute of Health, Bethesda, MD, USA)
Picosecond photobiology: Watching a signaling protein function in real time via time-resolved x-ray diffraction and solution scattering
- 14:50 – 15:25 Richard Cogdell (University of Glasgow, UK)
The energy transfer events taking place with a purple bacterial LH2 complex

15:30 – 15:50 Discussion - DESY Auditorium / Hörsaal

Chair: Jochen Schneider

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- 15:50 – 16:20 *coffee break - FEMTO12 tent*
- 16:30 – 19:00 **Poster session 2 - FEMTO12 tent**

FRIDAY 17th JULY, 2015

Session: Surface Femtochemistry - DESY Auditorium / Hörsaal

Chair: Andreas Stierle

08:45 – 09:20	Martina Dell'Angela (Elettra Sincrotrone Trieste, Italy) <i>Ultrafast surface chemistry and catalysis with an x-ray laser</i>
09:20 – 09:55	Hrvoje Petek (University of Pittsburgh, PA, USA) <i>Electron dynamics at surfaces</i>
09:55 – 10:30	Keith A. Nelson (MIT, Cambridge, MA, USA) <i>Nonlinear THz spectroscopy of molecules and materials</i>
10:30 – 11:05	Mischa Bonn (Max-Planck-Institut für Polymerforschung, Mainz, Germany) <i>Ultrafast charge carrier dynamics in graphene and graphene nanoribbons</i>
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11:10 – 11:40	<i>coffee break - FEMTO12 tent</i>

Session: Catalysis - DESY Auditorium / Hörsaal

Chair: Wojciech Gawelda

11:45 – 12:20	F. M. F. (Frank) de Groot (Universiteit Utrecht, The Netherlands) <i>Femtosecond x-ray spectroscopy in catalysis?</i>
12:20 – 12:55	Majed Chergui (EPFL Lausanne, Switzerland) <i>Charge transport, trapping and decay in metal oxides</i>
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13:00 – 14:10	<i>lunch - FEMTO12 tent</i>

Session: Imaging from Electrons to Proteins - DESY Auditorium / Hörsaal

Chair: Terry Mullins

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| 14:15 – 14:50 | Peter Vöhringer (Universität Bonn, Germany)
<i>Ultrafast solvated electron dynamics in liquids and supercritical fluid</i> |
| 14:50 – 15:25 | Arnaud Rouzée (Max-Born-Institut, Berlin, Germany)
<i>Clusters in intense XUV and NIR pulses</i> |
| 15:25 – 16:00 | Henry Chapman (CFEL, DESY, Universität Hamburg, Germany)
<i>Imaging macromolecules using X-ray free-electron lasers</i> |

16:00 – 16:30 Discussion - DESY Auditorium / Hörsaal

Chair: Angel Rubio

Departure

General Information

Conference venue

Campus Hamburg-Bahrenfeld / DESY, 12th to 17th July, 2015
(see campus map, inside front cover)

Main entrance - Notkestrasse 85, 22607 Hamburg, Germany

Side entrance - Luruper Chaussee 149, 22761 Hamburg, Germany

The side entrance is opened for motorists from Monday to Friday 06:00 to 19:00h, and closed on weekends. It is accessible to pedestrians and cyclists constantly, although after 19:00h you will need to ring the bell next to the gate and state your destination to the porter via the intercom.

Lectures & Posters

The lecture hall is located in building 5 in the DESY Auditorium / *Hörsaal*.

Poster presentations are organised in two blocks and both will be located in the FEMTO12 tent.

Tuesday - 14th July, 2015 (16:30–18:00h)

Thursday - 16th July, 2015 (16:30–18:00h)

All posters will be on display throughout the entire duration of the conference. Posters with designation "P1-#" will be presented during the Tuesday poster session, posters with designation "P2-#" during the Thursday poster session. All posters will be put up by the organizers and can be dropped off at the registration desk beginning Monday morning, 13th July.

Registration and Information desk

Sunday 12th July, 2015 18:00 – 20:00 (CFEL Foyer, building 99)

Monday to Friday 13th July to 17th July, 2015 from 08:00 (Auditorium Foyer, building 6)
tel: +49 40 8998 3636

Catering

Morning & afternoon tea/coffee as well as lunch will be served in the FEMTO12 tent.

Supermarkets & Restaurants

- LIDL (Supermarket) - Osdorfer Landstr. 8–10, 22607 Hamburg
From the main gate at Notkestrasse turn right and follow the street (550 m).
- PENNY (Supermarket) - Osdorfer Landstr. 2, 22607 Hamburg
From the main gate at Notkestrasse walk straight down the street “Zum Hünengrab” (500 m). The supermarket is located on the right side before the main intersection to Osdorfer Landstrasse. There is a bakery and other shops on the left side.
- BUDNIKOWSKI (Drug store) - Osdorfer Weg 106, 22607 Hamburg
From the main gate at Notkestrasse walk straight down the street “Zum Hünengrab”, on the main crossing (with Osdorfer Landstrasse) turn left and follow the street “Osdorfer Weg” (550 m). The Drug Store is on the left side.
- APOTHEKE an der Osdorfer Landstrasse (Pharmacy) - Osdorfer Landstr. 112, 22607 Hamburg
From the main gate at Notkestrasse turn right and follow the street “Notkestrasse” to the main crossing with Osdorfer Landstrasse. Turn right and follow the street “Osdorfer Landstrasse “ (1400 m). The Pharmacy is on the right hand side of the street.
- Restaurant Mahlzeit, Albert-Einstein-Ring 8
- Restaurant Hotel Mercure, Albert-Einstein-Ring 2
- L’italiano Bistro & Vinoteca, corner Osdorfer Landstrasse / Zum Hünengrab opposite to Flottbeker Marktplatz
- Restaurant Samarkand, Notkestraße 2
- L’incontro – Il Bistro, Ebertallee 232
- Ristorante Tre Posi, Bahrenfelder Chaussee 178

Smoking policy

FEMTO12 is a non-smoking venue.

