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Anatomy of a Paleozoic basin: the Permian Basin, USA, Volumes 1 and 2

edited by Stephen C. Ruppel, Austin, Texas, The University of Texas Bureau of Economic Geology (Report of Investigations 285) and The American Association of Petroleum Geologists (Memoir 118), 399 pp., ISBN: 978-1-970007-40-4; 526 pp., ISBN: 978-1-970007-35-0

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BOOK REVIEW

Anatomy of a Paleozoic basin: the Permian Basin, USA, Volumes 1 and 2, edited by Stephen C. Ruppel, Austin, Texas, The University of Texas Bureau of Economic Geology (Report of Investigations 285) and The American Association of Petroleum Geologists (Memoir 118), 399 pp., ISBN: 978-1-970007-40-4; 526 pp., ISBN: 978-1-970007-35-0

The University of Texas Bureau of Economic Geology (BEG), in conjunction with the American Association of Petroleum Geologists, has recently published an important two-volume set summarizing much of what is presently known about the geology of the US Permian Basin, which occupies a vast region in west Texas and southeast New Mexico. Volume 1 of the set was published in early 2019, and Volume 2 was published in Spring 2020, completing the publication of this impressive compendium. Together they consist of a total of 26 original papers. Both volumes are edited by Dr. Stephen C. Ruppel, Senior Research Scientist at the BEG and long-time researcher and expert in Texas geology and carbonate and mudrock systems. Dr. Ruppel sadly passed away in October 2019, as Volume 2 neared completion. Steve was a friend to all and his future scientific contributions will be greatly missed. He and the authors of individual chapters in this work, most of whom are current or past researchers at the BEG or have worked closely with the BEG, have provided us, in one compilation, with an updated, comprehensive summary of the geology and economic impact of one of the world's most interesting sedimentary basins and prolific petroleum-producing regions.

The two volumes are organized by geologic time, focusing on the Palaeozoic tectonic history and stratigraphy of the basin. Volume 1 contains 13 papers, beginning with a rich, in-depth introductory overview of the basin by Ruppel, followed by chapters on gravity and magnetics of the basin (G.R. Keller), Proterozoic basement (T.E. Ewing, M. A. Barnes, R.E. Denison), tectonic history (T.E. Ewing), and post-Permian history (A. Brown). This is followed by four chapters providing details on biostratigraphically important palaeontologic elements, including Siluro-Devonian conodonts (J.E. Barrick, B.D. Meyer), Permo-Pennsylvanian fusulinids (G.P. Wahlman), lower Permian conodonts (B.R. Wardlaw, M.K. Nestell), and middle Permian-integrated fusulinid, conodont, and radiolarian biostratigraphy (M.K. Nestell, G.P. Nestell, B.R. Wardlaw). The remainder of Volume 1 begins a series of comprehensive summaries of major stratigraphic units of the basin, most of which are also important hydrocarbon reservoir or source-rock intervals. The review of Palaeozoic stratigraphy and sedimentology starts with a synopsis of the Lower Ordovician Ellenberger Group, a series of karsted platform dolomites (R.G. Loucks, C. Kerans), followed by summaries of the Middle-Upper Ordovician Simpson Group, a mixed carbonate and terrigenous clastic unit (R.R. Harrington), the Middle Ordovician Montoya Group, a series of dolomitized ramp carbonates (R.R. Harrington, S.C. Ruppel), and the Upper Ordovician – Lower Silurian Fusselman Formation, a shallow-water carbonate unit showing evidence of karsting (S.C. Ruppel).

Volume 2 contains 13 papers and continues the inclusive summaries of younger individual stratigraphic units, including chapters on the Middle Silurian – Lower Devonian Wristen Group, a succession of shallow-water platform carbonates grading offshore into outer platform and slope carbonates (S.C. Ruppel); the Lower Devonian Thirtyone Formation, a collection of proximal shallow-water carbonates and distal biosiliceous cherts (S.C. Ruppel, S.D. Hovorka, R. Barnaby); the Upper Devonian – Lower Mississippian Woodford Formation, consisting largely of highly organic-rich, euxinic mudrocks that constitute an important hydrocarbon source-rock interval (S.C. Ruppel, H. Rowe, R.M. Reed, R.G. Loucks); Upper Carboniferous cyclothemic units (W.R. Wright); Lower Permian-Wolfcampian platform carbonates and deep-water shales (Q. Fu, R.W. Baumgardner, H.S. Hamlin); Lower Permian-Leonardian platform carbonates (S. C. Ruppel); lower Permian-Leonoradian basinal clastics, including the prolific Spraberry Trend submarine fan complexes (H.S. Hamlin, R.W. Baumgardner); the Bone Spring Formation/Leonardian mudrocks, another important unconventional hydrocarbon reservoir and source-rock interval of the region (H.S. Nance and H.S. Hamlin); middle Permian shelf carbonates, integrating the results of decades of detailed fieldwork in the Guadalupe Mountains (C. Kerans, S.C. Ruppel); upper Permian basinal clastics (H.S. Nance); and Middle and Upper Permian evaporites which constitute regional seal-rock facies for the Permian Basin petroleum system (H.S. Nance). Volume 2 concludes with an up-to-date summary by E.C. Potter, M.C. Walsh, C.L. Breton, C. Lemons, and R.C. Ready of the oil and gas production history of the basin, providing an important perspective on the massive, historically developed conventional petroleum resources of the region and its current transformation to one of the world's leading resource for unconventional shale oil. Volume 1 is dedicated to the memory of Dr Tim Denison, an expert on the Precambrian basement of the Permian Basin region and co-author of one chapter in Volume 1, and Dr. Bruce Wardlaw, who made significant contributions to palaeontologic studies of the region and who co-authored two papers in Volume 1. Volume 2 is aptly dedicated to the memory of Dr Ruppel, and his long-time BEG colleague and author of two chapters in Volume 2, Dr. Hardie Seay Nance.

Together, these two volumes provide a comprehensive summary of the geology and economic importance of the

U.S. Permian Basin, one of the world's top-ten classic petroleum provinces, or what are now termed 'super-basins.' In addition to the wealth of knowledge provided on basin-scale tectonics and regional stratigraphic units, there are many tectonic and stratigraphic themes here that may be useful for studies of other Palaeozoic basins of the world. These volumes should be required and welcome additions to all academic libraries, and will be of great interest and use to industry geoscientists, as well as to geoscience students and professional researchers and academicians. Another wonderful thing about these volumes is that they are very modestly priced at $49.95 USD U.S. dollars each, despite being produced with the highest quality of paper and binding, and with the majority of illustrations produced in full colour; these volumes would still be a bargain at triple the price! The numerous authors who contributed to this work must be congratulated for the wealth of information they have provided to the general geoscience community and students of the Permian Basin. The BEG must also be commended for being long-time stewards and ambassadors of the geology of Texas and the Permian Basin region and for producing these fine volumes.

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