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Stereographic Projection Techniques for Geologists and Civil Engineers (2nd Edition)

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picked up with a different slant by using trilobite associations in the form of relative abundances of the various genera. This approach pioneered by Ludvigsen in the 1970s, and rests on the assumption that all species of each genus would have had the same ecological requirements, more or less.

Using this approach, six "biofacies" are defined. Four of them consist of diverse associations but are dominated by species belonging to a single genus, which co-occur with several subordinate genera and a bunch of rare taxa. The two *Stenopareia* species, for example, are present in several biofacies but overwhelmingly dominate the reef-associated *Stenopareia* Biofacies, which is the least diverse of the six. This analysis of biofacies is compared to other Early Silurian associations, especially in Scandinavia and Great Britain. What governed all these distributions is not yet clear, and it would be unreasonable to decouple them from the other faunal and algal elements and sedimentological characteristics. In any case, the observations here stand in stark contrast to some lower Palaeozoic sedimentological work in which marine fossils are lumped together at the class or even phylum level - the palaeontologist winces at this kind of generalization.

If you still adhere to the view that trilobites are virtually exclusively Cambrian, this monograph should dispel that misconception. However, they certainly are different, mostly belonging to quite unrelated families, and are commonly flamboyant with prominent bumps, spines, furrows, knobs and lobes. This fauna occurs with brachiopods and other elements, which have been described by a number of distinguished palaeontologists: the Ordovician and Silurian of Anticosti Island is famous for its fossils and quality of preservation - a good thing that it is a protected area as otherwise naturally weathered slabs would soon vanish.

The historically minded geologist is in his/her element because the synonymies and discussion of each species present a wide-ranging, quasi-legal and historical justification for the pedigree of all species. Higher level taxa are discussed at length. Almost all species entries contain a diagnosis, and many, especially the newly named ones, are backed up by exacting formal descriptions. Discussions are detailed and authoritative. All species turn out to be indigenous to North America, but many genera contain representatives from other continents. Some species are illustrated with handsome line drawings. Unfortunately though, a few of these were scanned before printing which washed out the stippling. The six-page reference list cites virtually everything written on Early Silurian trilobites going back to the early 1800s, and everything about Anticosti Island geology since the 1700s (except, curiously, the excellent sedimentological study on the Lower Silurian by T. Sami and A. Desrochers, published in 1992).

This fine monograph is not just a tour de force by the authors but also an honour to Canadian palaeontology itself: out of the 32 new species fully 23 are named for Canadian palaeontologists and geologists (including field assistants). The one named after me is very handsome indeed; the plate is suitable for framing. I did admit, did I not, that this review would be perceived as biased? But I do know that every trilobite enthusiast, professional and amateur, and just about any person dealing with Ordovician and Silurian marine faunas anywhere on the planet will be thrilled with this tome. With this in hand you could finally convince your impecunious library to pick up the back issues and start subscribing!

Stereographic Projection Techniques for Geologists and Civil Engineers (2nd Edition)

By Richard J. Lisle and Peter R. Leyshon
Cambridge University Press, New York, 2004
ISBN 0-521-53582-4
US $35.00, softcover, 112 p.

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When I read this book, it brought to me pleasure and sorrow. It was a pleasure to surf through the simply explained and well-illustrated problems and it was sorrow to remember what I had to endure as a student to acquire sufficient understanding of the stereographic method, without having such a book. I remember well those years back in my native country, when I tried to study the stereographic method from a crystallographic manual, simply because there was not a good book on the geological applications of the projection techniques. Later, I discovered many structural geological manuals with introductory chapters on stereographic projection techniques, but found most of them unsatisfactory.

This lack of satisfaction is not just a personal view. My interactions with geologists of different nationalities and backgrounds indicate that only a few retain any working knowledge of the subject two or three years after graduation, even though all of them studied it; the reason for this is that they had not learned it properly in the first place. This method, no matter how simple it may look to the practicing structural geologist, requires a lot of work and concentration to be perfected and converted into an everyday tool.

