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6. AUTHOR(S)

Prof. Hermann Haus

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Research Laboratory of Electronics
Massachusetts Institute of Technology
77 Massachusetts Avenue
Cambridge, MA 02139

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

Office of Naval Research
800 N. Quincy St.
Arlington, VA 22217-5000

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1991 GORDON RESEARCH CONFERENCE ON NONLINEAR OPTICS AND LASERS

Final Progress Report

AFOSR and NSF Grant No: ECS-9111835
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Summary of Conference Events

The Conference on Nonlinear Optics and Lasers, which is held traditionally every other year, was held again this year. The topics were chosen on the basis of their current interest and of significant advances within the past year: production of X-rays with high power lasers, generation of millimeter waves with femtosecond pulses, microcavities and micro-lasers, second harmonic generation in fibers and advances in photorefractivity and parallel optical processing. It is important to introduce Gordon conferees to ways of thinking and scientific methods in fields that are related, but would not generally appear in specialized conferences. We had three such examples: The methods of nonlinear optics as applied to electronic signal processing (Dave Bloom), the concept of squeezing (special quantum states of the electromagnetic field) as used to explain the generation of gravitational waves in the expanding universe (Leonid Grishchuk), and particle interferometers with particle-instead of wave-gratings (Dave Pritchard).

By asking Nobel laureate Bloembergen one year in advance to give the traditional after dinner speech, we were privileged to hear him speak of the history of optics over the centuries resulting in the various principles of linear optics, and the highly accelerated pace of discovery of the analogous principles in nonlinear optics. His presence was particularly gratifying, since there was a large contingent of graduate students participating in the conference.

We had two foreign cochairman: Profs. E. Hanamura and Prof. E. Göbel. Invited foreign speakers were:

from France:	Prof. Jean-Michel Raimond
from Great Britain:	Prof. Wilson Sibbett
from the Soviet Union:	Profs. Leonid Grishchuk and Boris Zeldovitch
from Germany:	Prof. Theo Tschudi
from Austria:	Prof. Arnold Schmidt

In order to air the work of graduate students, and to give the opportunity to present very recent work, we have had the tradition of a poster session. This year we expanded the poster session to two evenings. This was a very useful innovation. The number of posters each night was of the order of 15, giving plenty of time for extensive discussion with the presenters. This mode is highly recommended for future conference.

At the Thursday conference dinner votes were taken on the "best poster." The winner was "Optical Coherence Tomography," Paper 29 on the poster program. The runner up was "Time Domain Observation of Squeezing in a Nonlinear Fiber Ring Interferometer," Paper 18 on the poster program.

On Tuesday afternoon, the committee consisting of the chairman, vice-chairman, and discussion leaders selected two candidates for vice-chairman of the 1993 conference (and thus chairman of the 1995 conference). In the Tuesday evening session an announcement was made to the conferees that on Wednesday night a vote would be taken on the next vice-chairman and that they should consider presenting candidates. When nominations were made on Wednesday night, the nominee of the conferees was Yaron Silberberg. In the vote, Silberberg was the winner. As chairman of this conference I can express my satisfaction that a very good candidate was chosen and that the 1995 conference planning is in good hands.

At any time during the week, about 90 conferees were present.

The atmosphere in Wolfeboro is beyond compare. I attend many conferences myself, yet I have never found an equally informal and productive setting for the exchange of ideas and the spawning of new ideas. On the whole, it is my opinion that the conference was very successful and I am looking forward to the 1993 conference, hopefully at the Brewster Academy.

