

Contents

Foreword: Subtle is the Lord IX

Preface XV

1 Introduction 1

1.1 The Tunneling Process 1

1.2 Time, Space and Velocity 6

2 Measures of Time and Space 17

2.1 Measures of Time: Heartbeat, Day and Year 19

2.2 Measures of Length: Foot, Meter and Light Year 21

3 Time in Biology 29

3.1 Perception, Thoughts, Brainwork, Memory 29

3.2 Biological Time Unit 32

4 Velocity 33

4.1 Velocity Definitions 36

4.2	Velocity Measurement	38
4.3	Interaction Processes	43
4.4	Signals	47
4.5	From Galilei via Newton and Einstein to Quantum Physics	51
5	Faster than Light and Zero Time Phenomena	57
5.1	The Tunneling Process: Space with Zero Time	58
5.1.1	The Tunneling Effect	58
5.1.2	Tunneling Time	79
5.2	Photonic Tunneling Structures	86
5.2.1	Double Prisms	88
5.2.2	The Quarter Wavelength or $\lambda/4$ Lattice	97
5.2.3	The Undersized Hollow Waveguide	101
5.3	Tunneling Velocity	104
5.3.1	Measuring Tunneling Time with Double Prisms	106
5.3.2	Measuring Tunneling Time with the Quarter Wavelength Lattice	108
5.3.3	Determining Tunneling Time with an Undersized Hollow Waveguide	111
5.3.4	Tunneling: Zero Time in the Tunnel Barrier	112
5.4	Tunneling as a Near-Field Phenomenon	115
5.5	Causality	116
5.6	Non-Locality: Reflection at Tunneling Barriers	120
5.7	Tunneling Particles are Not Observable	124
5.8	Universal Relation between Tunneling Time and Signal or Particle Frequency	125
5.9	Teleportation	129
5.10	Wormholes and Warp Drives	130

6	Summary	137
	Bibliography	139
	Index	141