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Static & Dynamic Analysis of Structures A Physical Approach with Emphasis on Earthquake Engineering *Computers and Structures Incorporated* "Summarizes the theoretical development of the finite elements and numerical methods used in the latest versions of the SAP and ETABS programs. Although only a minimum mathematical and programming background is required to completely understand the book, a thorough understanding of the physical behavior of real structures is essential"--Provided by publisher. **Three Dimensional Static and Dynamic Analysis of Structures A Physical Approach with Emphasis on Earthquake Engineering Product Performance Evaluation using CAD/CAE The Computer Aided Engineering Design Series** *Academic Press* This is one book of a four-part series, which aims to integrate discussion of modern engineering design principles, advanced design tools, and industrial design practices throughout the design process. Through this series, the reader will: Understand basic design principles and modern engineering design paradigms. Understand CAD/CAE/CAM tools available for various design related tasks. Understand how to put an integrated system together to conduct product design using the paradigms and tools. Understand industrial practices in employing virtual engineering design and tools for product development. Provides a comprehensive and thorough coverage on essential elements for product performance evaluation using the virtual engineering paradigms Covers CAD/CAE in Structural Analysis using FEM, Motion Analysis of Mechanical Systems, Fatigue and Fracture Analysis Each chapter includes both analytical methods and computer-aided design methods, reflecting the use of modern computational tools in

engineering design and practice A case study and tutorial example at the end of each chapter provide hands-on practice in implementing off-the-shelf computer design tools Provides two projects at the end of the book showing the use of Pro/ENGINEER® and SolidWorks ® to implement concepts discussed in the book **Progress in Industrial and Civil Engineering III** *Trans Tech Publications Ltd* Collection of selected, peer reviewed papers from the 2014 3rd International Conference on Civil, Architectural and Hydraulic Engineering (ICCAHE 2014), July 30 -31, 2014, Hangzhou, China. Volume is indexed by Thomson Reuters CPCI-S (WoS). The 477 papers are grouped as follows: Chapter 1: Structural Engineering, Chapter 2: Geotechnical and Geological Engineering, Chapter 3: Tunnel, Subway and Underground Facilities, Chapter 4: Bridge Engineering, Chapter 5: Road and Railway Engineering, Chapter 6: Coastal Engineering, Chapter 7: Materials and Technologies of Construction, Chapter 8: Computational Mechanics and Applied Mechanics, Chapter 9: Seismic Engineering, Chapter 10: Disaster Prevention and Mitigation, Chapter 11: Heating, Gas Supply, Ventilation and Air Conditioning Works, Chapter 12: Surveying Engineering, Cartography and Geographic Information Systems, Chapter 13: Architectural Design and Its Theory, Chapter 14: Project Management, Chapter 15: Engineering Management, Civil and Construction Industry Management, Infrastructure Demand and Supply, Engineering Education. **Computational Earthquake Physics: Simulations, Analysis and Infrastructure, Part II** *Springer Science & Business Media* This second part of a two-volume work contains 22 research articles on various aspects of computational earthquake physics. Coverage includes the promising earthquake forecasting model LURR (Load-Unload Response Ratio); pattern informatics and phase dynamics and their applications; computational algorithms, including continuum damage models and visualization and analysis of geophysical datasets; and assimilation of data. **Earthquake Research and Analysis New Advances in Seismology** *BoD – Books on Demand* The mitigation of earthquake-related hazards represents a key role in the modern society. The main goal of this book is to present 9 scientific papers focusing on new research and results on earthquake seismology. Chapters of this book focus on several aspect of seismology ranging from historical earthquake analysis, seismotectonics, and damage estimation of critical facilities. **International Handbook of Earthquake & Engineering Seismology** *Elsevier* The two volume International Handbook of Earthquake and Engineering Seismology represents the International Association of Seismology and Physics of the Earth's Interior's (IASPEI) ambition to provide a comprehensive overview of our present knowledge of earthquakes and seismology. This state-of-the-art work is the only reference to cover all aspects of seismology--a "resource library" for civil and structural engineers, geologists, geophysicists, and seismologists in academia and industry around the globe. Part B, by more than 100 leading researchers from major institutions of science around the globe, features 34 chapters detailing strong-motion seismology, earthquake engineering, quake prediction and hazards mitigation, as well as detailed reports from more than 40 nations. Also available is The International Handbook of Earthquake and Engineering Seismology, Part A. Authoritative articles by more than 100 leading scientists Extensive glossary of terminology plus 2000+ biographical sketches of notable seismologists **Advances in Earthquake Prediction Research and Risk Mitigation** *Springer*