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Hermann A. Haus
Institute Professor
Massachusetts Institute of Technology
Chairman, Gordon Research Conference
on Nonlinear Optics and Lasers, 1991



**PROPOSED BUDGET
1991 GORDON RESEARCH CONFERENCE**

	GRC	AFOSR	NSF	ONR	TOTALS
1. <u>Conference Fee</u>					
Invited Speakers: 24 × 350	1,100	4,000	—	3,300	8,400
Session Chairmen: 9 × 350	2,800	—	—	—	2,800
Junior Faculty, 22 × 350					
Students:	1,000	1,000	4,000	1,700	7,700
2. <u>Travel</u>					
Invited Speakers, domestic airfare: 9 × 455 (avg)	100	4,000	—	—	4,100
Invited Speakers, foreign airfare: 6 × 1,000 (avg)	6,000	—	—	—	6,000
Junior faculty, students, cochairmen: 10 × 300	—	1,000	2,000	—	3,000
Local transportation, bus from Logan airport to Wolfeboro 28 × 25	1,000	—	—	—	1,000
TOTALS	12,000	10,000	6,000	5,000	33,000

**GORDON RESEARCH CONFERENCE
NONLINEAR OPTICS AND LASERS**

Brewster Academy, Wolfeboro, NH
July 22-26, 1991

Chairman: **Hermann A. Haus** Vice Chairman: **Dana Z. Anderson**
Co-Chairmen: **E. Göbel** and **E. Hanamura**

Monday, July 22

Morning

8:30-9:15	D. Auston	J. Feinberg , Discussion Leader Terahertz Radiation from Photoconducting Antennas
9:15-10:00	D. Bloom	Nonlinear Electronics
10:00-10:30	Coffee Break	
10:30-11:15	Y. Silberberg	Photon Echoes in Er-doped Fibers
11:15-12:00	C. Rhodes	Interaction of High Intensity Radiation with Molecules and Solids

Evening

8:00-8:45	G. Mourou	R. Falcone , Discussion Leader Ultraintense Lasers and Nonlinear Optics of Free Electrons
8:45-9:30	S. Szatmári	Up-scaling of TW-class KrF Lasers

Tuesday, July 23

Morning

8:30-9:15	D. Steel	E. Göbel , Discussion Leader High Resolution Nonlinear Spectroscopy and Photon Echoes of Localized Excitons
9:15-10:00	T. Fukuzawa	Luminescence of Type-II Excitons in Coupled Q.W.'s
10:00-10:20	Coffee Break	
10:20-11:05	J. Shah	Subpicosecond Coherent Spectroscopy of Optical Waveguides
11:05-11:50	J. Stark	Nonlinear Optical Response of Strongly Confined Excitons
11:50-12:30	W. Knox	Femtosecond Quantum Well Opto-electronics

Evening

7:30-8:15	M. Murnane	C. Rhodes , Discussion Leader X-rays from Short-pulse Laser Produced Plasmas
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POSTER SESSION TUESDAY EVENING

POSTER SESSION I TUESDAY EVENING

1. "Ten Hertz laser generation of sub-Angstrom X-rays," J. D. Kmetec, C. L. Gordon III, and S. E. Harris, Stanford University.
2. "X-ray resonant nonlinear effects in plasma," A. E. Kaplan and P. Shkolnikov, The Johns Hopkins University.
3. "Relativistic pulse compression," H. C. Kapteyan and M. M. Murnane, Washington State University.
4. "Ultra-short pulse formation in passively mode-locked fiber lasers," M. E. Fermann and M. Hofer, Technical University of Vienna.
5. "Femtosecond desorption of molecules from surfaces: CO/Cu(111)," H. W. K. Tom, J. A. Prybyla and G. D. Anniller, AT&T Bell Laboratories.
6. "Probing the vibrational contribution to $\chi^{(3)}$ with femtosecond optical pulses," W. T. Lotshaw, C. P. Yakymyshyn, and P. K. Singh, General Electric Company.
7. "Photon echo in strongly saturated systems," V. L. da Silva, Y. Silberberg, J. P. Heritage and E. W. Chase, Bellcore.
8. "Ultrafast behavior of a nonlinear Fabry-Perot etalon," J. Paye and D. Hulin, École Polytechnique - École Nationale Supérieure de Techniques Avancées.
9. "Harmonic mode-locking of a Nd:BEL laser using a 20 GHz dielectric resonator/optical modulator," A. A. Godil, A. S. Hou, B. A. Auld, D. M. Bloom, Stanford University.
10. "Practical limitation of optical parametric oscillators," K. L. Schepler, Wright Laboratory.
11. "Biexciton AC Stark splitting in CuCl," R. Shimano and M. Kuwata-Gonokami, University of Tokyo.
12. "Near infrared dispersion of $\chi^{(3)}(3\omega)$, $\text{Im}[\chi^{(3)}(-\omega; \omega, \omega, -\omega)]$ and $\chi^{(3)}(2\omega_1 - \omega_2)$ of poly (4-BCMU) thin films," W. E. Torruellas, K. B. Rochford, R. Zanoni, S. Aramaki and G. I. Stegeman, University of Florida, CREOL.
13. "Optical nonlinear response and the generation of PCW in disordered exciton systems," N. Taniguchi and E. Hanamura, Univ. of Tokyo.
14. "Nonlinear Compton scattering in focused pulsed laser," U. Moludeen, H. W. K. Tom, R. R. Freeman, J. Bokor, P. H. Bucksbaum, AT&T Bell Laboratories.
15. "High-power femtosecond optical pulse compression using spatial solitons," D. H. Reitze, A. M. Weiner and D. E. Leaird, Bellcore.
16. "Picosecond transient photoreflectance measurements of heavily ion-implanted and annealed silicon," S. C. Moss, J. E. Wessel, and J. F. Knudsen, The Aerospace Corporation.
17. "Effects of chirp on coherent measurements: the case of the optical Stark effect in semiconductors," J. J. Baumberg, R. A. Taylor and J. F. Ryan, Oxford University.