Name badges and security

All delegates will receive a name badge upon registration. It must be worn visibly to obtain entry to all conference sessions, including social events.

Banking facilities - ATM

An ATM is located in the Foyer of the DESY canteen (building 9).

Internet access /WLAN

Free Wi-Fi access is offered throughout all buildings on campus.

1. Name: FEMTO12
2. (WPA / WPA2-PSK) Password: LVtwbs4W2

Emergency contact

DESY emergency number: 2500 (+49 40 8998 2500)

General emergency: 112

Tourist information

Hamburg tourism - <http://english.hamburg.de/tourist-information>

Public transport - for details on tickets, timetables, lines, etc. see the homepage of the Hamburg Transport Association (Hamburger Verkehrsverbund) <http://www.hvv.de>.

Travel information

The closest stops to DESY Campus are:

- Bus stop "Zum Hünengrab/DESY" - bus line M1 (close to Main entrance)
- Bus stop "Luruper Chaussee/DESY" - bus line M2 (close to Side entrance)
- Bus stop "Trabrennbahn" - bus line M3 (close to Side entrance)
- S-Bahn (city train) station "Othmarschen" - S1, S11

For detailed information on how to reach DESY, see

<https://www.femto12.org/venue>.

Exhibitors and Supporters



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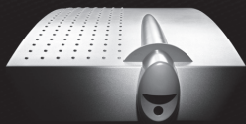
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Femtochemistry



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Time	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
8:45		Welcome <i>Chair: Jochen Küpper</i> <ul style="list-style-type: none">• Katharina Fegebank• Claudia Leopold• Helmut Dosch	Coherent Control <i>Chair: Marcos Dantus</i> <ul style="list-style-type: none">• Leticia González• Matthias Wollenhaupt• Kenji Ohmori• Niels Henriksen	Hot Topic session <i>Chair: Franz Kärtner</i> <ul style="list-style-type: none">• Taro Sekikawa• Heide Ibrahim• Andrew Attar• Marlene Adrian• Jan Wahl• Annemarie Huijser• Jukka Aumanen	Ultrafast Electron Dynamics <i>Chair: Volker Engel</i> <ul style="list-style-type: none">• Hans Jakob Wörner• Fernando Martín• Francesca Calegari• Artem Rudenko	Surface Femtochemistry <i>Chair: Andreas Stierle</i> <ul style="list-style-type: none">• Martina Dell’Angela• Hrvoje Petek• Keith Nelson• Mischa Bonn
9:20		Ultrafast Electron Diffraction <i>Chair: Jörn Manz</i> <ul style="list-style-type: none">• Dwayne Miller• Martin Centurion• Jom Luiten				
11:10		Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break
11:45		Reaction Dynamics (gas-phase) <i>Chair: Luis Bañares</i> <ul style="list-style-type: none">• Chengyin Wu• Regina de Vivie-Riedle	Chemical Dynamics <i>Chair: Christian Bressler</i> <ul style="list-style-type: none">• Villy Sundström• Stefan Lochbrunner	Reaction Dynamics (solution) <i>Chair: Oriol Vendrell</i> <ul style="list-style-type: none">• Tobias Brixner• Kevin Kubarych	Biochemistry <i>Chair: Dongping Zhong</i> <ul style="list-style-type: none">• Thomas Elsaesser• Damien Laage	Catalysis <i>Chair: Wojciech Gawelda</i> <ul style="list-style-type: none">• Frank de Groot• Majed Chergui
13:00		Lunch	Lunch	Lunch	Lunch	Lunch
14:15		Reaction Dynamics (gas-phase) <i>Chair: Tim Laermann</i> <ul style="list-style-type: none">• Ágnes Vibók• Henrik Stapelfeldt	Solvation Phenomena <i>Chair: Roseanne Sension</i> <ul style="list-style-type: none">• Bernd Abel• Huib Bakker	Reaction Dynamics (solution) <i>Chair: Nils Huse</i> <ul style="list-style-type: none">• Toshinori Suzuki• Philippe Wernet	Biology <i>Chair: Arwen Pearson</i> <ul style="list-style-type: none">• Philip Anfinrud• Richard Cogdell	Imaging from Electrons to Proteins <i>Chair: Terry Mullins</i> <ul style="list-style-type: none">• Peter Vöhringer• Arnaud Rouzée• Henry Chapman Discussion <i>Chair: Angel Rubio</i>
15:30		Discussion <i>Chair: Markus Drescher</i>	Discussion <i>Chair: Wilfried Wurth</i>	Discussion <i>Chair: Simone Teschert</i>	Discussion <i>Chair: Jochen Schneider</i>	
15:50		Coffee Break	Coffee Break	Coffee Break	Coffee Break	
16:30		Tours	Poster Session 1	Social program	Poster Session 2	
18:00	Registration	Refreshments and pretzels				
18:30	Reception (Registration continues)	Leuchtturm lecture: <ul style="list-style-type: none">• Ahmed Zewail				
19:00						
19:30						
late				Conference Dinner		