

## Monday Morning January 6 2003

*Plenary Session*, George R. Welch, Chair

7:30 **Herschel A. Rabitz**, *Princeton University*, "Tying the Loop Tighter Around Quantum Systems"

8:00 **Szymon Suckewer**, *Princeton University*, "Some New Approaches to Generation of Ultrashort and Ultraintense Pulses and Potential Applications"

8:30 **Jim Gordon**, *Lucent Technologies*, "Wigner densities, quantum noise, and solitons"

### *Closed Loop Control of Quantum Systems*

Herschel A. Rabitz, Chair

9:00 **Philip Bucksbaum**, *University of Michigan*, "Experimental aspects of closed-loop control of unimolecular reactions in liquids"

9:20 **Marcus Motzkus**, *Max-Planck-Institut für Quantenoptik*, "Quantum control of ultracomplex molecular systems with shaped pulses"

9:40 **Robert R. Jones**, *University of Virginia*, "Closed Loop Control of Intense Laser Fragmentation of Small Clusters"

### *Application of Ultrashort Pulses and X-Ray Radiations*

Szymon Suckewer, Chair

Todd Ditmore, *University of Texas, Austin*, "Generation of X-Rays and Neutrons with Ultraintense and Ultrafast Pulse Laser"

Nat Fisch, *Princeton University*, "Raman Amplification and Compression of Ultrashort Pulses in Plasmas; a Successor Technology to CPA?"

Jim Dunn, *Lawrence Livermore National Laboratory*, "Ultrashort Pulse Driven X-Ray Lasers"

### *Solitons*

Joseph W. Haus, Chair

Jorge R. Tredicce, *Institut Non Lineaire de Nice, France*, "Cavity solitons as pixels in semiconductor microcavities"

Ildar Gabitov, *University of Arizona*,

Randy Hulet, *Rice University*, "Tunable Interactions in Ultracold Bose and Fermi Gases: Solitons to Superfluids"

— Break —

*Plenary Session*, Wendell T. Hill, III, Chair

10:20 **Joseph W. Haus**, *University of Dayton*, "Nonlinear optics in photonic crystals"

10:50 **Gustav Gerber**, *Universität Würzburg*, "Adaptive Femtosecond Quantum Control"

### *Closed Loop Control of Quantum Systems*

Herschel A. Rabitz, Chair

11:20 **Ian Walmsley**, *University of Oxford*, "Looking for peace and quiet: Using learning control to avoid decoherence"

11:40 **Henry Kapteyn**, *JILA, University of Colorado*, "Coherent Control of Atoms and Molecules Using Broad-Bandwidth Light Pulses"

12:00 **Hideo Mabuchi**, *California Institute of Technology*, "Experiments in Quantum Feedback"

12:20 **Ludger Wöste**, *Freie Universität Berlin*, "Coherent Control of Metal Clusters: Learning Dynamics with Self-Learning Algorithms"

12:40 **Robert Lewis**, *Temple University*, "Adaptive Strong Field Control of Chemistry"

### *Photonics*

Joseph W. Haus, Chair

Giuseppe D'Aguanno, *Università di Roma "La Sapienza"*, "Trapping and Storing Light in c(2) Photonic Crystals"

Lute Maleki, *Jet Propulsion Laboratory*, "Photonic oscillator"

Shi-Yao Zhu, *Hong Kong Baptist College*, "Light propagation in one-dimensional photonic crystals with dispersion"

Kobzo Hakuta, *The University of Electro-Communications, Japan*, "Quantum coherence in solid hydrogen"

Anil K. Patnaik, *University of Electro-Communications, Japan*, "Slow light propagation in a thin optical fiber via electromagnetically induced transparency"

## Monday Evening January 6 2003

Plenary Session, D. P. Sheehan, Chair

19:00 Leon Cohen, *City University of New York (Hunter College)*, “Quantum phase space, correspondence rules, and the speech-hearing connection”

19:30 Theo Nieuwenhuizen, *University of Amsterdam*, “Thermodynamics and small quantum systems”

20:00 M. Shapiro, *Weizmann Institute*, “Dark states: An analytical solution to the non-degenerate quantum control problem and a proposed mechanism for quantum jumps”

— Break —

*Quantum Control of Molecular Processes*

Paul Brumer, Chair

20:50 Paul Brumer, *University of Toronto*, “Control and Decoherence: When is Quantum Decoherence Dynamics Classical?”

