

gashes and stylolites); structures associated with homogeneous deformation (cleavage and lineations) and those which characterize heterogeneous deformation (folds and boudins). Incremental strain markers (pressure shadows and synkinematic crystals) are also considered. Lastly, as an appendix, some elements of tensor analysis and methods of finite strain measurements are given.

This book is original in that it favours a kinematic interpretation of structures rather than geometrical description alone. Its appreciation may well depend on a similarity of geological philosophy in the reader.

Finally, one must note that one of the advantages of this book, which will be translated into English, is its low price due to the camera ready copy.

Le livre de A. Nicolas, "*Principes de tectonique*", n'a pas son équivalent en français: il rassemble tous les apports récents concernant l'analyse des structures dans les roches déformées et leur interprétation en terme cinématique.

On y trouve d'abord les notions élémentaires de contrainte et de déformation, de la théorie de la déformation discontinue et de mécanisme de déformation continue. Cette partie de l'ouvrage est présentée très classiquement dans les trois premiers chapitres. Les chapitres suivants sont consacrés aux structures: les structures caractéristiques de la déformation discontinue (failles, joints, fentes de tension et stylolites), les structures liées à la déformation continue homogène (schistosité et linéations) et les structures liées à la déformation continue hétérogène (plis et boudins) sont successivement examinées. Les objets susceptibles de renseigner sur l'histoire (zones abritées, minéraux synkinématiques) sont inclus dans cette partie de l'ouvrage. Enfin, en annexe, sont donnés des éléments d'analyse tensorielle et de mesures de la déformation finie des roches.

L'originalité de l'ouvrage est bien évidemment de privilégier l'analyse cinématique par rapport à l'analyse géométrique. La question posée par l'auteur est celle de l'interprétation et non de la description. Chacun verra, dans ce choix, des avantages et des inconvénients.

Le succès de ce livre auprès des étudiants français qui n'ont pas à leur disposition une grande littérature sur le sujet, dans leur langue, est certain; ceci est sans nul doute dû au fait qu'il s'agit d'un livre de base, simple et clair et sa présentation économique est un encouragement supplémentaire.

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The R_f/ϕ technique

Lisle, R. J. 1985. *Geological Strain Analysis: A Manual for the R_f/ϕ Technique*. Pergamon Press, Oxford. 99 pp. Price: hardcover £11.50; soft cover £6.95.

This book is exactly what it says it is, a manual for the R_f/ϕ technique. Before readers are carried away by ecstasy at the thought of a book title and publisher's blurb that tell the truth, I should hastily add a caveat. The terminology of strain analysis is very precise and the " R_f/ϕ technique" is very different from the "unstraining R_f/ϕ technique"; in other words the book devotes almost all its attention to the analysis of originally random fabrics of the type very rarely seen in unmetamorphosed rocks. Even accepting the book at face value causes some difficulty because several nettles are not grasped, though the fairly specific restriction of scope does allow some grace. The theory of strain analysis involves some of the fundamental questions in structural geology but these are not tackled head on when they encroach upon the topic in hand. A much debated question is the geometrical relationship between planar/linear tectonic elements and the strain ellipsoid but this only rates a couple of lines. The phrase grain-boundary-sliding is nowhere to be seen despite the implications of this mechanism for strain analysis.

This book reflects the dichotomy of approach between analysts of finite/total/cumulative strain and those of strain histories. Page one in fact seems to suggest that nothing can be determined of the latter yet it is clear that analysis of initially non-random fabrics can only be successful if the strain history can be defined. In this regard the interesting debate of Siddans (1980) by De Paor (1981b) and Siddans (1981a) does not figure nor does another debate between these two authors on the subject of the R_f/ϕ method (De Paor 1980, 1981a, Siddans 1981b).

Much of the literature of strain analysis is liberally sprinkled with strings of assumptions which many people may find uncomfortable, thus letting them slip from view. The assumption/restrictions are not clearly spelt out in this text and several disturbing problems are left dangling. A handbook should guide the uninitiated firmly through the quagmire but here some quicksands were not fenced off. Non-ellipticity of markers was broached but the reader was told that little was known of "errors incurred by the use of markers which deviate in shape from exact ellipses". We are told a knowledge of initial shape factors is the basis of much strain analysis but page sixteen says "little is known of their R_f/θ properties". Rare 3-D analyses of tectonites (e.g. Bell 1981) appear to confirm our state of ignorance.

The acid test wasn't performed, that is, to ask a beginner to have a go at strain analysis of ellipsoid objects using this handbook. However, I suspect all would not be plain sailing. Several aspects were more clearly explained in the original publications and a series of omissions could cause problems (e.g. axes and curves on some graphs not labelled, R_f curves not formally named when introduced, and different lines on a graph having the same ornament when the text refers to them differently). The number of type-setting/proof-reading errors is mercifully small considering the abundance of elaborate equations.

The main advantage of the book is the publication of the standard R_f and θ curves for a variety of strain states making the method less exclusive. Unfortunately the limited scope means an opportunity was lost to produce a more definitive exposition on the fundamentals of strain analysis.

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Earth Science

Press, F. and Siever, R. 1986. *Earth* (4th edition). Freeman and Co, New York. 626 pp. Price: hardback £32.95; paperback £16.95.

The book, which first appeared in 1974, is written by two distinguished American geoscientists of whom one is a well-known sedimentologist at Harvard and the other has been a science adviser to the President of the U.S.A. It is written for first year university students who often have no particular intention to specialize in geology. The philosophy of the book is explained in a preface, although some of the suggested aims cannot be easily combined in an elementary presentation. To quote a few of the claims: the text is "broad", "stresses concepts", "shows how science is actually done", indicates "bases of geologic theories", "emphasizes dependence of geology on physics and chemistry", "is about geologic processes" and "methods", and "integrates the newest discoveries". That the authors by virtue of their experience and position are capable to carry out their complex task can be accepted; the real question, however, is whether this actually can be done.

The twenty three constituent chapters are divided into three parts, with the introductory part I referred to as Prologue, part II concerned with surface processes and part III with internal processes. Part I introduces basic geological notions, such as Earth's place in the solar system, its material composition, geological time and elements of structural geology. In general, part I reasonably presents a variety of geological concepts, although it is not clear why chapter 4 on structure, which suffers from minor errors, has been included at this stage.