Lisle and Leyshon's textbook is a carefully worded and well-illustrated introductory course in stereographic visualization of three-dimensional geological data. It is designed to satisfy the needs of the undergraduate geoscience students, but it also addresses many problems of interest for the practicing geologist. The selection of topics and the order of presentation of the practi-

cal problems are arranged in such a way that the reader is introduced painlessly into techniques of increasing complexity. The core of the book contains 46, two-page chapters illustrated with composite figures of high quality. At the end of the book, solutions are given to the exercises that are presented in some of the chapters. There are also seven appendices that have graphical templates, useful formulas and alternative projection algorithms. In light of the new trends in teaching and research, a list of freely available stereographic software is supplied at the end of the book.

The selection of problems is designed to train inexperienced geoscientists in 3-D geometry. In this aspect, the first 25 chapters are critical for the understanding of the entire content; here, all the basic operations with lines and planes are marvellously explained and the road is paved for a better understanding of more complicated problems. Rock-mechanics applications are discussed in brief in the last five chapters of the book. Crystallographic (mineralogical) applications of the stereographic projection are not discussed.

The book fills a gap in the market place. Recently, most of the authoritative manuals in structural geology offer concise introductory chapters in basic stereographic techniques; however, the explanations and the selection of problems are too economic and fail to address the needs of many students. Lisle and Leyshon's book introduces the basic stereographic concepts in a more clear and efficient way than any other textbook of similar content, except perhaps for the classical book of Phillips (1971), which is still an unbeatable short introduction, but it is now out of print. Lisle and Leyshon's book is expanded in scope and has more illustrations than the book of Phillips (1971), and is more focused and internally coherent than that of Ragan (1985). The quality of the book becomes obvious, when the reader examines the chapters dealing with rotation around an inclined axis, analysis of refolded structures or the introduction of cones and small circles. These problems are explained with less detail and efficiency in the other textbooks of Phillips (op. cit) and Ragan (op. cit).

The chapter dealing with geotechnical applications could have been more detailed; the authors include analysis of simple wedge failure, the friction cone solution and some simple analysis of daylighting conditions, but there is no mention of the mechanical basis of these methods. Comments on the resolution of stresses on discontinuity surfaces or the modified Coulomb failure criterion for fractured rocks would have facilitated the understanding of the material.

Some of the methods explained in the book have well entrenched names in the geological literature. For example, the method for finding of preferred direction by observations in arbitrary planes (pp. 38-39) is known in the geological literature as the N-plane method of Lowe (1946), which might have been mentioned in the text.

The book does not include some less common applications of the stereographic method, which can be found in the scientific journals. For example, it does not introduce operations with vectors in stereographic space. However, these applications are beyond the scope of an ordinary undergraduate course and certainly would overburden students unnecessarily.

Based on my experience in teaching structural geology, the information in the book is sufficient for a complete undergraduate course. For purely practical geological mapping projects the book offers plenty of good advice and certainly will be useful to field geologists. In conclusion, I can recommend the book to students and practitioners alike as a thorough and affordable modern introduction in the stereographic projection method.

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Ragan, D.M. 1985, Structural Geology: An Introduction to the Geometrical Techniques (3rd edition). New York: McGraw-Hill, 393 p.

Time Series Analysis and Cyclostratigraphy: Examining stratigraphic records of environmental cycles

By Graham Weedon
Cambridge University Press, New York, 2003
ISBN 0-521-62001-5
US $70.00, hardcover, 259 p

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This book provides a very useful and well illustrated introduction to time series analysis and its application to the determination of cyclic behaviour of environmental variables. The author has succeeded admirably in summarizing the main methods used in the examination of quantitative records of ancient environmental change. The book is well-organized and clearly written with a minimum of jargon. The Table of Contents allows easy search for sections cross-referenced in the text. The author has included an index at the end of the book which also makes for easy searching. At the end of each of the six chapters, a brief summary of key issues addressed is presented in point form, an excellent idea for an introductory book. I especially liked the use of bold typeface for terms relating to time series analysis, particularly appropriate for an introductory text. Both the author and the editors are to be commended on production of a remarkably well-edited book.

Weedon demonstrates the applicability of time series analysis to a wide temporal range of palaeoenvironmental data ranging from annual to Milankovitch cycles. The overall balance in the examples presented is quite appropriate to the author's stated aim of encouraging new researchers to venture into the field of cyclostratigraphy and time series analysis. Weedon has drawn extensively on his own experience which, in some respects, strengthens his presentation through personal familiarity with his own time series data and its interpretation. This reviewer would