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GORDON RESEARCH CONFERENCES *frontiers of science*

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Nancy Ryan Gray, Ph.D.
Director

**2012 GORDON RESEARCH CONFERENCE
on MULTIPHOTON PROCESSES**

FINAL PROGRESS REPORT

DEPARTMENT OF ENERGY
GRANT NO. DE-SC0008186

The Gordon Research Conference on MULTIPHOTON PROCESSES was held at Mount Holyoke College, South Hadley, Massachusetts, June 3 - 8, 2012. The Conference was well-attended with 121 participants (attendees list attached). The attendees represented the spectrum of endeavor in this field coming from academia, industry, and government laboratories, both U.S. and foreign scientists, senior researchers, young investigators, and students. Of the 121 attendees, 23 voluntarily responded to a general inquiry regarding ethnicity which appears on our registration forms. Of the 23 respondents, 21% were Minorities – 4% Hispanic, 17% Asian and 0% African American. Approximately 20% of the participants at the 2012 meeting were women.

In designing the formal speakers program, emphasis was placed on current unpublished research and discussion of the future target areas in this field. There was a conscious effort to stimulate lively discussion about the key issues in the field today. Time for formal presentations was limited in the interest of group discussions. In order that more scientists could communicate their most recent results, poster presentation time was scheduled. Attached is a copy of the formal schedule and speaker program and the poster program. In addition to these formal interactions, "free time" was scheduled to allow informal discussions. Such discussions are fostering new collaborations and joint efforts in the field.

Thank you for your support of this Conference. As you know, in the interest of promoting the presentation of unpublished and frontier-breaking research, Gordon Research Conferences does not permit publication of meeting proceedings. If you wish any further details, please feel free to contact me. Thank you.

Sincerely,
David Villeneuve, Conference Chairperson
NATIONAL RESEARCH COUNCIL

Multiphoton Processes
Attoseconds, Intense Fields, and Ultrafast Imaging

June 3-8, 2012

Mount Holyoke College
South Hadley, MA

Chair:

David Villeneuve

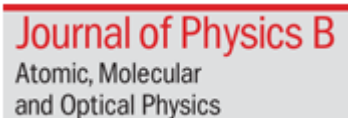
Vice Chair:

Barry C. Walker

The 16th Gordon Research Conference on Multiphoton Processes will take place at a new venue, Mount Holyoke College. The field has progressed considerably since the first meeting, and so the conference topics have adapted as exciting new research areas open up. The scientific program is cross-disciplinary, including physicists, chemists and optical engineers, in both theory and experiment. The speakers and discussion leaders are a mixture of established leaders in the field and young and upcoming researchers from around the world. The sessions will focus on:

- Attosecond science
- Strong-field processes in molecules and solids
- Generation of harmonics and attosecond pulses
- Free-electron laser experiments and theory
- Ultrafast imaging
- Applications of very high intensity lasers
- Propagation of intense laser fields

Contributors





SUNDAY

2:00 pm - 9:00 pm	Arrival and Check-in (Office Closed 6:00 pm - 7:00 pm)
6:00 pm	Dinner
7:30 pm - 7:40 pm	Welcome / Introductory Comments by GRC Site Staff
7:40 pm - 9:30 pm	Poster Previews
	Discussion Leader: Barry Walker (University of Delaware, USA)
7:40 pm - 9:30 pm	Poster Previews: 2 minute presentation by each poster contributor.
9:30 pm - 11:30 pm	Wine and cheese reception

MONDAY

7:30 am - 8:30 am	Breakfast
8:45 am	Group Photo
9:00 am - 12:30 pm	Attosecond Electron Dynamics
9:00 am - 9:15 am	Discussion Leader: Dimitrios Charalambidis (IESL-FORTH, Greece)
9:15 am - 9:50 am	Mette Gaarde (Louisiana State University, USA) "Theory of attosecond transient absorption"
9:50 am - 10:00 am	Discussion
10:00 am	Coffee Break
10:30 am - 11:05 am	Eleftherios Goulielmakis (MPQ, Garching, Germany) "Attosecond transient absorption"
11:05 am - 11:15 am	Discussion
11:15 am - 11:25 am	Guillaume Laurent (Kansas State University, USA) "Hot Topic: Attosecond control of orbital parity mix interferences"
11:25 am - 11:30 am	Discussion
11:30 am - 11:40 am	Gopal Dixit (CFEL, Hamburg, Germany) "Hot Topic: Imaging electronic quantum motion with light"
11:40 am - 11:45 am	Discussion
11:45 am - 12:20 pm	Olga Smirnova (Max Born Institute, Berlin, Germany) "Attosecond multielectron dynamics in tunnel ionization"
12:20 pm - 12:30 pm	Discussion
12:30 pm	Lunch
1:30 pm - 4:00 pm	Free Time
4:00 pm - 6:00 pm	<u>Poster Session</u> (Optional)

