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| Nota di contenuto | Frontmatter -- List of Participants -- Contents -- Foreword -- Physical Bases and New Challenges in High Resolution Imaging -- Hypertelescopes: The Challenge of Direct Imaging at High Resolution -- Optical Long Baseline Interferometry: Examples from VEGA/CHARA -- The Fresnel Diffraction: A Story of Light and Darkness -- Astronomical Imaging... Atmospheric Turbulence? Adaptive Optics! -- Introduction to Wavefront Coding for Incoherent Imaging -- Adaptive Optics Feedback Control -- SCIROCCO+: Simulation Code of Interferometric-observations for ROtators and CirCumstellar Objects including Non-Radial Pulsations -- High Angular Resolution and Young Stellar Objects: Imaging the Surroundings of MWC 158 by Optical Interferometry -- Physical Models and Data Processing -- Principles of Image Reconstruction in Interferometry -- Imaging Techniques in Millimetre Astronomy -- SMOS-NEXT: A New Concept for Soil Moisture Retrieval from Passive Interferometric Observations -- Formation, Simulation and Restoration of Hypertelescopes Images -- Statistical Models in Signal and Image Processing -- Introduction to the Restoration of Astrophysical Images by Multiscale Transforms and Bayesian Methods -- Constrained Minimization Algorithms. Linear Models -- Scaled Gradient Projection Methods for Astronomical Imaging -- SGM to Solve NMF - Application to Hyperspectral Data -- |

Sommario/riassunto

This book is a collection of 19 articles which reflect the courses given at the Collège de France/Summer school "Reconstruction d'images Applications astrophysiques" held in Nice and Fréjus, France, from June 18 to 22, 2012. The articles presented in this volume address emerging concepts and methods that are useful in the complex process of improving our knowledge of the celestial objects, including Earth. The book contains three parts. The first part is titled "Physical bases and new challenges in high resolution imaging". This part draws a picture of some of the high angular resolution instruments of the near to far future, and of the issues to overcome to make this picture real. It deals with hypertelescopes, optical interferometry, adaptive optics, wavefront coding, and with polychromatic astrophysical models. The point of view of the articles of the second part, titled "Physical models and data processing" embraces not only the description of data using physical modeling, but also the resulting data processing in radio and optical interferometry, including hypertelescopes. The third part is titled "Statistical models in signal and image processing". These contributions cover past and recent developments in multiresolution analysis, Bayesian modeling, sparsity, convex optimization and hyperspectral data. While reading, the alert reader will notice that the successful realization of future observation technologies and the best extraction of the astrophysical information encapsulated in their data involve the joint expertise of several research communities. The various articles collected in this book may contribute to such a synergy.