



GORDON RESEARCH CONFERENCES *frontiers of science*

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2001 GORDON RESEARCH CONFERENCE

on Quantum Control of Light & Matter

FINAL PROGRESS REPORT

DOE
DE-FG02-01ER15152

The Gordon Research Conference (GRC) on Quantum Control of Light & Matter was held at Mount Holyoke College, South Hadley, Massachusetts, July 29-August 3, 2001. The conference was well attended with 119 participants (list enclosed). The attendees represented the spectrum of endeavor in this field coming from academia, industry, and government laboratories, both US and foreign scientists, senior researchers, young investigators, and students.

In designing the formal speakers program, emphasis was placed on current unpublished research and discussion of the future target areas in this field.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. 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 (program enclosed).

I want to personally 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 As you know, in the interest of promoting the presentation of unpublished and frontier-breaking research, Gordon Research Conferences does not permit publication of meeting proceedings.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.

Moshe Shapiro
Conference Chair

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Quantum Control Of Atomic & Molecular Motion

July 29 - August 3, 2001
Mount Holyoke College

Moshe Shapiro, Chair
Klaas Bergmann, Vice-Chair

Sunday

19:30-19:45 **General Perspectives**

Peter Lambropoulos, FORTH, Greece

19:45-20:35 **Stuart Rice** U. of Chicago, USA

"Optical Control of Molecular Dynamics: Problems and Prospects"

20:35-20:45 Discussion

20:45-21:35 **Anton Zeilinger**, U. of Vienna, Austria
"Information and Quantum Mechanics"

21:35-21:45 Discussion

Monday

8:40-8:55 Group photo

9:00-9:15 **Phase Control**

Karl Kompa, MPI, Garching, Germany

9:15-9:55 **Paul Brumer**, U. of Toronto, Canada

"Controlled Chiral Purification and Controlled Quantum Chaotic Diffusion"

9:55-10:05 Discussion

10:05-10:45 **Stephen Leone**, NIST and U. of Colorado, USA

"Wave Packet Phase Control, Evolutionary Algorithms, and Quantum Information"

10:45-10:55 Discussion

10:55-11:15 Coffee break

11:15-11:55 **Robert Gordon**, U. of Illinois at Chicago, USA

"Using Coherent Phase Control to Probe Structure in the Continuum"

11:55-12:05 Discussion

12:05-12:25 **Robert Levis**, Wayne State U., Detroit, USA

Hot Topic I: "Strong Field Control of Chemical Dissociation and Rearrangement"

12:25-12:30 Discussion

16:30-18:00 *Poster session I*

Klaas Bergmann, Kaiserslautern U., Germany

19:30-19:45 **Optimal Control**

Herschel Rabitz, Princeton U., USA

19:45-20:25 **Yaron Silberberg**, Weizmann Inst., Israel

"Femtosecond control of multiphoton transitions"

20:25-20:30 Discussion

20:30-21:10 **Tobias Brixner**, U. of Würzburg, Germany

"Quantum control in the liquid phase by adaptive femtosecond pulse shaping"

21:10-21:15 Discussion

21:15-21:55 **Yulchi Fujimura**, Tohoku U., Japan

"Optimal control of selective preparation of enantiomers from their racemate"

21:55-22:00 Discussion

Tuesday

9:00-9:15 Quantum Information

Carlos Stroud, U. of Rochester, USA

9:15-9:55 Gershon Kurizki, Weizmann Inst., Israel

"Decoherence and Entanglement: Control of intra- and inter- molecular processes"

9:55-10:05 Discussion

10:05-10:45 Ian Walmsley, U. of Rochester, USA

"Decoherence and learning control for information processing in the quantum regime"

10:45-10:55 Discussion

10:55-11:15 Coffee break

11:15-11:55 Eugene Polzik, U. of Arhus, Denmark

"Entanglement and Quantum Communication with Spin Polarized Atomic Samples"

11:55-12:05 Discussion

12:05-12:25 Daniel Lidar, U. of Toronto, Canada

Hot Topic II: "Decoherence-Free Quantum Computation"

12:25-12:30 Discussion

14:00-14:30 Meeting of the nomination committee

19:30-19:45 Light Manipulation and Manipulation with Light

Bretislav Friedrich, Harvard, USA

19:45-20:25 Alexei Sokolov, Stanford U., USA

"Femtosecond Light Source for Phase- Controlled Multiphoton Ionization"

20:25-20:30 Discussion

20:30-21:10 Michael Fleischhauer, Kaiserslautern U., Germany

"Coherent control of light pulses. Quantum memories for photons"

Mikhail Lukin, Harvard, USA

"Coherent trapping of photon states in matter: experiments & applications for quantum processing"

21:10-21:15 Discussion

Wednesday

9:00-9:15 Control in the condensed phase

Philip Bucksbaum, U. of Michigan, Ann-Arbor, USA

9:15-9:55 Ronnie Kosloff, Hebrew U., Israel

"Impulsive Control of Ground Surface Dynamics"

9:55-10:05 Discussion

10:05-10:45 Robert Coalson, U. of Pittsburgh, USA

"Laser Control of Electron Transmission through Molecular Wires"

