

CLEO® '94

CONFERENCE ON LASERS AND ELECTRO-OPTICS



TECHNICAL DIGEST

POSTCONFERENCE EDITION

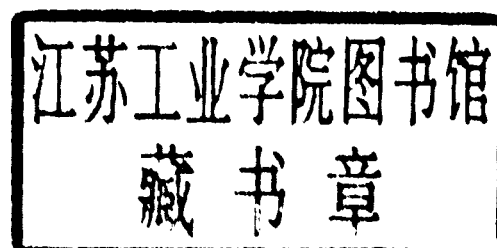
VOLUME 8

CLEO[®]'94

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Conference on Lasers and Electro-Optics

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Anaheim, California

Volume 8
1994 Technical Digest Series
Conference Edition



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FOREWORD

Welcome to CLEO'94. The Conference on Lasers and Electro-Optics provides a central forum for an update and review of a wide range of laser and electro-optic disciplines, from device development to systems engineering and applications. Moreover, the meeting serves to stimulate the use of the more mature technologies in other fields. This fourteenth annual CLEO is being held concurrently with the twenty-first International Quantum Electronics Conference (IQEC), which covers related topics by emphasizing basic science and applications to research.

CLEO presentations cover a range of topics in the development of new laser and electro-optic technologies. New ultrafast laser sources and switching schemes, for example, promise to dramatically increase transmission speeds along the information highway. Along the super-highway, workstations, storage facilities, and peripheral equipment require increased capacity and performance. Blue diode lasers and upconversion fiber lasers could potentially quadruple the information stored on compact disks. High resolution laser printers and a number of medical applications, including tissue welding and retinal reattachment, will benefit from novel semiconductor designs that herald several watts of continuous output in a near-diffraction limited beam from tapered amplifier devices. As building blocks for high-tech components reach down to the nanometer scale, designers are relying heavily on lasers to fabricate intricate microchips. Their use in producing ultra-thin film devices and exotic materials such as ferro-electric films, as well as in cleaning semiconductor surfaces prior to film deposition continues to grow.

This year's conference hosts a comprehensive exhibit of laser and electro-optic equipment, systems, and services, giving attendees an opportunity to gain hands-on knowledge of the wide and innovative applications this industry has to offer. Twenty-eight short courses ranging from introductory to advanced levels have been scheduled to provide a broad range of knowledge by experts in their respective fields.

The CLEO'94 technical program boasts a total of 655 presentations: 3 plenary papers, 5 tutorials, 64 invited papers, 397 contributed oral papers, and 186 papers presented in three poster sessions. The joint CLEO/IQEC plenary session, held on Monday afternoon in conjunction with the IEEE/OSA awards ceremony. Three speakers have been invited to address the following areas: the role lasers play in the mapping of the human genome, applications of lasers emitting ultrashort pulses to dynamical measurements in biology, physics, and engineering, and the manipulation of atoms by laser beams. Another highlight of the week's activities is a special session on biotechnology. Four speakers have been invited to focus on the use of lasers in biotechnology. Another special session, The Future of Optoelectronics, is planned for Wednesday evening; a panel of experts will discuss the primary issues and directions for optoelectronics and the information highway.

CLEO'94 is organized and cosponsored by the Optical Society of America and the IEEE/Lasers and Electro-Optics Society, in cooperation with the Quantum Electronics and Optics Division of the European Physical Society (EPS), and the Japanese Quantum Electronics Joint Group (JQEJG). The people behind the scenes, however, deserve credit for pulling together the pieces that develop into a conference of this magnitude. In addition to applauding the authors who contributed papers to the conference, we thank the members of the committees who spent time and energy to organize this year's conference. And, we express special appreciation to the staff of the Optical Society of America for the professionalism, skill, and consideration in planning and managing this conference.

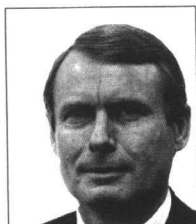
This is CLEO'94. Enjoy it, and look forward to 1995 when CLEO returns to Baltimore under the guidance of general chairs Thomas M. Deutsch and John E. M. Goldsmith and program chairs Dennis K. Killinger and George C. Valley.