**POSTER SESSION II
WEDNESDAY EVENING**

- 18 "Time domain observation of squeezing in a nonlinear fiber ring interferometer," K. Bergman, Massachusetts Institute of Technology.
19. "Two-photon correlation of squeezed pulse train," T. Kuga, Y. Miyamoto, T. Hirano and M. Matsuoka, University of Tokyo.
20. "Spatial dark soliton stripes and grids," G. A. Swartzlander, Jr. Naval Research Laboratory.
21. "Transoceanic fiber transmission that overcomes the Gordon-Haus limit," A. Mecozzi, Y. Lai, and H. A. Haus, Massachusetts Institute of Technology.
22. "Quantum frequency conversion: experimental evidence," P. Kumar and J. Huang, Northwestern University.
23. "High-nonlinearity optical fibers," D. L. Weidman, J. C. Lapp, and M. A. Newhouse, Corning Incorporated.
24. "Holographic mode structure in waveguides," D. Brady, University of Illinois, Champagne-Urbana.
25. "A self-organizing photorefractive demultiplexer," M. Saffman, C. Benkert and D. Z. Anderson, University of Colorado.
26. "Self-organizing feature extraction by a photorefractive system," D. Montgomery, C. Benkert and D. Z. Anderson. University of Colorado.
27. "Photorefractive gratings in KLTN," R. Agranat, Hebrew University of Jerusalem.
28. "All optical ultrafast serial-to-parallel conversion using excitonic giant nonlinearity," K. Ema, M. Kuwata-Gonokami, T. Saiki, K. Takeuchi, and F. Shimizu, University of Tokyo.
29. "Optical coherence tomography," D. Huang, E. A. Swanson, C. P. Lin, J. S. Schuman, W. G. Stinson, W. Chang, M. R. Hee, T. Flotte, K. Gregory, C. A. Puliafito, and J. G. Fujimoto, Massachusetts Institute of Technology.
30. "Coherent detection of the AC Kerr effect by pump-probe prism coupling in semiconductor doped glasses," B. J. Offrein, H. J. W. M. Hoekstra, T. H. Hoekstra, A. Driessen and T. J. A. Popma," Technical University of Twente.
31. "Observation of intermode correlation in whispering gallery mode laser with dye doped micro sphere," M. Kuwata-Gonokami, K. Ema and K. Takeda, University of Tokyo.