Science & Business Media The special natural conditions in Iceland as well as high level technology, were the basis for multidisciplinary and multinational cooperation for studying crustal processes, especially processes ahead of large earthquakes. This work leads to new innovative results and real time warnings which are described in the book. The results obtained in Iceland are of significance for earthquake prediction research worldwide. **Proceedings of US-Korea Workshop on New Frontier in Infrastructural/Seismic Engineering 24-25 August 1999, Seoul, Korea Microscopic and Macroscopic Simulation: Towards Predictive Modelling of the Earthquake Process** *Birkhäuser* **Practical Approaches to Earthquake Prediction and Warning** *Springer Science & Business Media* A seminar on "Practical Approaches to Earthquake Prediction and Warning" was held in Tokyo and Tsukuba, Japan on November 7-11, 1983. This was the sixth seminar on earthquake prediction in the framework of the U.S.-Japan Cooperation in Science Program, a series that was initiated in 1964. The Japan Society for the Promotion of Science and the National Science Foundation of the U.S.A. sponsored the seminar. The U.S. Geological Survey gave substantial additional support by sen ding a number of scientists to the seminar. C. H. Scholz, Columbia University, and T. Rikitake, Nihon University, were the co-convenors on behalf of the U.S.A. and Japan, respectively. 23 Japanese and 23 American delegates and observers took part in the seminar. Forty papers were presented during the three days of scientific sessions at the Interna tional House of Japan, Roppongi, Tokyo, November 7-9. The other two days were spent on a field trip to Tsukuba Science City, where national laboratories engaged in earthquake prediction research and other aspects of earthquake hazard reduction have been established by several agencies of the Japanese Government. The program of the scientific sessions was organized according to the following topics: 1. The national programs of Japan and the U.S.A. 2. Theory and long-term earthquake prediction. 3. Strain and stress. 4. Observation systems. 5. Various precursors. 6. Social response, public policy and earthquake engineering. **International Handbook of Earthquake & Engineering Seismology** *Elsevier* Modern scientific investigations of earthquakes began in the 1880s, and the International Association of Seismology was organized in 1901 to promote collaboration of scientists and engineers in studying earthquakes. The International Handbook of Earthquake and Engineering Seismology, under the auspices of the International Association of Seismology and Physics of the Earth's Interior (IASPEI), was prepared by leading experts under a distinguished international advisory board and team of editors. The content is organized into 56 chapters and includes over 430 figures, 24 of which are in color. This large-format, comprehensive reference summarizes well-established facts, reviews relevant theories, surveys useful methods and techniques, and documents and archives basic seismic data. It will be the authoritative reference for scientists and engineers and a quick and handy reference for seismologists. Also available is The International Handbook of Earthquake and Engineering Seismology, Part B. Two CD-ROMs containing additional material packaged with the text **Three Dimensional Static and Dynamic Analysis of Structures A Physical Approach with Emphasis on Earthquake Engineering Earthquake Processes: Physical Modelling, Numerical Simulation and Data Analysis Part II** *Birkhäuser* In the last decade of the 20th century, there has been great progress in the

physics of earthquake generation; that is, the introduction of laboratory-based fault constitutive laws as a basic equation governing earthquake rupture, quantitative description of tectonic loading driven by plate motion, and a microscopic approach to study fault zone processes. The fault constitutive law plays the role of an interface between microscopic processes in fault zones and macroscopic processes of a fault system, and the plate motion connects diverse crustal activities with mantle dynamics. An ambitious challenge for us is to develop realistic computer simulation models for the complete earthquake process on the basis of microphysics in fault zones and macro-dynamics in the crust-mantle system. Recent advances in high performance computer technology and numerical simulation methodology are bringing this vision within reach. The book consists of two parts and presents a cross-section of cutting-edge research in the field of computational earthquake physics. Part I includes works on microphysics of rupture and fault constitutive laws, and dynamic rupture, wave propagation and strong ground motion. Part II covers earthquake cycles, crustal deformation, plate dynamics, and seismicity change and its physical interpretation. Topics in Part II range from the 3-D simulations of earthquake generation cycles and interseismic crustal deformation associated with plate subduction to the development of new methods for analyzing geophysical and geodetical data and new simulation algorithms for large amplitude folding and mantle convection with viscoelastic/brittle lithosphere, as well as a theoretical study of accelerated seismic release on heterogeneous faults, simulation of long-range automaton models of earthquakes, and various approaches to earthquake predicition based on underlying physical and/or statistical models for seismicity change. **Seismic Analysis of the Folsom-auxiliary-spillway Stilling Basin**