CLEO®'94

General Chairs

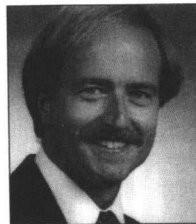


Thomas M. Baer
Biometric Imaging

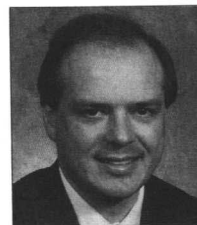


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AGENDA OF SESSIONS

Monday, May 9, 1994

CONVENTION CENTER ROOM B1	CONVENTION CENTER ROOM B2	CONVENTION CENTER ROOM B3	CONVENTION CENTER ROOM B4
8:00 am–10:00 am CMA , High-Power Diode Lasers 1	8:00 am–10:00 am CMB , Optical Storage	8:00 am–10:00 am CMC , Phase Conjugation: SBS and Fidelity	8:00 am–10:00 am CMD , Fiber Sensors and Measurements
10:00 am–10:30 am COFFEE BREAK, EXHIBIT HALL C & D			
10:30 am–12:30 pm CMH , High-Power Diode Lasers 2	10:30 am–12:30 pm CMI , Vertical Cavity Surface Emitting Lasers	10:30 am–12:30 pm CMJ , Materials for Phase Conjugation and Beam Coupling	10:30 am–12:30 pm CMK , Fiber Lasers
12:30 pm–2:00 pm LUNCH (On your own)			
MARRIOTT HOTEL 2:00 pm–6:00 pm JMB, CLEO® /IQEC PLENARY AND AWARDS SESSION			

Monday, May 9, 1994

CONVENTION CENTER ROOM C1	CONVENTION CENTER ROOM C2	CONVENTION CENTER ROOM C3	CONVENTION CENTER ROOM C4	Tutorials MARRIOTT SALON E
8:00 am–10:00 am CME , High-Speed Optoelectronics	8:00 am–10:00 am QMA , Chemical and Biological Photochemistry	8:00 am–10:00 am QMB , Nonlinear Optics in Nanostructures	8:00 am–10:00 am QMC , Coherent Dynamics	8:00 am–9:00 am CLEO® Tutorial CMF , Diode- Pumped Solid- State Lasers
				9:00 am–10:00 am CLEO® Tutorial CMG , Vertical Cavity Semiconductor Lasers
10:00 am–10:30 am COFFEE BREAK, EXHIBIT HALL C & D				
10:30 am–12:30 pm JMA , Joint Symposium on Biotechnology	10:30 am–12:30 pm QMD , Solution Photochemistry in Vibrational Coherence	10:30 am–12:30 pm QME , Nonlinear Wave Propagation	10:30 am–12:30 pm QMF , Ultrafast Physics	
12:30 pm–2:00 pm LUNCH (On your own)				
MARRIOTT HOTEL 2:00 pm–6:00 pm JMB, CLEO®/IQEC PLENARY AND AWARDS SESSION				

Tuesday, May 10, 1994

CONVENTION CENTER ROOM B1	CONVENTION CENTER ROOM B2	CONVENTION CENTER ROOM B3	CONVENTION CENTER ROOM B4
8:00 am–10:00 am CTuA , Biomedical Optical Imaging	8:00 am–10:00 am CTuB , Ultrashort Pulse Generation and Propagation in Fibers 1	8:00 am–10:00 am CTuC , High-Speed Switching	8:00 am–10:00 am CTuD , Optical Modulators
10:00 am EXHIBIT OPENS 10:00 am–10:30 am COFFEE BREAK, EXHIBIT HALL C & D			
10:30 am–12:00 m CTuG , Diagnostic Tissue Spectroscopy	10:30 am–12:00 m CTuH , Ultrashort Pulse Generation and Propagation in Fibers 2	10:30 am–12:00 m CTuI , Guided-Wave Switching	10:30 am–12:00 m CTuJ , Photorefractive Information Storage
12:00 m–1:00 pm LUNCH (available for purchase in Exhibit Hall C & D)			
CONVENTION CENTER, EXHIBIT HALL C & D 1:00 pm–2:30 pm CTuK, CLEO® POSTERS 1:00 pm–2:30 pm QTuJ, IQEC POSTERS			
2:30 pm–4:00 pm CTuL , Therapeutic and Diagnostic Techniques	2:30 pm–4:00 pm CTuM , Ultrafast Measurement Techniques	2:30 pm–4:00 pm CTuN , Quantum Devices for Switching	2:30 pm–4:00 pm CTuO , Applications of Phase Conjugation and Photorefractive Devices
4:00 pm–4:30 pm REFRESHMENT BREAK, EXHIBIT HALL C & D			
4:30 pm–6:00 pm CTuR , Laser Diagnostics	4:30 pm–6:00 pm CTuS , Ultrafast Measurements of Materials and Devices	4:30 pm–6:00 pm CTuT , Switching Devices	4:30 pm–6:00 pm CTuU , Eyesafe Lasers