21:10 Ara Apkarian, *University of California, Irvine*, “Multilinear spectroscopy to control and compute in the molecular Hilbert space”

21:30 Ilya Averbukh, *Weizmann Institute of Science*, “Squeezing of Atoms by Pulsed Optical Lattices”

21:50 Andre D. Bandrauk, *Univ. de Sherbrooke, Canada*, “Attosecond Control of Harmonic Generation”

22:10 Victor Batista, *Yale University*, “Coherent Control of Photoisomerization in Retinal”

*Quantum Thermodynamics*

Theo Nieuwenhuizen, Chair

D. P. Sheehan, *University of San Diego*, “Hammers, anvils and stirrups: sounding second law tests”

M. Howard Lee, *University of Georgia*, “Carnot cycle for photon gas?”

Peter Keefe, *Keefe & Associates*, “Coherent Magneto-Caloric Effect Superconductive Heat Engine Process Cycle”

Zoe Sariyanni, *Texas A&M University*, “Photo-Carnot quantum engine”

*The Quantum/Classical Interface*

Leon Cohen, Chair

Pat Loughlin, *University of Pittsburgh*, “Instantaneous frequency, quantum mechanical current, and phase-space distributions”

Lorenzo Galleani, *Politecnico di Torino, Italy*, “Nonlinear oscillations and the Wigner distribution”

Robert Kosut, *SC Solutions, Inc.*, “Adaptive Control of Quantum Systems”

David H. Hughes, *AFRL*, “Time-Frequency Signatures in Classical Phenomenological Physics”

Yanhua Shih, *UMBC*, “Classical and Quantum Imaging”

## Tuesday Morning January 7 2003

Plenary Session, Philip Bucksbaum, Chair

7:30 **Federico Capasso**, *Harvard University*, “Mid and far infrared Quantum Cascade lasers”

8:00 **Daniel J. Heinzen**, *University of Texas at Austin*, “Coherent production of molecules in Bose-Einstein condensates”

8:30 **Tamar Seideman**, *National Research Council of Canada*, “Current-Triggered Dynamics in Molecular-Scale Devices”

*Strong Field Control of External Molecular Modes*

Tamar Seideman, Chair

9:00 **Roger E. Miller**, *University of North Carolina*, “Transition Moment Directions in Oriented Biomolecules: A New Structural Tool”

9:20 **Ilya Averbukh**, *Weizmann Institute of Science*, “Controlling Quantum Rotation with Light”

9:40 **Bretislav Friedrich**, *Harvard University*, “Population Transfer, Spectroscopy and Manipulation of Molecules in Nonresonant Fields”

*Quantum Information and Quantum Computing*

Janos Bergou, Chair

10:20 **Timothy F. Havel**, *Massachusetts Institute of Technology*, “The Real Density Matrix”

10:50 **Jean-Pierre Leburton**, *University of Illinois*, “A scalable Spin-qubit Circuit with Quantum Dots”

11:20 **Mark Hillery**, *Hunter College, CUNY*, “Programmable quantum circuits”

*Infrared Semiconductor Optoelectronics*

Federico Capasso, Chair

11:40 **Claire Gmachl**, *Bell Labs, Lucent Technologies*, “Multi-wavelength and Nonlinear Light Generation in Quantum Cascade Lasers”

12:10 **Alexey Belyanin**, *Texas A&M University*, “Resonant Non-linear Optical Processes in Semiconductor Lasers”

12:40 **Ben Williams**, *Massachusetts Institute of Technology*, “Development of THz quantum-cascade lasers”

— Break —

Plenary Session, Yanhua Shih, Chair

10:20 **Michael Feld**, *Massachusetts Institute of Technology, Biological and Organic Photonics*

10:50 **Charles Munnerlyn**, *Visx Inc.*, “Lasers in Ophthalmology: Past, Present, and Future”

*Strong Field Control of External Molecular Modes*

Tamar Seideman, Chair

11:20 **Gerard Meijer**, *FOM-Institute for Plasma-Physics ‘Rijnhuizen’*, “Deceleration and Trapping of Polar Molecules”