Earthquake Thermodynamics and Phase Transformation in the Earth's Interior *Academic Press* A group of distinguished scientists contributes to the foundations of a new discipline in Earth sciences: earthquake thermodynamics and thermodynamics of formation of the Earth's interior structures. The predictive powers of thermodynamics are so great that those aspiring to model earthquake and the Earth's interior will certainly wish to be able to use the theory. Thermodynamics is our only method of understanding and predicting the behavior of many environmental, atmospheric, and geological processes. The need for Earth scientists to develop a functional knowledge of thermodynamic concepts and methodology is therefore urgent. Sources of an entropy increase the dissipative and self-organizing systems driving the evolution and dynamics of the Universe and Earth through irreversible processes. The non-linear interactions lead to the formation of fractal structures. From the structural phase transformations the important interior boundaries emerge. Non-linear interactions between the defects in solids lead the authors to develop the physics of continua with a dense distribution of defects. Disclinations and dislocations interact during a slow evolution as well as during rapid dynamic events, like earthquakes. Splitting the dynamic processes into the 2D fault done and 3D surrounding space brings a new tool for describing the slip nucleation and propagation along the earthquake faults. Seismic efficiency, rupture velocity, and complexity of seismic source zone are considered from different points of view, fracture band earthquake model is developed on the basis of thermodynamics of line defects, like dislocations. Earthquake thermodynamics offers us a microscopic model of earthquake sources.

Physics of defects helps the authors decscribe and explain a number of precursory phenomena caused by the buildup of stresses. Anomalies in electric polarization and electromagnetic radiation prior to earthquakes are considered from this point of view. Through the thermodynamic approach, the authors arrive at the fascinating question of posssibility of earthquake prediction. In general, the Earth is considered here as a multicomponent system. Transport phenomena as well as wave propagation and shock waves are considered in this system subjected also to chemical and phase transformations. **Earthquake Information Bulletin Structural Dynamics of Earthquake Engineering Theory and Application Using Mathematica and Matlab** *Elsevier* Given the risk of earthquakes in many countries, knowing how structural dynamics can be applied to earthquake engineering of structures, both in theory and practice, is a vital aspect of improving the safety of buildings and structures. It can also reduce the number of deaths and injuries and the amount of property damage. The book begins by discussing free vibration of single-degree-of-freedom (SDOF) systems, both damped and undamped, and forced vibration (harmonic force) of SDOF systems. Response to periodic dynamic loadings and impulse loads are also discussed, as are two degrees of freedom linear system response methods and free vibration of multiple degrees of freedom. Further chapters cover time history response by natural mode superposition, numerical solution methods for natural frequencies and mode shapes and differential quadrature, transformation and Finite Element methods for vibration problems. Other topics such as earthquake ground motion, response spectra and earthquake analysis of linear systems are discussed. Structural dynamics of earthquake engineering: theory and application using Mathematica and Matlab provides civil and structural engineers and students with an understanding of the dynamic response of structures to earthquakes and the common analysis techniques employed to evaluate these responses. Worked examples in Mathematica and Matlab are given. Explains the dynamic response of structures to earthquakes including periodic dynamic loadings and impulse loads Examines common analysis techniques such as natural mode superposition, the finite element method and numerical solutions Investigates this important topic in terms of both theory and practise with the inclusion of practical exercise and diagrams **Achievements and New Frontiers in Research Oriented to Earthquake Forecasting** *Frontiers Media SA* Cover Image Credit: Zhaofei Liu and Ying Li From the Institute of Earthquake Forecasting, China **Pre-Earthquake Processes A Multidisciplinary Approach to Earthquake Prediction Studies** *John Wiley & Sons* Pre-Earthquake signals are advanced warnings of a larger seismic event. A better understanding of these processes can help to predict the characteristics of the subsequent mainshock. Pre-Earthquake Processes: A Multidisciplinary Approach to Earthquake Prediction Studies presents the latest research on earthquake forecasting and prediction based on observations and physical modeling in China, Greece, Italy, France, Japan, Russia, Taiwan, and the United States. Volume highlights include: Describes the earthquake processes and the observed physical signals that precede them Explores the relationship between pre-earthquake activity and the characteristics of subsequent seismic events Encompasses physical, atmospheric, geochemical, and historical characteristics of pre-earthquakes Illustrates thermal infrared, seismo–ionospheric, and other satellite and ground-based pre-earthquake anomalies Applies