Tuesday, May 10, 1994

CONVENTION CENTER ROOM C1	CONVENTION CENTER ROOM C2	CONVENTION CENTER ROOM C3	CONVENTION CENTER ROOM C4	Tutorials MARRIOTT SALON E
8:00 am–10:00 am CTuE , Tunable Solid-State Lasers	8:00 am–10:00 am QTuA , Photochemistry	8:00 am–10:00 am QTuB , Nonlinear Optics of Organic Materials	8:00 am–10:00 am QTuC , Atom Interferometry	8:00 am–9:00 am CLEO® Tutorial CTuF , Holographic Information Storage
				9:00 am–10:00 am IQEC Tutorial QTuD , How Strange is Quantum Mechanics? An Introduction to Local-Realism Violation
10:00 am EXHIBIT OPENS 10:00 am–10:30 am COFFEE BREAK, EXHIBIT HALL C & D				
10:30 am–12:00 m QTuE , Physics of Solid-State Lasers	10:30 am–12:00 m QTuF , Dynamics of Condensed Phases and Surfaces	10:30 am–12:00 m QTuG , Nonlinear Properties of Organics	10:30 am–12:00 m QTuH , Electromagnetically Induced Transparency	10:30 am–11:30 am IQEC Tutorial QTuI , Optical Parametric Generators from the Nanosecond to the Femtosecond Time Domain
12:00 m–2:00 pm LUNCH (available for purchase in Exhibit Hall C & D)				
CONVENTION, CENTER, EXHIBIT HALL C & D 1:00 pm–2:30 pm CTuK, CLEO® POSTERS 1:00 pm–2:30 pm QTuJ, IQEC POSTERS				
2:30 pm–4:00 pm CTuP , End-Pumped Solid-State Lasers	2:30 pm–4:00 pm CTuQ , Laser Technology for Fusion	2:30 pm–4:00 pm QTuK , Third-Order Processes in Organic Materials	2:30 pm–4:00 pm QTuL , High Resolution Spectroscopy	2:30 pm–3:30 pm IQEC Tutorial QTuM , Ultrafast Lasers in Chemistry and Biology
4:00 pm–4:30 pm REFRESHMENT BREAK, EXHIBIT HALL C & D				4:30 pm–5:30 pm CLEO® Tutorial CTuW , Lasers for WDM Optical Communications
4:30 pm–6:00 pm CTuV , Lasers Accelerators and X-ray Sources	4:30 pm–6:00 pm QTuN , Photorefractive Media	4:30 pm–6:00 pm QTuO , Nonlinear Optical Semiconductor and Inorganic Materials	4:30 pm–6:00 pm QTuP , Laser Spectroscopy	

Wednesday, May 11, 1994

CONVENTION CENTER ROOM B1	CONVENTION CENTER ROOM B2	CONVENTION CENTER ROOM B3	CONVENTION CENTER ROOM B4
8:00 am–10:00 am CWA , Femtosecond Solid-State Lasers 1	8:00 am–10:00 am CWB , Tunable and Multiple Wavelength Lasers	8:00 am–10:00 am CWC , Infrared Devices and Optoelectronic Displays	8:00 am–10:00 am CWD , Atmospheric, Space, and Ocean Optics 1
10:00 am EXHIBIT OPENS 10:00 am–12:00 m EXHIBITS ONLY TIME			
12:00 m–1:00 pm LUNCH (available for purchase in Exhibit Hall C & D)			
CONVENTION CENTER, EXHIBIT HALL C & D 1:00 pm–2:30 pm CWH, CLEO® POSTERS 1:00 pm–2:30 pm QWC, IQEC POSTERS			
2:30 pm–4:00 pm CWI , Femtosecond Solid-State Lasers 2	2:30 pm–4:00 pm CWJ , Monolithic Integrated Laser Structures	2:30 pm–4:00 pm CWK , Fiber Gratings and Related Technologies 1	2:30 pm–4:00 pm CWL , Atmospheric, Space, and Ocean Optics 2
4:00 pm–4:30 pm REFRESHMENT BREAK, EXHIBIT HALL C & D			
4:30 pm–6:00 pm CWN , Ultrafast Semiconductor Laser Dynamics	4:30 pm–6:00 pm CWO , Long-Wavelength Laser Diodes	4:30 pm–5:45 pm CWP , Fiber Grating and Related Technologies 2	4:30 pm–6:00 pm CWQ , Atmospheric, Space, and Ocean Optics 3
MARRIOTT HALL 6:00 pm–7:30 pm CONFERENCE RECEPTION			
MARRIOTT SALON E 7:30 pm–9:00 pm SPECIAL SESSION ON THE FUTURE OF OPTOELECTRONICS			

