



Playing against Nature

Integrating Science and Economics to Mitigate
Natural Hazards in an Uncertain World

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WILEY

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“This is truly an amazing book! The product of a unique collaboration between a renowned economist and renowned seismologist (who happen to be father and son), *Playing against Nature* lays out a clear story, in easy-to-read prose, of what natural disasters are, what the limitations of risk prediction can be, and how society's response to them has to account for the reality that we have limited economic resources. The authors present fascinating case studies to illustrate examples of where predictions have failed, and why. They also take a bold step by showing how natural disasters and economic disasters provide similar challenges, and provide a clear description of how risk should be assessed, and how it can be mitigated reasonably. This is a book that researchers, policy makers, and the general public should read. It can even serve as valuable text for the new generation of interdisciplinary college courses addressing the interface between science and social science.” – Stephen Marshak, Professor and Director of the School of Earth Society and Environment, University of Illinois at Urbana-Champaign

“I very highly recommend this book for anyone dealing with or interested in natural hazards assessment and mitigation. It is a *tour de force* with examples, descriptions, illustrations, reference lists, and explanations for understanding natural disasters and negotiating the often perilous and misguided approaches for hazards mitigation. This book is a huge achievement in that it has collected an enormous amount of relevant information, case studies, economics and engineering factors, loss statistics, references, and even study guides and questions for students. It is both highly technical with all the probability and statistics formulations needed to express necessary relationships but on the other hand, so well written that

professionals in government, business, and education will find it exceedingly readable. In my everyday work experience, I attempt to communicate principles of hazard occurrences and risks. This book gives me far more useable material than I have ever had to achieve my goals for advising public officials, teaching university students, and educating citizens. This is the best resource in existence for understanding natural hazards and hazard mitigation.” – James C. Cobb, State Geologist and Director, Kentucky Geological Survey, University of Kentucky

“*Playing against Nature* is a virtuoso performance by a father-son duo. A distinguished economist and seismologist have produced a pioneering work that promises to enhance our ability to integrate assessment science, cost-benefit analysis and mitigation design and engineering. The result will be more informed, bottom-up, hazard mitigation policies. This outstandingly researched book is highly readable and destined to become a classic.” – Steve H. Hanke, Professor of Applied Economics, The Johns Hopkins University

“Elegantly written in Seth Stein's usual memorable prose, *Playing against Nature* treats jointly seismic and economic catastrophes in a thought-provoking and readable way. How blindingly obvious something can be after the event! Ringing oh so very true, it provides insight into why science and scientists don't get things right all the time. Enriched with gems of quotes, and an unusual mix of hard science and philosophy, *Playing against Nature* will make a great supporting text for any course on hazards – geologic, engineering, political or economic – and judging from current trends, we could all use as much understanding of this topic as possible.” – Gillian R. Foulger, Professor of Geophysics, University of Durham

“Authored by a remarkable father and son team, *Playing against Nature* is a comprehensive, lucid assessment of the interplay between natural hazards and economics of many kinds. As world population continues to increase to more and more unsustainable numbers, and demand for economic growth plagues the world, human activities continue to place us in more and greater vulnerability as Earth processes go on, as they have over deep time. We need to better recognize and thus more responsibly prepare for inevitable natural events. Blunt, forceful, and true statements (e.g., ‘Humans have to live with natural hazards’ and ‘Hazards are geological facts that are not under human control’) characterize *Playing against Nature* and make reading this contribution, by anyone, a sobering and enlightening experience. I highly recommend *Playing against Nature* to those who care about the future of the human race.” – John Geissman, Professor of Geosciences, University of Texas at Dallas

“In the wake of recent natural disasters and economic crises, the authors question the inability of specialists – of earth and planetary sciences on one side and economists on the other – to predict such events. Beyond these two spheres, this work also reveals a bridge between seemingly distinct fields of science, which meet as soon as one starts to focus on concepts that are fundamental for both, such as hazard, risk or vulnerability. This book discusses the laws of probability and the most appropriate models for predicting rare events; it also offers strategies to optimize mitigation plans. *Playing against Nature* thus is an innovative work that should encourage researchers in different disciplines to collaborate. It may also become a useful tool for graduate students. This book furthermore constitutes an ideal reference work for policy makers.” – Serge Rey, Professor of Economics, University of Pau

“Insightful and provocative, *Playing against Nature* by Stein and Stein explains in a brilliant yet playful way why experts missed many of the recent natural and manmade disasters, from the 2011 Tohoku earthquake to the 2008 financial crisis. It makes an enjoyable read for anyone who has ever wondered how society prepares and responds to natural disasters. The authors, an economist father and a geophysicist son, provide a unique perspective of how scientific study of natural disasters interplays with policy making for hazard mitigation. As a student of earthquake science, I found many arguments and facts in the book compelling and intriguing. Facing many unknowns and with limited resources, we are gambling with nature in hazard preparation and mitigation, as the authors put it. We may not expect to win every hand, but we need to understand our odds. *Playing against Nature* offers a fresh way to look at nature's games. It should be helpful to professionals, and delightful to everyone who opens the book.” – Mian Liu, Curators' Distinguished Professor in Geological Sciences, University of Missouri

“How can policy defend society better against natural disasters whose probabilities are uncertain and in flux? In *Playing against Nature*, Seth Stein, a geologist, and his late father Jerome, an economist, joined forces. Their book is a clear Guide for the Perplexed, combining scholarship and exposition to show how to prepare more wisely for hurricanes, earthquakes, and tsunamis.” – Shlomo Maital, Professor Emeritus, Institute for Advanced Studies in Science and Technology, Technion-Israel Institute of Technology

“What do natural disasters and economic disasters have in common, and how is it possible to efficiently mitigate their effects? You will find the answer in this scholarly book. But there is more to it than meets the eye: this important monograph is based on what I call ‘the Steins' synergy’

(after the late Jerome Stein, an economist, and his son Seth Stein, a geoscientist). The interaction between these two scientists has been such that the combined result of their joint research, reported in this book, is much greater than the sum of the individual results: the quintessential example of what interdisciplinarity can achieve.” –

Giancarlo Gandolfo, Professor, Accademia Nazionale dei Lincei, Rome, Research Fellow, CESifo, Munich, Professor of International Economics, Sapienza University of Rome (retired)

“ ‘Nature's smarter than us’ might be a good subtitle for this well-written and illustrated tome by a father-son team. Reviewing numerous natural disasters from Katrina to Haiti to Sandy to the Japan earthquake, the authors find most disaster responses to be seriously wanting. Their accounts of nature at its most violent range from humorous to appalling. The solution: a better understanding of the uncertainties of disaster response, free of politics, tradition and too narrow science.” – Orrin H. Pilkey, Professor Emeritus of Earth and Ocean Sciences, Duke University



Jerome and Seth Stein, spring 2012. Photo by Hadassah Stein.

Playing against Nature

Integrating Science and Economics to Mitigate
Natural Hazards in an Uncertain World

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