

# Structural Geology Fossen

A pioneering single-semester undergraduate textbook that balances descriptive and quantitative analysis of geological structures.

Comprehensively describes the principles and applications of 'global' and 'exploration' geophysics for introductory/intermediate university students.

Designed to be carried in the field, this pocket-sized how-to book is a practical guide to basic techniques in mapping geological structures. In addition to including the latest computerised developments, the author provides succinct information on drawing cross-sections and preparing and presenting 'fair copy' maps and geological diagrams. Contains a brief chapter on the essentials of report writing and discusses how to keep adequate field notebooks. A checklist of equipment needed in the field can be found in the appendices. Quote from 3rd edition "provides a wealth of good advice on how to measure, record and write reports of geological field observations" *The Naturalist*

This second edition of Atlas of Structural Geology features a broad and inclusive range of high-quality mesoscale and microscale full-color photographs, descriptions, and captions related to the deformation of rocks and geologic structures. It is a multicontributed, comprehensive reference that includes

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submissions from many of the world's leading structural geologists, making it one of the most thorough and comprehensive references available to the geoscience community. All types of structures are featured, including those related to ductile and brittle shear zones, sigma and delta structures, mineral fish, duplexes and trapezoids, shear-related folds, and flanking structures in the mesoscale and microscale. This second edition features new and expanded coverage, including seismic-image interpretation, landslide deformations, flowing glacial structures, and more than 150 new full-color images to illustrate the geologic features. A stunning collection of the world's most beautiful and arresting geologic structures, this book is the ideal resource to illustrate key concepts in geology. Presents more than 400 top-quality, full-color photographs contributed by the world's most respected structural geologists Features a broad range of morphological variations of geologic structures, making it the most up-to-date and inclusive reference of its kind Aids researchers in developing mathematical and analogue models on the peculiarity and uniqueness of the world's most iconic structures

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The third edition of this widely acclaimed textbook provides a comprehensive introduction to all aspects of global tectonics, and includes major revisions to reflect the most significant recent advances in the field. A fully revised third edition of this highly acclaimed text written by eminent authors including one of the pioneers of plate tectonic theory Major revisions to this new edition reflect the most significant recent advances in the field, including new and expanded chapters on Precambrian tectonics and the supercontinent cycle and the implications of plate tectonics for environmental change Combines a historical approach with process science to provide a careful balance between geological and geophysical material in both continental and oceanic regimes Dedicated website available at [www.blackwellpublishing.com/kearey/](http://www.blackwellpublishing.com/kearey/)

This book provides a comprehensive introduction to the field of geochemistry. The book first lays out the 'geochemical toolbox': the basic principles and techniques of modern geochemistry, beginning with a review of thermodynamics and kinetics as they apply to the Earth and its environs. These basic concepts are then applied to understanding processes in aqueous systems and the behavior of trace elements in magmatic systems. Subsequent chapters introduce radiogenic and

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stable isotope geochemistry and illustrate their application to such diverse topics as determining geologic time, ancient climates, and the diets of prehistoric peoples. The focus then broadens to the formation of the solar system, the Earth, and the elements themselves. Then the composition of the Earth itself becomes the topic, examining the composition of the core, the mantle, and the crust and exploring how this structure originated. A final chapter covers organic chemistry, including the origin of fossil fuels and the carbon cycle's role in controlling Earth's climate, both in the geologic past and the rapidly changing present. Geochemistry is essential reading for all earth science students, as well as for researchers and applied scientists who require an introduction to the essential theory of geochemistry, and a survey of its applications in the earth and environmental sciences. Additional resources can be found at: <http://www.wiley.com/go/white/geochemistry> This market-leading textbook has been updated to include a chapter on joints and veins, additional examples and stunning new photos.

The critical evaluation of the kinematic significance of natural geological deformation structures, particularly referring to the determination of shear-sense, requires a high degree of familiarity with the basic concepts of flow and the influence of material properties (discontinuities, rheological layering, anisotropy)

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on the nature of flow at the local scale. This publication includes information on flow, followed by a critical examination of geological deformation, structures which are commonly used as shear-sense indicators, foliations, stiff inclusions and their attendant wings, and folds and veins.

