

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.

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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.

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"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

information and an evaluation of available petroleum to "policy makers and the general public" the chances of achieving this aim have to be evaluated in this review. In my opinion they are nil. And what would be a great pity because here we have as unbiased a consensus of opinion about Canada's petroleum resources as we can get. It demands a vigorous following-up by means of press releases, popular articles, radio and television programmes and other tricks of the trade of public relations people. Not only needs this to be done with the country-wide information in this book but with regional and even local data of interest to only a limited lay audience. Let the Canadian Society of Petroleum Geologists give all this information wide distribution.

How many legislators are aware of where we stand with respect to past production and future potential of regions in Canada and in their own province? From personal experience I am convinced that a substantial number is fascinated by such an elementary fact as "approximately 47 per cent of the total area of Canada within the continental shelf edge is underlain by unmetamorphosed sedimentary rock" and the implications of that fact on debates concerning resource policies. A lack of awareness appears to be coupled to a willingness to learn; but there is a dearth of instructional material tailored to the general public.

What about the answer to the question raised in the first sentence of this review? Before giving a quantitative answer, the qualifying statements made in this book have to be presented. For one, the oil sands of Alberta are not included in the evaluation. Neither are the sources of oil and natural gas that may occur in the continental slope and rise deposits. More importantly, it should be stressed that no studies were made to determine at what time in the future the resources believed to exist will become economically exploitable. The authors take pains to state and repeat that the various potential estimates are not to be regarded as inevitably part of the future supply. Without extensive economic studies and much looking into a crystal ball it is impossible to

say what supplies will be available at various times in the future. With these caveats then let us have a look at the nation-wide picture.

Canada is believed to have the fairly large future potential of 85 billion barrels (one barrel equals 35 Imperial gallons) of oil and 577 trillion cubic feet of gas. But as recent estimates put the world's resources at the most likely value of 2,000 billion barrels of oil and 12,000 trillion cubic feet of gas, Canada possesses only about four per cent of the world's oil and five per cent of its gas.

Our country has only 32 per cent of the hydrocarbon potential of the United States. To a large extent this apparent Canadian deficiency can be explained in terms of geological differences which become evident to the reader of this book once he is familiar with various types of basins here and across the border.

The bulk of major future conventional supplies is expected in geographically remote areas: the Mackenzie-Banks region, the Arctic Islands, and the Baffin Bay-Labrador Shelf. Compared to the potential of these regions that of the Prairie Provinces is relatively small as can be seen from the following summary, which shows the ultimate recoverable potential of all oil and gas expressed in billions of barrels of oil equivalent.

Western Canada	43.0	} 147.7
Mackenzie-Banks	22.5	
Arctic Islands	52.2	
Baffin Bay-Labrador Shelf	30.0	

Given these estimates there remains little doubt that the oil seekers will intensify the trek northward started in the early 1960s. The economic, political, and environmental consequences of this search are of great importance, not only to the inhabitants of the Prairie Province and those of the North, but to all Canadians.

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Canada's Energy Crisis

James Laxer
James, Lewis and Samuel
 Toronto, 136 p., 1974.
 \$3.95.

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No geological document, this!

This book is mistitled, as its author, a leader of the Waffle group, must be well aware. A more appropriate title would be "The Geopolitics of Petroleum, and Canada's Place in It".

The basic thesis of the book, argued persuasively and well documented, is that if the great leap in the world price of oil had not taken place in 1973, the giant US oil companies would have had to engineer it, or accept for the United States almost total dependence on imported oil in the near future. Not only does the new price make possible the exploitation of hitherto uneconomic conventional domestic hydrocarbon deposits and alternative sources of petroleum (oil shales, liquification of coal); it also raises the manufacturing costs of foreign business competitors of the US to the levels that US manufacturers must suffer through use of high-cost domestic oil.

Laxer argues that too much of the new high price of exported Canadian oil goes to the producing companies as profit (the export tax notwithstanding), and that the only answer satisfactory to Canadian self-interest is public ownership of the oil business.

The book is a political document, but even for those who reject its main conclusions, it brings together in a slim volume much of recent world economic history, and through the references, facilitates individual investigation of the questions treated. It also provides an entertaining evening's reading.

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