AN INVENTORY OF GEOGRAPHICAL RESEARCH ON DESERT ENVIRONMENTS

SERIES EDITORS: WILLIAM G. McGINNIES, BRAM J. GOLDMAN, PATRICIA PAYLORE

IX

INVENTORY OF RESEARCH ON

Desert Regional Types

by
John R. Healy

OFFICE OF ARID LANDS STUDIES • THE UNIVERSITY OF ARIZONA

AN INVENTORY OF GEOGRAPHICAL RESEARCH ON DESERT ENVIRONMENTS

SERIES EDITORS: WILLIAM G. McGINNIES, BRAM J. GOLDMAN, PATRICIA PAYLORE

CHAPTER IX

INVENTORY OF RESEARCH ON

Desert Regional Types

by

John R. Healy

Sponsored by
Office, Chief of Research and Development, Department of the Army
Monitored by
Earth Sciences Laboratory, U. S. Army Natick Laboratories, Natick, Mass.

OFFICE OF ARID LANDS STUDIES ● THE UNIVERSITY OF ARIZONA
Tucson, Arizona
1968

FOREWORD

This chapter is one of a series compiled by the editors under a program started in November, 1964, entitled "An Inventory of Geographical Research on Desert Environments." Geographic areas covered by the inventory were generally those classified as arid or extremely arid by Peveril Meigs in his maps, *Distribution of Arid Homoclimates*, published by Unesco (1952).* Some variation in coverage occurs from chapter to chapter, without change in the objective of compiling and presenting the greatest possible amount of useful information in the allotted time.

The purpose of the inventory is to determine in detail what topics have been or are being investigated for the world's deserts, to appraise the reported work, and to disclose areas of study where further work is needed. The series of chapters does not attempt to recapitulate all information known about the deserts of the world, but rather comprises a compendium-guidebook to past and present research. It is based upon a critical review of the published literature augmented by consultations with specialists.

The compendium series covers physical features, flora and fauna, weather and climate, coastal zones, and desert regional types. A University of Arizona Press edition of most of this compendium will be published in November, 1968, as *Deserts of the World: An Appraisal of Research into Their Physical and Biological Environments*. A separate publication resulting from this program is *Arid-Lands Research Institutions: A World Directory* by Patricia Paylore (University of Arizona Press, 1967, 268 pp.).

Work on this program has been accomplished by staff members of the Office of Arid Lands Studies of the University of Arizona, and cooperating faculty members from that institution and others throughout the world. Funding has been provided by the University of Arizona and the U. S. Army under contract DA-49-092-ARO-71.

W. G. McGinnies
Office of Arid Lands Studies
The University of Arizona
Tucson, Arizona, U. S. A.
October 24, 1968

*Original maps dated 1952 accompanied "World Distribution of Arid and Semi-Arid Homoclimates" in *Reviews of Research on Arid Zone Hydrology* (Unesco, Paris, 1953). Maps were revised in 1960.

CONTENTS

I. INTRODUCTION

A. SUBJECT AND SCOPE

This chapter is concerned with the state of knowledge of regional studies as they have been applied to various types of desert environments.

In one sense this entire compendium and the study it reports constitutes a work of geography; however, in another sense this chapter relates to other chapters of the compendium somewhat as geography relates to most other disciplines of science. Most disciplines of science are differentiated by their subject matter; geography overlaps the subject matter of numerous other sciences and is distinguished rather by its general approach to its vast subject matter – that is, by description and analysis primarily in terms of space or location. Similarly, other chapters of this compendium consider research and the state of knowledge regarding distinct types of phenomena, such as weather and climate, geomorphology, surface materials, and vegetation, while this chapter is concerned with reviewing the application and the state of knowledge of the general regional approach (essentially spatial or locational) to the study of arid lands.

Certain problems are unique to this chapter. The general field of study of desert regional types is not a formal academic discipline with special training required for all those who work in it. Pertinent contributions have come from members of a number of the natural and social sciences, especially geography, geology, economics, history, and climatology, and also from explorers and travelers, employees and representatives of many governments having deserts within their purview, and even laymen long resident in desert areas. Usually each work was designed or grew in accord with the special interest and techniques of its author; even among the most careful scientists there were few, or no, common ground rules to render the studies similar. Works cited throughout the chapter reflect this variety.

Bound together with this chapter is a bibliography of culture features. For our purposes, a "culture feature" is a visible work of man, although we have not concentrated on agricultural features because they were beyond the scope of our contract.

