



## CONTENTS

Preface .....	xiii
Memorial to Arthur Rich (1937–1990).....	xvii
Memorial to William L. Williams (1937–1986) .....	xix
Introduction: Comments on ICAP, 1990 .....	xxi
Daniel Kleppner	

## NOBEL LAUREATES

Measurements with Separated Oscillatory Fields and Hydrogen Masers.....	1
Norman F. Ramsey	
Experiments with an Isolated Subatomic Particle at Rest.....	28
Hans Dehmelt	

## EXPERIMENTS WITH COOLED AND TRAPPED ATOMS AND IONS

Applications of Laser Cooling and Trapping .....	47
Mark Kasevich, Kathryn Moler, Erling Riis, Elizabeth Sunderman, David Weiss, and Steven Chu	
Curious Behavior of Optically Trapped Neutral Atoms .....	58
Carl Wieman, Thad Walker, David Sesko, and Chris Monroe	
Laser Cooling of Cesium Atoms Below 3 microKelvins .....	73
Christophe Salomon, Jean Dalibard, William D. Phillips, André Clairon, and Saida Guellati	
Measurement of Fluorescence from Cold Atoms: Localization in Three-Dimensional Standing Waves .....	89
C. I. Westbrook, P. S. Jessen, C. E. Tanner, P. D. Lett, S. L. Rolston, R. N. Watts, and W. D. Phillips	
Sub-Doppler Laser Cooling in a Magnetic Field.....	105
S.-Q. Shang, B. Sheehy, P. Van der Straten, and H. Metcalf	
Theory of Atomic Collisions at Ultracold Temperatures .....	116
Paul S. Julienne, Robert Heather, Jacques Vigue	
On the Optical Cooling of Trapped Ions .....	137
Peter E. Toschek	
Atom Optics.....	165
David E. Pritchard	
Laser and Electron Cooling of Relativistic Stored Beams .....	175
G. Huber, S. Schröder, R. Klein, N. Boos, R. Grieser, I. Hoog, M. Krieg, P. Merz, T. Kühl, R. Neumann, V. Balykin, M. Grieser, D. Habs, E. Jaeschke, W. Petrich, D. Schwalm, M. Steck, B. Wanner, and A. Wolf	
Atomic Physics of Highly Charged Ions in an Electron Beam Ion Trap .....	189
R. E. Marrs	

## ONE ATOM MASERS, CAVITY QED, AND INTERFERENCE EFFECTS

<b>Radiative Shifts in Cavity QED and their Use in Quantum Nondemolition Measurement of Small Photon Number Fields .....</b>	204
S. Haroche, M. Brune, and J. M. Raimond	
<b>The One-Atom Maser and the Generation of Nonclassical Light .....</b>	219
G. Rempe, M. O. Scully, and H. Walther	
<b>Inhibited Spontaneous Emission and Thresholdless Microlasers .....</b>	244
Y. Yamamoto, S. Machida, and G. Björk	
<b>Neutron Interferometric Measurement of the Topological Aharonov–Casher Phase Shift.....</b>	247
H. Kaiser, S. A. Werner, R. Clothier, M. Arif, A. G. Klein, G. I. Opat, and A. Cimmino	
<b>Non-Classical Interference Experiments with Photon Pairs .....</b>	269
L. Mandel	
<b>Phase Sensitive Multi-Photon Ionization .....</b>	280
Ce Chen, Yi-Yian Yin, and D. S. Elliott	

## CASIMIR EFFECT AND RELATED TOPICS

<b>Deflection of an Atomic Beam by the Casimir Force .....</b>	283
E. A. Hinds, C. I. Sukenik, M. G. Boshier, and D. Cho	
<b>Precision Spectroscopy of High-<i>L</i> Rydberg States of Helium.....</b>	288
S. R. Lundeen	

## COLLISIONS

<b>Electron Capture by Ions in a Rydberg Atom Target .....</b>	310
K. B. MacAdam	
<b>Softening of the Molecular Bond in Intense Laser Fields.....</b>	325
H. G. Muller, P. H. Bucksbaum, A. Zavriyev, and D. W. Schumacher	
<b>Collisions of Atoms and Molecules with Laser Fields .....</b>	336
K. Bergmann	
<b>Advances in the Exploration of Spin-Dependent Interactions Using Polarized Electrons .....</b>	346
Joachim Kessler	
<b>Absolute Electron Scattering Cross Sections for the <math>^2S \rightarrow ^2P</math> Transition in <math>Zn^+</math> Using Energy-Loss and Merged-Beams Methods.....</b>	363
S. J. Smith, K.-F. Man, R. J. Mawhorter, I. D. Williams, and A. Chutjian	

## PRECISION SPECTROSCOPY

<b>High Resolution Spectroscopy of the Hydrogen 1S–2S Transition in an Atomic Beam.....</b>	366
C. Zimmermann, R. Kallenbach, W. Vassen, F. Schmidt-Kaler, M. Weitz, D. Leibfried, and T. W. Hänsch	