6:00 pm	Dinner
7:30 pm - 9:30 pm	Electron Dynamics in Strong Fields
7:30 pm - 7:45 pm	Discussion Leader: Andreas Becker (JILA / University of Colorado, USA)
7:45 pm - 8:15 pm	Reinhard Dörner (Goethe-Universität Frankfurt, Germany) "Interference and electron entanglement in molecular photoionization"
8:15 pm - 8:20 pm	Discussion
8:20 pm - 8:50 pm	Chris Greene (JILA / University of Colorado, USA) "Transient absorption spectroscopy of laser-dressed helium autoionizing states"
8:50 pm - 8:55 pm	Discussion
8:55 pm - 9:25 pm	Matthias Kling (Kansas State University, USA) "Imaging of correlated electron emission"
9:25 pm - 9:30 pm	Discussion
9:30 pm - 11:30 pm	<u>Poster Session</u>

TUESDAY

7:30 am - 8:30 am	Breakfast
9:00 am - 12:30 pm	Above Threshold Ionization and Photoelectrons
9:00 am - 9:15 am	Discussion Leader: Johan Mauritsson (Lund University, Sweden)
9:15 am - 9:50 am	Arnaud Rouzee (AMOLF, Netherlands) "ATI with far infrared sources"
9:50 am - 10:00 am	Discussion
10:00 am	Coffee Break
10:30 am - 11:05 am	Cosmin Blaga (Ohio State University, USA) "Molecular imaging with recollision electrons"
11:05 am - 11:15 am	Discussion
11:15 am - 11:25 am	Patrick Grugan (University of Delaware, USA) "Hot Topic: Validity of the dipole approximation for the bound-state interaction in ultrastrong fields"
11:25 am - 11:30 am	Discussion
11:30 am - 11:40 am	Lauge Christensen (Aarhus University, Denmark) "Hot Topic: Femtosecond x-ray induced electron diffraction from aligned molecules"
11:40 am - 11:45 am	Discussion
11:45 am - 12:20 pm	Peter Hommelhoff (MPQ, Garching, Germany) "Above-threshold photoemission and strong-field physics with a nanometric metal tip"
12:20 pm - 12:30 pm	Discussion
12:30 pm	Lunch

1:30 pm - 4:00 pm	Free Time
4:00 pm - 6:00 pm	<u>Poster Session</u> (Optional)
6:00 pm	Dinner
7:30 pm - 9:30 pm	Strong Fields and XUV Sources
7:30 pm - 7:45 pm	Discussion Leader: Chang Hee Nam (KAIST, Korea)
7:45 pm - 8:15 pm	François Légaré (INRS-EMT, Canada) "Intense CEP stable few-cycle IR laser pulses for ultrafast X-ray science"
8:15 pm - 8:20 pm	Discussion
8:20 pm - 8:50 pm	Henry Kapteyn (JILA / University of Colorado, USA) "High harmonic generation to the water window"
8:50 pm - 8:55 pm	Discussion
8:55 pm - 9:25 pm	Lars Bojer Madsen (Aarhus University, Denmark) "Strong field ionization of molecules"
9:25 pm - 9:30 pm	Discussion
9:30 pm - 11:30 pm	<u>Poster Session</u>