B. ACKNOWLEDGMENTS

The author wishes to acknowledge gratefully the help of the following individuals, who provided important assistance in the initial research of the literature, compiled the initial bibliographies, and generated, to varying extents, the initial discussions for various geographical areas: U.S.A. – Dr. Melvin E. Hecht, Department of Geography, University of Arizona, Tucson; Soviet Union – Dr. Paul E. Lydolph, Department of Geography, University of Wisconsin, Milwaukee; Australia – Dr. Francis H. Bauer, Department of Geography and Anthropology, California State College, Hayward; Southwest Africa – Dr. Richard F. Logan, Department of Geography, University of California at Los Angeles; mainland China – Dr. Chiao-min Hsieh, Department of Geography, Catholic University of America, Washington, D.C.; South America – Dr. Berl Golomb, Department of Geography, University of California, Santa Barbara, and Dr. Herbert M. Eder, Geography Department, University of California, Berkeley; North Africa and Arabia – Mr. Donald A. Holm, formerly with ARAMCO (retired), consultant, Office of Arid Lands Research, University of Arizona; and the Near East and Pakistan – Dr. John Haupert, Department of Geography, State University of New York at Buffalo.

Dr. Dan Stanislawski, Department of Geography, University of Arizona, served as topic director.

C. BACKGROUND

1. Historical Outline of Regional and Regional-Type Studies

Various portions of the surface of the Earth have been subject to special attention by various men and groups since prehistoric times. Early men were able to conceive that superior conditions in regard to food, water, and absence of enemies prevailed more generally in certain areas than in others; they preferred certain areas to others on the basis of their implicit study and evaluation of the local environment.

Down through history, geographical space has continued to be subject to the attention of observant travelers, interested residents (occasionally

military planners, and, probably most often, those interested in the economic potential of the areas. With the development and extension of writing and scientific concepts, regional and regional-type studies came gradually to be more careful and explicit.

In recent generations and especially the past few decades, the development of new lands, most notably in the U.S.A., Australia, and the Soviet Union has involved such studies. Programs to establish, extend, or improve farming, lumbering, mineral development, transportation, communications, and industrial and population centers have usually involved some kind of study of the landscapes involved. With the growth of economies and the capacity to support greater scientific effort, more studies of areas have appeared which are more careful and comprehensive than previously.

Still, as we have noted, the study of region as such is not a specific discipline with common ground rules, training, and procedures. Numerous studies of parts of the Earth's surface continue to be undertaken with widely divergent specific interests in mind, by workers in widely divergent fields and with very different training and knowledge, with different levels of funding and facilities available, and under widely varying conditions (as between the Rub' al Khālī of southeastern Arabia and the more comfortably accessible desert in Arizona). Even now, regional studies differ widely from each other, not only locationally and in the selection of phenomena treated, but often also in techniques, in degrees of precision, in comprehensiveness, in underlying philosophy, in basic approach, in validity, and, consequently, in usefulness.

2. The Concept of "Region"

The term "area" has been used generally to mean a portion of the surface of the Earth with no implication of homogeneity or cohesion. "Region" has been used traditionally and remains widely current as meaning an uninterrupted area possessing some kind of homogeneity in its core, but lacking clearly defined limits.

Geographers have been trying for decades to shape and sharpen the technical meaning of the term "region" into a more powerful tool than the nontechnical usage provides, but they have had only limited success.

The Problem of Ambiguity

A central problem for scientists interested in research on desert regional types continues to be the definition of the term "region." Unfortunately there is still no general[illegible]pon definition of the term within the [illegible]ommunity. Many scientists have not carefully considered the ambiguity of the term before they used it. Others, especially geographers, who have been interested in systems of dividing the world into areal units as a convenient research and teaching technique, have encountered the utmost difficulty in defining "region" to the satisfaction of all who must work with the term, and so the search for a solution agreeable to all regionalists goes on. From their research has come a considerable mass of literature devoted to theories of regionalization and a number of studies attempting to apply these theories to phenomena on the surface of the Earth. Despite the wide publication of these efforts, research concerned with the development of areal units has continued for the most part, with loose, almost casual, use of the term "region." It is often used as an omnibus term, embracing the most diverse material and varying in its interpretation according to the requirements and standards of the individual researcher.