This book is intended as a practical handbook for those engaged in the task of analyzing the paleogeographic evolution of ancient sedimentary basins. The science of stratigraphy and sedimentology is central to such endeavors, but although several excellent textbooks on sedimentology have appeared in recent years little has been written about modern stratigraphic methods. Sedimentology textbooks tend to take a theoretical approach, building from physical and chemical theory and studies of modern environments. It is commonly difficult to apply this information to practical problems in ancient rocks, and very little guidance is given on methods of observation, mapping and interpretation. In this book theory is downplayed and the emphasis is on what a geologist can actually see in outcrops, well records, and cores, and what can be obtained using geophysical techniques. A new approach is taken to stratigraphy, which attempts to explain the genesis of lithostratigraphic units and to de-emphasize the importance of formal description and naming. There are also sections explaining principles of facies analysis, basin mapping methods, depositional systems, and

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the study of basin thermal history, so important to the genesis of fuels and minerals. Lastly, an attempt is made to tie everything together by considering basins in the context of plate tectonics and eustatic sea level changes.

A modern quantitative approach to structural geology and tectonics for advanced students and researchers.

The Second Edition also benefits from new artwork that clearly illustrates complex concepts. New to the Second Edition: New Chapter: 15, "Geophysical Imaging," by Frederick Cook Within Chapters 21 and 22, four new essays on "Regional Perspectives" discuss the European Alps, the Altai, the Appalachians, and the Cascadia Wedge. New and updated art for more informative illustration of concepts. The Second Edition now has 570 black & white figures.

This book helps a novice to explore the terrain independently. Geoscience fieldwork with a focus on structural geology and tectonics has become more important in the last few years from both academic and industrial perspectives. This book also works as a resource material for batches of students or geological survey professional undergoing training as parts of their course curriculum. Industry persons, on the other hand, can get a first-hand idea about what to expect in the field, in case no academic person is available with the team. This

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book focused on structural geology and tectonics compiles for the very first time terrains from several regions of the globe.

Structural Geology Cambridge University Press

This graduate textbook, first published in 2008, presents a comprehensive, unified treatment of the materials science of deformation as applied to solid Earth geophysics and geology. The deformation of Earth materials is presented in a systematic way covering elastic, anelastic and viscous deformation. Advanced discussions on relevant debates are also included to bring readers a full picture of science in this interdisciplinary area. This textbook is ideal for graduate courses on the rheology and dynamics of solid Earth, and includes review questions with solutions so readers can monitor their understanding of the material presented. It is also a much-needed reference for geoscientists in many fields including geology, geophysics, geochemistry, materials science, mineralogy and ceramics.

Relates the physical and geometric elegance of geologic structures within the Earth's crust and the ways in which these structures reflect the nature and origin of crystal deformation through time. The main thrust is on applications in regional tectonics, exploration geology, active tectonics and geohydrology. Techniques, experiments, and calculations are described in detail, with the purpose of offering

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active participation and discovery through laboratory and field work.

Salt tectonics is the study of how and why salt structures evolve and the three-dimensional forms that result. A fascinating branch of geology in itself, salt tectonics is also vitally important to the petroleum industry. Covering the entire scale from the microscopic to the continental, this textbook is an unrivalled consolidation of all topics related to salt tectonics: evaporite deposition and flow, salt structures, salt systems, and practical applications. Coverage of the principles of salt tectonics is supported by more than 600 color illustrations, including 200 seismic images captured by state-of-the-art geophysical techniques and tectonic models from the Applied Geodynamics Laboratory at the University of Texas, Austin. These combine to provide a cohesive and wide-ranging insight into this extremely visual subject. This is the definitive practical handbook for professional geologists and geophysicists in the petroleum industry, an invaluable textbook for graduate students, and a reference textbook for researchers in various geoscience fields.