GORDON RESEARCH CONFERENCES
NON-LINEAR OPTICS AND LASERS
Brewster Academy, Wolfeboro, New Hampshire
JULY 22-26, 1991

REGISTRATION LIST

Auston, David N. off site
Columbia University
School of Engineering & Appl. Science
New York, NY 10027

212-854-2993

Baumberg, Jeremy J. Kimball Room 3
Oxford University
Clarendon Laboratory
Parks Road
Oxford OX 1 3PU England
865-272338

Bergman, Keren Estabrook Room 4
Massachusetts Inst. of Technology
36-355
50 Vassar Street
Cambridge MA 02139
617-253-5481

Bloom, David M. off site
Stanford University
Ginzton Lab
GL-269
Stanford CA 94305-4085
415-723-0464

Cudney, Roger S. Kimball Room 4
Univ. of Southern California
Dept. of Physics
Los Angeles, CA 90089-0484

213-740-0844

Dominic, Vincent G. Kimball Room 4
Univ. of Southern California
SSC 320, Physics Dept.
Los Angeles, CA 90089-0484

213-740-1129

Driessen, A. Sargent Room 205
Univ. of Twente
Dept. of Applied Physics
P.O. Box 212
7500 Ae Enschede The Netherlands
053-892744

Bacher, Gerald David Kimball Room 3
Univ. of Southern California
Dept. of Physics
Seaver Science Center, Room 300
Los Angeles CA 90089-0484
213-740-0844

Benkert, Claus H. Haines Room 1
Univ. of Colorado
JILA
Box 440
Boulder CO 80309-0440
303-492-5129

Bloembergen, Nicolaas off site
Harvard University
231 Pierce Hall
29 Oxford Street
Cambridge MA 02139
617-495-3336

Brady, David Haines Room 1
Univ. of Illinois
Beckman Institute
405 N. Mathews
Ursana IL 61801
217-224-5558

Da Silva, Valeria L. Estabrook Room 4
Bellcore
331 Newman Springs Road
Red Bank, NJ 07701

908-758-3130

Donoghue, Jack Kupper Room 2
Tufts University

Ema, K. Sargent Room 108
Univ. of Tokyo
Dept. of Applied Physics
7-3-1 Hongou, Bunkyo-Ku
Tokyo 113 Japan
81-2-2812-2111

NON-LINEAR OPTICS AND LASERS 1991

Falcone, Roger off site
Univ. of California, Berkeley
Physics Dept.
Berkeley, CA 94720

415-642-8916

Fermann, M.E. House 1 Room 4
Tu Vienna
Gusshausstr. 27/359/9
Dept. Electronics
Vienna Austria A-1040
22588013879

Fujimoto, James G. Brown Room 3
Massachusetts Inst. of Technology
Dept. of Electrical Eng. & Comp.
Science Bldg, 36-361 50 Vassar St.
Cambridge MA 02139
617-253-8528

Gabetta, Giuseppe House 3 Room 1
Univ. of Pavia
Via Abbiategrasso, 209
Pavia, Italy 27100

39-382-381212

Glassner, David S. Kupper Room 3
USCLA Physics Dept.

Godil, Asif A. Sargent Room 107
Stanford University
Ginzton Lab
Stanford, CA 94305

915-723-0294

Guthals, Dennis House 3 Room 2
Rockwell International

Hanamura, E. House 1 Room 2
Univ. of Tokyo, Applied Physics
7-3-1 Hongo, Bunkyo-Ku
Tokyo, Japan 113

3-3812-2111

Feinberg, Jack House 2 Room 2
Univ. of Southern California
Dept. of Physics
Mail Code 0484
Los Angeles CA 90089-0484
213-740-1134

Froberg, Nan M. Estabrook Room 1
Columbia University
Dept. of Electrical Engineering
Mudd Building
New York NY 10027
212-859-1738

Fukuzawa, Tadashi Brown Room 4
IBM, Japan, Ltd. Tokyo Res. Lab
5-19, Sanbancho
Chiyoda-Ku
Tokyo Japa 102
3-3288-8366

Garmire, Elsa House 2 Room 6
Univ. of Southern California
Center For Laser Studies, MC1112
Los Angeles, CA 90089-1112

213-740-4235

Gobel, Ernst D. House 1 Room 3
Philipps Univ., FB Physik
Renthof 5
Marburg, Germany 3550