Range of Usage

In its simplest application the term "region" is used to refer to what would be considered from the true regionalist's point of view to be a rather poorly defined portion of the Earth's surface. Such areas are often identified solely on the basis of brief visual observation, or through a largely subjective psychological sensing or feeling that an area has some kind of unity and therefore qualifies as a region.

At the other extreme from this extremely simplistic application of the term "region," we find that there has been a great deal of intensive investigation by some geographers and regional scientists into the problems of regionalization by the application of rigorous quantitative methods. This research, which attempts to give the most scientific definition of the term "region," has resulted in model-building through quantitative analysis, and the setting up of regional classifications and hierarchies of regions.

The great mass of recent work by those interested in regionalization falls somewhere between these two extremes. The first approach is rejected by most regionalists as being too naive and unscientific. The second approach has not yet found widespread use, not only because of difficulties of application due primarily to lack of numerical data, but also because its novel concepts incur some suspicion and because it requires a knowledge of quantitative techniques not provided in the training of many geographers and other regionalists. Finally, some geographers regard further theorizing and discussion about regions as being unproductive and "... frustrating without prior

painstaking analysis of the processes significant to the evolution of all space content and space relations." (Ackerman, 1958, p. 36). The fact remains, nevertheless, that, whether intuitively or quantitatively identified, the idea of the region remains a central intellectual concept in the field of geography.

Definitions and Categories

No single definition of the term "region" could begin to embrace all the shades of meaning of the term, explicit or implicit, as it is used in the variety of regional studies of desert environments, nor could a single definition be stated now which would satisfy all regionalists for future use. Many regionalists probably agree, however, (in a very general way) with Whittlesey's definition (Whittlesey, 1954, pp. 21, 22), which will also serve to clarify our discussion here.

According to Whittlesey a region may be thought of as:

> An area of any size throughout which accordant areal relationships between phenomena exist. The area is singled out by applying specific criteria to earth-space, and it is homogeneous in terms of the criteria by which it is defined.

This general definition for any region can be applied to arid, as well as other parts, of the Earth's surface; thus, no specific definition is necessary for desert regions.

Further, according to Whittlesey (1954, p. 30):

> Any segment or portion of the earth surface is a region if it is homogeneous in terms of such an areal grouping. Its homogeneity is determined by criteria formulated for the purpose of sorting from the whole range of earth phenomena the items required to express or illuminate a particular grouping, areally cohesive. So defined, a region is not an object, either self-determined or nature-given. It is an intellectual concept, an entity for the purposes of thought, created by the selection of certain features that are relevant to an areal interest or problem and by the disregard of all features that are considered to be irrevelant.

The following is a categorization of regions, derived from Whittlesey's work:

1) Single-feature regions "... in each case delineate an individual phenomenon that is examined in relation to other phenomena in the search for accordant relationships."
2) Multiple-feature regions are "... differentiated on the basis of combinations or associations of features." Such regions may be uniform throughout, or they may be nodal, in which case there will be a focus or foci and a surrounding area tied to the focus by lines of circulation.
3) Total regions are "... differentiated in terms of the entire content of human occupance of an area."

This last appears to be a most difficult concept, since it may require the study of the entire content of Earth-space. The concept is rejected as untenable by many regionalists. A less difficult approach is offered whereby there is a search for "total functional associations" in which case the "community of features that depict the human occupance of an area" are studied (Whittlesey, 1954, pp. 35-36).

Whittlesey's rather carefully defined categories do not seem to have had much effect as yet on contemporary studies as reflected in geographical writings, most authors continuing to use subjectively defined regions suiting the purposes of whatever study is being made. The most recent study of the regional problem is by the British geographer Minshull (1967). After a lengthy discussion of regional theory and practice, Minshull comes to the conclusion that this use of subjectively defined regions, and lack of categorization and classification, is not a fault but follows from the fact that areas on the Earth's surface are unique and so regions must of necessity be unique. Such a viewpoint does not allow for systemization, each region requiring a unique approach since there is not single definition of a region possible, nor a single technique possible in regionalization. Acceptance of this concept would bring to an end the search for generalizations concerning regions, each researcher developing his own criteria for the identification of a portion of the Earth's surface as a region.

3. Ambiguities Prevailing in the Study of Desert Environments

There is still extensive difference of opinion over the proper definition of the term "desert" and as to proper criteria to delineate arid and semiarid areas. Often these and other terms applicable to the study of desert environments are used differently by authors, resulting in problems of communication. (These problems are noted in various chapters of this compendium.)