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Microtectonics is the interpretation of small-scale deformation structures in rocks. They are studied by optical microscope and contain abundant information on the history and type of deformation and metamorphism in a rock and are therefore used by most geologists to obtain data for large-scale geological interpretations. This advanced textbook contains a large number of photographs and explanatory drawings, special chapters on related techniques, a chapter on microgauges and a simple, non-mathematical treatment of continuum mechanics with practical examples. Special terms are explained in boxes. This textbook is suited for independent use during optical studies on microstructures as a reference manual and as a manual for short courses.

Faults commonly trap fluids such as hydrocarbons and water and therefore are of economic significance. During hydrocarbon field development, smaller faults can provide baffles and/or conduits to flow. There are relatively simple, well established workflows to carry out a fault seal analysis for siliciclastic rocks based primarily on clay content. There are, however, outstanding challenges related to other rock types, to calibrating fault seal models (with static and dynamic data) and to handling uncertainty. The variety of studies presented here demonstrate the types of data required and workflows followed in today's

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environment in order to understand the uncertainties, risks and upsides associated with fault-related fluid flow. These studies span all parts of the hydrocarbon value chain from exploration to production but are also of relevance for other industries such as radioactive waste and CO<sub>2</sub> containment.

The practical application of structural geology in industry is varied and diverse; it is relevant at all scales, from plate-wide screening of new exploration areas down to fluid-flow behaviour along individual fractures. From an industry perspective, good structural practice is essential since it feeds into the quantification and recovery of reserves and ultimately underpins commercial investment choices. Many of the fundamental structural principles and techniques used by industry can be traced back to the academic community, and this volume aims to provide insights into how structural theory translates into industry practice. Papers in this publication describe case studies and workflows that demonstrate applied structural geology, covering a spread of topics including trap definition, fault seal, fold-and-thrust belts, fractured reservoirs, fluid flow and geomechanics. Against a background of evolving ideas, new data types and advancing computational tools, the volume highlights the need for structural geologists to constantly re-evaluate the role they play in solving industrial challenges.

Lavishly illustrated in color, this textbook takes an applied approach to introduce

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undergraduate students to the basic principles of structural geology. The book provides unique links to industry applications in the upper crust, including petroleum and groundwater geology, which highlight the importance of structural geology in exploration and exploitation of petroleum and water resources. Topics range from faults and fractures forming near the surface to shear zones and folds of the deep crust. Students are engaged through examples and parallels drawn from practical everyday situations, enabling them to connect theory with practice. Containing numerous end-of-chapter problems, e-learning modules, and with stunning field photos and illustrations, this book provides the ultimate learning experience for all students of structural geology.

For advanced undergraduate structural geology courses.

This market-leading textbook has been fully updated in response to extensive user feedback. It includes a new chapter on joints and veins, additional examples from around the world, stunning new field photos, and extended online resources with new animations and exercises. The book's practical emphasis, hugely popular in the first edition, features applications in the upper crust, including petroleum and groundwater geology, highlighting the importance of structural geology in exploration and exploitation of petroleum and water resources.

Carefully designed full-colour illustrations work closely with the text to support

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student learning, and are supplemented with high-quality photos from around the world. Examples and parallels drawn from practical everyday situations engage students, and end-of chapter review questions help them to check their understanding. Updated e-learning modules are available online ([www.cambridge.org/fossen2e](http://www.cambridge.org/fossen2e)) and further reinforce key topics using summaries, innovative animations to bring concepts to life, and additional examples and figures.

China and Russia are rising economic and political powers that share thousands of miles of border. Despite their proximity, their interactions with each other - and with their third neighbour Mongolia - are rarely discussed. Although the three countries share a boundary, their traditions, languages and worldviews are remarkably different. *Frontier Encounters* presents a wide range of views on how the borders between these unique countries are enacted, produced, and crossed. It sheds light on global uncertainties: China's search for energy resources and the employment of its huge population, Russia's fear of Chinese migration, and the precarious independence of Mongolia as its neighbours negotiate to extract its plentiful resources. Bringing together anthropologists, sociologists and economists, this timely collection of essays offers new perspectives on an area that is currently of enormous economic, strategic and geo-political relevance.