Wednesday, May 11, 1994

CONVENTION CENTER ROOM C1	CONVENTION CENTER ROOM C2	CONVENTION CENTER ROOM C3	CONVENTION CENTER ROOM C4	Tutorials MARRIOTT SALON E
8:00 am–10:00 am CWE , OPOs and Applications	8:00 am–10:00 am CWF , Blue-Green Diode Lasers	8:00 am–10:00 am QWA , Spin and Magnetic Field Effects	8:00 am–10:00 am QWB , Atomic Quantum Optics	8:00 am–9:00 am CLEO® Tutorial CWG , Undersea Lightwave Transmission Systems Using Erbium-Doped Fiber Amplifiers
10:00 am EXHIBIT OPENS 10:00 am–12:00 m EXHIBITS ONLY TIME				
12:00 m–1:00 pm LUNCH (available for purchase in Exhibit Hall C & D)				
CONVENTION CENTER, EXHIBIT HALL C & D 1:00 pm–2:30 pm CWH, CLEO® POSTERS				
1:00 pm–2:30 pm QWC IQEC POSTERS				
2:30 pm–4:00 pm CWM , OPOs—Pulsed	2:30 pm–4:00 pm QWD , Time Resolved Spectroscopy	2:30 pm–4:00 pm QWE , Low Dimensional Semiconductors	2:30 pm–4:00 pm QWF , Quantum Cryptography	
4:00 pm–4:30 pm REFRESHMENT BREAK, EXHIBIT HALL C & D				
4:30 pm–6:00 pm JWA , Joint Symposium on Photorefractive Semiconductors and Quantum Wells	4:30 pm–6:00 pm QWG , High Field Atomic Physics	4:30 pm–6:00 pm QWH , Propagation and Nonlinear Effects in Semiconductors	4:30 pm–6:00 pm QWI , Quantum Nondemolition Measurement	
MARRIOTT HALL 6:00 pm–7:30 pm CONFERENCE RECEPTION				
MARRIOTT SALON E 7:30 pm–9:00 pm SPECIAL SESSION ON THE FUTURE OF OPTOELECTRONICS				

Thursday, May 12, 1994

CONVENTION CENTER ROOM B1	CONVENTION CENTER ROOM B2	CONVENTION CENTER ROOM B3	CONVENTION CENTER ROOM B4
8:00 am–10:00 am CThA , Multiwavelength Optical Fiber Systems and Technology	8:00 am–10:00 am CThB , High Speed Lasers	8:00 am–10:00 am CThC , High Power Diode Pumped Solid-State Lasers	8:00 am–10:00 am CThD , Waveguide Frequency Conversion
10:00 am EXHIBIT OPENS 10:00 am–10:30 am COFFEE BREAK, EXHIBIT HALL C & D			
10:30 am–12:00 m CThE , System Implications of Chirp and Dispersion	10:30 am–12:00 m CThF , Semiconductor Laser Physics	10:30 am–12:00 m CThG , Thermal Limits to Solid-State Lasers	10:30 am–12:00 m CThH , Frequency Conversion
12:00 m–1:00 pm LUNCH (available for purchase in Exhibit Hall C & D)			
CONVENTION CENTER, EXHIBIT HALL C & D 1:00 pm–2:30 pm CTuI, CLEO® POSTERS 1:00 pm–2:30 pm QTuJ, IQEC POSTERS			
2:30 pm–4:00 pm CThJ , Advanced Lightwave Techniques for Broadband Video Networks	2:30 pm–4:00 pm CThK , Infrared Lasers	2:30 pm–4:00 pm CThL , Diode Pump Source Development	2:30 pm–4:00 pm CThM , UV-Visible Nonlinear Frequency Conversion
4:00 pm–4:30 pm REFRESHMENT BREAK, EXHIBIT HALL			
4:30 pm–6:00 pm CThN , Technology for Ultrafast Systems	4:30 pm–6:00 pm CThO , High Power Gas Lasers	4:30 pm–6:00 pm CThP , Smart Pixel Devices and Systems	4:30 pm–6:00 pm CThQ , Infrared Frequency Conversion Devices
CONVENTION CENTER ROOM B1 8:00 pm–10:00 pm CLEO® POSTDEADLINE PAPER SESSION CONVENTION CENTER ROOM B3 8:00 pm–10:00 pm IQEC POSTDEADLINE PAPER SESSION			