WEDNESDAY

7:30 am - 8:30 am	Breakfast
9:00 am - 12:30 pm	High Harmonic Spectroscopy
9:00 am - 9:15 am	Discussion Leader: Jiro Itatani (University of Tokyo, Japan)
9:15 am - 9:50 am	Markus Guehr (Stanford University, USA) "HHG with molecules"
9:50 am - 10:00 am	Discussion
10:00 am	Coffee Break
10:30 am - 11:05 am	Caterina Vozzi (Politecnico di Milano, Italy) "HHG with molecules"
11:05 am - 11:15 am	Discussion
11:15 am - 11:25 am	Kyung Taec Kim (NRC/University of Ottawa, Canada) "Hot Topic: The characterization of attosecond pulses in space and time"
11:25 am - 11:30 am	Discussion
11:30 am - 11:40 am	Ming-Fu Lin (UC Berkeley and LBNL, USA) "Hot Topic: Molecular orbital dynamics probed by XUV transient absorption spectroscopy"
11:40 am - 11:45 am	Discussion
11:45 am - 12:20 pm	Chii-Dong Lin (Kansas State University, USA) "Quantitative rescattering theory"
12:20 pm - 12:30 pm	Discussion
12:30 pm	Lunch
1:30 pm - 4:00 pm	Free Time

4:00 pm - 6:00 pm	<u>Poster Session</u> (Optional)
6:00 pm	Dinner
7:00 pm - 7:30 pm	<u>Business Meeting</u> <i>Nominations for the next Vice Chair; Fill out Conference Evaluation Forms; Discuss future Site & Scheduling preferences; Election of the next Vice Chair</i>
7:30 pm - 9:30 pm	Imaging with X-rays
7:30 pm - 7:50 pm	Discussion Leader: Chris Jacobsen (Argonne National Lab)
7:50 pm - 8:30 pm	Adam Hitchcock (McMaster University, Canada) "Chemically sensitive imaging with soft X-rays"
8:30 pm - 8:40 pm	Discussion
8:40 pm - 9:20 pm	John Spence (Arizona State University, USA) "Femtosecond X-ray protein nanocrystallography"
9:20 pm - 9:30 pm	Discussion
9:30 pm - 11:30 pm	<u>Poster Session</u>

THURSDAY

7:30 am - 8:30 am	Breakfast
9:00 am - 12:30 pm	Photoionization Delay
9:00 am - 9:15 am	Discussion Leader: Paul Hockett (National Research Council, Canada)
9:15 am - 9:50 am	Claudio Cirelli (ETH Zurich, Switzerland) "Delay in tunnel ionization"
9:50 am - 10:00 am	Discussion
10:00 am	Coffee Break
10:30 am - 11:05 am	Marcus Dahlstrom (Stockholm University, Sweden) "Theory of attosecond delays in laser-assisted photoionization"
11:05 am - 11:15 am	Discussion
11:15 am - 11:25 am	Thushani Herath (Wayne State University, USA) "Hot Topic: Strong field ionization rate depends on the sign of the magnetic quantum number"
11:25 am - 11:30 am	Discussion
11:30 am - 11:40 am	Jens Nielsen (Aarhus University, Denmark) "Hot Topic: Alignment of molecules in helium droplets"
11:40 am - 11:45 am	Discussion
11:45 am - 12:20 pm	Martin Schultze (MPQ, Garching, Germany) "Attosecond delay in photoionization"
12:20 pm - 12:30 pm	Discussion
12:30 pm	Lunch
1:30 pm - 4:00 pm	Free Time

4:00 pm - 6:00 pm	<u>Poster Session</u> (Optional)
6:00 pm	Dinner
7:30 pm - 9:30 pm	Free Electron Laser Experiments
7:30 pm - 7:45 pm	Discussion Leader: John Costello (Dublin City University, Ireland)
7:45 pm - 8:15 pm	Li Fang (Western Michigan University) "Double-core-hole spectroscopy for chemical analysis"
8:15 pm - 8:20 pm	Discussion
8:20 pm - 8:50 pm	Nina Rohringer (CFEL, Hamburg, Germany)
8:50 pm - 8:55 pm	Discussion
8:55 pm - 9:25 pm	Kiyoshi Ueda (Tohoku University, Japan) "Multiphoton processes of atoms, molecules and clusters by intense FEL pulses"
9:25 pm - 9:30 pm	Discussion
9:30 pm - 11:30 pm	<u>Poster Session</u>

FRIDAY

7:30 am - 8:30 am	Breakfast
9:00 am	Departure

Multiphoton Processes (2012)

