from 30 fields at different stages of shifting cultivation in four locations in the Altamira-Calderas area of the Venezuelan Andes from an area considered relatively uniform in soil properties. Changes in bulk density, pH, organic matter, organic nitrogen, available phosphorus, and exchangeable bases were analyzed as a function of time. No major changes in soil properties under cultivation were observed. This is probably confounded by soil variability among the sample sites.

Dr. Watters recommends that shifting cultivation in Latin America be eliminated through colonization projects in the best soils and pasture establishment elsewhere. Where such measures are impractical, he suggests the system be modified using the “corridor” clearings proposed by the Belgians in what is now Zaire, or planting marketable trees as secondary forest regrowth. He expects that the costs in changing from shifting to settled cultivation will be borne by the individual governments.

This is a valuable book for agronomists and development specialists concerned with Latin America. It is one of the few publications that deals with the predominant soil management system in about 40% of the American tropics. Dr. Watters’ detailed descriptions of the different shifting cultivation practices and the distinction between traditional and unsettled shifting cultivators are valuable. The lack of information about the solutions proposed underlines the need for agronomic research on shifting cultivation in Latin America.

A Spanish version of this publication is available from FAO outlets.—Pedro A. Sánchez, Associate Professor of Soil Science, North Carolina State University, Raleigh, N. C.

Atlas of Quartz Sand Surface Textures


As with almost everything else, quartz grain surfaces display an exotic and complex physiography when examined with the scanning electron microscope. However, quartz grains, having relatively high chemical and physical stability coupled with high surface energy, are ideally suited to record their history on their surfaces. It has been demonstrated that the “activation threshold” for surface modification is quite low—rendering quartz surfaces as sensitive recorders of changes in microenvironment. At SEM magnification, a silt grain is an enormous object and so can carry a complex of microrelief features that can represent three or more episodes of abrasion, sedimentary transport, or pedogenetic process.

David Krinsley, a pioneer in the study of quartz microrelief, and John Doornkamp, an active researcher in that area, have assembled an introductory primer to the subject. The main purpose of their Atlas is the display and classification of quartz surface microfeatures without laying too much stress on their origins. This has been handsomely accomplished. The text and associated references clearly document the technique and its utility. The Atlas consists of three parts: a 24-page introduction and bibliography, a 2-page summary table that displays the morphogenetic classification of microfeatures keyed to the Atlas proper, and a 61-page atlas containing 122 SEM photographs of varying magnifications—each with a brief descriptive paragraph. The photographs are well reproduced and display far finer resolution than needed to document the intended features.

The Atlas is intended as an aid to active research. It contains an enormous amount of information for so brief a book—a condition which helps in its accessibility. It is a worthwhile investment.—Robert Ehrlich, Associate Professor of Soil Science, Department of Agronomy, University of Georgia, Athens.

The Chemistry of Clay Minerals


This book is number 15 in a series of books on “Elements in Sedimentology.” The book is written for the most part for those interested in the layer silicates of clay size, although smectites, hectorite, illite, and vermiculite are also discussed. The monograph is divided into 10 parts, each concentrating on various aspects of the subject. These include discussions on the origin of these minerals, chemical analysis, and internal variations in size of the octahedral sheets and rotation and tilting of tetrahedral sheets. The chemical content of the minerals to the reviewer is titled “Relations of Chemical Composition of Clay Minerals to Their Origin.”