Structural Geology Of Rocks And Regions 2nd Edition

This market-leading textbook has been updated to include a chapter on joints and veins, additional examples and stunning new photos.

Structural geology is the study of the three-dimensional distribution of rock units with respect to their deformational histories. The primary goal of structural geology is to use measurements of present-day rock geometries to uncover information about the history of deformation (strain) in the rocks, and ultimately, to understand the stress field that resulted in the observed strain and geometries. This understanding of the dynamics of the stress field can be linked to important events in the regional geologic past; a common goal is to understand the structural evolution of a particular area with respect to regionally widespread patterns of rock deformation due to plate tectonics.

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The small-scale structures referred to in this publication are those structures of tectonic origin that can be observed with the naked eye in the field. Their scale varies broadly between that of the hand-specimen to that of the exposure, or even mountainside. Such structures are the visible effects of rock deformation caused by local stresses and movements which have been induced in the rocks by external tectonic forces of possibly unknown origin. Recognition of these minor structures, and appreciation of their origin and significance assist the field geologist to elucidate the larger-scale geological structures of his area. Commonly some can be used in deciphering the order of strati graphic succession in regions of strongly-folded unfossiliferous beds; and, in ground which has suffered superposed tectonic movements, the minor structures may provide evidence of successive phases or events in the tectonic history. The work contains descriptions of the more common varieties of small-scale tectonic structures, the different ways in which these structures may have been formed, and the limitations of the conclusions which can be drawn from their observation in the field. Gilbert Wilson June 1981 Acknowledgements An outline of much of the material given in this book was delivered at the 'Cinquieme Conference Gustave Dewalque' to the Societe Geologique de Belgique in 1958 and was published in the annals of the society in 1961.

Structural Geology of Rocks and RegionsJohn Wiley & Sons

When author George Davis conceptualized the cover illustration for the first edition of Structural Geology of Rocks and Regions, he wanted to emphasize that the human adventure of learning comes from doing; and that new insight springs from careful, detailed examination of field relationships, viewed at all scales from rocks to regions. He asked illustrator David Fisher to combine four photos into the single painting, you see here. The geologist is enveloped by challenging structural relationships of folded rocks in outcrop; the curvature of back and neck, torqued as eyes and brain move closer and closer to clipboard, is the classic language of geologic mapping. When George Davis and new co-author Steve Reynolds contemplated the cover illustration for the second edition of Structural Geology of Rocks and Regions, they asked: "Who else is in the picture?" Stepping back, and handing David Fisher a couple of additional photos, the scene suddenly changed. The original geologist who had been sitting on the outcrop recording data is now up and walking around, gathering new data. A second geologist has moved into the new foreground, mapping and sketching a system of small-scale imbricate faults. Again, the head is torqued to handle the requirements of fine description and careful mapping. Like so many structural geologists, she seems to thrive on visualization of three-dimensional relationships.

Structural geology includes features of and overlaps with facets of geomorphology, metamorphism and geotechnical studies. By studying the three dimensional structure of rocks and regions, inferences on tectonic history, past geological environments and

deformation events can be made. These can be fixed in time using stratigraphical controls as well as geochronology, to determine when the structural features formed. This book provides leading-edge research on this field from around the world.

Folding and Fracturing of Rocks was first published in 1967. It was one of the first major publications aimed at developing for geologists the basic theory of stress and strain in mathematical terms and explaining how this theory could be used to solve practical problems in structural geology and tectonics. Although out-of-print for many years, it is still one of the most frequently cited and quoted texts in modern research publications in structural geology.

This book sets out the basic materials science needed for understanding the plastic deformation of rocks and minerals. Although at atmospheric pressure or at relatively low environmental pressures, these materials tend to be brittle, that is, to fracture with little prior plastic deformation when non-hydrostatically stressed, they can undergo substantial permanent strain when stressed under environmental conditions of high confining pressure and high temperature, such as occur geologically in the Earth's crust and upper mantle. Thus the plastic deformation of rocks and minerals is of fundamental interest in structural geology and geodynamics. In mountain-building processes and during convective stirring in the Earth's mantle, rocks can undergo very large amounts of plastic flow, accompanied by substantial changes in microstructure. These changes in microstructure remain in the rocks as evidence of the past

deformation history. There are a number of types of physical processes whereby rock and minerals can undergo deformation under geological conditions. The physics of these processes is set out in this book.