6421-282018

Grishchuck, Leonid Sargent Room 304
JILA
Univ. of Colorado
Boulder, CO 80302

301-492-2860

Hall, Gregory off site
Savannah River Laboratory
Bldg. 735A
Aiken, SC 29808

803-725-5451

Harris, S.E. off site
Stanford University
Ginzton Laboratory #4
Stanford, CA 94305

415-723-0224

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Harvey, Albert B. Haines Room 4
National Science Foundation
1800 G Street NW, Rm 1151
Washington, DC 20550

202-357-9618

Houser, Glenn D. Kimball Room 2A
Univ. of Southern California
Center For Laser Studies
1042 West 36th Place/DRB-15
Los Angeles CA 90089-1112
213-740-4245

Huang, David Sargent Room 109
Univ. of Waterloo
Dept. of Ede
Waterloo, Ontario N2L 3G1
Canada
519-885-1211

Jacobson, Joseph M. Sargent Room 109
Massachusetts Inst. of Technology
Dept. of Physics
Room 36-347, 50 Vassar St.
Cambridge MA 02139
617-253-8908

Jewell, Jack House 1 Room 7
AT&T Bell Labs
Rm 4G-520
Holmdel, NJ 07733

201-949-7666

Joneckis, Lance G. House 3 Room 5
Massachusetts Inst. of Technology
36-477
77 Massachusetts Avenue
Cambridge MA 02139
617-253-2532

Kapteyn, Henry C. House 2 Room 5
Washington State University
Dept. of Physics
Pullman, WA 99164-2814

509-335-4671

Kmetec, Jeff Kupper Room 7
Stanford University
Ginzton Labs 29
Stanford, CA

415-725-2258

Haus, Hermann A. Kupper Room 5
Massachusetts Inst. of Technology
79 Massachusetts Avenue
Cambridge, MA 02139

617-253-2585

Hu, Binbin Kupper Room 4
Columbia University
1725 Mudd Bldg.
500 W. 120th Street
New York NY 10027
212-854-1738

Huang, Weiping House 3 Room 5
Univ. of Waterloo
Dept. of Ede
Waterloo, Ontario N2L 3G1
Canada
519-885-1211

Jasinski, Jerry P. House 3 Room 3
Keene State College
229 Main Street
Keene, NH 03431

603-358-2563

Joffre, Manuel B. Sargent Room 307
Ensta-Ecole Polytechnique
Pab D'Optique Appliquee
Palaiseau, France F91120

33-1-601003318

Kaplan, Alexander E.
Johns Hopkins University

Kinrot, Opher Kupper Room 6
Weizmann Inst. of Science
Chemical Physics Dept.
Rehovot, Israel 76100

972-8-343193

Knox, Wayne H. House 1 Room 5
AT&T Bell Labs
4B-415
Crawford Corner Road
Holmdel NJ 07733
908-949-0958

NON-LINEAR OPTICS AND LASERS 1991

Kuga, Takahiro House 3 Room 4
Univ. of Tokyo
Inst. for Solid State Physics
7-22-1 Roppongi
Tokyo 106 Japan
81-3-3478-6811

Kuwata-Gonokami, Makoto House 3 Room 4
Univ. of Tokyo
Dept. of Applied Physics
7-3-1 Hongo, Bunkyo-Ku
Tokyo 113 Japan
81-3-3812-2111

Lenz, Gadi Bearce Room 1
Massachusetts Inst. of Technology
36-315
Elc Eng. & Computer Science
Cambridge MA 02139
617-253-8524

Little, Brent Bearce Room 2
Univ. of Waterloo
Dept. of Electrical Engineering
Waterloo, Ontario N2L 3G1
Canada
519-885-1211

MacCormack, Stuart Bearce Room 3
Univ. of Southampton
Optoelectronics Research Centre
Southampton, England 509-5NH

0703-592066

Mecozzi, Antonio Kimball Room 1
Fondazione Ugo Bordon
Optics Group
Via B. Castiglione 59
00142 Roma Italy
39-6-5480-2232