Name	Organization	Participation	Status
AMELIE, FERRE	CELIA	Poster Presenter	Registered
ANDERSON, NEIL	SEMROCK, INC	Attendee	Registered
ARISSIAN, LADAN	UNIVERSITY OF NEW MEXICO	Poster Presenter	Registered
BASET, FARHANA	UNIVERSITY OF OTTAWA	Poster Presenter	Registered
BECKER, ANDREAS	JILA - UNIVERSITY OF COLORADO	Discussion Leader	Registered
BERTRAND, JULIEN B.	UNIVERSITY OF OTTAWA	Poster Presenter	Registered
BHARDWAJ, SIDDHARTH	MASSACHUSETTS INSTITUTE OF TECHNOLOGY	Attendee	Registered
BHARDWAJ, RAVI V	UNIVERSITY OF OTTAWA	Attendee	Registered
BIAN, XUEBIN	UNIVERSITE DE SHERBROOKE	Poster Presenter	Registered
BLAGA, COSMIN I	OHIO STATE UNIVERSITY	Speaker	Registered
CHARALAMBIDIS, DIMITRIOS	UNIVERSITY OF CRETE AND FO.R.T.H.	Discussion Leader	Registered
CHARLES, HANDSCHIN	CELIA, UNIVERSITÉ BORDEAUX1	Poster Presenter	Registered
CHELKOWSKI, SZCZEPAN	UNIVERSITE DE SHERBROOKE	Poster Presenter	Registered
CHRISTENSEN, LAUGE	AARHUS UNIVERSITY	Poster Presenter	Registered
CHU, WEI-CHUN	KANSAS STATE UNIVERSITY	Poster Presenter	Registered
CIAPPINA, MARCELO F	ICFO - THE INSTITUTE OF PHOTONIC SCIENCES	Poster Presenter	Registered
CIRELLI, CLAUDIO	ETH ZURICH	Speaker	Registered
CORKUM, PAUL	NATIONAL RESEARCH COUNCIL OF CANADA	Attendee	Registered
COSTELLO, JOHN	DUBLIN CITY UNIVERSITY	Discussion Leader	Registered
CRYAN, JAMES P	LAWRENCE BERKELEY NATIONAL LABORATORY	Poster Presenter	Registered
DAHLSTROM, MARCUS	STOCKHOLM UNIVERSITY	Speaker	Registered
DIMITROVSKI, DARKO	AARHUS UNIVERSITY	Poster Presenter	Registered
DING, XIAOYAN	UNIVERSITY OF OTTAWA, NRC CANADA	Poster Presenter	Registered
DIXIT, GOPAL	CENTER FOR FREE-ELECTRON LASER SCIENCE, DESY	Poster Presenter	Registered
DORNER, REINHARD	GOETHE UNIVERSITY FRANKFURT	Speaker	Registered
DREISSIGACKER, INGO	LEIBNIZ UNIVERSITAET HANNOVER	Poster Presenter	Registered
EKANAYAKE, NAGITHA	UNIVERSITY OF DELAWARE	Poster Presenter	Registered
FANG, LI	STANFORD UNIVERSITY	Speaker	Registered
FERNANDES, GUSTAVO E	BROWN UNIVERSITY	Poster Presenter	Registered

