

# Contents

## *PART ONE* *INTRODUCTION* 1

Chapter 1	
<b>From Classical Physics to Quantum Physics: A Still Aborning Paradigm Shift</b>	3
Anomalous Data	4
What Is Quantum Physics?	5
The Submicroscopic World	5
The Radicalness of Quantum Physics	6
Paradigms and Paradigm Shifts	8
Chapter 2	
<b>Can We Determine the Metaphysics Underlying Reality?</b>	11
Dualism	12
Holism	12
Monistic Idealism	13
Bridging Science, the Arts and the Humanities, and Spirit	14
Experimental Metaphysics	15
In Summary	17

## *PART TWO* *THE BEGINNINGS OF QUANTUM PHYSICS* 19

Chapter 3	
<b>Planck Takes a Quantum Leap</b>	21
The Energy Quanta of Max Planck	24
Chapter 4	
<b>Einstein's Photons</b>	29
Wave-Particle Duality of Light	24
Chapter 5	
<b>The Bohr Atom</b>	35
Atoms and Philosophy	39
Chapter 6	
<b>The Discovery of Quantum Mechanics</b>	41
Wave-Particle Duality of Matter	43
	ix

Heisenberg's Discovery	45
The Schrödinger Equation	45
Chapter 7	
<b>Possibility Waves, Uncertainty, and Complementarity</b>	47
Probability and Uncertainty	52
Probability, Indeterminacy, and Acausality	54
More on Uncertainty	56
Wave-Particle Duality and Quantum Measurement	59
The Correspondence Principle	61
Chapter 8	
<b>The Copenhagen Interpretation</b>	65
Cutting Through Classical Prejudices	66
The Dancing Wu Li Masters	68
<i>PART THREE</i>	
<i>QUANTUM PHYSICS COMES OF AGE</i>	71
Chapter 9	
<b>Atoms and Light</b>	73
Absorption Spectra	76
Fluorescence	76
Do Blondes Have More Fun?	77
The Laser	77
Chapter 10	
<b>Atoms and Chemistry</b>	85
The Quantum Explanation of the Periodic Table	87
Pauli Principle in the Stars	91
Chapter 11	
<b>The World of Nuclei</b>	93
Nuclear Stability	97
Nuclear Fission	99
Nuclear Structure	100
An Application of Nuclear Physics: A Revolution in Geology and Archeology	103
Chapter 12	
<b>Elementary Particle Physics: The Quest for Elementarity</b>	107
The Particles and Their Interactions	110
The Quarks: The End of the Quest?	111
A New Picture of the Forces	113
Chapter 13	
<b>More Quantum Technology: Solid State Physics</b>	119
The Carriers of Electricity	119
Energy Bands in Solids	120
The Solid-State Rectifier	123
The Solar Cell	125
The Transistor	125
Quantum World at a Glance	126

	<i>PART FOUR</i>	
	<i>THE PARADOX OF THE QUANTUM</i>	129
Chapter 14		
<b>Quantum Nonlocality</b>		131
Singlet Bohm, Singlet Bell		133
Chapter 15		
<b>The Paradox of Schrödinger's Cat</b>		139
Bohm's Hidden Variables		141
The Copenhagen Interpretation,		
the Classical/Quantum Dichotomy, and Macrorealism		142
The Many Worlds Theory		143
Transactional Interpretation		145
In Summary		146
Chapter 16		
<b>Speculations About the Brain: Consciousness Within the Quantum</b>		147
Consciousness and Interconnectedness		149
About Neurons		151
Does Self-Consciousness Arise from Quantum Coherence of the Brain?		153
Quantum Gravity in the Brain?		155
	<i>PART FIVE</i>	
	<i>QUANTUM WITHIN CONSCIOUSNESS</i>	159
Chapter 17		
<b>Consciousness Enters Physics</b>		161
Who or What Collapses the Wave Function?		162
The Paradox of Dualism		164
Who Is Correct—Bohr or Von Neumann?		166
Chapter 18		
<b>The Idealist Interpretation</b>		167
Monistic Idealism		169
Quantum Measurement and the Nature of Consciousness		171
Dualism		172
The Apparent Subject-Object Duality		172
The Epistemological Question		174
Chapter 19		
<b>A Summary Tour of Quantumland</b>		177
Uncertainty and Potentia		178
Consciousness and the Quantum		179
The Double-Slit Experiment		181
Schrödinger's Cat		183
How Does the One Become Many?		188
Chapter 20		
<b>From Deep to Deeper to Deepest Ecology</b>		189

