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REVIEWS

Log Analysis of Subsurface Geology: Concepts and Computer Methods by John H. Doveton, 1986, John Wiley & Sons, 273 p., $37.95 hardcover

This book is a refreshing departure from the cookbook approach of most books and papers on logging. For one thing there is a detailed description of the logging tools and the physical properties of the parameters they measure and their meaning in terms of real rocks and their pore fluids. There is even a history of logs and logging and the author has included an excellent set of references. This description of logs and logging alone would have made the book a worthwhile contribution, however there is much more. The remainder of the book describes virtually every numerical technique that has ever been applied to logs plus in the Appendix, a FORTRAN program for automatic lithology analysis. Topics include the usual within well analysis where logs from a single well are examined and between well spatial analysis where logs from many wells are considered. Examples explain methods of displaying the results of the analysis and range from graphic charts to regional maps.

Chapters in the book cover Resistivity Logging; the Dipmeter; the Spontaneous Potential and Gamma Ray Logs; Porosity Logs, including the Sonic, Density, and Neutron Logs; Graphical Methods of Lithology Determination; Numerical Methods for Lithology Determination from Well Logs; Mathematical Analysis of Log Trends and Patterns; Remedial Correction of Logs and Lithofacies Mapping from Logs.

The first chapter is concerned with resistivity, the logging tools and the properties they measure. There is extensive coverage of the relationships between resistivity, porosity, and rock texture including a detailed examination of the origin and application of the cementation factor. Next is an introductory description of the Dipmeter with a sampling of the standard sedimentary environmental solutions. Then the SP and Gamma Logs are described and there are a number of examples of log response to shale content and log reaction to different depositional environments. The final chapter on tools describes the porosity logs and suggests some of the implications of porosity variations. The second half of the book is on the translation of log data into physical geology, usually aided by computer processing.

The differences in tool response to rock type, pore geometry, and pore fluids are factors in the solution of log derived lithology and reservoir analysis. This book tells the why and how for both graphic and numeric solutions. There are good explanations and numerous examples. Descriptions cover simple overlays and multidimensional charts through to computer matrix analysis and even include numeric methods for optimizing proportions of mineral components. The chapter on numerical lithology includes a simple explanation of matrix algebra and how it is applied to lithology solutions. A FORTRAN coding kernel for the Kansas Kiwi program for compositional analysis from logs is in the Appendix.

The final three chapters describe methods for the mathematical analysis of log trends and patterns, correction of logs, and lithofacies mapping. Techniques range from time-series analysis to pattern recognition and include maps that display complex interplays among multidimensional log derived parameters. Log corrections tend towards the purely mathematical, usually at the expense of geology. The only real criticism is in reference to the final three chapters. There is no discrimination between methods that are effective and aid geological understanding and those computer applications that produce a product that is more difficult to interpret than the original input. The reader is left to select from a smorgasbord of techniques from the good to the trivial.

Log Analysis of Subsurface Geology probably is the best book on the market for the neophyte in log applications because of its explanations of log and rock interactions. It is a good introduction to log analysis and the only available volume that gives extensive coverage to computer applications in the logging field. It would make an important addition to any logging reference library.

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Computers and the Representation of Geographical Data by E. E. Shiryaev, translated from Russian by V. M. Divid, N. N. Protsenko, and Yu. U. Rajabov, 1987, John Wiley & Sons, New York, xiii + 263 p., ISBN 0 471 90915 7

Shiryaev's *Kartograficheskoe Otobrazhenie Preobrazovanie Geoinformatsii* was published originally in 1977, but now has been translated into English and is available from Wiley–Interscience in hard cover. This is really a new edition, and a substantial number of new references have been added to extend the bibliography to *c.* 1983.

