Contents

Preface xiii

Acknowledgments liii

1. INTRODUCTION 1
   1 Axiomatic Consistency of Quantum Chemistry 1
   2 Scope of These Studies 2
   3 Insufficiencies of Quantum Chemistry for Molecular Structures 5
   4 Insufficiency of Quantum Chemistry for Chemical Reactions 11
   5 Insufficiencies of Quantum Chemistry for Biological Structures 12
   6 The Central Topic of Study of This Monograph 14
   7 Catastrophic Inconsistencies of Generalized Nonunitary Theories on Conventional Mathematics 19
   8 Hadronic Mechanics 27
   9 Hadronic Superconductivity 34

2. ELEMENTS OF ISO-, GENO-, AND HYPER-MATHEMATICS AND THEIR ISODUALS 59
   1 Introduction 59
   2 Elements of Isomathematics 61
      2.1 Isounits and Isoproducts 61
      2.2 Isonumbers and Isofields 64
      2.3 Isospaces and Isogeometries 65
      2.4 Isodifferential Calculus 69
      2.5 Isohilbert Spaces 70
      2.6 Isoperturbation Theory 72
      2.7 Isofunctional Analysis 74

2.8 Isolinearity, Isolocality, Isocanonicity and Isounitarity 75
2.9 Lie-Santilli Isotheory 77
3 Elements of Genomathematics 81
3.1 Introduction 81
3.2 Main Structural Lines of Genomathematics 82
3.3 Genounits and Genoproducts 88
3.4 Genonumbers and Genofields 89
3.5 Genospaces and Genogeometries 91
3.6 Genodifferential Calculus 92
3.7 Genohilbert Spaces 93
3.8 Genolinearity, Genolocality, and Genounitarity 94
3.9 Lie-Santilli Genotheory 95
4 Hypermathematics 97
5 Isodual Mathematics 99

3. FOUNDATIONS OF HADRONIC CHEMISTRY 107
1 Introduction 107
2 Classical Foundations of Hadronic Chemistry 111
2.1 The Historical Teaching of Lagrange and Hamilton 111
2.2 The Inevitability of the Historical Teaching 112
2.3 Problematic Aspects of External Terms 113
2.4 Classification of Hamilton's Equation with External Terms 114
2.5 Hamilton-Santilli Isomechanics 115
2.6 Classical Lie-Santilli Brackets 118
2.7 Isoaction Principle 120
2.8 Hamilton-Jacobi-Santilli Isoequations 121
2.9 Examples of Classical Applications 121
2.10 Connection Between Isotopic and Birkhoffian Mechanics 122
2.11 Hamilton-Santilli Geno-, Hyper-, and Isodual-Mechanics 124
2.12 Simple Construction of Classical Isochemistry 126
2.13 Invariance of Classical Isochemistry 128
2.14 Simple Construction of Classical Genochemistry 129
2.15 Invariance of Classical Genochemistry 129
2.16 Simple Construction and Invariance of Hyper- and Isodual Mechanics 129
3 Operator Foundations of Hadronic Chemistry 130
3.1 Introduction 130
3.2 Naive Iso-, Geno, Hyper-, and Isodual Quantization 130
3.3 Structure of Operator Isochemistry 132

3.4 Basic Equations of Operator Isochemistry 134
3.5 Preservation of Quantum Physical Laws 135
3.6 Simple Construction of Operator Isochemistry 139
3.7 Invariance of Operator Isochemistry 142
3.8 Gaussian Screenings as Particular Cases of Isochemistry 143
3.9 Elements of Operator Geno-, Hyper-, and Isodual-Chemistry 144
3.10 Simple Construction of Operator Geno-, Hyper-, and Isodual Chemistry 147
3.11 Invariance of Operator Geno-, Hyper-, and Isodual Chemistry 149
3.12 Classification of Hadronic Chemistry 149

