

Contents

Part I Towards a Comprehensive Theory of Cancer Growth

Combining Game Theory and Graph Theory to Model Interactions between Cells in the Tumor Microenvironment	3
Attila Csikász-Nagy, Matteo Cavaliere, and Sean Sedwards	
Growth as the Root of all Evil in Carcinomas: Synergy between pH Buffering and Anti-Angiogenesis prevents Emergence of Hallmarks of Cancer	19
Ariosto Silva and Robert Gatenby	
Phase Transitions in Cancer	35
Ricard V. Solé	

Part II Cancer Related Signalling Pathways

Spatio-Temporal Modelling of Intracellular Signalling Pathways: Transcription Factors, Negative Feedback Systems and Oscillations	55
Mark A.J. Chaplain, Marc Sturrock, and Alan J. Terry	
Understanding Cell Fate Decisions by Identifying Crucial System Dynamics	83
Dirk Fey, David R. Croucher, Walter Kolch, and Boris N. Kholodenko	
Modelling Biochemical Pathways with the Calculus of Looping Sequences	105
Paolo Milazzo, Antonella Del Corso, Andrea Maggiolo-Schettini, Umberto Mura, and Roberto Barbuti	
Dynamic Simulations of Pathways Downstream of TGFβ, Wnt and EGF-Family Growth Factors, in Colorectal Cancer, including Mutations and Treatments with Onco-Protein Inhibitors	127
Lorenzo Tortolina, Nicoletta Castagnino, Cristina De Ambrosi, Annalisa Barla, Alessandro Verri, Gabriele Zoppoli, Luca Bagnasco, Daniela Piras, Franco Patrone, Alberto Ballestrero, and Silvio Parodi	

Part III Basic Mechanisms of Tumor Progression

Some Results on the Population Behavior of Cancer Stem Cells	145
Edoardo Beretta, Vincenzo Capasso, Annick Harel-Bellan, and Nadya Morozova	
Glucose Metabolism in Multicellular Spheroids, ATP Production and Effects of Acidity	173
Antonio Fasano	
Cell-Cell Interactions in Solid Tumors – the Role of Cancer Stem Cells .	191
Xuefeng Gao, J. Tyson McDonald, Lynn Hlatky, and Heiko Enderling	
Hybrid Cellular Potts Model for Solid Tumor Growth	205
Marco Scianna and Luigi Preziosi	

Part IV Tumor-Immune System Interplay and Immunotherapy

Computational Models as Novel Tools for Cancer Vaccines	227
Filippo Castiglione, Pier Luigi Lollini, Santo Motta, Arianna Paladini, Francesco Pappalardo, and Marzio Pennisi	
On the Dynamics of Tumor-Immune System Interactions and Combined Chemo- and Immunotherapy	249
Alberto d’Onofrio, Urszula Ledzewicz, and Heinz Schättler	
Modeling the Kinetics of the Immune Response	267
Ami Radunskaya and Sarah Hook	

Part V Computational Method for Improving Chemotherapy

Optimizing Cancer Chemotherapy: from Mathematical Theories to Clinical Treatment	285
Zvia Agur and Yuri Kheifetz	
A Systems Biomedicine Approach for Chronotherapeutics Optimization: Focus on the Anticancer Drug Irinotecan	301
Annabelle Ballesta, Jean Clairambault, Sandrine Dulong, and Francis Levi	
Modeling the Dynamics of HCV Infected Cells to Tailor Antiviral Therapy in Clinical Practice: Can This Approach Fit for Neoplastic Cells?	329
Piero Colombatto, Filippo Oliveri, Ferruccio Bonino, and Maurizia R. Brunetto	
Introducing Drug Transport Early in the Design of Hypoxia Selective Anticancer Agents Using a Mathematical Modelling Approach	337
Kevin Hicks	

***Top-Down* Multiscale Simulation of Tumor Response to Treatment in the Context of In Silico Oncology. The Notion of *Oncosimulator* 355**
Georgios Stamatakos

Challenges in the Integration of Flow Cytometry and Time-Lapse Live Cell Imaging Data Using a Cell Proliferation Model 377
Paolo Ubezio, Francesca Falcetta, and Monica Lupi

New Challenges for Cancer Systems Biomedicine

D'Onofrio, A.; Cerrai, P.; Gandolfi, A. (Eds.)

2012, XII, 400 p., Hardcover

ISBN: 978-88-470-2570-7