Thursday, May 12, 1994

CONVENTION CENTER ROOM C1	CONVENTION CENTER ROOM C2	CONVENTION CENTER ROOM C3	CONVENTION CENTER ROOM C4
8:00 am–10:00 am JThA , Joint Symposium on Generation and Applications of Intense Ultrashort Laser Pulses 1	8:00 am–10:00 am QThA , Atomic Coherence	8:00 am–10:00 am QThB , Microcavity and Quantum Well Lasers	8:00 am–10:00 am JThB , Joint Symposium on Nonlinear Optics of Surfaces and Thin Films 1
10:00 am EXHIBIT OPENS 10:00 am–10:30 am COFFEE BREAK, EXHIBIT HALL C & D			
10:30 am–12:00 m QThC , Tunable Femtosecond Sources	10:30 am–12:00 m QThD , Quantum Noise in Semiconductor Lasers	10:30 am–12:00 m QThE , Microcavity Phenomena	10:30 am–12:00 m JThC , Joint Symposium on Nonlinear Optics of Surfaces and Thin Films 2
12:00 m–1:00 pm LUNCH (available for purchase in Exhibit Hall C & D)			
CONVENTION CENTER, EXHIBIT HALL C & D 1:00 pm–2:30 pm CThI, CLEO® POSTERS 1:00 pm–2:30 pm QThF, IQEC POSTERS			
2:30 pm–4:00 pm CThG , Gain Dynamics in Semiconductors	2:30 pm–4:00 pm QThH , Quantum Effects in Propagation	2:30 pm–4:00 pm QThI , Novel Spectroscopy and Nanostructures	2:30 pm–4:00 pm QThJ , Four-Wave Mixing
4:00 pm–4:30 pm REFRESHMENT BREAK, EXHIBIT HALL			
4:30 pm–6:00 pm CThR , Strained Layer and Quantum Wire Lasers	4:30 pm–6:00 pm CThS , Material Processing with Lasers	4:30 pm–6:00 pm QThK , Exciton Physics	4:30 pm–6:00 pm QThL , Cavities and Photonic Gap
CONVENTION CENTER ROOM B1 8:00 pm–10:00 pm CLEO® POSTDEADLINE PAPER SESSION CONVENTION CENTER ROOM B3 8:00 pm–10:00 pm IQEC POSTDEADLINE PAPER SESSION			

Friday, May 13, 1994

CONVENTION CENTER ROOM B1	CONVENTION CENTER ROOM B2	CONVENTION CENTER ROOM B3	CONVENTION CENTER ROOM B4
8:00 am–10:00 am CFA , Laser Materials	8:00 am–10:00 am CFB , Microfabrication	8:00 am–10:00 am CFC , Second Harmonic Generation in Amorphous Materials	8:00 am–10:00 am CFD , Metal Vapor Lasers
10:00 am–10:30 am COFFEE BREAK, EXHIBIT HALL C & D			
10:30 am–12:30 pm CFE , Resonator Design for Solid-State Lasers	10:30 am–12:30 pm CFF , Electro-optic and Frequency Conversion Crystals	10:30 am–12:30 pm CFG , Nonlinear Optical Devices	10:30 am–12:30 pm CFH , Rare Gas Halide Lasers

Friday, May 13, 1994

CONVENTION CENTER ROOM C1	CONVENTION CENTER ROOM C2	CONVENTION CENTER ROOM C3	CONVENTION CENTER ROOM C4
8:00 am–10:00 am JFA , Joint Symposium on Generation and Application of Intense Ultrashort Laser Pulses 2	8:00 am–10:00 am QFA , Laser Cooling 1	8:00 am–10:00 am QFB , Dynamics and Chaos	8:00 am–10:00 am QFC , Nonclassical Light
10:00 am–10:30 am COFFEE BREAK, EXHIBIT HALL C & D			
10:30 am–12:30 pm JFB , Joint Symposium on Generation and Application of Intense Ultrashort Laser Pulses 3	10:30 am–12:30 pm CFI , Advanced Diagnostics	10:30 am–12:30 pm QFD , Laser Cooling 2	10:30 am–12:30 pm QFE , Novel Lasers

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