11:40 **Jon Marangos**, *Imperial College*, “Molecular HHG and Electron Dynamics in Strong Laser Fields”

12:00 **Robert Gordon**, *University of Illinois at Chicago*, “Nano-lithography with Molecular Optics”

12:20 **Wolfgang Lange**, *Max-Planck Institut für Quantenoptik*, “Ions and Photons under Deterministic Control”

12:40 **Karl L. Kompa**, *Max-Planck Institut für Quantenoptik*, “Controlling vibrational energy in molecules”

*Biological and Organic Photonics*

Robert W. Boyd, Chair

10:20 **Andrew Berger**, *University of Rochester*, “Raman spectroscopy for studying oral bacteria”

10:50 **Frank Wise**, *Cornell University*, “Semiconductor Quantum Dots: New Capabilities for Fluorescence Microscopy”

11:20 **Lewis Rothberg**, *University of Rochester*, “Photophysics of Conjugated Polymers”

11:40 **Z. Vally Vardeny**, *University of Utah*, “Random Lasers in Organics”

11:50 **Hans Schuessler**, *Texas A&M University*, “Heart and brain research at the molecular and subcellular levels with laser excited surface plasmons”

*Infrared Semiconductor Optoelectronics*

Vitaly Kocharovsky, Chair

11:40 **Oleg Astafiev**, *Japan Science and Technology Corporation*, “Infrared photon detectors using semiconductor quantum dots”

12:10 **Dennis G. Deppe**, *The University of Texas at Austin*, “Unipolar Quantum Cascade Quantum Dot Structures for Infrared Light Emission”

12:40 **Rolf Binder**, *University of Arizona*, “Theory of biexcitonic electromagnetically-induced transparency in semiconductor dots”

1:10 **Jerome Faist**, *University of Neuchâtel, Switzerland*, “Quantum Cascade Lasers: THz and the Search for Second-Order Gain”

## Tuesday Evening January 7 2003

Plenary Session, John Holzrichter, Chair

19:00 **Bob Doering**, *Texas Instruments*, “Can We Tunnel Through the Barriers Facing Moore’s Law?”

19:30 **Vladimir M. Shalaev**, *Purdue University*, “Plasmonic Nanophotonics: Manipulating Light and Sensing Molecules”

20:00 **Barry Sanders**, *Macquarie University, Australia*, “Requirements for quantum computation”

— Break —

### *Quantum Information and Quantum Computing*

### *Nano-Optics*

*Bose-Einstein Condensation and Ultra-cold Gases*

Mark Hillery, Chair

Vladimir M. Shalaev, Chair

Suhail Zubairy, Chair

20:50 **Janos Bergou**, *Hunter College, CUNY*, “Quantum state discrimination”

**Naomi Halas**, *Rice University*, “Plasmon Hybridization: Design Principles and Realization of Nanophotonic Architectures”

**Juha Javanainen**, *University of Connecticut*, “Making a molecular condensate using the Feshbach resonance”

21:10 **Jim Franson**, *Johns Hopkins University*, “Progress in Linear Optics Quantum Computing”

**Jason W. Fleischer**, *Technion, Israel*, “Solitons in optically-induced photonic lattices”

**Belen Paredes**, *Max-Planck Institut für Quantenoptik*, “ $1/2$ -Anyons with small atomic Bose-Einstein condensates”

21:30 **Laszlo Kish**, *Texas A&M University*, “Noise, Speed and Dissipation: End of Moore’s Law of Miniaturization?”

**Yujie J. Ding**, *Lehigh University*, “Efficient laser amplifiers based on quasi-indirect-bandgap GaAs/AlAs nanostructures”

**Robert Brecha**, *University of Dayton*, “Collapse of a degenerate Fermi gas”

21:50 **Attila Bergou**, *Jet Propulsion Laboratory*, “Relativistic Quantum Information Theory”

**Jonathan Weinstein**, *NIST*, “Photoassociation spectroscopy of Na<sub>2</sub> and electromagnetically-induced matter-wave transparency”

22:10

## Wednesday Morning January 8 2003

*Plenary Session*, Margaret Mumane, Chair

7:30 **Alexander Gaeta**, *Cornell University*, “The Universal Nature of Nonlinear Wave Collapse”

