

## TABLE OF CONTENTS

Preface .....	ix
Professor Zdzislaw Bubnicki .....	xiii

### INVITED LECTURE: BRIAN D. JOSEPHSON, NOBEL PRIZE IN PHYSICS

General Principles for Brain Design .....	3
B. D. Josephson, <i>Invited Speaker</i>	

### INTRODUCTION: THE INCURSIVE AND HYPERINCURSIVE HARMONIC OSCILLATOR

The Dual Incursive System of the Discrete Harmonic Oscillator .....	11
A. F. Antippa and D. M. Dubois	
The Superposed Hyperincursive System of the Discrete Harmonic Oscillator .....	65
A. F. Antippa and D. M. Dubois	

### 1. PHYSICS, QUANTUM MECHANICS, RELATIVITY, FIELD THEORY, GRAVITATION

Thermonuclear Fusion Research Progress and the Way to the Reactor .....	129
R. Koch	
Cosmological Constant Problem Solution Valid for Both Planck's and Cosmological Scales .....	144
B. M. Novakovic, D. B. Novakovic, and A. B. Novakovic	
Further Development of the Mie-de Broglie Theory of Quantum Gravity and the Implications for the General Theory of Relativity .....	157
E. P. J. de Haas	
Why do Quantum Systems Implement Self-Referential Logic? A Simple Question with a Catastrophic Answer .....	167
J. Small	
Structure of Ensemble of Cosmological Models with Dark Energy .....	184
M. Szydłowski and A. Krawiec	
The Space Structure, Force Fields and Quantum Mechanics .....	191
V. Krasnoholovets and D.-Y. Chung	
Building the Space-Time Structure in Theories of Physics .....	198
G. Nibart	
A Toy-World that Satisfies Some Principles of "El Naschie's E-Infinity Theory" .....	212
H. Sommer	

*5th BCSCMsG International Symposium, organized by Peter Marcer,  
British Computer Society - Cybernetic Machine Specialist Group (BCS)*

Fermion Interactions and Mass Generation in the Nilpotent Formalism .....	225
P. Rowlands, <i>Invited Speaker</i>	
The Doubling Theory Corrects the Titius-Bode Law and Defines the Fine Structure Constant in the Solar System .....	236
J.-P. Garnier-Malet	

### 2. ANTICIPATORY SYSTEMS, INCURSION, HYPERINCURSION, PREDICTIVE MODELS

Object-Oriented Representations of Formal Theories as Tools for Simulation of Anticipatory Systems .....	253
E. Kindler	

<b>An Anticipatory Extension of Malthusian Model</b> .....	260
M. U. Akhmet, H. Öktem, S. W. Pickl, and G.-W. Weber	
<b>Some Two-Steps Discrete-Time Anticipatory Models with ‘Boiling’ Multivaluedness</b> .....	265
A. S. Makarenko and A. S. Stashenko	
<b>Avoiding Extinction in a Managed Single Species Population Model by Means of Anticipative Control</b> .....	273
M. E. Burke	
<b>Conditions for Fully Autonomous Anticipation</b> .....	282
J. Collier	
<b>Probability as Sentence Sets and its Incurive Calculus</b> .....	290
A. G. Grappone	

### 3. LOGICAL AND DYNAMICAL SYSTEMS, FUZZINESS, OPTIMIZATION, CONTROL

<b>The Nature of the Sign as a <i>WFF</i> — A Well-Formed Formula</b> .....	303
E. Taborsky	
<b>The Virtual Reality as an Anticipative Concept in Warehouse Optimization in Uncertain Environment</b> .....	314
M. Kljajić and D. Kofjač	
<b>The Study of the Adaptational Phenomenon in Complex Systems</b> .....	322
M. B. Ignatyev	
<b>Complete and Linear Hedge Algebras, Fuzziness Measure of Vague Concepts and Linguistic Hedges and Application</b> .....	331
N. Cat-Ho and N. Van Long	
<b>New Examples for a Duality Principle in the Theory of Dynamical Systems</b> .....	340
C. Corduneanu, Y. Li, and M. Mahdavi	

### 4. COMPUTING SYSTEMS, AUTOMATA, SIMULATION, INFORMATION NETWORKS

<b>Mathematical Interpretations of Kernel Ridge Regression</b> .....	347
A. Tanaka, H. Imai, M. Kudo, and M. Miyakoshi	
<b>Anticipation Models in BETA</b> .....	354
F. Hunka	
<b>An Analysis of Program Phase Behavior and its Predictability</b> .....	361
F. Vandeputte, L. Eeckhout, and K. De Bosschere	
<b>Local Cellular Automata as an Abstract Model of Self-Organizing Process</b> .....	371
T. Haruna and Y.-P. Gunji	
<b>Demands on Intranets - Viable System Model as a Foundation for Intranet Design</b> .....	381
C. Amcoff Nyström	
<b>Global Coordinating of Multiagent System Result from Dual Forces Embedded in a Local Agent</b> .....	388
S. Nomura	
<b>A Prototype Implementation of an Anticipatory Reasoning-Reacting System</b> .....	401
F. Shang, S. Nara, T. Omi, Y. Goto, and J. Cheng	

