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Nota di contenuto	Preface; Acknowledgments; Contents; Introduction; 1 A Probabilistic Motivation; 1.1 The Random Walk with Arbitrarily Long Jumps; 1.2 A Payoff Model; 2 An Introduction to the Fractional Laplacian; 2.1 Preliminary Notions; 2.2 Fractional Sobolev Inequality and Generalized Coarea Formula; 2.3 Maximum Principle and Harnack Inequality; 2.4 An s-Harmonic Function; 2.5 All Functions Are Locally s-Harmonic Up to a Small Error; 2.6 A Function with Constant Fractional Laplacian on the Ball; 3 Extension Problems; 3.1 Water Wave Model; 3.1.1 Application to the Water Waves; 3.2 Crystal Dislocation 3.3 An Approach to the Extension Problem via the Fourier Transform4 Nonlocal Phase Transitions; 4.1 The Fractional Allen-Cahn Equation; 4.2 A Nonlocal Version of a Conjecture by De Giorgi; 5 Nonlocal Minimal Surfaces; 5.1 Graphs and s-Minimal Surfaces; 5.2 Non-existence of Singular Cones in Dimension 2; 5.3 Boundary Regularity; 6

Sommario/riassunto

Working in the fractional Laplace framework, this book provides models and theorems related to nonlocal diffusion phenomena. In addition to a simple probabilistic interpretation, some applications to water waves, crystal dislocations, nonlocal phase transitions, nonlocal minimal surfaces and Schrödinger equations are given. Furthermore, an example of an s-harmonic function, its harmonic extension and some insight into a fractional version of a classical conjecture due to De Giorgi are presented. Although the aim is primarily to gather some introductory material concerning applications of the fractional Laplacian, some of the proofs and results are new. The work is entirely self-contained, and readers who wish to pursue related subjects of interest are invited to consult the rich bibliography for guidance.