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Book Review - 1

'Modern Approaches to Fluvial Geomorphology'
Author: Ramakrishna Maiti
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'Modern Approaches to Fluvial Geomorphology' a book published (in February, 2016) by Replica Press Pvt. Ltd. is authored by Prof. Ramkrishna Maiti. It is one of the rare books written by an Indian author on the subject. The practical approach of the author towards the concepts and theories is reflected throughout the book. The author has given experimental studies at the end of each chapter. These are based on the concepts/ theories/ principles discussed in the respective chapters. Such an approach makes the book more useful for students as well as for researchers. Out of total thirteen chapters three chapters (chapter nos. 1, 6 and 8) are unique as these have explicitly explained the concepts and applications in fluvial geomorphology. Chapter number one is about the System Approach in Fluvial Geomorphology. The 'System Approach' was first brought to geomorphology by Chorley (1962) is one of the fundamental approaches in the subject. Its application particularly to fluvial geomorphology is very well discussed by the author in the first chapter. Three types of system approaches are suggested by the author – morphological, cascading and stochastic. The dependent and independent variables along with the concept such as threshold and equilibrium of river systems are also discussed. The chapter ends with a case study on application of concept of threshold for slope height, rainfall and slope angle. It would have been appropriate if an example directly related to fluvial processes (within channel/along channel) would have been given instead of an example of slope modification by slope-wash processes and anthropogenic interventions. The second chapter is about development of drainage network. In the broad framework of drainage development given by Glock (1931), the author has discussed the stages of drainage development by giving references of work by Horton (1945), Sparks (1974), Leopold, et.al. (1956), Morisawa (1964), Dunne (1980, 1990) and Knighton (1973). Instead of discussing the concept proposed by each of the researcher separately, the author has taken one approach as basic/ fundamental and has successfully linked all other approaches to it. This approach gives a comprehensive idea of the concept of drainage development. The third and the fourth chapters are devoted to channel forms and hydraulics of open channels respectively. The third chapter contains discussion on channel forms at a station and downstream hydraulic geometry. Channel forms and velocity distribution across the channel, stream energy along a Pool-Riffle section and importance of width-depth ratio to channel form are the topics explained. The chapter ends with an experimental study by the author carried

out for a select part of the Kangsabati River. The study covers many aspects such as relation between depth and orientation of bars and shoals, sand mining and width of channel, flow pattern, channel orientation, pool-riffle spacing. Textural characteristics of sediments on river channel and the width-depth ratio are correlated. It would have been better if a discussion on tenary diagramme was discussed with help of an example.

The fourth chapter deals with open channel hydraulics with elaborate discussion on stream velocity, velocity distribution across a river reach and stream energy. Actual application of these parameters is illustrated through an experimental study conducted for a select stretch of Kangsabati River. The fifth chapter covers geometry of a meander, theories of meander development and flow pattern through meander and factors affecting flow pattern. The chapter also covers types of channel patterns and difference between channel pattern and river pattern.

The sixth chapter is about dynamics of a channel and covers some unique topics. Modern approaches to channel dynamics, causes of changes in channel orientation and channel geometry, techniques to monitor change in channel are some worth mentioning. These topics are helpful especially to researchers who wish to undertake research in fluvial geomorphology in the era of forced modifications in river channels. Effects of flood on channel are discussed with examples of sedimentary channels. A wide range of changes as results of flood such as change in river gradient, width-depth ratio, channel shift due to meander cut-offs, bank erosion, construction of levees along flood plains are discussed at length. Additional examples of changing courses of rivers (the Bhagitathi, the Hoogly, the Damodar, and the Teesta) from various parts of India are given at the end of the chapter.

The seventh chapter deals with movement of sediments in an open channel. The processes of entrainment, transport and deposition are discussed in detail. The forces responsible for entrainment such as drag, lift, gravity forces and critical shear stress, critical velocity are discussed with diagrammes and illustrations. Field sketches used to explain these concepts make it easy and interesting, especially for those who do not have science background.

The eighth chapter is about bank erosion, especially found in case of sedimentary river channels. Bank erosion is reviewed not only as a geomorphic process by also as a potential threat to the riparian areas. After explaining the basic processes involved in bank erosion (hydraulic action and mass failure), the author discusses the mechanism of bank erosion with an experimental study. Detail observations of the process of bank erosion after the release of stored water are interesting. The whole process of bank failure is described step by step with photographs. The factors influencing bank erosion and measured rates of bank erosion (from rivers in near-polar and temperate areas) as given by Knighton (1998) are reproduced in tabular form. The same for at least major tropical rivers would have been a valuable addition here.

The next four chapters (from 9th to 12th) deal with formation processes of major fluvial landforms such as alluvial terraces (Ch.9), alluvial fans (Ch. 10), Flood Plain (Ch. 11) and Delta (Ch.12). These chapters give a comprehensive account of the respective landforms including their formation processes, development mechanism, morphological details, types and dynamic modifications. It seems that these chapters are written especially for post graduate students and are syllabus oriented.

The last chapter (13th) deals with drainage basin as a hydro-geomorphic unit. It includes concepts such as drainage basin as a basic topographic unit and as a open physical system, for computation of water balance, resource appraisal and management, hazard management. Drainage basin is also discussed as a system concept in this chapter. This particular topic could have been a part of the first chapter which exclusively discusses system approach in fluvial geomorphology.

The book strikingly lacks examples from rocky river channels. Use of sections of maps and satellite images of suitable resolutions could have made the book more interesting. Some concepts such as classification of stream, river rejuvenation are not given representation in the book which is fundamental in understanding the subject. But the pragmatic approach towards the subject, case studies, hand-drawn sketches and some unique chapters would make this book a valuable addition to the collection of books on fluvial geomorphology.

Dr. Deepali Gadkari
Department of Geography
University of Mumbai.