

---

# Contents

<b>Roland Bulirsch – 75<sup>th</sup> Birthday</b> .....	1
<b>Academic Genealogy of Roland Bulirsch</b> .....	3

---

## Part I Mathematics and Applications in Nanoscale

---

### **Circuit Simulation for Nanoelectronics**

<i>Georg Denk, Uwe Feldmann</i> .....	11
---------------------------------------	----

### **Transformation Qualities of Warped Multirate Partial Differential Algebraic Equations**

<i>Roland Pulch</i> .....	27
---------------------------	----

### **An Improved Method to Detect Riblets on Surfaces in Nanometer Scaling Using SEM**

<i>E. Reithmeier, T. Vynnyk</i> .....	43
---------------------------------------	----

---

## Part II Mathematics and Applications in Microscale

---

### **Numerical Simulation of a Molten Carbonate Fuel Cell by Partial Differential Algebraic Equations**

<i>K. Chudej, M. Bauer, H.J. Pesch, K. Schittkowski</i> .....	57
---	----

### **Rigid Registration of Medical Images by Maximization of Mutual Information**

<i>Rainer Lachner</i> .....	71
-----------------------------	----

### **Early Delay with Hopf Bifurcation**

<i>R. Seydel</i> .....	91
------------------------	----

**A Singular Value Based Probability Algorithm for Protein Cleavage**  
*T. Stolte, P. Rentrop* ..... 99

**Calculation of Magnetic Fields with Finite Elements**  
*G. Wimmer, M. Clemens, J. Lang* ..... 111

---

**Part III Mathematics and Applications in Macroscale**

---

**Smooth Approximation and Rendering of Large Scattered Data Sets**  
*Jörg Haber, Frank Zeilfelder, Oleg Davydov, Hans-Peter Seidel* ..... 127

**Fast Projected Convolution of Piecewise Linear Functions on Non-equidistant Grids**  
*W. Hackbusch* ..... 145

**Intrusive versus Non-Intrusive Methods for Stochastic Finite Elements**  
*M. Herzog, A. Gilg, M. Paffrath, P. Rentrop, U. Wever* ..... 161

**Walking, Running and Kicking of Humanoid Robots and Humans**  
*M. Stelzer, O. von Stryk* ..... 175

**Numerical Simulation of Shape Memory Actuators in Mechatronics**  
*G. Teichelmann, B. Simeon* ..... 193

---

**Part IV Mathematics and Applications in Real World**

---

**Customer Tailored Derivatives: Simulation, Design and Optimization with the WARRANT-PRO-2 Software**  
*Michael H. Breitner* ..... 211

**Complete the Correlation Matrix**  
*C. Kahl, M. Günther* ..... 229

**Accelerating the Distributed Multiplication Protocol with Applications to the Distributed Miller-Rabin Primality Test**  
*P. Lory* ..... 245

---

**Part V Mathematics and Applications in Space**

---

**Optimal Control of Free-Floating Spin-Stabilized Space Robotic Systems**  
*R. Callies, Ch. Sonner*..... 261

**Computing the Earth Gravity Field with Spherical Harmonics**  
*Michael Gerstl*..... 277

**Integrated Guidance and Control for Entry Vehicles**  
*W. Grimm, W. Rotärmel* ..... 295

**A Note on Nonsmooth Optimal Control Problems**  
*Hans Joachim Oberle* ..... 309

**Color Figures**..... 323