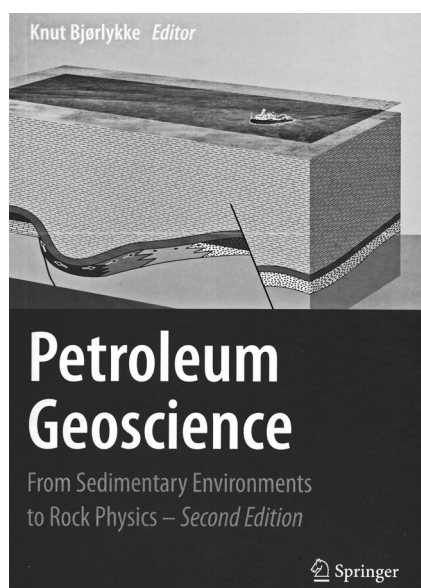


Book reviews

Petroleum geoscience. From sedimentary environments to rock physics (second edition), by Knut Bjørlykke (Ed.). Springer Verlag GmbH. 637 pages. Hardback: price \$119.99 ISBN 978-3-642-34131-1; paperback: price \$99.99, ISBN 978-3-662-51896-0; e-book: price \$79.99, ISBN 978-3-642-34132-8.



It is widely accepted that scientific disciplines that are connected with practical applicability constitute the avant-garde and push forward the frontiers of pure knowledge. This is particularly well visible in the case of petroleum-related technical sciences, which is easily explained by the still critical economic importance of oil and gas in today's world. Therefore, it may be expected that also the earth sciences connected with petroleum conform to this picture, which is assumed to be manifest in related textbooks. Novel methods, up-to-date knowledge and use of new technological solutions are the true sign of cutting-edge disciplines. The present tome corroborates the special role of this branch of earth sciences; numerous examples illustrate the implementation of the most recent technologies, supported by state-of-the-art theoretical knowledge, build a convincing image of this innovative scientific subdiscipline on the intersection of geology and geophysics.

The editor and the contributing authors, all of them representing either Norwegian academic institutions or companies that are connected mostly

with the oil and gas industry, cover a wide range of topics, assembled in separate chapters. The large number of chapters in the present book (26), covering about 650 pages in all, does not appear to be an exaggeration. Such a clearly divided structure helps the reader to focus on selected issues, which makes use of the tome more convenient, both from the point of view of a large number of readers with different backgrounds and expertise, as well as single readers with changing, often restricted needs. The voluminous tome would classify as a compendium, comprising, as it does, the most important knowledge in the field of petroleum geology and petroleum geophysics which is presented in a concise manner. Simultaneously, it can be treated as a textbook, useful to students who are engaged in a wide range of earth science courses, related in many ways to oil and gas exploration and production. 'Petroleum geoscience' is profusely illustrated, usually in high-quality figures, coloured where needed. This makes the present book more comprehensible and facilitates reception of data presented.

This second edition has been distinctly expanded in comparison to the first and contains more than a quarter of additional pages. The new material is comprised mainly in four additional chapters, focusing on leading-edge topics of carbon capture and storage, non-seismic geophysical methods, reservoir modelling and exploration strategy. These newly added issues constitute a valuable enrichment of this tome. Apart from the supplementary texts, in the new edition the significant chapter on well logging has been written by another author, with contents both expanded and more detailed. Finally, many chapters have been corrected or extended, with the introductory Chapter 1 being a good example of such improvements. Altogether this does make a difference, which is such as to suggest to treat the updated version as a truly new, high-quality publication.