Geology Applied to Engineering bridges the gap between the two fields through its versatile application of the physical aspects of geology to engineering design and construction. The Second Edition elucidates real-world practices, concerns, and issues for today's engineering geologists and geotechnical engineers. Both undergraduate and graduate students will benefit from the book's thorough coverage, as will professionals involved in assessing sites for engineering projects, evaluating construction materials, developing water resources, and conducting tests using industry standards. West and Shakoor offer expanded coverage of important topics such as slope stability and ground subsidence and significant fields in engineering geology, such as highways, dams, tunnels, and rock blasting. In order to allow for the diverse backgrounds of geologists and engineers, material on the properties of minerals, rocks, and soil provides a working knowledge of applied geology as a springboard to more comprehensive subjects in engineering. Example problems throughout the text demonstrate the practical applications of soil mechanics, rock weathering and soils, structural geology, groundwater, and geophysics. Thought-provoking and challenging exercises supplement core concepts such as determining shear strength and failure conditions, calculating the depth needed for borings, reading and analyzing maps, and

constructing stratigraphic cross sections.

Structural Geology is a groundbreaking reference that introduces you to the concepts of nonlinear solid mechanics and non-equilibrium thermodynamics in metamorphic geology, offering a fresh perspective on rock structure and its potential for new interpretations of geological evolution. This book stands alone in unifying deformation and metamorphism and the development of the mineralogical fabrics and the structures that we see in the field. This reflects the thermodynamics of systems not at equilibrium within the framework of modern nonlinear solid mechanics. The thermodynamic approach enables the various mechanical, thermal, hydrological and chemical processes to be rigorously coupled through the second law of thermodynamics, invariably leading to nonlinear behavior. The book also differs from others in emphasizing the implications of this nonlinear behavior with respect to the development of the diverse, complex, even fractal, range of structures in deformed metamorphic rocks. Building on the fundamentals of structural geology by discussing the nonlinear processes that operate during the deformation and metamorphism of rocks in the Earth's crust, the book's concepts help geoscientists and graduate-level students understand how these processes control or influence the structures and metamorphic fabrics-providing applications in hydrocarbon exploration, ore mineral exploration, and architectural engineering. Authored by two of the world's foremost experts in structural geology, representing more than 70 years of experience in research and instruction

Nearly 300 figures, illustrations, working examples, and photographs reinforce key concepts and underscore major advances in structural geology

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 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

This textbook is a complete, up-to-date, and highly illustrated account of Structural Geology for students and professionals, and includes fundamentals of the subject with field and practical aspects. The book aims to be highly reader-friendly, containing simple language and brief

introductions and summaries for each topic presented, and can be used both to refresh overall knowledge of the subject as well as to develop models for engineering projects in any area or region. The book is presented in 20 chapters and divided into 3 parts: (A) Fundamental Concepts, (B) Structures: Geometry and Genesis, and (C) Wider Perspectives. For the first time as full chapters in a textbook, the book discusses several modern field-related applications in Structural Geology, including shear-sense indicators, and deformation and metamorphism. Also uniquely included are colored photographs, side by side with line diagrams, of key deformation structures not seen in other books before now. Boxes in each chapter expand the horizons of the reader on the subject matter of the chapter. Questions at the end of each chapter, and detailed significance of the key structures, provide a better grasping to students. Glossary at the end of the book is a refreshing aspect for the readers. Though written primarily for undergraduate and graduate students, the text will also be of use to specialists and practitioners in engineering geology, petrology (igneous, sedimentary, and metamorphic), economic geology, groundwater geology, petroleum geology, and geophysics, and will appeal to beginners with no preliminary knowledge of the subject.

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Structural geology has developed at a very rapid pace in recent years. Evolution of Geological Structures in Micro- to Macro-Scales, covering a wide spectrum of current research in

structural geology from the grain scale to the scale of orogenic belts and from the brittle to the ductile field, provides an overview of newly emerging concepts in a single volume. The book covers a wide range of advances in such broad fields as hydraulic factures, normal faults, overthrusts, ductile shear zones, rock fabrics, folds, superposed folds and basement structures.

