was found 17½ feet below the present sea level; in places mussel shells were found at the top of this bed. The authors are able to show that emergence of the land had begun by A.D. 600. The stratigraphic and historical evidence had shown that peat-digging took place during the period of emergence which ended early in the 13th century. This information, combined with the archeological evidence, made it clear that the basins were dug after the arrival of the Danes (about A.D. 900) and that the broads originated with the beginning of inundation and the close of the era of peat production. The authors point out that the recent origin of the broads necessitates a rapid rate of sedimentation in the basins inasmuch as many are now filled with deposits and some are known to have filled many years ago. They also note that the rates required are in excess of those customarily reported for lakes.

This poor recounting of the bare bones of the mystery is given here only because I hope to illustrate some of the diverse kinds of observations and facts which are skillfully woven together in this study. Beginning with a delightful preface by Professor Godwin, of Cambridge, the monograph is closely reasoned and written. Judicious handling of the mass of detailed observations is one of its striking characteristics. Although interdisciplinary research has become a cliche, this study is recommended to those who have forgotten or who wish to see again what the real article looks like. Send for your copy.

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Our Developing World. L. Dudley Stamp. Faber and Faber, London, 1960. 188 pp. Illus. 21s.

The central problem facing the diverse societies of this earth now, and for at least the next few decades, is the development and maintenance of levels of living which provide food and shelter adequate for the reasonable health of a rapidly expanding world population. To the layman in Anglo-America, Europe, and a few outliers elsewhere, this does not appear as a troublesome problem because adequate food supplies have been attained. The peoples of the well-fed areas constitute a minority of the world's population and probably a decreasing percentage of the total. In most of the rest of the world, nutritional levels are not sufficient and the prospects for future improvement are uncertain.

It is to this problem that Dudley Stamp addresses himself, and for the second time. In his earlier venture, *Our Underdeveloped World* (1953), his thesis was that the really underdeveloped lands, those susceptible to increased productivity given inputs of known techniques, were located in the mid-latitudes rather than in the tropics. He found the United States to be one of the underdeveloped countries. It was a novel thesis which helped to clarify our thinking about the nature of development.

In *Our Developing World* Stamp reexamines the problem in view of the changes in population and technology which have occurred since the early 1950's and makes use of the data which have become available since that time.

The immediate nature of the problem is indicated by a quote that Stamp uses from *The Future Growth of World Population* [U.N. Population Studies No. 28 (1958)]: "It took 200,000 years for the world's human population to reach 2,500 million, it will now take a mere 30 years to add another 2,000 million." Simplistic arguments of birth control or antibirth control dogmas to one side, societies in a world with nearly twice the present population must have drastically altered technology and social organization if they are to function. And the transition must be rapid. Here is the fascination for the social scientist.

Stamp discusses the changes in agricultural resources needed to enable societies of the world to keep pace with the population explosion. He finds that the habitable world is already inhabited, though with varying degrees of effectiveness in terms of food production. The two large areas of the world which at present make little contribution are the tropical regions of South America and Africa. We do not yet have the technological means for making these areas productive on other than a bare subsistence basis. Active research to this end is underway. (It is deplorable that the promising developments in the study of land use in the Congo have been arrested—and are likely to be lost —by the present disorganization in that territory.) Problems of tropical land use are noted briefly and with insights that reflect Stamp's considerable experience in Burma and Nigeria. The argument here is that tropical land conditions are so different from those of the mid-latitudes that both the local physical and cultural background must be studied before meaningful development can be undertaken. Mechanization, so useful in the mid-latitudes, has proved to be largely unsuccessful in the tropical lands. The probability is not that mechanization itself is unsuitable but that suitable techniques have yet to be developed.

The techniques of the Western World's agricultural revolution, which has taken place largely in the United States, and most drastically since 1950, are discussed in terms of their application in the underdeveloped countries. The heavy use of fertilizers on tillage crops, the potential use of soil structure conditioners, spray irrigation, and the use of antibiotics in livestock feed are all considered with respect to their obvious effects on yield and to the often awkward aspects of their use. Stamp concludes that by a modest diffusion of existing techniques we could feed several times our present population. The problem of diffusion is of course more difficult than the development of techniques.

Stamp states the need for an inventory of existing land resources and suggests a system of land classification to facilitate the inventory.

Further sections are on energy, water, and mineral resources. They are somewhat general and have been handled elsewhere in more analytical fashion by Ayres and Scarlot (1952), Harrison Brown (1955), and Bruce Netschert (1958).

Stamp concludes with several chapters on the relationships between the developed and the underdeveloped countries within the world exchange economy. He notes that many of the impoverished countries have little to offer on world markets that the developed countries cannot better supply for themselves and that attempts to increase the prosperity of these poor countries are therefore severely impeded. Stamp seems to feel that the United States is the main villain; he points out that this country raises severe barriers to imports from the underdeveloped countries and then offers these same countries massive aid which is resented. There are further comments on the less happy aspects of the behavior of American firms and American personnel abroad. The problem of the relationships between the developed and underdeveloped countries has

been treated from a different viewpoint by Gunnar Myrdal in *Rich Lands and Poor, the Road to World Prosperity* (1958).