Probably a main source of the problems of inadequate definitions and lack of fixed and precise terminology is the ambiguity resulting from assigning names to overly complex groupings of phenomena. Each "desert" area is a vastly complex ecological system with innumerable interrelated variables of topography, soils, weather and climate, flora, fauna, culture features, and so forth. Usually there are very few clear demarcations such as lines on a map would imply as one moves through space in a desert area, phenomena appear, increase,

fluctuate, decrease, and disappear gradually, often interrelated in ways still largely unknown. When words are assigned to masses of phenomena too complex for clear and verifiable description using present techniques, ambiguity results and the words are often used by different researchers in the different ways most meaningful to each individual.

If the study of desert environments and regions is to go forward effectively, one basic requirement that must be recognized is the need to reduce the present ambiguity in concepts and communication by using terms of greater clarity and precision. One very important effort in this direction must be an increased emphasis on quantitative procedures, initially at least on the quantitative treatment of a single phenomenon or relatively simple combinations of significant, carefully selected phenomena.

4. Quantitative Techniques

General Development in the Sciences

Generally as sciences have developed through time, there has been gradually less emphasis placed upon purely qualitative and more upon quantitative description and techniques. Doubtless a major reason for this evolution has been a corresponding evolution in the means of applying quantitative techniques.

Some decades ago, a string of malevolent adjectives uttered by a desiccated scientist too long astride a camel might have been regarded as a reasonable report. Compared with scientists of today, he had little with which to measure, little opportunity to make extensive measurements in most desert areas, and no feasible means of processing large quantities of data even had he been able to collect them. Nevertheless, much of our present knowledge of deserts is often based on the observations of such hardy scientist-explorers.

As techniques of transportation, observation, measurement, and calculation have improved, however, it has become possible to apply quantitative procedures to more and more areas that were previously amenable to description only by adjectives or expletives. Generally it was found that where quantitative and mathematical techniques could be applied, ambiguity and unverifiable theories tended to give way to clearer, more precise definitions, terms, results, theories, and communication among scientists. In recent years, especially since World War II, the realization has spread that effective scientific description and analysis should be, as much as possible, soundly based upon quantitative procedures. In a relatively recent research paper, Ackerman forcefully makes this point in discussing geographic research. He states that "... observations concerning specific features, so far as possible, should show duplicable results, whoever the observer, and yield the same meaning to every interpreter. For distributional phenomena this is best achieved through quantification. In addition, accurate study of covariation depends on quantification." (Ackerman, 1958) (This is also emphasized by Lustig and others elsewhere in this compendium.)

Fortunately, contemporary technological advances in transportation, instrumentation, communication, and data processing are making possible the introduction of quantitative procedures into more and more studies of deserts where such procedures were previously impossible because of the inhospitable aridity of the desert or the complexity of the data pertaining to it.

Quantitative Procedures for Regional Studies

During the past decade a number of papers have been published by geographers interested in the application of quantitative techniques to the study of geographic problems. Outstanding among these is Haggett's general review of the quantitative methods now available for the description and analysis of element-complexes (Haggett, 1966). While the application of graph theory, discriminant analysis, distance-minimization functions, and other quantitative methods appears to be moving in the direction of the most positive results in regional analysis, the value of much of this work depends upon availability of adequate and reliable data. Unfortunately, such information for many desert regions of the world is almost nonexistent. Even in desert areas of the more technologically advanced nations, there has usually been little in the way of data collecting. Available descriptions in qualitative terms cannot supply the kinds of information required for the use of these more sophisticated techniques of regional identification.

One may expect that recent extensive advances in technology, including transportation, remote sensing, improved and more reliable instrumentation and telemetry equipment, and automatic data processing may soon provide the types and amounts of quantitative data necessary to apply quantitative procedures to regional study of at least some types of phenomena in desert environments. In a recent paper Latham suggests that electronic instrumentation may be the solution to the data-collecting problem, and states that quantitative statements provided by such methods can be processed by computer (Latham, 1963).

D. SOURCE LITERATURE

Works cited by author and date throughout

this chapter are included in the Pertinent Publications list at the end of the chapter. The list also includes numerous applicable studies not individually cited in the text. Many works of particular significance or interest to this study are annotated.

1. Desirable Criteria

Desirable criteria for desert regional studies that would be most useful (1) in directly increasing knowledge of specific desert regions, and (2) in serving as models exemplifying effective techniques of regional study, include the following:

The subject region should be defined upon the basis of carefully selected, related, measurable phenomena.