these multidisciplinary data to earthquake forecasting and prediction Written for seismologists, geophysicists, geochemists, physical scientists, students and others, Pre-Earthquake Processes: A Multidisciplinary Approach to Earthquake Prediction Studies offers an essential resource for understanding the dynamics of pre-earthquake phenomena from an international and multidisciplinary perspective. **A Method to Predict a Significant Earthquake** *Booktango* **Rock Friction and Earthquake Prediction** *Birkhäuser* **AutoBATS and 3D MUSIC: New Approaches to Imaging Earthquake Rupture Behaviors** *Springer Nature* This book presents the kinematic earthquake rupture studies from moment tenor to spatial-temporal rupture imaging. For real-time seismic hazard monitoring, the new stable automatic moment tensor (AutoBATS) algorithm is developed and implemented for the real-time MT reports by the Taiwan Earthquake Science Information System (TESIS). In order to understand the rupture behavior of the 2013 Mw 8.3 Okhotsk deep earthquake sequence, the 3D MUltiple SIgnal Classification Back Projection (MUSIC BP) with P and pP phases is applied. The combined P- and pP-wave BP imaging of the mainshock shows two stages of anti-parallel ruptures along two depths separating for about 10~15 km. Unusual super-shear ruptures are observed through the 3D BP images of two Mw 6.7 aftershocks. In last two chapters, the 3D BP imaging reveals similar rupture properties of two shallow catastrophic earthquakes (Mw=6.4) in southwestern Taiwan. Both the 2010 Jiashian and 2016 Meinong earthquakes ruptured westward with similar velocity of ~2.5 km/s along a NE-ward shallow dipping blind fault. The rupture similarities of the doublet suggest two parallel elongate asperities along the causative fault. After several decades of seismic quiescence, the 2010 Jiashian event initiated the rupture at the deeper asperity and triggered the shallower asperity which caused catastrophes six years later. **Earthquake, Hearings Before the Subcommittee on Oceans and Atmosphere of ..., 93-1, April 26 and 27, 1973 Experimental Studies of Rock Friction with Application to Earthquake Prediction Proceedings of Conference II Earthquakes and Health Monitoring of Civil Structures** *Springer Science & Business Media* Health monitoring of civil structures (HMS) is a new discipline, which contributes to successful and on time detection of damages to structures. This book is a collection of chapters on different topics written by leading scientists in the field. It is primarily focused on the latest achievements in monitoring the earthquake effect upon the health of civil structures. The first chapter of the book deals with the geotechnical and structural aspects of the 2010-2011 Christchurch earthquakes. Further chapters are dedicated to the latest HMS techniques of identification of damage to structures caused by earthquakes. Real time damage detection as well as sensors and acquisition systems used for that purpose are presented. The attention is focused on automated modal analysis, dynamic artificial neural networks and wavelet techniques used in HMS. Particular emphasis is put on wireless sensors and piezo-impendance transducers used for evaluation of seismically induced structural damage. The discussion is followed by presentation of case studies of application of health monitoring for buildings and other civil structures, including a super tall structure. The book ends with a presentation of shaking table tests on physical models for the purpose of monitoring their behaviour under earthquake excitation. Audience The book is primarily intended for engineers and scientists working in the field of application of the

HMS technique in earthquake engineering. Considering that real time health monitoring of structures represents a sophisticated approach applying the latest techniques of monitoring of structures, many experts from other industries will also find this book useful. **Whittier Narrows, CA, Earthquake Lessons Learned : Hearing Before the Subcommittee on Science, Research, and Technology of the Committee on Science, Space, and Technology, House of Representatives, One Hundredth Congress, First Session, November 10, 1987 Scientific and Technical Aerospace Reports** Lists citations with abstracts for aerospace related reports obtained from world wide sources and announces documents that have recently been entered into the NASA Scientific and Technical Information Database. **Earthquake Resistant Design and Risk Reduction** *John Wiley & Sons* Earthquake Resistant Design and Risk Reduction, 2nd edition is based upon global research and development work over the last 50 years or more, and follows the author's series of three books Earthquake Resistant Design, 1st and 2nd editions (1977 and 1987), and