Malthus was one of the first to analyze the problem of world population and food supplies. Stamp is the latest. *Our Developing World* is very good in its treatment of land, population, and agricultural resources, less so in its treatment of energy and mineral resources. It is written not for the specialist in population or agriculture but for the layman and the specialist in other fields who lacks background on this most urgent of problems.

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Principles of Mineralogy. William H. Dennen. Ronald, New York, 1959. v + 429 pp. Illus. $7.50.

During this last year there has been a rash of new textbooks and new editions of old established works on mineralogy. These include, in addition to the book here reviewed, the following: *Mineralogy* by Kraus, Hunt, and Ramsdell (McGraw-Hill, New York, ed. 5, 1959); *Dana's Manual of Mineralogy* by C. S. Hurlbut, Jr. (Wiley, New York, ed. 17, 1959); and *Mineralogy, Concepts, Descriptions, Determinations* by E. G. Berry and Brian Mason (Freeman, San Francisco, 1959). Recently it was announced that a fifth volume would be published: "Elements of Crystallography and Mineralogy" by F. Alton Wade and Richard B. Mattox. Of the first four, two are essentially traditional in their approach (the two revised editions), but the other two contain numerous innovations of treatment and organization.

This volume by Dennen is divided into two parts: part 1, "General principles," and part 2, "Mineral descriptions." It contains no identification tables but has mineral and subject indexes. Part 1 begins with a chapter on symmetry; in essence, it is a chapter on crystallography, but it lacks many of the standard features. It does not deal with such subjects as the representation of crystals by projections or the determination of crystal faces by means of goniometry. Chapter 2, entitled "Fundamentals of crystal chemistry," considers the architecture of atoms (including nuclear progression, electronic cloud, and quantum states), periodic classification, intrinsic atomic properties, bonds and bonding, and the size and shape of atoms and ions. In chapter 3, which is vaguely entitled "Mineralogical relations," Dennen discusses chemical variation in series and groups and geometrical variations (polymorphs, twinning, and crystal imperfections). In "The physical characteristics of minerals" (chapter 4) he describes not only the several physical and optical properties of minerals but also includes a section on electrical, magnetic, and thermal properties as well as a discussion of crystal growth and habit.

Most of the standard chemical tests for the important elements as well as a discussion of the use of the blowpipe are presented in chapter 5; on page 154 of this chapter there is an extraordinary illustration—a line drawing of a student using the blowpipe as seen from a point directly overhead. Such topics as classification of matter, number and abundance of minerals, mineral classification, and mineral interrelationships are discussed in chapter 6. Emphasis here is on the description of the structures of the ionic species, with a great many drawings of crystal structures.

Part 2, involving mineral descriptions, has but one chapter. The breakdown is by the conventional system of classification: native elements, sulfides, sulfosalts, halides, oxides, hydroxides, oxygen salts (8 subdivisions), and finally silicates. Each species is described under the following headings: crystallography, structure, habit; physical properties; distinctive properties and tests; association and occurrence; alteration; confused with; variance; and related minerals. Some 150 species are described; yet the mineral index lists approximately 600 mineral names. Although most of the names are to be found in the section on mineral descriptions, they are mentioned but briefly as minerals related in various ways to those described in greater detail. There are no drawings of crystals and no photographs of specimens. The section does include representations of the structures of some of the species and a few reproductions of pencil drawings of crystalline groups or crystals. The lack of significant illustrations and the omission of reference to specific deposits, classical or economic, represents a most unfortunate feature, because this tends to impart a degree of abstractness or unreality to the mineral descriptions.

The book, which is "intended for an introductory college course in mineralogy," may serve well as a text for such a course intended for embryonic physicists, chemists, and crystallographers, but it seems inappropriately organized to interest and stimulate beginning mineralogists and geologists.

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Les Mekhadma. Etude sur l'évolution d'un groupe humain dans le Sahara moderne. Arts et Métiers Graphiques, Paris, 1960. 224 pp. Illus. + maps.

Les Mekhadma is a study of a largely sedentary (though formerly pastoral nomadic) Arab tribe caught up in the whirl of the Saharan oil boom. The study is devoted mainly to descriptions of experiments carried out by a team of specialists from PROHUZA (Centre d'Etudes et d'Informations des Problèmes Humains dans les Zones Arides). The experiments involved a great variety of procedures designed to select, mainly by psychometric means, the most able local candidates for employment in an oil field. Also included are a brief history of the Mekhadma, a summary description of their culture, and a rough sketch of the adult male physical type.

The primary objectives of the project were to develop aptitude tests applicable to Saharan native laborers and to learn enough about Mekhadma culture to be able to counteract, at least to some extent, the disruptive effects of sudden and violent contact with European oilfield culture. Therefore, the sociological and psychological sections are slanted strongly by economic emphasis, and they reveal very little concerning either personality or culture beyond those elements whose practical importance seemed obvious to the investigators.

It is regrettable that the authors could not present more information concerning social and political structures, physical anthropology, and health and disease among the community as a whole. But this was not entirely their fault. On the one hand, they were feeling their way in the semidarkness of an almost completely new field of investigation, and they prudently avoided biting off at the start more than they could reasonably expect to chew; on the other hand, their professional enthusiasm was strictly channeled by