GAARDE, METTE	LOUISIANA STATE UNIVERSITY	Speaker	Registered
GARIEPY, GENEVIEVE	UNIVERSITY OF OTTAWA	Attendee	Registered
GLOWNIA, JAMES M	STANFORD-PULSE / SLAC	Poster Presenter	Registered
GOULIELMAKIS, ELEFTHERIOS	MPQ	Speaker	Registered
GREENE, CHRIS H	JILA / U COLORADO	Speaker	Registered
GRILJ, JAKOB	STANFORD PULSE INSTITUTE	Poster Presenter	Registered
GRUGAN, PATRICK D	UNIVERSITY OF DELAWARE	Poster Presenter	Registered
GUEHR, MARKUS	SLAC NATIONAL ACCELERATOR LABORATORY	Speaker	Registered
GUPTA, ASHISH K	IIT GUWAHATI	Poster Presenter	Registered
HARVEY, ALEX G	MAX-BORN-INSTITUT	Poster Presenter	Registered
HERATH, THUSHANI N	WAYNE STATE UNIVERSITY	Poster Presenter	Registered
HERRMANN, JENS	ETH ZÜRICH	Poster Presenter	Registered
HEYL, CHRISTOPH M	LUND UNIVERSITY	Poster Presenter	Registered
HICKSTEIN, DANIEL D	JILA - UNIVERSITY OF COLORADO	Poster Presenter	Registered
HITCHCOCK, ADAM	MCMASTER UNIVERSITY	Speaker	Registered
HOCKETT, PAUL	NATIONAL RESEARCH COUNCIL	Discussion Leader	Registered
HOMMELHOFF, PETER	MAX PLANCK INSTITUTE OF QUANTUM OPTICS	Speaker	Registered
HONG, KYUNG-HAN	MASSACHUSETTS INSTITUTE OF TECHNOLOGY	Poster Presenter	Registered
IBRAHIM, HEIDE N.	INRS EMT	Poster Presenter	Registered
ISHII, NOBUHISA	UNIV. OF TOKYO	Poster Presenter	Registered
ITATANI, JIRO	UNIVERSITY OF TOKYO	Discussion Leader	Registered
JACOBSEN, CHRIS	ARGONNE LAB/NORTHWESTERN UNIVERSITY	Discussion Leader	Registered
JIANG, WEI-CHAO	PEKING UNIVERSITY	Poster Presenter	Registered
JIN, CHENG	KANSAS STATE UNIVERSITY	Poster Presenter	Registered
JOHNSON, NORA G	KANSAS STATE UNIVERSITY	Poster Presenter	Registered
KAPTEYN, HENRY C	JILA / U COLORADO	Speaker	Registered
KAUSHAL, JIVESH	MAX BORN INSTITUTE	Poster Presenter	Registered
KIM, KYUNG TAEC	UNIV. OF OTTAWA AND NATIONAL RESEARCH COUNCIL	Poster Presenter	Registered
KLING, MATTHIAS	KANSAS STATE UNIVERSITY	Speaker	Registered
KO, DONG HYUK	KOREA ADVANCED INSTITUTE OF SCIENCE AND	Poster	Registered

	TECHNOLOGY	Presenter	
KUMARAPPAN, VINOD	KANSAS STATE UNIVERSITY	Attendee	Registered
KURZ, HEIKO G	INSTITUTE OF QUANTUM OPTICS	Poster Presenter	Registered
LANDSMAN, ALEXANDRA S.	ULTRAFAST LASER PHYSICS GROUP, ETH ZURICH	Poster Presenter	Registered
LAURENT, GUILLAUME	KANSAS STATE UNIVERSITY	Poster Presenter	Registered
LE, ANH-THU	KANSAS STATE UNIVERSITY	Poster Presenter	Registered
LEE, KEVIN F	NRC CANADA & UNIVERSITY OF OTTAWA	Poster Presenter	Registered
LEGARE, FRANCOIS	INRS-EMT	Speaker	Registered
LIN, CHII-DONG	KANSAS STATE UNIVERSITY	Speaker	Registered
LIN, MING-FU	UC BERKELEY AND LBNL	Poster Presenter	Registered
LOREK, ELEONORA	LUND UNIVERSITY	Poster Presenter	Registered
LUO, SUI	UNIVERSITY OF DELAWARE	Poster Presenter	Registered
MADSEN, LARS BOJER	AARHUS UNIVERSITY	Speaker	Registered
MAGRAKVELIDZE, MAIA	KANSAS STATE UNIVERSITY	Poster Presenter	Registered
MAKHIJA, VARUN	KANSAS STATE UNIVERSITY	Poster Presenter	Registered
MAURITSSON, JOHAN	LUND UNIVERSITY	Attendee	Registered
MORALES, FELIPE	MAX-BORN-INSTITUT	Poster Presenter	Registered
MOSES, JEFFREY	MIT	Attendee	Registered
NAM, CHANG HEE	KAIST	Discussion Leader	Registered
NIELSEN, JENS H	AARHUS UNIVERSITY	Poster Presenter	Registered
PABST, STEFAN	CENTER FOR FREE-ELECTRON LASER SCIENCE, DESY	Poster Presenter	Registered
PAZOUREK, RENATE	VIENNA UNIVERSITY OF TECHNOLOGY	Poster Presenter	Registered
PENG, JIAHUI	UNIVERSITY OF OTTAWA	Poster Presenter	Registered
PENKA, EMMANUEL FOWE	UNIVERSITY OF SHERBROOKE	Poster Presenter	Registered
PRELL, JAMES S	UNIVERSITY OF CALIFORNIA, BERKELEY	Poster Presenter	Registered
PUROHIT, GHANSHYAM	SIR PADAMPAT SINGHANIA UNIVERSITY	Poster Presenter	Registered
REN, XIAOMING	KANSAS STATE UNIVERSITY	Poster Presenter	Registered
RICHTER, MARIA	MAX-BORN-INSTITUTE	Poster Presenter	Registered
ROHRINGER, NINA R.G.	MAX PLANCK ADVANCED STUDY GROUP	Speaker	Registered
ROSS, MATTHEW W	PENN STATE UNIVERSITY	Poster	Registered

