## Contents

Part I Quantum Optics Experiments	
An Axially Symmetric Imaging System for Ultra-Cold Neutral Ator By H. Takuma, T. Nayuki, A. Shindoh, J. Kawanaka, K. Shimizu, and F. Shimizu (With 2 Figures)	
Matter-Wave Optics and Interferometry with Laser-Cooled Atoms By M. Christ, J.H. Müller, D. Bettermann, R. Deutschmann, V. Rie M. Schiffer, A. Scholz, K. Sengstock, U. Sterr, and W. Ertmer (With 9 Figures)	ger, 8
Towards a Cold-Atom Matter-Wave Interferometer By P. Hannaford, R.J. McLean, G.I. Opat, W.J. Rowlands, and A. Sidorov (With 1 Figure)	18
Uncertainty-Principle-Limited Position Measurement of Moving Ato By J.E. Thomas, J.R. Gardner, G.R. Welch, M.L. Marable, T.A. Sav and L.J. Wang (With 3 Figures)	vard,
Atoms Optics with Standing Waves of Light By HA. Bachor, Q. Li, B.W. Stenlake, I.C.M. Littler, K.G.H. Bald and D.E. McClelland (With 9 Figures)	
Part II Atomic Optics Theory	
Quantum Effects in Atomic Diffraction and Reflection By S.M. Tan and D.F. Walls (With 5 Figures)	49
Theory of Interactions Between Laser-Cooled Atoms By M.J. Holland, K.A. Suominen, and K. Burnett (With 6 Figures)	59
Many-Body Theory of Atom Optics By G. Lenz and P. Meystre	68
Bragg Scattering of a Coherent Ultracold Atomic Beam in Nonlinear Atom Optics By W. Zhang and D.F. Walls (With 3 Figures)	78
Atom Optics in Quantized Light Fields By D.S. Krähmer, A.M. Herkommer, E. Mayr, V.M. Akulin, I.Sh. Averbukh, T. van Leeuwen, V.P. Yakovlev, and W. Schleich	
(With 7 Figures)	87



Quantum Nonlinear Dynamics in Atom Optics By S. Dyrting, W.Y. Chen, and G.J. Milburn (With 7 Figures)	03
Non-Classical States of Motion and Quantum Collapse and Revival in an Ion Trap	
By J.I. Cirac, R. Blatt, A.S. Parkins, and P. Zoller (With 5 Figures) 1	12
Part III Quantum Measurement and Quantum Noise	
Quantum Non-Demolition Measurements and Back-Action-Induced Squeezing in Atomic-Three-Level Systems By P. Grangier, JPh. Poizat, P. Grelu, F. Castelli, L.A. Lugiato,	
and A. Sinatra (With 5 Figures)	23
Competing $\chi^{(2)}$ Nonlinearities in a Cavity By M.A.M. Marte (With 4 Figures)	34
Measurement Effects on Quantum Optical Systems By M. Orszag and R. Ramírez (With 4 Figures)	2
Quantum-Optical Phase and Its Measurement By D.T. Pegg, J.A. Vaccaro, and S.M. Barnett (With 1 Figure) 153	3
Nonlinear Quantum Optics with Few Atoms By U. Martini, C. Wagner, and A. Schenzle (With 3 Figures) 162	2
Dissipative Environments:  Quantum Jumps or Phase-Space Localization?	
By B.M. Garraway and P.L. Knight (With 4 Figures)	3
Ponderomotive Control of Quantum Noise By P. Tombesi	4
Quantum Soliton Collisions: Logic and QND By P.D. Drummond, J. Breslin, W. Man, and R.M. Shelby 194	4
Nonlinear and Quantum Dynamics of an Optical Cavity Containing Cold Atoms By E. Giacobino, J.M. Courty, and A. Lambrecht (With 6 Figures) 203	3
Quantum Optics with Mirrors By J.G. Rarity, D.M. Atkin, P.R. Tapster, P.C.M. Owens, T. Herzog, H. Weinfurter, and A. Zeilinger (With 5 Figures)	1
Decoherence: Is Dissipation All It Takes?  By H.J. Carmichael	9

Part IV New Theoretical Techniques	
Quantum Optical Correlations: A Green's Function Approach By C.J. Mertens and T.A.B. Kennedy (With 4 Figures)	. 227
Wigner Distributions for Quantum States with Minimum Phase Uncertainty By B. Daeubler, H. Risken, and L. Schoendorff (With 4 Figures)	. 236
Spatial and Temporal Optical Field Reconstruction Using Phase-Space Tomography By M.G. Raymer, M. Beck, and D. McAlister (With 4 Figures)	. 245
Driving Atoms with Light of Arbitrary Statistics By C.W. Gardiner and A. Parkins (With 5 Figures)	. 254
Quantum Trajectories and Stochastic Schrödinger Equation for Nonlinear Optical Processes  By P. Goetsch and R. Graham (With 2 Figures)	. 262
Part V Applications in Laser Physics	
Intensity Coherence in Multimode Lasers By P. Mandel	. 275
Electron-Photon Manipulation with Sub-Poissonian Semiconductor Junction Arrays By P.J. Edwards (With 4 Figures)	. 285
Near Dipole-Dipole Effects in Nonlinear and Quantum Optics with Applications to Piezophotonic Switching By C.M. Bowden, J.P. Dowling, A.S. Manka, and M. Fleischhauer (With 3 Figures)	. 296
A Superradiant Laser By F. Haake, M.I. Kolobov, C. Fabre, E. Giacobino, and S. Reynaud (With 4 Figures)	
Laser-Induced Processes in Molecular Systems By S. Stenholm (With 3 Figures)	. 313
Coherent Pulse Propagation in Mode-Locked Laser Systems By J.D. Harvey, J.M. Dudley, D.B. Hirst, S.J. Carter, and P.D. Drummond (With 4 Figures)	. 321
Long-Range Atom-Dielectric Interactions  By M. Ducloy (With 4 Figures)	. 330
Index of Contributors	339