Earthquake Risk Reduction (2003). Many advances have been made since the 2003 edition of Earthquake Risk Reduction, and there is every sign that this rate of progress will continue apace in the years to come. Compiled from the author's wide design and research experience in earthquake engineering and engineering seismology, this key text provides an excellent treatment of the complex multidisciplinary process of earthquake resistant design and risk reduction. New topics include the creation of low-damage structures and the spatial distribution of ground shaking near large fault ruptures. Sections on guidance for developing countries, response of buildings to differential settlement in liquefaction, performance-based and displacement-based design and the architectural aspects of earthquake resistant design are heavily revised. This book: Outlines individual national weaknesses that contribute to earthquake risk to people and property Calculates the seismic response of soils and structures, using the structural continuum "Subsoil – Substructure – Superstructure – Non–structure" Evaluates the effectiveness of given design and construction procedures for reducing casualties and financial losses Provides guidance on the key issue of choice of structural form Presents earthquake resistant design methods for the main four structural materials – steel, concrete, reinforced masonry and timber – as well as for services equipment, plant and non-structural architectural components Contains a chapter devoted to problems involved in improving (retrofitting) the existing built environment This book is an invaluable reference and guiding tool to practising civil and structural engineers and architects, researchers and postgraduate students in earthquake engineering and engineering seismology, local governments and risk management officials. **Earthquake Risk Reduction** *John Wiley & Sons* Encompassing theory and field experience, this book covers all the main subject areas in earthquake risk reduction, ranging from geology, seismology, structural and soil dynamics to hazard and risk assessment, risk management and planning, engineering and the architectural design of new structures and equipment. Earthquake Risk Reduction outlines individual national weaknesses that contribute to earthquake risk to people and property; calculates the seismic response of soils and structures, using the structural continuum 'Subsoil - Substructure - Superstructure - Non-structure'; evaluates the effectiveness of given designs and construction procedures for reducing casualties and financial losses;

provides guidance on the key issue of choice of structural form; presents earthquake resistant designs methods for the four main structural materials - steel, concrete, reinforced masonry and timber - as well as for services equipment, plant and non-structural architectural components; contains a chapter devoted to problems involved in improving (retrofitting) the existing built environment. Compiled from the author's extensive professional experience in earthquake engineering, this key text provides an excellent treatment of the complex multidisciplinary process of earthquake risk reduction. This book will prove an invaluable reference and guiding tool to practicing civil and structural engineers and architects, researchers and postgraduate students in seismology, local governments and risk management officials. **Technical Report The Mexico Earthquake Scientific and Engineering Implications : Hearing Before the Subcommittee on Science, Research and Technology of the Committee on Science and Technology, House of Representatives, Ninety-ninth Congress, First Session Earthquake Occurrence Short- and Long-term Models and Their Validation** *John Wiley & Sons* Earthquake Occurrence provides the reader with a review of algorithms applicable for modeling seismicity, such as short-term earthquake clustering and pseudo-periodic long-term behavior of major earthquakes. The concept of the likelihood ratio of a set of observations under different hypotheses is applied for comparison among various models. In short-term models, known by the term ETAS, the occurrence space and time rate density of earthquakes is modeled as the sum of two terms, one representing the independent or spontaneous events, and the other representing the activity triggered by previous earthquakes. Examples of the application of such algorithms in real cases are also reported. Dealing with long-term recurrence models, renewal time-dependent models, implying a pseudo-periodicity of earthquake occurrence, are compared with the simple time-independent Poisson model, in which every event occurs regardless of what has occurred in the past. The book also introduces a number of computer codes developed by the authors over decades of seismological research. **Seismogenesis and Earthquake Forecasting: The Frank Evison Volume II** *Springer Science & Business Media* This special issue of Pure and Applied Geophysics is the second of two volumes containing an augmented collection of papers originating from the Evison Symposium on Seismogenesis and Earthquake Forecasting held in Wellington, New Zealand, in February 2008. The volumes honor Frank Evison's interest in earthquake generation and forecasting. This volume includes descriptions of earthquake