The title notwithstanding, the book is really the culmination of the author's own work in a unique and fascinating area which he terms "normalization", and which has hitherto been essentially inaccessible to Western digital cartographers. Compared to magnetic

media, the paper map is an efficient and cost-effective store of spatial data. It is sufficiently stable for most purposes, carries a high density of information per unit volume, is distributed and reproduced easily. Its one fault is that it is frustratingly difficult to carry out such conceptually simple operations as editing and updating, overlay, measurement of area, and scale or projection change, all key elements of GIS functionality.

Shiryaev's solution is not to convert the map to digital form, which is itself a tedious, labor-intensive and error-prone operation, but to redesign the map so that the input operation is quick and straightforward. In this way the map can retain its role as a primary store, converted to digital form only when some type of processing or analysis is needed. For example, linework could be scanned with much less ambiguity if printed in fluorescent inks, thus avoiding any confusion with coffee stains, dust or text. Keystroking of labels and attributes could be automated if polygons were shaded with patterns designed to be recognized by scanners, such as bar codes.

"Normalization" is the series of steps required to make the content of maps unambiguous to scanners, and the map a more convenient carrier of information. At the same time there must not be conflict with the primary use of maps, which relies on the human eye's own perceptual processes. In essence, Shiryaev is asking that maps change to accommodate both human and mechanical perception, and that standards of cartographic design be modified appropriately. The examples in the book make it clear that the demands of accurate mechanical perception are relatively minor.

The bulk of the papers describing these ideas appeared in the Russian literature in the mid-1970s. The book describes algorithms for processing normalized maps, but it is difficult to locate indications that these have been implemented on any significant scale. Despite the elegant simplicity of the ideas, it is disappointing to learn nothing about the extent to which the methods have influenced map production. What has happened since the 1970s? What progress has been made in adopting normalization as a concept in the mapping agencies in the Soviet Union?

The traditional map is far from the formalized, machine-readable ideal which Shiryaev proposes. So, for that matter, is printed text. By analogy, we might argue that fonts should be modified to make text more easily scanned. The fact that this has not happened except in limited areas such as check processing may give us a clue as to why Shiryaev's ideas have not had more influence on map production. Text fonts have evolved over centuries to satisfy a complex of aesthetic and perceptual objectives, and cartographic conventions are similarly the result of long evolution. On the other hand the density of map information is much higher than that of text, and map digitizing costs are probably higher per byte than keystroking costs. So perhaps now that Shiryaev's ideas are available in English we will see the beginning of a trend toward normalization of map design.

At the same time, it is worth noting that the cartographic model yet plays a key role in the storage of spatial information; variation on the surface of the Earth is represented by points, lines, and areas, and digitizing is the step of transferring these objects to digital form. Yet spatial databases are not so constrained, and structures ranging from rasters and quadtrees to TINs and wire-frames now are considered essential as general-purpose data models. Perhaps map normalization is no longer the simple question of how to modify cartographic conventions to permit easy machine interpretation, but now must include also the question of how to generalize cartographic conventions to reflect the full diversity of spatial data models.

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Exploration Software and Data Source Director (4th ed.), Houston Geological Society, April 1989, Special Publication, Bruce Grethen, editor, 221 p., softback $18.00 (US)

This publication is a compilation of software and data sources for the explorationist. It is divided into six sections: Data Sources; Software for IBM Compatible Microcomputers, Software for Apple Microcomputers, Software for Other Microcomputers, Alphabetical Listing by Company of All Data Sources and Software, and Advertisements.

Section I on data source companies is sorted by category and are mostly commercially available services relating to the petroleum industry. Information includes cost, computer hardware, description of data, and contact addresses.

Section II is a list of IBM-compatible microcomputer software with information on source, description, and contact address. Categories include geology, geophysics, log analysis, engineering, economics, accounting, lease records, and digitizing. There are subheadings for each of these to make it easier to locate a program of interest. Section III on Apple microcomputer software is arranged in the same way with the same categories as is Section IV on other microcomputer software.

A list of data source companies sorted by company name comprises Section V. For each company an address, phone, and representative is given along with the catagory application and description. By my count about 550 companies are cited. Section VI contains the advertisements from these companies.

An Appendix contains a form to submit programs