4. ISOCHEMICAL MODEL OF THE HYDROGEN MOLECULE 155
1 Introduction 155
2 Isochemical Model of Molecular Bonds 158
3 The Limit Case of Stable Isoelectronium 168
4 Isochemical Model of the Hydrogen Molecule with Stable Isoelectronium 174
5 Exactly Solvable, Three-Body, Isochemical Model of the Hydrogen Molecule 177
6 Isochemical Model of the Hydrogen Molecule with Unstable Isoelectronium 180
7 Gaussian Approximation of the Isochemical Model of the Hydrogen Molecule as a Four-Body System 183
8 Summary of the Results 188
9 Concluding Remarks 191
Appendix 4.A Isochemical Calculations for the Three-Body H_2 Molecule 195
Appendix 4.B Isochemical Calculations for the Four-Body H_2 Molecule 196

5. ISOCHEMICAL MODEL OF THE WATER MOLECULE 205
1 Introduction 205
2 Main Characteristics of Water 211
3 Exactly Solvable Model of the Water Molecule with Stable Isoelectronium 215
4 Gaussian Approximation of the Isochemical Model of the Water Molecule with Unstable Isoelectronium 219
5 The Method 223
6 The Main Results 226
7 Conclusions 228

6. VARIATIONAL CALCULATIONS OF ISOCHEMICAL MOLECULAR MODELS 233
1 Introduction 233
2 Aringazin-Kucherenko Study of the Restricted, Three-Body Isochemical Model of the Hydrogen Molecule 234
3 Aringazin Variational Study of the Four-Body Isochemical Model of the Hydrogen Molecule 239

7. APPLICATION OF HADRONIC CHEMISTRY TO NEW CLEAN ENERGIES AND FUELS 251
1 Introduction 251
2 Alarming Environmental Problems Caused by Gasoline and Coal Combustion 254
3 Alarming Environmental Problems Caused by Natural Gas Combustion 257
4 Alarming Environmental Problems Caused by Hydrogen Combustion, Fuel Cells and Electric Cars 258
5 The Need for New, Environmentally Acceptable Primary Sources of Electricity 261
6 Insufficiencies of Quantum Mechanics, Superconductivity, and Chemistry for the Solution of Current Environmental Problems 262
7 The New Clean Primary Energies Predicted by Hadronic Mechanics, Superconductivity and Chemistry 263
8 PlasmaArcFlow Reactor for the Conversion of Liquid Waste into the Clean Burning Magnegas 279
9 Surpassing by Magnegas Exhaust of EPA Requirements without Catalytic Converter 283
10 Anomalous Chemical Composition of Magnegas 288
11 Anomalous Energy Balance of Hadronic Molecular Reactors 291
12 Concluding Remarks 298
Appendix 7.A 300

8. THE NEW CHEMICAL SPECIES OF MAGNECULES 303
1 Introduction 303
2 The Hypothesis of Magnecules 305
3 The Five Force Fields Existing in Atoms 308
4 Magnecules Internal Bonds 310
5 Production of Magnecules in Gases, Liquids and Solids 316
6 New Molecules Internal Bonds 322
7 Main Features of Magnecules to be Detected 324

8 Necessary Conditions for the Correct Detection of Molecules and Magnecules 326
8.1 Selection of Analytic Instruments 326
8.2 Unambiguous Detection of Molecules 328
8.3 Unambiguous Detection of Magnecules 331
8.4 Apparent Magnecular Structure of H_3 and O_3 333
8.5 Need for New Analytic Methods 336
9 Experimental Evidence of Gas Magnecules 337
9.1 Conventional Chemical Composition of Magnegas Used in the Tests 337
9.2 GC-MS/IRD Measurements of Magnegas at the McClellan Air Force Base 338
9.3 GC-MS/IRD Tests of Magnegas at Pinellas County Forensic Laboratory 341
9.4 Interpretations of the Results 347
9.5 Concluding Remarks 352
10 Experimental Evidence of Liquid Magnecules 354
10.1 Preparation of Liquid Magnecules used in the Tests 354
10.2 Photographic Evidence of Magnecules in Liquids 355
10.3 Spectroscopic Evidence of Liquid Magnecules at the Tekmar-Dohrmann Corporation 358
10.4 Spectroscopic Evidence of Liquid Magnecules at Florida International University 363
11 Experimental Verification of Mutated Physical Characteristics 364
12 Concluding Remarks 375
Appendix 8.A Aringazin's Studies on Toroidal Orbits of the Hydrogen Atom under an External Magnetic Field 376

Index 393