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This widely used, highly readable introduction to structural analysis is specifically designed to support the laboratory work of undergraduates in structural geology courses. The new third edition includes: New and amended exercises and redrafted figures to improve clarity A single fold-out map of the Bree Creek Quadrangle – a mythical site used to help students analyze various aspects of the geologic structures exposed within this quadrangle and ultimately to develop a grand synthesis A user-friendly spiral binding ideal for work in the lab or out in the field An Instructor manual CD-ROM for this title is available. Please contact our Higher Education team at [HigherEducation@wiley.com](mailto:HigherEducation@wiley.com) for more information.

This state-of-the-art text offers students balanced coverage of the full range of topics, supported by a wealth of outstanding illustrations and photographs. The text opens with an overview of basic geologic principles that paves the way for a better understanding of structural geology. The topics of stress and strain, deformation mechanisms, and strain measurement provide a foundation upon which the text's remaining coverage is built. Self-contained chapters meet instructor's individual needs. A brief introduction to geophysical techniques, principally seismic reflection and refraction, Earth magnetism, and gravity,

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enhances a better understanding of crustal structures. This latest edition has been revised for greater clarity and to incorporate the most current technical information possible. \*Provides balanced coverage of all topics, supported by numerous illustrations and photographs. \*An introductory review of fundamental geologic principles and laws, geochronology, and principles of equilibrium gives students a strong foundation and prepares them for subsequent topics. \*Essays in each chapter encourage further study in key subjects. Each chapter offers a short section on an ad

This market-leading textbook has been fully updated in response to extensive user feedback. It includes a new chapter on joints and veins, additional examples from around the world, and stunning new field photos. Extended online resources reinforce key topics using summaries, examples, and innovative animations to bring concepts to life.

This combination of text and lab book presents an entirely different approach to structural geology. Designed for undergraduate laboratory classes, it provides a step-by-step guide for solving geometric problems arising from structural field observations. The book discusses both traditional methods and cutting-edge approaches, with emphasis given to graphical methods and visualization techniques that support students in tackling challenging two- and three-

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dimensional problems. Numerous exercises encourage practice in using the techniques, and demonstrate how field observations can be converted into useful information about geological structures and the processes responsible for creating them. This updated fourth edition incorporates new material on stress, deformation, strain and flow, and the underlying mathematics of the subject. With stereonet plots and solutions to the exercises available online at [www.cambridge.org/ragan](http://www.cambridge.org/ragan), this book is a key resource for undergraduates, advanced students and researchers wanting to improve their practical skills in structural geology.

Thirty-five million years ago, a meteorite three miles wide and moving sixty times faster than a bullet slammed into the sea bed near what is now Chesapeake Bay. The impact, more powerful than the combined explosion of every nuclear bomb on Earth, blasted out a crater fifty miles wide and one mile deep. Shock waves radiated through the Earth for thousands of miles, shaking the foundations of the Appalachians, as gigantic waves and winds of white-hot debris transformed the eastern seaboard into a lifeless wasteland. Chesapeake Invader is the story of this cataclysm, told by the man who discovered it happened. Wylie Poag, a senior scientist with the U.S. Geological Survey, explains when and why the catastrophe occurred, what destruction it caused, how scientists unearthed

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evidence of the impact, and how the meteorite's effects are felt even today. Poag begins by reviewing how scientists in the decades after World War II uncovered a series of seemingly inexplicable geological features along the Virginia coast. As he worked to interpret one of these puzzling findings in the 1980s in his own field of paleontology, Poag began to suspect that the underlying explanation was the impact of a giant meteorite. He guides us along the path that he and dozens of colleagues subsequently followed as--in true scientific tradition--they combined seemingly outrageous hypotheses, painstaking research, and equal parts good and bad luck as they worked toward the discovery of what turned out to be the largest impact crater in the U.S. We join Poag in the lab, on deep-sea drilling ships, on the road for clues in Virginia, and in heated debates about his findings. He introduces us in clear, accessible language to the science behind meteorite impacts, to life and death on Earth thirty-five million years ago, and to the ways in which the meteorite shaped the Chesapeake Bay area by, for example, determining the Bay's very location and creating the notoriously briny groundwater underneath Virginia. This is a compelling work of geological detective work and a paean to the joys and satisfactions of a life in science. Originally published in 1999. The Princeton Legacy Library uses the latest print-on-demand technology to again make available previously out-of-print books