8:00 **Ludger Wöste**, *Freie Universität Berlin*, ““First” fs-TW Generated Artificial Beacons”

8:30 **Terry Michalske**, *Sandia National Laboratories*, “Integrated Nanotechnology: Activities at Sandia and Opportunities with DOE’s Nanoscience User Facilities”

*Ultrashort Laser Propagation*

Vern Schlie, Chair

9:00 **Vern Schlie**, *AFRL/DE*, “Propagation Summary”

9:20 **Andrey Mysyrowicz**, *Ecole Polytechnique, France*, “Femtosecond Light bullets in the sky: recent advances”

9:40 **Jerry Moloney**, *Univ of Arizona*, “Femtosecond Atmospheric Light Strings: Supercontinuum and Rf Emission Sources”

10:00 **Phil Sprangle**, *Naval Research Laboratory*, “Propagation of Intense, Short Laser Pulses in Air”

*Semiconductor Lasers*

Weng W. Chow, Chair

9:00 **Jim Harris**, *Stanford University*, “VCSELs for snowmaking”

9:20 **Kent Choquette**, *University of Illinois*, “Coupled Microcavities in Vertical Cavity Lasers”

9:40 **Hailin Wang**, *University of Oregon*, “Electromagnetically induced transparency from spin coherence in semiconductors”

10:00 **Connie Chang**, *University of California, Berkeley*, “Proposal of Semiconductor Variable All-Optical Buffer”

*EIT and Coherence Effects*

Robert Lucht, Chair

9:00 **Kishore Kapale**, *Texas A&M University*, “Quenching of spontaneous emission through interference of incoherent pump processes”

9:20 **Olga Kocharovskaya**, *Texas A&M University*, “Atomic and Nuclear Interference in Solids”

9:40 **Roman Kolesov**, *Texas A&M University*, “Electromagnetically induced transparency in a neon discharge: prospects for a new method of plasma diagnostics”

10:00 **George R. Welch**, *Texas A&M University*, “Ellipticity-dependent magneto-optical polarization rotation via multi-photon coherence”

— Break —

*Plenary Session*, Marlan O. Scully, Chair

10:40 **Award Lamb Medal**, “The presentation of the 2002 Willis E. Lamb medal for Laser Science and Quantum Optics to Leon Cohen, Michael Feld, and Herschel Rabitz”

*Ultrashort Laser Propagation*

Vern Schlie, Chair

11:20 **Antonio Ting**, *Naval Research Laboratory*, “Optical Guiding fs-TW Experiments in Air/Plasmas”

11:40 **Mike Campbell**, *General Atomics*, “Application of Petawatt Lasers for Fast Ignition”

*Coherent Optics in Semiconductors*

Alexey Belyanin, Chair

11:20 **Leonid Butov**, *University of California at Berkeley*, “Exciton condensation in semiconductor nanostructures”

11:40 **Cristiano Ciuti**, *University of California at San Diego*, “Polariton parametric interactions in semiconductor microcavities”

12:00 **Roberto Merlin**, *University of Michigan*, “Optically-Induced Multi-Spin Entanglement in a Semiconductor Quantum Well”

12:40 **Carlo Piermarocchi**, *Michigan State Univ.*, “Optical control of electron spins in quantum dots for quantum computation”

*Quantum Information and Quantum Computing*

Laszlo Kish, Chair

11:20 **Suhail Zubairy**, *Texas A&M University*, “Cavity QED based quantum phase gate and applications”

11:40 **Paolo Tombesi**, *U. Camerino, Italy*, “Beating the standard quantum limit with entangled meters”

12:00 **Phil Hemmer**, *Texas A&M University*, “Progress toward quantum computing and stopped-light quantum storage, using EIT in solids”

12:40 **Gordon Chen**, *Texas A&M University*, “Quantum Circuit Design for the Multi-Object Search Problem”

12:40

## Wednesday Evening January 8 2003

Plenary Session, William A. Bundy, Chair

19:00 **Christoph H. Keitel**, *University of Freiburg*, "Ultra-intense laser-matter interaction: from atomic towards high-energy physics"

19:30 **Gershon Kurizki**, *Weizmann Institute of Science*, "Cold Gases with Laser-Induced Long-Range Forces"

