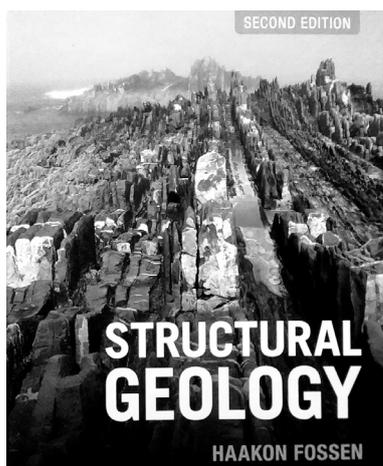


**Structural Geology (2nd edition)**, by Haakon Fossen, 2016. Cambridge University Press, Cambridge. Hardback, 524 pages, price GBP 49.99, ISBN 9781107057647



The second edition of this well-received and highly acclaimed textbook by Haakon Fossen falsifies the old proverb, 'Better is the enemy of good'. Several years after the publication of the first edition (which became a geological bestseller), the new version turns out to be even better. In view of the fact that the original edition was judged very positively (in only five years' time), the author did not carry out deep modifications of the book, which I find to be a reasonable decision. The new tome comprises almost 50 pages more, and involves one new chapter, entitled 'Joints and veins'. The volume has been improved not only by the addition of this module, but also by expansion and/or restructuring of the 'old' text and exchange or addition of some figures in the inherited part of the book. The author has carefully modified the layout, rendering it a new set of stunning, full-page photographs of tectonic features that head off each chapter. Such illustrations do well in attracting young people to the newly discovered discipline of science described in this textbook, which is quite frequently (and undeservedly) thought of as difficult and lacking charm. I would just have liked to see captions placed directly underneath the photographs, or on facing pages, rather than at the end of the tome.

The printed (or electronic) version of the textbook is, by intention, more strictly linked to the supplementary online material than the previous

release. This is accomplished by new special boxes on the first page of each chapter, signaling specific e-modules related to the given parts of the textbook, available in open access (web address). These features strongly encourage readers to use online resources while studying. This emphasis on the use of dedicated websites is, in my opinion, a good step towards meeting expectations held by new generations of students.

The main features of the tome under review have remained the same in both editions, and should be clearly pointed out as the strong points of this work. As the volume appears to be intended mainly for undergraduate students, the first important plus is the reader-friendly, comprehensive language used. Because English-language textbooks have come to be used globally, and a great percentage (if not the majority of readers) are not native speakers, this communicative style is a considerable merit of Fossen's educational masterpiece. The next important advantage relates to the numerous references to the practical side of structural geology and its applications, such as in hydrocarbon prospecting, groundwater extraction, etc. In addition, every chapter concludes with a list of literature items for further reading. It is a major help for both students and experienced specialists who wish to broaden their knowledge. Unfortunately, such lists usually do not include papers that came out after the first edition (i.e., after 2010). Even taking into account the obvious notion that the most classic, fundamental papers are, of course, usually older, I still regret this lack of updates. In the case of basic textbooks of structural geology, a critical role is played by illustrations. The reviewed volume contains an excellent, rich set of colour photographs and line drawings. Both of these are of high quality, aesthetic and instructive. The large number of different type and size field examples of structures, presented in these photographs, is indispensable for accurate learning about tectonic issues. In this respect, the graphical content is a very strong point of this tome. However, it should be borne in mind that the voluminous extension of the illustrative part is stored as online resources. Apart from typical pictures, these

resources include also simple, yet informative animations that illustrate changes due to deformational processes. When referring to illustrations, it must be admitted that the book delivers good-quality artwork that shows interpreted seismic sections in a quality that is rarely met in basic structural geology textbooks. Another positive feature is the marked content of block diagrams of different types (both simplified sketches related to theory and complicated images depicting regional tectonic features). These 3D pictures do well to develop imaginative powers on the student's part and increase proper grasp of the spatial, three-dimensional forms and phenomena described. Perhaps some more photographs of examples of tectonic structures taken under a microscope could have been added (for instance in Chapter 14, devoted to foliation and cleavage). However, there is a considerable representation of microscale pictures, especially in a separate, microtectonic unit (Chapter 11). Each chapter is concluded by a concise summary, listing a recapitulation of the main points of the material presented and followed by review questions; always helpful in testing the reader's level. Apart from these separate parts, chapters contain dedicated boxes focused on selected issues, as well as distinguished phrases of special importance. Both these features are found within the specific chapters. Last but not least, the book includes two components which always make for great support for students, namely a glossary of terms and a quite extensive list of references.

The order of the information presented is harmoniously organised. The main body of the book is subdivided into 22 chapters, starting with the most general module, providing answers to queries about definition, data sources and objectives of structural geology (Chapter 1). It is followed by Chapters 2 to 6, devoted to the basic concepts of this discipline, such as deformation, strain, stress and rheology. Then, the author turns to two main types of deformational processes, i.e., brittle and plastic (ductile) deformation and their products. Chapters 7 to 10 are devoted to the brittle regime and its structural features, such as fractures, joints and veins – extensional features are treated separately – and faults. Subsequently, plastic deformation is presented (Chapters 12–16), with individual units on folds, lineations, foliations and cleavage, boudinage and ductile shear zones. This block of issues is preceded by Chapter 11, entitled 'Deformation at the microscale', balancing between the two above-mentioned groups of tectonic processes. Chapters 17 to 19 concern three main mechanical regimes: contractional, extensional and strike-slip environments, the last-named supplemented by transpression and transtension. These

chapters discuss both examples of specific features related to each regime, and the theory behind their interpretation. A very positive role in the construction of this chapter is played by well-selected illustrations which make understanding of these more advanced problems so much easier. A special chapter (20) is devoted to salt tectonics, a phenomenon that does not occur universally, but which is of great importance in numerous parts of the world, including the Mexican Gulf and its vicinity, as well as central and western Europe, including Poland. This is followed by Chapter 21, discussing significant, modern techniques of reconstructing map-scale tectonic processes since their very beginning, i.e., presenting balanced cross sections and structural restorations. The last chapter includes the highly appropriate final words, with the text elucidating the meaning of synthesis in the work and mind of structural geologists. It also demonstrates interrelationships of tectonics with other branches of geoscience, such as petrology, geochronology or sedimentology – united, multidisciplinary data render full insight into the evolution of an area. Such closing remarks are an important complement to the previous 21 chapters.

As mentioned above, the second edition of the present tome is enhanced with a new chapter on joints and veins. These extremely common deformational features required a separate module, which makes the extended edition more complete. The chapter covers current knowledge of the original mechanisms, geometry, kinematics and classifications of extensional fractures and their mineral infills (veins). Features discussed are considered at a small, even microscopic, scale (e.g., crystallisation types in veins), as well as at regional, hundreds of kilometre-wide scales. The content of the new chapter (Chapter 8) was virtually missing from the first edition, making this additional part of the book significant.

People may ask me how a sound textbook on structural geology should be constructed. I would not go into detail in explaining, but rather would hand him or her a copy of 'Structural Geology' by Haakon Fossen: an appropriate reply for the second decade of the twenty-first century. The most important task of any educational book is to awake an interest on the reader's part and sustain it, on any given topic, without compromises as to content. I find such a potential in the present volume. Nothing is perfect. However, this textbook is definitely a very high-value proposition for anyone who embarks on or continues his/her adventures in structural geology and tectonics.

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