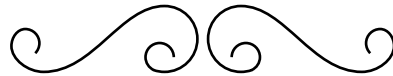


CONTENTS



Preface	vii
Prologue	xi
Chapter 1. Chua's Oscillator and Its Generalizations	1
1. Introduction	2
2. Chua Oscillator	3
2.1. Chaotic nature of Chua Oscillator	5
2.1.1. Sensitive dependence on initial conditions	5
2.1.2. Strange attractors	10
2.1.3. Many routes to chaos	10
2.1.4. Fractal basin boundaries	14
3. Diode with Cubic Function	14
4. n-Scroll Attractors	14
4.1. Multiple breakpoints	14
4.2. The sine function	20
4.3. Hyperbolic function	20
4.4. Additional breakpoints	22
4.5. Grids	28
4.6. Chua single scroll	28
4.6.1. First system	30
4.6.2. Second system	37
4.6.3. Third system	40
4.6.4. Fourth system	40

5.	From Chaos to Hyperchaos	47
5.1.	Hyperchaotic systems	47
5.2.	Synchronization of chaotic systems	48
6.	A Gallery of Chua Attractors	58
7.	Conclusions	58
Chapter 2.	The Physical Circuit	61
1.	Introduction	61
2.	A Gallery of Attractors	62
3.	Visualization Issues	137
4.	Conclusions	146
Chapter 3.	Dimensionless Equations	149
1.	Introduction	149
2.	Information Seeking in Chaos Domain	151
3.	The Main Features of the Gallery	152
4.	Representing Parameter Space	206
5.	Conclusions	215
Chapter 4.	The Cubic Equation	227
1.	Introduction	227
2.	A Gallery of Attractors	266
3.	Representations of Parameter Space	266
4.	Laws of Morphogenesis	276
5.	Shape Distance in Phase Space	281
6.	Conclusions	283
Chapter 5.	Single-Scroll Systems	289
1.	Introduction	289
2.	The Gallery of Attractors	379
3.	Representing Attractors in Parameter Space	390
4.	Visualizing the Parameter Space: The Inertial Ellipsoid Method	403
5.	Visualizing Parameter Space: The Hausdorff Distance Method	409
6.	Conclusions	414
Chapter 6.	Multiscrolls Systems	419
1.	Introduction	420
2.	Formal Aspects of n -Scroll, Hyper-chaotic and Synchronized Systems	421

2.1. n -Scroll systems	422
2.1.1. Multiple breakpoints	422
2.1.2. Sine function	422
2.1.3. Hyperbolic function	423
2.1.4. Additional breakpoints	423
2.1.5. Grids	423
2.2. Hyperchaotic systems	424
2.3. Synchronized systems	424
3. The Gallery	426
3.1. Attractors generated by the multiple breakpoints systems	426
3.2. Attractors generated by the sine function system	493
3.3. Attractors generated by the hyperbolic function systems	493
3.4. Attractors generated by the system with additional breakpoints	493
3.5. Attractors from grid systems	496
3.6. Attractors produced by hyperchaotic systems	496
3.7. Attractors produced by synchronized systems	501
4. Computational Tools	509
4.1. The CHAOS manipulator	512
4.2. The CHAOS analyzer	515
4.3. The CHAOS explorer	516
5. The Virtual Museum and the Navigable Galleries	520
6. Conclusions	521
Index	529