Mohideen, Umar Bearce Room 4
Columbia University
Rm 48-43G, AT&T Bell Labs
Crawford Corner Road
Holmdel NJ 07733
908-949-2013

Moroi, David S. House 2 Room 4
Kent State University
Dept. of Physics
Kent, OH 44242

216-672-2542

Kumar, Prem off site
Northwestern University
2145 Sheridan Road
Evanston, IL 60208

708-491-4128

Lai, Yinchieh Kimball Room 1
Massachusetts Inst. of Technology
Room 36-363
Cambridge, MA 02139

617-253-8302

Levenson, Marc D. Sargent Room 201
IBM Research Division

Lotshaw, William T. House 3 Room 6
General Electric Res. & Dev.
Room KWD 270
P.O. Box 8
Schenectady NY 12391
518-387-5163

Majetich, Sara Estabrook Room 5
Carnegie Mellon University
Dept. of Physics
Pittsburgh, PA 15213

412-268-31-5

Miller, Ian J. House 3 Room 7
Lumonics Inc.
105 Schneider Road
Kanata (Ottawa), Ontario K2K 1Y3
Canada
613-993-6018

Montgomery, Don House 3 Room 7
Univ. of Colorado
JILA
Campus Box 440
Boulder CO 80302
303-492-7806

Moss, Steven C. Sargent Room 309
Aerospace Corporation
MS/M2-253
P.O. Box 92957
Los Angeles CA 90009
213-336-9216

NON-LINEAR OPTICS AND LASERS 1991

Mourou, Gerard A. House 1 Room 5
Univ. of Michigan
Ultrafast Science Lab
1st Bldg. Room 1008, 2200 Bonisteel Blvd.
Ann Arbor MI 48109-2099
313-763-4877

Nathel, Howard Sargent Room 206
Lawrence Livermore National Lab
L-Division, L-59
P.O. Box 808
Livermore CA 94550
415-294-6449

Partanen, Jouni Sargent Room 207
Univ. of Southern California
Physics Dept., SSC-328
Los Angeles, CA 90089-0484

213-740-0046

Pollock, Clifford Brown Room 5
Cornell University
Phillips Hall
School of Electrical Engineering
Ithaca NY 14853
617-255-5032

Raimond, Jean-Michel Brown Room 7
E.N.S. -Paris VI
24 Rue Lhomond
Paris, France 75005

33-143291225

Rhodes, Charles K. Brown Room 8
Univ. of Illinois at Chicago
Dept. of Physics (MC 273)
POB 4348
Chicago IL 60680

Schepler, Kenneth L. Sargent Room 310
Wright Patterson AFB
Wright Lab
WL/Elos
WFAFB OH 45433-6543
513-255-3804

Shah, J. House 3 Room 1
AT&T Bell Labs
Rm 4D-415
Crawford Corner Road
Holmdel NJ 07733
908-949-3691

Murnane, Margaret M. House 2 Room 5
Washington State University
Dept. of Physics
Bullman, WA 99164-2814

509-335-6389

Pang, Lily Estabrook Room 6
Massachusetts Inst. of Technology
Lincoln Lab, Room C-372
244 Wood Street
Lexington MA 02173
617-981-2751

Paye, Jerome Sargent Room 307
Ensta Centre De L'Yvette
Lab D'Optique Appliquee
Palaiseau, France 91120

Pritchard, David E. Brown Room 6
Massachusetts Inst. of Technology
Physics Dept.
Cambridge, MA 02139

617-253-6812

Reitze, Dave Sargent Room 308
Bellcore
331 Newman Springs Road
Red Bank, NJ

908-758-3225

Rothenberg, Joshua E. off site
IBM T.J. Watson Research Center
P.O. Box 218
Yorktown Heights, NY 10598

914-945-3749

Schmidt, A.J. House 1 Room 4
Technische Universitat Wien
Susshausstrasse 27
A1040 Wien
Austria
222-58801-3714

Shimano, Ryo Sargent Room 108
Univ. of Tokyo
Dept. of Applied Physics
7-3-1 Hongo, Bunkyo-Ku
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