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from the distinguished backlist of Princeton University Press. These editions preserve the original texts of these important books while presenting them in durable paperback and hardcover editions. The goal of the Princeton Legacy Library is to vastly increase access to the rich scholarly heritage found in the thousands of books published by Princeton University Press since its founding in 1905.

State-of-the-art analysis of geological structures has become increasingly quantitative but traditionally, graphical methods are used in teaching. This innovative lab book provides a unified methodology for problem-solving in structural geology using linear algebra and computation. Assuming only limited mathematical training, the book begins with classic orientation problems and progresses to more fundamental topics of stress, strain and error propagation. It introduces linear algebra methods as the foundation for understanding vectors and tensors, and demonstrates the application of geometry and kinematics in geoscience without requiring students to take a supplementary mathematics course. All algorithms are illustrated with a suite of online MATLAB functions, allowing users to modify the code to solve their own structural problems. Containing 20 worked examples and over 60 exercises, this is the ideal lab book for advanced undergraduates or beginning graduate students. It will also provide

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professional structural geologists with a valuable reference and refresher for calculations.

Regional Geology and Tectonics: Principles of Geologic Analysis, 2nd edition is the first in a three-volume series covering Phanerozoic regional geology and tectonics. The new edition provides updates to the first edition's detailed overview of geologic processes, and includes new sections on plate tectonics, petroleum systems, and new methods of geological analysis. This book provides both professionals and students with the basic principles necessary to grasp the conceptual approaches to hydrocarbon exploration in a wide variety of geological settings globally. Discusses in detail the principles of regional geological analysis and the main geological and geophysical tools Captures and identifies the tectonics of the world in detail, through a series of unique geographic maps, allowing quick access to exact tectonic locations Serves as the ideal introductory overview and complementary reference to the core concepts of regional geology and tectonics offered in volumes 2 and 3 in the series

"...the structural geology text that I have long been waiting for ...this text truly shows the application of structural geology to real life academic and industry problems. It will go straight onto my syllabus as the required text." Professor Bruce Trudgill, Colorado School of Mines "If you only buy one structural geology textbook - this is the one to get.

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It's both theoretical and practical... with excellent illustrations and thought-provoking examples." Professor Rob Butler, University of Aberdeen Lavishly illustrated in color, this textbook takes an applied approach to introduce undergraduate students to the basic principles of structural geology. The book provides unique links to industry applications in the upper crust, which highlight the importance of structural geology in exploration and exploitation of petroleum and groundwater resources.

Written for a first course in sedimentary geology or sedimentary rocks and stratigraphy (with only an introductory geology/physical geology course as a prerequisite), Prothero and Schwab shows students how sedimentary strata serves geologists as a continuous record of Earth's history. The authors' conversational style, and focus on the important concepts make the book highly accessible to an undergraduate audience.

This edited book discusses various challenges in teaching structural geology and tectonics and how they have been overcome by eminent instructors, who employed effective and innovative means to do so. All of the chapters were written by prominent and active academics and geoscientists fully engaged in teaching Structural Geology and Tectonics. New instructors will find this book indispensable in framing their teaching strategy. Effective teaching of Structural Geology and Tectonics constitutes the backbone of geoscience education. Teaching takes place not only in classrooms, but also in labs and in the field. The content and teaching methodologies for these two fields have changed over time, shaped by the responsibilities that present-day

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geoscientists are expected to fulfill.

Introduction to geologic fracture mechanics covering geologic structural discontinuities from theoretical and field-based perspectives.

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