### 5. SOFT COMPUTING, FUZZY SYSTEMS, NEURAL NETWORKS, LEARNING

<b>Augmented Evolutionary Computation Using Genetic Programming</b> .....	417
T. Ae and M. Kamitani	
<b>Optimal Decision Making in a Class of Uncertain Systems Based on Uncertain Variables</b> .....	427
Z. Bubnicki	
<b>Self-Organizing Neural Network Models for State Anticipatory Systems</b> .....	436
M. Pöllä and T. Honkela	
<b>Multi Modal Anticipation in Fuzzy Space</b> .....	442
V. Asproth, S. C. Holmberg, and A. Håkansson	

<b>A Note on Granular Reasoning and Semantics of Four-Valued Logics</b> . . . . .	<b>453</b>
Y. Kudo and T. Murai	

**6. COGNITIVE SYSTEMS, PERCEPTION, LANGUAGE AND CONSCIOUSNESS**

<b>Spacetime Holism and the Hard Problem of Consciousness</b> . . . . .	<b>465</b>
F.-G. Winkler	
<b>Peircean Proto-Signs</b> . . . . .	<b>474</b>
J. J. Sarbo	
<b>Failure in Anticipation and Plasticity in Perception of Taste</b> . . . . .	<b>480</b>
T. Moriyama, S. Yokokawa, and Y. Tsukahara	
<b>Another Function for Language and its Theoretical Consequences</b> . . . . .	<b>488</b>
I. Barahona da Fonseca, J. Barahona da Fonseca, and J. Simões da Fonseca	
<b>Could Intelligent Tutors Anticipate Successfully User Reactions?</b> . . . . .	<b>493</b>
E. Kalisz and A. M. Florea	

**7. NEUROSCIENCE, BIOSYSTEMS, COMPUTATIONAL INTELLIGENCE**

<b>Neuroimaging Techniques: A Conceptual Overview of Physical Principles, Contribution and History</b> . . . . .	<b>503</b>
L. Minati	
<b><i>Figura et Forma</i>—Understanding and Engineering Biological Intelligence?</b> . . . . .	<b>520</b>
S. Santoli	
<b>A New Approach for Modeling Prokaryotic Biochemical Networks with Differential Equations</b> . . . . .	<b>526</b>
J. Gebert and N. Radde	
<b>Starfish Behavior as an Anticipatory System: Its Flexibility in Obstacle Avoidance</b> . . . . .	<b>534</b>
M. Migita	
<b>Anticipatory Behavior and Intracellular Communication in <i>Physarum polycephalum</i></b> . . . . .	<b>541</b>
T. Shirakawa and Y.-P. Gunji	

**8. RISK MANAGEMENT, ECONOMY, SOCIAL MODELS, OPERATIONS RESEARCH**

<b>A Model for Systemic Control</b> . . . . .	<b>549</b>
M. Schwaninger, K. Ambroz, and C. Olaya	
<b>Hyperincursion and the Globalization of the Knowledge-Based Economy</b> . . . . .	<b>560</b>
L. Leydesdorff	
<b>Decisional Information System for Safety (D.I.S.S.) Dedicated to the Human Space Exploration Mission</b> . . . . .	<b>570</b>
S. Grès and J.-F. Guyonnet	
<b>The Evolution of Functional Systems through the Generalized Uncertainty and Nash Equilibria</b> . . . . .	<b>579</b>
E. Chauvet	
<b>Optimal Airline Multi-Leg Flight Seat Inventory Control</b> . . . . .	<b>591</b>
N. A. Nechval, K. Rozite, and V. F. Strelchonok	

**9. ENGINEERING SYSTEMS, MODELING, OPTIMIZATION, SIMULATION, CONTROL**

<b>An Autopilot to Make <i>Perfect Loops</i> Varying Only <i>Gflyup</i> through the Loop as an Anticipatory System</b> . . . . .	<b>603</b>
J. Barahona da Fonseca	
<b>Anticipatory Systems near Bifurcation Points</b> . . . . .	<b>610</b>
P. B. Béda	
<b>Anticipating Operational and Wash out Conditions in Biotechnological Reactors</b> . . . . .	<b>618</b>
M. Sbarciog, M. Loccufier, and E. Noldus	
<b>Automatic Clustering of Rolling Element Bearings Defects with Artificial Neural Networks</b> . . . . .	<b>630</b>
M. Antonini, R. Faglia, M. Pedersoli, and M. Tiboni	

<b>Constrained Pole Assignment Control — Real &amp; Complex Poles</b> .....	<b>638</b>
M. Huba	
<b>Author Index</b> .....	<b>651</b>