When flipping through the pages, it becomes clear that the special meaning of this book is attrib-

uted to sedimentology, which is deservedly treated as an essential discipline for understanding the complex patterns of hydrocarbon occurrences in rocks. Apart from Chapter 2, which is dedicated to purely sedimentological issues, this topic also appears in the following chapters (4–6) that describe specific types of sedimentary rocks (sandstones, carbonates, shales, evaporites and others) within the context of petroleum exploration. The other basic disciplines of geoscience important for oil and gas prospecting and exploitation, such as sedimentary geochemistry, stratigraphy and geomechanics are thoroughly discussed in separate chapters. Incidentally, such a way of data presentation helps the reader to become already familiar with a specific part of the material discussed or skip these and just concentrate on selected questions. Deeper insight into more detailed issues, such as sequence and seismic stratigraphy, sedimentary basins, heat transport or fluid flow follows the presentation of the above-mentioned basic items, being contained in chapters 8 to 14. The impressively illustrated Chapter 12, which describes hydrocarbon traps, also provides a succinct background in structural geology – this is one of the most rewarding parts of the book. A separate section, numbered 13, is devoted to compaction. At this point comes the reflection whether diagenesis, as a complex group of processes shaping sedimentary rocks subsequent to deposition, does not deserve a separate chapter in this strongly systematised textbook. Naturally, the authors did not forget about diagenesis; this is frequently discussed throughout the entire tome.

Having focused mostly on geological problems in the first fifteen chapters, the next five are dedicated to geophysics, i.e., well logging, seismics (including 4D seismics), rock physics and potential fields and geophysical methods. Subsequently, more advanced issues, strictly connected to the application side of a petroleum geoscientist's job are the subjects of two important sections: Chapter 21 on production geology and Chapter 22 dedicated to reservoir modelling. Unconventional hydrocarbons, a hot topic in the modern petroleum sector, were not omitted; these are discussed in a separate chapter (Chapter 23). The reader might have expected a slightly more detailed presentation of this growing issue. Especially from a Polish perspective, the section on shale oil and gas, in the light of their increasing significance, is rather short. In addition, concepts of tight gas/oil and hydrofracturing are lacking; these are worth mentioning in future editions. By contrast, there is the positive surprise of a short chapter on carbon capture and storage (CCS), the green technology of

the future, important while we consider increasing concentrations of CO₂ in the earth's atmosphere. The reasons, such as content of carbon dioxide in natural and exhaust gases, as well as the possibility of its storage in depleted hydrocarbon reservoirs, justify the inclusion of this CCS-related chapter. An interesting idea, which emphasises the Norwegian origin of the authors, is seen in Chapter 25, which outlines the geology of the Norwegian Continental Shelf (NCS), which is amongst the crucial regions of hydrocarbon exploration and production, not only in Europe, but on a global scale. I do appreciate this also as a contribution that adequately helps in disseminating knowledge by making its territory an example of regional geology analysis; this definitely is needed in petroleum geoscience studies. The closing chapter (Chapter 26), entitled 'Exploration strategy', brings a more distanced perspective to the subject of petroleum geoscience, by demonstrating economic context, the role of teamwork and the historical frame. Again, the Norwegian Continental Shelf comes back as a model example of an area with successful exploration of oil and gas from diverse play types. The fifty years of NCS hydrocarbon prospecting are concisely chronicled, implicitly giving a good reference point to the level of exploration in other parts of the globe.

As an academic teacher, I would recommend, without hesitation, this second edition of 'Petroleum Geoscience' as a highly valuable textbook, which discusses key features of a good source of knowledge. It is comprehensive and comprehensible, including a remarkably wide spectrum of subjects and explaining them in a clear and simple way. Each issue is carefully discussed, starting from basic concepts and definitions. A great number of instructive illustrations helps to absorb the information and understand the issues discussed. It is important to note that these, often full coloured, illustrations are also indispensable examples of visual data – fundamental in geological and geophysical interpretations in petroleum geoscience. Apart from obvious issues, it also explores auxiliary subjects (e.g., CCS) and extends its range with sophisticated topics (such as reservoir modelling or marine CSEM and MT data interpretation). I am convinced that the reader will succeed in augmenting his or her knowledge and, equally important, strengthening his or her interest in petroleum geoscience.

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