20:00 **Alexander Litvak**, *Institute of Applied Physics, RAS*, "High Power Microwaves: Sources and Applications"

— Break —

*Ultraintense laser fields*

Christoph H Keitel, Chair

20:50 **Wilhelm Becker**, *Max Born Institute, Berlin*, "Quantum-path survey of the relativistic laser-atom interaction"

21:10 **Pravesh Patel**, *Lawrence Livermore National Laboratory*, "Generation of intense proton beams with ultrashort-pulse lasers"

21:30 **Koichi Yamakawa**, *Japan Atomic Energy Research Institute, Kyoto*, "Ultrafast, petawatt Ti:sapphire laser and its applications to relativistic ionization of atoms and clusters"

21:50 **Joerg Evers**, *University of Freiburg*, "Spontaneous emission suppression with intense low-frequency laser fields"

22:10

*Laser Induced Effects in Cold Gases*

Gershon Kurizki, Chair

**Roy Ozeri**, *Weizmann Institute*, "Experiments in Laser - Induced Interactions in Condensates"

**Qian Niu**, *University of Texas at Austin*, "Laser Tweezers in Condensates"

**Duncan O'Dell**, *University of Sussex*, "Rotons and Excitation Spectra in Laser-Illuminated Condensates"

**Pierre Pillet**, *Laboratoire Aimé Cotton*, "Experiments in Frozen Rydberg Gases"

*Field Effects*

Mark Trainoff, Chair

**L. J. Wang**, *NEC*, "Light transmission through nano-apertures"

**Marcus Pollnau**, *Swiss Federal Institute of Technology*, "Novel broadband light sources for optical coherence tomography"

**Steve Blair**, *University of Utah*, "Engineering the nonlinear phase shift using artificial resonances"

**Qiang Lin**, *Zhejiang University*, "Coherence effect on superluminal propagation of light"

**Thomas Becker**, *Max-Planck Institut für Quantenoptik*, "Fock-state generation and phase diffusion"

## Thursday Morning January 9 2003

*Plenary Session, Bob Doering, Chair*

7:30 **Mark A. Kasevich**, *Stanford University*, "Towards Heisenberg-limited de Broglie-wave force sensors"

8:00 **Alessandra Gatti**, *Università dell'Insubria*, "Entangled imaging and wave-particle duality: from the microscopic to the macroscopic realm"

*Entanglement*

Byoung Ham, Chair

8:30 **Marc J. Feldman**, *University of Rochester*, "Computers without Switches"

8:50 **Mauro Paternostro**, *The Queen's University of Belfast*, "Generation of entangled coherent states using a double electromagnetically induced transparency"

9:10 **Ashok Muthukrishnan**, *Texas A&M University*, "Two-photon sources and path entanglement"

*Novel Optics*

Robert Byren, Chair

**Howard Brandt**, *Army Research Lab*, "Quantum Vacuum Heuristics"

**Manfred Kleber**, *Technical University of Munich*, "Matter waves from quantum sources"

**Michael E. Crenshaw**, *US Army Aviation and Missile Command*, "Index Enhancement and Absorption Compensation via Quantum Coherence Control in Multicomponent Media"

*Metrology*

Alexander A. Betin, Chair

**Alexander Kolomenski**, *Texas A&M University*, "A comparative analysis of laser methods in Raman spectroscopy"

**Nan Yu**, *Jet Propulsion Laboratory*, "Atom interferometry in space - from fundamental physics to practical applications"

**Irina Novikova**, *Texas A&M University*, "Effects of buffer gas on nonlinear magneto-optic rotation"

— Break —

*Plenary Session, Eric Mazur, Chair*

10:00 **Alexander Sergienko**, *Boston University*, "Quantum Metrology with Entangled Photons"

10:30 **Robert Boyd**, *University of Rochester*, "Everything photonic"

*Femtosecond Pulses*

Karl L. Kompa, Chair

11:00 **Eric Mazur**, *Harvard University*, "Femtosecond Laser Micromachining: Applications in Photonics and Biology"

11:20 **Alexei V. Sokolov**, *Texas A&M University*, "Ultra-Short Optical Pulse Generation by the Adiabatic Raman Technique"