10:45-10:55 Discussion

10:55-11:15 Coffee break

11:15-11:55 Milena Grifoni, U. of Delft, The Netherlands

"Control of tunneling in nonadiabatic quantum ratchets"

11:55-12:05 Discussion

12:05-12:25 Jon Marangos, Imperial College, UK

Hot Topic III: "High Order Harmonic Generation in Aligned Molecules"

12:25-12:30 Discussion

16:30-18:00 Poster session II

Klaas Bergmann, Kaiserslautern U., Germany

19:30-19:45 Strong Field Control

Paul Corkum, NRC, Ottawa, Canada

19:45-20:25 Tamar Seideman, NRC, Ottawa, Canada

"Spatially controlled ro-translational wavepackets"

20:25-20:30 Discussion

20:30-21:10 **Henrik Stapelfeldt, U. of Arhus, Denmark**
"Control of chemical reactions by laser aligned molecules"

21:10-21:15 Discussion

21:15-21:55 **Andre Bandrauk, U. de Sherbrooke, Canada**
"Controlling Electron- Nuclear Dynamics with Short Intense Laser Pulses: From Super-Computer Simulations to Applications"

21:55-22:00 Discussion

Thursday

9:00-9:15 **Laser Cooling and BEC Dynamics**

David Tannor, Weizmann Inst., Israel

9:15-9:55 **Amichay Vardi , ITAMP, Harvard, USA & James Anglin, MIT, USA**
"Quantum atom optics: Bose-Einstein condensates beyond Gross-Pitaevskii"

9:55-10:05 Discussion

10:05-10:45 **Pierre Pillet, Lab. Aime Coton, France**
"Control of a Pair of Colliding Atoms Through Photoassociation and Formation of Ultracold Molecules"

10:45-10:55 Discussion

10:55-11:15 Coffee break

11:15-11:55 **Gerard Meijer, FOM, Nieuwegein, The Netherlands**
"Deceleration and trapping of neutral dipolar molecules"

11:55-12:05 Discussion

12:05-12:25 **Stefan Vajda, Freie U. Berlin, Germany**
Hot Topic IV: "Fragmentation Control of Small Alkaline Clusters: What Can We Learn From the Optimized Pulse Shapes"

12:25-12:30 Discussion

14:00-14:30 Business Meeting

19:30-19:45 **Control in the Solid Phase**

Henry van-Driel, U. of Toronto, Canada

19:45-20:25 **Walter Potz, U. of Gratz, Austria**
"Coherent Control Schemes in Semiconductor Nanostructures"

20:25-20:30 Discussion

20:30-21:10 **V. Ara Apkarian, U.C. Irvine, USA**
"Preparation, manipulation, and interrogation of molecular coherences OR reset, process, and readout of quantum registers using four-wave mixing"

21:10-21:15 Discussion

21:15-21:55 **Keith Nelson, MIT, USA**
"Polaritonics: Coherent control over collective modes that move at light-like speeds"

21:55-22:00 Discussion



QUANTUM CONTROL OF LIGHT AND MATTER

MOUNT HOLYOKE COLLEGE
(29-Jul-01) - (03-Aug-01)

This was the final registration list for the 2001 Conference on
QUANTUM CONTROL OF LIGHT AND MATTER.