<b>Recent Measurement of the Rydberg Constant: Results and Prospects .....</b>	<b>381</b>
L. Julien and F. Biraben	
<b>High Precision Isotope Shift Measurement in Helium.....</b>	<b>393</b>
P. Zhao, J. R. Lawall, and F. M. Pipkin	
<b>Measurement of the Lamb Shift of He, 2 <math>^1\text{S}_0</math>.....</b>	<b>396</b>
W. Lichten, D. Shiner, and Z. X. Zhou	
 <b>PARITY AND SYMMETRY STUDIES</b>	
<b>Atomic Parity Violation, a Low Energy Test of the Electroweak Standard Model.....</b>	<b>399</b>
M. A. Bouchiat	
<b>A Review of the EDM of Atoms and the Neutron.....</b>	<b>429</b>
Larry R. Hunter	
<b>A New Experimental Limit on the Electric Dipole Moment of the Electron .....</b>	<b>442</b>
C. Carlberg, K. Abdullah, E. D. Commins, H. Gould, and S. B. Ross	
<b>Atomic Physics Tests of Nonlinear Quantum Mechanics.....</b>	<b>461</b>
J. J. Bollinger, D. J. Heinzen, W. M. Itano, S. L. Gilbert, and D. J. Wineland	
 <b>TESTS OF QED</b>	
<b>The Decay Rate of Orthopositronium .....</b>	<b>481</b>
J. S. Nico, D. W. Gidley, A. Rich, and P. W. Zitzewitz	
<b>Measurement of the Lamb Shift in Lithium Like Uranium (<math>\text{U}^{89+}</math>).....</b>	<b>495</b>
J. Schweppe, A. Belkacem, L. Blumenfeld, N. Claytor, B. Feinberg, H. Gould, V. E. Kostroun, L. Levy, S. Misawa, J. R. Mowat, and M. Prior	
<b>M1 Decay of the <math>2^{-3}\text{S}_1</math> State of Helium-Like Bromine.....</b>	<b>498</b>
R. W. Dunford, C. J. Liu, H. G. Berry, M. L. A. Raphaelian, D. A. Church, M. Hass, and L. J. Curtiss	
<b>Electron Screening Correction to the Self Energy in High-Z Atoms .....</b>	<b>501</b>
Paul Indelicato and Peter J. Mohr	
 <b>THEORY OF ATOMIC STRUCTURE, SPECTRA, AND INTERACTIONS</b>	
<b>Light Induced Drift: Application to Nuclear Spin Modifications Problem .....</b>	<b>504</b>
P. L. Chapovsky	
<b>Spectroscopic Factors of Subvalent Electrons in Argon and Xenon .....</b>	<b>519</b>
M. Ya. Amusia and A. S. Kheifets	
<b>Relativistic Variational Calculations for Hydrogenic Atoms in Strong Magnetic Fields .....</b>	<b>525</b>
Z. Chen and S. P. Goldman	
<b>Software for Relativistic Atomic Structure Theory: The GRASP Project at Oxford .....</b>	<b>528</b>
F. A. Parpia and I. P. Grant	
<b>Atoms in Strong Fields: Chaotic Dynamics, Localization, and “Scars” .....</b>	<b>531</b>
R. V. Jensen	

<b>Coupled-Cluster Calculations for Atoms.....</b>	<b>534</b>
I. Lindgren, A.-M. Pendrill, S. Salomonson, A. Ynnerman, and P. Öster	
<b>Dirac-Fock Basis Set Calculations for Atoms and Molecules.....</b>	<b>537</b>
A. K. Mohanty and E. Clementi	

## RELATED FUNDAMENTAL TOPICS

<b>Pulsar Timing and Relativistic Gravity.....</b>	<b>540</b>
Joseph H. Taylor	
<b>Cryogenic Antiprotons: A 1000-Fold Improvement in their Measured Mass.....</b>	<b>549</b>
G. Gabrielse, X. Fei, W. Jhe, L. A. Orozco, J. Tan, R. L. Tjoelker, J. Haas, H. Kalinowsky, T. A. Trainor, W. Kells	
<b>Antimatter Gravity and the Weak Equivalence Principle.....</b>	<b>573</b>
M. H. Holzscheiter, R. E. Brown, J. Camp, T. Darling, P. Dyer, D. B. Holtkamp, N. Jarmie, N. S. P. King, M. M. Schauer, S. Cornford, K. Hosea, R. A. Kenefick, M. Midzor, D. Oakley, R. Ristinen, and F. C. Witteborn	
<b>Atomic Physics Searches for Bound State Beta Decay .....</b>	<b>576</b>
D. E. Murnick and N. Kwon	

## GENERAL INTEREST

<b>Memorial to Sylvain Liberman .....</b>	<b>579</b>
P. Jacquinot	
<b>Informal Discussion Session on the History of the International Conference on Atomic Physics.....</b>	<b>585</b>
V. Hughes, H. Shugart, B. Bederson, N. Ramsey, B. Judd, I. Lindgren, H. Metcalf, J. Zorn, and M. Weiss	
<b>Author Index.....</b>	<b>609</b>
<b>Subject Index .....</b>	<b>613</b>