11:40 **Roland Allen**, *Texas A&M University*, "Molecular Transformations following Femtosecond-scale Laser Pulses"

12:00 **Kazuhiko Misawa**, *Tokyo University of Agriculture and Technology*, "Wave packet engineering using a phase-programmable femtosecond optical source"

12:20 **Robert Lucht**, *Purdue University*, "Sensitive, Selective Detection of Molecular Species Using Electronic-Resonance-Enhanced Coherent Anti-Stokes Raman Scattering (ERE-CARS)"

*Quantum Metrology*

Alexander Sergienko, Chair

**Ulvi Yurtsever**, *Jet Propulsion Laboratory*, "using entangled particles to do metrology on the gravitational metric"

**Aepharaim M. Steinberg**, *University of Toronto*, "Quantum information with photons and atoms: from tomography to error correction"

**A. Migdall**, *NIST (Gaithersburg)*, "Two photon metrology - getting gown to business"

**S. Castelletto**, *IEN Galileo Ferraris, Italy*, "Quantum and Classical resources for the metrology of biphoton field in parametric down conversion"

*Plasmas and Free Electron Lasers*

Yuri Rostovtsev, Chair

**Sandra G. Biedron**, *MAX-Laboratory and Argonne National Lab.*, "Overview of short-wavelength free-electron lasers and exotic schemes"

**Takashi Tanaka**, *Institute of Physical and Chemical Research, Japan*, "Theoretical investigation of misalignment effects in the FEL based on self-amplified spontaneous emission"

**Yuri Rostovtsev**, *Texas A&M University*, "Free Electron Lasers without Inversion: Concept and First Numerical Experiments"

**Gennady Shvets**, *Illinois Institute of Technology and Fermilab*, "Electromagnetically Induced Transparency of Plasma: From Quantum to Classical Mechanics, and Back"

**Jonathan S. Wurtele**, *University of California at Berkeley*, "Magnetically Induced Transparency of Plasma: Applications to Particle Acceleration and Pulse Compression"

## Thursday Evening January 9 2003

Plenary Session, Phillip Szuromi, Chair

19:00 **Jay Eversole**, *Naval Research Laboratory*, “Bio-Agent Detection: DoD application of optical techniques”

19:30 **Marlan O. Scully**, *Texas A&M University*, “FAST CARS Detection of Large Molecules”

20:00 **Regina de Vivie-Riedle**, *MPI für Quantenoptik*, “Conversion of an atomic to a molecular Bose-Einstein-Condensate with optimized pulses in the n- and fs-regime”

— Break —

*Detection of Large Biological Molecules*

Stuart Wolf, Chair

20:50 **Patrick J. Treado**, *Chemicon Inc.*, “Raman Chemical Imaging for Rapid, Non-Invasive and Reagentless BioThreat Detection”

21:10 **John Reintjes**, *Naval Research Laboratory*, “Femtosecond CARS for real time spore detection”

21:50 **Tomas Opatrny**, *Texas A&M University*, “Molecular coherence preparation using chirped pulses and fractional STIRAP”

21:50 **Guy Beadie**, *Naval Research Laboratory*, “Femtosecond CARS in polyatomic molecules”

22:10 **Aleksander Rebane**, *Montana State University*, “Background-free femtosecond CARS detection of porphyrins in solids”

*Bells Inequalities*

Dennis Couwenberg, Chair

**Louis Sica**, *NRL*, “A new view of Bell’s inequalities”

**Karl Hess**, *University of Illinois*, “Time and setting dependent instrument parameters and proofs of the Bell inequalities”

**Walter Philipp**, *University of Illinois*, “A local mathematical model for EPR experiments”

**Edward S. Fry**, *Texas A&M University*, “Loophole-free tests of Bell Inequalities”

*Novel Optics*

Juha Javanainen, Chair

**Vitaly Kocharovsky**, *Texas A&M University*, “Mechanism of BEC”

**Frank Narducci**, *Naval Air Systems Command*, “Progress towards magneto-optic rotation in a cold gas”

**Andrey Matsko**, *Jet Propulsion Laboratory*, “Optical measurements of gravity fields”

**Justin Peatross**, *Brigham Young University*, “Group Velocity and the Propagation of Broadband Pulses”