Chapter 21	
<b>The reconciliation with David Bohm's Physics</b>	193
Implicate and Explicate Order	195
Chapter 22	
<b>The Gifts of Quantum Physics</b>	197
The Discontinuity of Creativity	198
Nonlocality	199
Downward Causation	204
Tangled Hierarchy	205
Chapter 23	
<b>Quantum Creativity</b>	207
Situational, Fundamental, Inner, and Outer Creativity	207
The Quantum Nature of Creativity	208
The Creative Process and the Importance of Unconscious Processing	210
Creative Encounter With the Quantum Self and the Flow Experience	211
Creativity and Development	213
The Role of the Unconscious	214
Inner Creativity	214
Chapter 24	
<b>Integrating Dualities</b>	219
Quantum Measurement Theory	221
Life-Nonlife Duality	222
The Mind-Brain Problem: A New Psychophysical Parallelism	222
Conclusions	226
Chapter 25	
<b>Quantum Cosmology and Consciousness</b>	227
Self-Reference and the Origin of Life	228
The Delayed-Choice Experiment	229
The Strong Anthropic Principle	231
The Arrow of Time	232
 <i>PART SIX</i> <i>QUANTUM BIOLOGY–</i> <i>HOW CONSCIOUSNESS CREATES BIOLOGICAL ORDER</i>  	
Chapter 26	
<b>Anomalies in Biology and the Need for a Paradigm Shift</b>	237
The Need for Biology Within Consciousness	241
Chapter 27	
<b>Toward a Paradigm Shift in Biology</b>	245
Inside a Living Cell	247
Neo-Darwinism	248
Reductionism and Holism	248
Self-Reproducing Automata and the Game of Life	250
Chaos Theory	252
Chapter 28	
<b>What Is Life?</b>	255

More on Purpose	257
The Creative Purpose of Consciousness	259
Consciousness and Order Within Chaos	260
The Question of Causal Efficacy of Life	262
Consciousness As the Creative Organizing Principle of Life	265
Chapter 29	
<b>The Quantum Theory of Punctuated Equilibrium</b>	269
A Review of Existing Theories of Quantum Evolution	271
Comparison With the Case of the Brain	274
Apparent Purposiveness and Directionality in Evolution	276
The Nature of Life	277
Chapter 30	
<b>Evolution and Morphogenesis</b>	279
Sheldrake's Theory: How Form Is Remembered	280
Who Programs?	281
Avoiding Dualism in Biophysical Parallelism	283
Nonlocality in Morphogenesis	285
Evolution and Morphogenesis	285
Regulation and Regeneration	286
Quantum Healing	287
Chapter 31	
<b>Creativity in Biological Systems</b>	289
Directed Mutation	290
A Quantum Epigenetic Model	291
Explaining Phenocopies Within Neo-Darwinism	294
Rubin's Experiments: Heterogeneity and Creativity	296
<i>PART SEVEN</i>	
<i>OUTLOOK</i>	299
Chapter 32	
<b>Consciousness and Evolution</b>	301
The Theme Body or the Body of Intuitive Knowledge	304
Science and the Great Chain of Being	304
How Far Evolution?	307
Chapter 33	
<b>The Challenge of Trans-Modernism</b>	311
The Dance of Gaia	312
The Driving Principles of Trans-Modernism	312
The Question of Spirituality in Human Affairs	318
The Evolution of Human Society	319
Chapter 34	
<b>Epilogue: God and the Physicists' View of Nature</b>	321
<b>Glossary</b>	331
<b>Index</b>	339



<http://www.springer.com/978-0-306-46509-3>

The Physicists' View of Nature Part 2

The Quantum Revolution

Goswami, A.

2001, XIII, 343 p., Hardcover

ISBN: 978-0-306-46509-3