CONTENTS

Con	tributors	V11
Pref	face	ix
	Introduction: Paul Witherspoon and the Birth of Contemporary Fractured Rock Hydrogeology R. Allan Freeze, Iraj Javandel, and Shlomo P. Neuman	1
1	A Complex Systems Approach to Describing Flow and Transport in Fractured-Porous Media Boris Faybishenko, Sally M. Benson, John E. Gale, and Fred Molz	5
Par	rt I: Methods of Field Measurements and Experiments	
2	Fracture Flow and Underground Research Laboratories for Nuclear Waste Disposal and Physics Experiments Joseph S. Y. Wang and John A. Hudson	21
3	Permeability Structure of a Strike-Slip Fault Kenzi Karasaki, Celia T. Onishi, and Junichi Goto	43
4	Feasibility of Long-Term Passive Monitoring of Deep Hydrogeology with Flowing Fluid Electric Conductivity Logging Method Prabhakar Sharma, Chin-Fu Tsang, Christine Doughty, Auli Niemi, and Jacob Bensabat	53
Par	rt II: Collective Behavior and Emergent Properties of Complex Fractured Rock Systems	
5	Particle Swarms in Fractures Eric Boomsma and Laura J. Pyrak-Nolte	65
6	The Effect of Chemical Osmosis on Oil and Gas Production from Fractured Shale Formations Perapon Fakcharoenphol, Basak Kurtoglu, Hossein Kazemi, Sarinya Charoenwongsa, and Yu-Shu Wu	85
7	An Experimental Investigation of Stress-Dependent Permeability and Permeability Hysteresis Behavior in Rock Fractures Da Huo and Sally M. Benson	99
8	Permeability of Partially Cemented Fractures Michael C. Tsenn	115
9	An Emergent Conductivity Relationship for Water Flow Based on Minimized Energy Dissipation: From Landscapes to Unsaturated Soils Hui-Hai Liu	129
10	Comparison of Simulated Flow in a Discrete Fracture Laboratory Sample Based on Measured Average and Spatially Varying Hydraulic Conductivity Eunjeong Seok and John E. Gale	137

Part III: Connection to the Surrounding Environment

11	Fractures as Advective Conduits at the Earth-Atmosphere Interface Maria Inés Dragila, Uri Nachshon, and Noam Weisbrod
12	Quantifying Water Flow and Retention in an Unsaturated Fracture-Facial Domain John R. Nimmo and Siamak Malek-Mohammadi
Par	t IV: Multidisciplinary Research for Different Applications
13	Plutonium Transport in Soil and Plants: An Interdisciplinary Study Motivated by Lysimeter Experiments at the Savannah River Site Fred Molz, Inci Demirkanli, Shannon Thompson, Dan Kaplan, and Brian Powell
14	Experimental and Modeling Studies of Episodic Air-Water Two-Phase Flow in Fractures and Fracture Networks Thomas Wood and Hai Huang
15	Simulation of THM Processes in Fractured Reservoirs Philip H. Winterfeld and Yu-Shu Wu
Ind	ex 243