forecasting test centers through the Collaboratory for the Study of Earthquake Predictability (CSEP) program and the first results from the Regional Earthquake Likelihood Model (RELM) experiment in California. Other papers discuss methods of testing predictions, in particular by the use of error diagrams. There is discussion of prediction methodologies using seismicity, including an application of the statistical technique of Hidden Markov Models to identify changes in seismicity and a new technique for identifying precursory quiescence. Several papers employ other data besides seismicity, such as geologically determined faults, calculations of stress changes via Coulomb stress modeling, tomographically determined velocity structure, groundwater, crustal deformation, and comparisons of real earthquakes to synthetic seismicity determined from hypothesized earthquake physics. One paper focuses on the prediction of human casualties in

the event that a large earthquake occurs anywhere on the globe. The volume will be useful to students and professional researchers who are interested in the earthquake preparation process and in converting that understanding into forecasts of earthquake occurrence. **The Northridge Earthquake Vulnerability and Disaster** *Routledge* This book provides a global view of the social effects of disaster in developed and developing countries. It focuses on the 1994 Northridge Earthquake in the US and other recent disasters to examine vulnerability and post-disaster recovery strategies. The authors also explore the ways state policy can reduce vulnerability in the future. **Mechanics of Earthquake Faulting** *IOS Press* The mechanics of earthquake faulting is a multi-disciplinary scientific approach combining laboratory inferences and mathematical models with the analysis of recorded data from earthquakes, and is essential to the understanding of these potentially destructive events. The modern field of study can be said to have begun with the seminal papers by B. V. Kostrov in 1964 and 1966. This book presents lectures delivered at the summer school 'The Mechanics of Earthquake Faulting', held under the umbrella of the Enrico Fermi International School of Physics in Varenna, Italy, from 2 to 7 July 2018. The school was attended by speakers and participants from many countries. One of the most important goals of the school was to present the state-of-the-art of the physics of earthquakes, and the 10 lectures included here cover the most challenging aspects of the mechanics of faulting. The topics covered during the school give a very clear picture of the current state of the art of the physics of earthquake ruptures and also highlight the open issues and questions that are still under debate, and the book will be of interest to all those working in the field. **Seismic Fragility Assessment for Buildings due to Earthquake Excitation** *Springer* This book presents a simplified approach to earthquake engineering by developing the fragility curve for regular and irregular moment-resisting frames based on different types of structural material, height, and ground motion records. It examines six sets of concrete and steel frames, which vary in terms of their height (3-, 6- and 9-storey) and include regular and irregular frames. Each structure frame was designed based on Eurocode 2 and 3 with the aid of Eurocode 8 for earthquake loading. The SAP2000 software was used as the main tool for the pushover analysis and incremental dynamic analysis. Readers are first provided with background information on the development of nonlinear analysis in earthquake engineering. Subsequently, each chapter begins with a detailed explanation of the collapse of the structures and the application in nonlinear analysis. As such, the book will greatly benefit students from both public and private institutions of higher, particularly those who are dealing with the subject of earthquake engineering for the first time. It also offers a valuable guide for Civil Engineering practitioners and researchers who have an interest in structural and earthquake engineering. **National Earthquake Hazards Reduction Program Summaries of Technical Reports Computational Earthquake Science Part II** *Birkhäuser* Exciting developments in earthquake science have benefited from new observations, improved computational technologies, and improved modeling capabilities. Designing models of the earthquake generation process is a grand scientific challenge due to the complexity of phenomena and range of scales involved from microscopic to global. Such models provide powerful new tools for the study of earthquake precursory phenomena and the earthquake cycle.

Through workshops, collaborations and publications, the APEC Cooperation for Earthquake Simulations (ACES) aims to develop realistic supercomputer simulation models for the complete earthquake generation process, thus providing a "virtual laboratory" to probe earthquake behavior. Part II of the book embraces dynamic rupture and wave propagation, computational environment and algorithms, data assimilation and understanding, and applications of models to earthquakes. This part also contains articles on the computational approaches and challenges of constructing earthquake models. **Goals, Strategy, and Tasks of the Earthquake Hazard Reduction Program**