		Presenter	
ROUZEE, ARNAUD	MAX BORN INSTITUTE	Speaker	Registered
RUDAWSKI, PIOTR	LUND UNIVERSITY	Poster Presenter	Registered
SAENZ, ALEJANDRO	HUMBOLDT UNIVERSITY BERLIN	Poster Presenter	Registered
SCHMIDT, BRUNO E	INRS	Poster Presenter	Registered
SCHULTZE, MARTIN	MPQ	Speaker	Registered
SHAARAN, TAHIR	ICFO-INSTITUT DE CIÈNCES FOTÒNIQUES	Poster Presenter	Registered
SHERRATT, PAUL A	NORTHWESTERN UNIVERSITY	Poster Presenter	Registered
SHVETSOV-SHILOVSKIY, NIKOLAY I.	AARHUS UNIVERSITY	Poster Presenter	Registered
SMIRNOVA, OLGA	MAX BORN INSTITUTE	Speaker	Registered
SOIFER, HADAS	WEIZMANN INSTITUTE OF SCIENCE	Poster Presenter	Registered
SPECTOR, LIMOR S	STANFORD UNIVERSITY & SLAC	Poster Presenter	Registered
SPENCE, JOHN	ARIZONA STATE UNIVERSITY	Speaker	Registered
SPIEWANOWSKI, MACIEJ M	AARHUS UNIVERSITY	Poster Presenter	Registered
SU, JING	UNIVERSITY OF COLORADO AT BOULDER & JILA	Poster Presenter	Registered
SZAFRUGA, URSZULA B	OHIO STATE UNIVERSITY	Poster Presenter	Registered
THIRE, NICOLAS	INRS-EMT	Poster Presenter	Registered
TORLINA, LISA	MAX BORN INSTITUTE	Poster Presenter	Registered
TRALLERO, CARLOS A	KANSAS STATE UNIVERSITY	Poster Presenter	Registered
UEDA, KIYOSHI	TOHOKU UNIVERSITY	Speaker	Registered
VAMPA, GIULIO	UNIVERSITY OF OTTAWA	Poster Presenter	Registered
VILLENEUVE, DAVID	NATIONAL RESEARCH COUNCIL	Chair	Registered
VOZZI, CATERINA	IFN-CNR	Speaker	Registered
WALKER, BARRY C	UNIVERSITY OF DELAWARE	Vice Chair	Registered
WANG, GUOLI	KANSAS STATE UNIVERSITY	Attendee	Registered
WU, MENGXI	LOUISIANA STATE UNIVERSITY	Poster Presenter	Registered
XU, HAN	GRIFFITH UNIVERSITY	Poster Presenter	Registered
XU, JUNLIANG	OHIO STATE UNIVERSITY	Poster Presenter	Registered
ZENG, SHUO	KANSAS STATE UNIVERSITY	Poster Presenter	Registered
ZHANG, KAIKAI	OHIO STATE UNIVERSITY	Poster Presenter	Registered
ZHANG, CHUNMEI	UNIVERSITY OF OTTAWA	Poster	Registered

		Presenter	
ZHAO, JING	LEIBNIZ UNIVERSITY HANNOVER	Poster Presenter	Registered
ZHAO, KUN	UNIVERSITY OF CENTRAL FLORIDA	Poster Presenter	Registered
ZOHRABI, MOHAMMAD	KANSAS STATE UNIVERSITY	Poster Presenter	Registered
121 Attendees			