A text aimed at practicing exploration and mining professionals working in folded, sheared, or cleaved terranes, but also including an outline of basic mapping and field procedures applicable to a variety of terranes.

Map Interpretation for Structural Geologists exemplifies various topics, from deciphering topography using contour patterns to interpreting folds, faults, unconformities and dykes. By solving several types of maps, this book gives readers the confidence to solve difficult geologic questions related to map interpretation in the classroom and in the field. Interpreting geological and structural maps is an inseparable part of learning structural geology in the undergraduate curriculum and postgraduate development. Features approximately 30 full-color geological or structural maps and their solutions, from basic to the most complex Includes content appropriate for undergraduate and graduate students and professional geoscientists alike Presents a self-learning guide and teaching manual with minimum instruction required

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 active participation and discovery through laboratory and field work.

Presents a comprehensive and up-to-date account of the fundamental aspects of structural geology, emphasising both classical concepts and modern developments. A detailed account of the techniques of geometrical analysis is provided, giving a sound background to principles of geological deformation and in-depth analysis of mechanisms of formation of geological structures. Many new features are included such as detailed discussions on rotation of rigid inclusions and passive markers, boudinage (including chocolate tablet boudins, foliation boudins and shear fracture boudins), structural implications of basement-cover relations and time-relation between crystallation and deformation. The book presents the methods of structural analysis from microscopic to map scale, describes modern techniques used in field and laboratory and offers a balanced picture of modern structural geology as it emerges from combined field, experimental and theoretical studies.

This book is a systematic guide to the recognition and interpretation of deformation microstructures and mechanisms in minerals and rocks at the scale of a thin section. Diagnostic features of microstructures and mechanisms are emphasized, and the subject is extensively illustrated with high-quality color and black and white photomicrographs, and many clear diagrams. After introducing three main classes of deformation microstructures and mechanisms, low- to high-grade deformation is

presented in a logical sequence in Chapters 2 to 5. Magmatic/submagmatic deformation, shear sense indicators, and shock microstructures and metamorphism are described in Chapters 6 to 8, which are innovative chapters in a structural geology textbook. The final chapter shows how deformation microstructures and mechanisms can be used quantitatively to understand the behavior of the earth. Recent experimental research on failure criteria, frictional sliding laws, and flow laws is summarized in tables, and palaeopiezometry is discussed. Audience: This book is essential to all practising structural and tectonic geologists who use thin sections, and is an invaluable research tool for advanced undergraduates, postgraduates, lecturers and researchers in structural geology and tectonics.

Contents: Introduction, Origin of the Earth, Age of the Earth, Interior of the Earth, Interior of the Earth, The Continents and Mountains, Isostasy, Theory of Plate Tectonics, Evolution of Landforms, Volcanoes, Earthquakes, Weathering, Soils, The Study of Rocks, Mineralogy, Structural Geology.

Non-diastrophic structures; Rock deformation: mechanical principles; Major crustal structures; Folds; Faults; Structures of igneous rocks; Petrofabric analysis.

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calculations are described in detail, with the purpose of offering active participation and discovery through laboratory and field work"--

Detailed mapping and analysis of the structural features of rocks enable the 3D geometry of their structures to be reconstructed. The resulting evidence of the stresses and movement patterns which rocks have undergone indicates the processes by which they were formed, and allows evaluation of past deformations of the earth’s crust. Written to show how one actually describes, measures and records rock structures such as folds and faults with the emphasis on accuracy, detail and on-going interpretation throughout, this handbook gives students and enthusiasts the practical information and guidance which allows their fieldwork to become vastly more rewarding. "...the author is to be congratulated on producing such an excellent text. The whole range of mapping techniques that an undergraduate student will require are described and the book will still be immense help to post-graduates setting out on their research work. The book represents extremely good value and is thoroughly recommended." —C.R.L. Friend, Mineralogical Magazine

For advanced undergraduate structural geology courses.

Describes the physical forces that have shaped the earth's surface and the geological features that have resulted.