Name	Organization	Participation	Status
HAKIMA ABOU - RACHID	UNIVERSITE LAVAL	Poster Presenter	Registered
VARDI AMICHAY	HARVARD UNIVERSITY	Speaker	Registered
ZOHAR AMITAY	JILA, UNIVERSITY OF COLORADO, NIST	Poster Presenter	Registered
JAMES ANGLIN	HARVARD CFA	Speaker	Registered
ARA APKARIAN	UNIVERSITY OF CALIFORNIA, IRVINE	Speaker	Registered
ANDRE D BANDRAUK	UNIVERSITE DE SHERBROOKE	Speaker	Registered
VICTOR S BATISTA	YALE UNIVERSITY	Poster Presenter	Registered
KLAAS BERGMANN	UNIVERSITAET KAISERSLAUTERN	Vice Chair	Registered
ZSOLT BIHARY	UNIVERSITY OF CALIFORNIA	Poster Presenter	Registered
TOBIAS BRIXNER	UNIVERSITY OF WUERZBURG	Speaker	Registered
PHILIP H BUCKSBAUM	UNIVERSITY OF MICHIGAN	Speaker	Registered
THANDI M BUTHELEZI	WESTERN KENTUCKY UNIVERSITY	Poster Presenter	Registered
MARTA CASTILLEJO	INSTITUTO DE QUIMICA FISICA ROCASOLANO, CSIC	Attendee	Registered
SZCZEPAN CHELKOWSKI	UNIVERSITY OF SHERBROOKE	Poster Presenter	Registered
ROB D COALSON	UNIVERSITY OF PITTSBURGH	Speaker	Registered
MATTHEW G COMSTOCK	MICHIGAN STATE UNIVERSITY	Poster Presenter	Registered
CHARLES CONOVER	COLBY COLLEGE	Poster Presenter	Registered
PAUL CORKUM	NATIONAL RESEARCH COUNCIL	Speaker	Registered
BEATRICE DE BEAUVOIR	LCAR-TOULOUSE UNIVERSITY	Poster Presenter	Registered
REGINA DE VIVIE-RIEDEL	MPI FUER QUANTENOPTIK	Poster Presenter	Registered
MUSTAFA DEMIRPLAK	THE UNIVERSITY OF CHICAGO	Attendee	Registered
DAVID R ERMER	MISSISSIPPI STATE UNIVERSITY	Poster Presenter	Registered
MICHAEL FLEISCHHAUER	KAISERSLAUTERN UNIVERSITAET	Speaker	Registered
JAMES M FRASER	NATIONAL RESEARCH COUNCIL OF CANADA	Poster Presenter	Registered
TIM FREEGARDE	UNIVERSITY OF TRENTO	Poster Presenter	Registered
BRETISLAV FRIEDRICH	HARVARD UNIVERSITY	Speaker	Registered
EINAT FRISHMAN	THE WEIZMANN INSTITUTE OF SCIENCE	Poster Presenter	Registered
YUICHI FUJIMURA	TOHOKU UNIVERSITY	Speaker	Registered
SUKETU R GANDHI	ADVANCED TECHNOLOGY ENGINEERING	Attendee	Registered
EITAN GEVA	UNIVERSITY OF MICHIGAN	Attendee	Registered
DAVID R GLENN	UNIVERSITY OF TORONTO	Attendee	Registered
JIANGBIN GONG	UNIVERSITY OF TORONTO	Poster Presenter	Registered
LETICIA GONZALEZ	FREIE UNIVERSITY BERLIN	Poster Presenter	Registered
ROBERT J GORDON	UNIVERSITY OF ILLINOIS AT CHICAGO	Attendee	Registered
MILENA GRIFONI	DELT Institute of TECHNOLOGY	Speaker	Registered
GERBER G GUSTAV	UNIVERSITY OF WUERZBURG	Attendee	Registered
THOMAS HALFMAN	UNIVERSITY OF KAISERSLAUTER	Poster Presenter	Registered
HANNO HAMMER	THE WEIZMANN INSTITUTE OF SCIENCES	Attendee	Registered
HEEKYUNG HAN	UNIVERSITY OF TORONTO	Poster Presenter	Registered
RACHEL HASBANI	NATIONAL RESEARCH COUNCIL	Poster Presenter	Registered
NICK HAY	IMPERIAL COLLEGE	Poster Presenter	Registered
KUNIHITO HOKI	TOHOKU UNIVERSITY	Poster Presenter	Registered
MARKKU JÄÄKELÄINEN	ROYAL INSTITUTE OF TECHNOLOGY	Poster Presenter	Registered
SEOGJOO JANG	MIT	Poster Presenter	Registered
GEDIMINAS JUZELIUNAS	OREGON CENTER FOR OPTICS, UNIVERSITY OF OREGON	Poster Presenter	Registered
MICHAEL A KARAVITIS	UNIVERSITY OF CALIFORNIA, IRVINE	Poster Presenter	Registered
FRANK KECK	UNIVERSITY OF KAISERSLAUTERN	Poster Presenter	Registered
ANI KHACHATRIAN	UNIVERSITY OF ILLINOIS AT CHICAGO	Attendee	Registered

TEODORA V KIROVA	TEMPLE UNIVERSITY	Attendee	Registered
ZSOLT KIS	KTH - ROYAL INSTITUTE OF TECHNOLOGY	Poster Presenter	Registered
KARL KOMPA	MAX PLANCK INSTITUT FUER QUANTENOPTIK	Speaker	Registered
RONNIE B KOSLOFF	HEBREW UNIVERSITY JERUSALEM	Speaker	Registered
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KEITH A NELSON	MIT	Speaker	Registered
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STUART A RICE	THE UNIVERSITY OF CHICAGO	Speaker	Registered
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FLORENTINA ROSCA-PRUNA	FOM INSTITUTE FOR ATOMIC AND MOLECULAR PHYSICS	Poster Presenter	Registered
KENNETH J SCHAFER	LOUISIANA STATE UNIVERSITY / LUND UNIVERSITY	Attendee	Registered
ELMAR SCHREIBER	PRINCETON UNIVERSITY	Poster Presenter	Registered
N SCHWENTNER	FREIE UNIVERSITÄT BERLIN	Poster Presenter	Registered
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IGNACIO R SOLA	UNIVERSITY COMPLUTENSE MADRID	Poster Presenter	Registered
HENRIK STAPELFELDT	AARHUS UNIVERSITY	Speaker	Registered
NIKOLAY STOYANOV	MASSACHUSETTS INSTITUTE OF TECHNOLOGY	Attendee	Registered
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DAVID TANNOR	WEIZMANN INSTITUTE	Speaker	Registered
IOANNIS THANOPULOS	THE WEIZMANN INSTITUTE OF SCIENCE	Poster Presenter	Registered
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JIRI VALA	HEBREW UNIVERSITY OF JERUSALEM	Poster Presenter	Registered
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JOSHUA C VAUGHAN	MIT	Attendee	Registered
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