

Time Sequence Analysis in Geophysics

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Book Reviews

Physics and Geology (2nd Edition)

J. A. Jacobs, R. D. Russell and
J. Tuzo Wilson
McGraw-Hill, Inc.
622 p., 1974.
\$18.85.

Reviewed by D. W. Strangway
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"Convection currents may exist deep in the mantle and probably were important in the earth's early history, and polar wandering may well be occurring. But neither one of these nor any other proposal yet made provides an account of the development of the earth's surface features comparable to that now possible by using the contraction theory."

This quote is taken from the first edition of *Physics and Geology* published in 1959, only 15 years ago. Since then the study of the earth has been completely revolutionized and the authors have carried a major role in this. The second edition of this book has been so totally rewritten that it represents a drastically different book than the original. I found the material in this book to be excellent and read it from cover to cover with great interest as it represents an account of the new view of our planet earth. The chapters which deal with the earth's interior and those which deal with sea floor spreading and global tectonics are especially well done and provide a fascinating account of the developments "since 1967."

Although the book is titled *Physics*

and *Geology* an attempt has been made to incorporate a significant amount of geochemistry in the chapter on the universe and the solar system as well as in several other chapters and one could have wished for a more up-to-date account of developments in this area. The chapter of *Physics of the Upper Atmosphere* scarcely seems to be pertinent in a book largely confined to a study of the solid earth. With these minor reservations, the reviewer feels obliged to point out that this is an excellent and timely book which will serve as an excellent text as well as a chronicle of an exciting period in the study of the earth.

The authors state in their conclusion that "... it is at least clear that any theory must consider both continents and ocean basins and both geology and geophysics. These have too long been kept apart, and it seems essential that the teaching of both these subjects be united." The unification of the earth sciences is important and these authors and this textbook successfully point the way for the future in their skillful combination of geophysics and geology in a single textbook.

MS received, September 18, 1974.

Time Sequence Analysis in Geophysics

E. R. Kanasewich
*The University of Alberta Press
Edmonton 352 p., 1973.*
\$9.95.

Reviewed by R. A. Wiggins
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and Astronomy
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Many geophysics departments have recognized the need for teaching a course on digital data manipulation. Generally most teachers faced with such a course have had to start from scratch, either designing the subject content or establishing a consistent nomenclature. Kanasewich's book should prove to be very useful text for such courses at an introductory level.

The content of the book is logically laid out and is thorough. A selection of chapter headings give a good indication of this: Convolution of a time series; Fast Fourier transforms; Laplace transforms, complex representation; Impulse response, convolution and the transfer function; Correlation and covariance; Aliasing; Power spectral estimates and spectral windows; Cross spectral analysis, coherency and bispectral analysis; Minimum phase and properties of an impulse response function; Deconvolution; Zero phase shift band pass filters; Wave propagation in layered media in terms of filter theory; Velocity filters; Maximum entropy and maximum likelihood methods of spectral analysis. There are also appendices on Fourier series and integrals; the Dirac delta function;

The relation between the Euler-Lagrange equation and the Weiner-Hopf equations; and Stationary time series and white noise.

There are no proofs and derivations are given only when they seem to help the comprehension of a particular concept. This introductory, descriptive approach is nicely balanced by excellent historical and current references.

In some places the text seems more of an outline than an exposition of the subject. This provides, however, an opportunity to dazzle their students, for any teachers who are willing to read some of the references.

I believe that there are two serious omissions from the text. The author has not elucidated the ideas of prediction error and inverse filters and their relationship to the recursive solution of Toeplitz equations in the "Deconvolution" chapter. Rather he develops the normal equations and then refers the reader to Levinson's original paper for the recursive solution. More recent work by Treitel and Robinson illuminated this subject considerably. In fairness, the author does treat some of these topics rather well in the "Maximum entropy" chapter from Burg's viewpoint. Even here, the relationship to normal equations is not spelled out.

The second omission is related to the first. In the "Wave propagation in layered media" chapter, the author does not point out the intimate relationship between the reflection coefficients, synthetic seismograms and the recursive solution of normal equations. Here again, even though the subject is avoided, the proper references are given.

The author states that most of the material was taken from class notes for fourth-year undergraduate and first-year graduate courses. I believe the book is very well suited for that purpose. Future editions that contained either problems or suggested computer projects would make the book even more useful.

The book has been offset from typescript to reduce publication costs. The (relatively) low price should enhance its value as a teaching aid.

MS received, September 16, 1974.

Future Petroleum Provinces of Canada

Editor, R. G. McCrossan
*Canadian Society of
 Petroleum Geologists
 Calgary, Memoir 1, 720 p., 1973.*
 Members \$20.00,
 Non-members \$25.00.

Reviewed by W. O. Kupsch
*Churchill River Study
 233 - 22nd. Street East
 Saskatoon, Saskatchewan S7K 0G3*

"How much oil and natural gas still remains to be discovered in Canada?" A simple but vital question which demands as accurate an answer as it is possible to give with our present geological knowledge. In a recent issue of *Geoscience Canada* (March 1974, v. 1, no. 1, p. 24-30), and previously elsewhere, F. K. North has shown convincingly that the time has passed when first approximations based on rough volumetric calculations of sedimentary rocks, without due respect to differences in geology between various kinds of basins, are acceptable. Much detail regarding the type of rocks and their history of deposition needs to be known to provide realistic estimates that will stand close scrutiny.

Future Petroleum Provinces of Canada is a companion volume to the *Future Petroleum Provinces of the United States - Their Geology and Potential*, published as Memoir 15 by the American Association of Petroleum Geologists. The Canadian Society of Petroleum Geologists is the publisher of the book reviewed here. It is their Memoir 1. The two memoirs then "provide a very important basis for future policy decisions in the energy field". The Canadian volume is the result of the work of some 27 authors from industry and government who combined their efforts to give the policy makers and the general public an intelligent evaluation of this country's potential petroleum resources based on the best geological knowledge available.

Canada has some 38 sedimentary basins with potential for oil and gas.

These are dealt with in 17 chapters, some combining two or more of the smaller units. An introduction and a synthesis add two more chapters. Such a wide scope makes it difficult, if not impossible, for one reviewer to provide a balanced and thorough critique of the whole book. It is inevitable that most attention is paid to those chapters dealing with areas familiar to the reviewer and to the synthesis that constitutes the last chapter.

This book with its wealth of information deserves a place on the bookshelf of every Canadian working with rocks younger than Precambrian. For years to come it can be expected to provide a baseline from which other more detailed studies will start. Unavoidably, the day will come when it will be regarded as obsolete and needing replacement by an up-dated version. There is a need for every country periodically to take stock of its resources. *Future Petroleum Provinces of Canada* does this and does it successfully.

It is inevitable with a work of this kind that one can easily discern differences in quality of style and thoroughness of treatment between the various chapters. But to me at least this range lies between acceptable and excellent, none of them being so poorly done as to be an embarrassment to the others. Typographical errors too can be spotted without too much searching but again they are not so numerous that they distress the reader. Unfortunately, the same cannot be said for some of the illustrations whose quality can be rated from poor to good. The reduction of several tables and cross sections is so severe as to make the material illegible even for eyes much younger than mine. And when will draftsmen finally join other conservationists by using India ink more sparingly? To replace the inordinately wide lines and fat letters, to which many draftsmen seem to be addicted, by a greater restraint in design would accomplish such conservation. As an added bonus it would enhance the esthetic value of the illustrations.

Because one of the book's avowed purposes is to present geological