The reasons for selecting the criteria phenomena and the known or expected relationships among them should be noted at the outset.

The region should be delimited with some precision according to the criteria phenomena.

The spatial and functional relationships among the criteria phenomena and among any other elements considered should be analyzed and explained.

Quantitative procedures should be emphasized whenever possible, and, other things being equal, probably the fewer and simpler the set of phenomena dealt with at one time, the more effective the use that can be made of quantitative procedures.

2. Available Literature

Unfortunately, most of the very many works reviewed during the course of the present study do not embody the basic desirable criteria, nor can many of them be regarded as "regional studies" in a very rigorous or useful sense.

As might be expected in a topic with no clearly defined and consistent methodology sanctioned by widespread usage among scientists and others interested in deserts, the publications reviewed vary greatly in both approach and content and often have in common little more than their interest in particular parts of the world's deserts and their concern with describing some part in greater or less detail. In many instances the description of a particular region, or some aspect of a regionally-defined area, is the principal objective of the author; in other cases, the description is merely prefatory to an extensive analysis of the physical and/or cultural environment of a region. Several studies seek to find analogous desert regions in various parts of the world.

Studies range in approach from those designed only as simple general descriptions of the territories or subterritories of political units, with the boundaries of the units forming regional lines, to the often intricately-organized studies of "conceptual" regions most often based on the results of academic research. The purpose of many of the descriptive studies is merely to explain and describe "what it is like" in some desert region, emphasizing the more obvious aspects of the cultural and physical landscape. Such pure descriptions are of varying quality and usefulness.

The "conceptual" type of study also has as one of its basic objectives the description of a region, but the region is generally defined on the basis of methodically analyzed environmental complexes. These complexes are composed of either physical or cultural phenomena, or in many cases an integration of the two is attempted. Such studies are often concerned not only with description of the visible aspects of a desert region, but also with analysis of the functional interrelationships of many phenomena occurring in the desert. Methodologies used in this type of analysis have been developed for the most part by geographers. Recent studies of this sort have tended toward greater use of quantitative techniques, especially when dealing with the more technologically advanced countries of the world; unfortunately there are only inadequate data available for most of the world's desert regions, and no rigorous studies of this sort were discovered in the present research.

These two approaches are examples of the many types of studies that for the purposes of this chapter may be said to apply to desert regional types. The bulk of published material on desert regions available is still of the generally descriptive kind. Much of the remainder consists of more specialized descriptions of certain sorts of phenomena, sometimes with attempts at analysis, but few of these are based soundly upon adequate quantitative data. These kinds of studies, if carefully done, may contribute significantly to the knowledge of desert environments, but we hope future regional studies will be based soundly upon quantitative procedures and the other desirable criteria noted above.

3. Selection of Material

Regional studies of desert environments well based upon quantitative techniques and the other desirable criteria were found to be disappointingly few. Many works originally considered were later discarded. Still, it seemed necessary to broaden the criteria for inclusion; thus, many works have been included that do not typify what could be regarded a desert regional study in any rigorous sense today, but that do indicate the kinds of studies of parts of deserts that have most commonly been made.

Unfortunately such studies as were found to be available are so diverse in both method and content and vary across such a wide field of interests, that it was difficult at times to decide what to include. Despite awareness that this subject might easily become an omnibus, heavy with information of uncertain relevance, there are a number of studies included that can only be termed "borderline cases." Undoubtedly, some pertinent studies were not discovered.

Some of the works included deal principally with regional planning, others with economic development, and still others with some particular problem of desert environments, including physical or cultural elements, or both.

As noted at the outset of this chapter, the phenomena treated in desert regional studies are, for the most part, also the subject matter of academic disciplines; often single regional studies will treat a variety of phenomena embraced by several disciplines. Thus, some of the works cited here are cited in other chapters of this compendium, particularly climatology, geomorphology, and botany; because phenomena embraced by these fields are much used as criteria for delimiting desert regions.

The initial bibliography was gathered from the "Research Catalogue" of the American Geographical Society (A.G.S.). This source and subsequent issues of "Recent Acquisitions" of the A.G.S. proved to contain most of the titles found in *Bibliographie Geographique International*, in publications of the Arid Lands Commission of Unesco, and in other published texts and articles. Five-year samples of the following indices failed to produce anything of further value: *World Agricultural Economics and Rural Sociology Abstracts*, *International Index*, *Technical Translations*, *Dissertation Abstracts*, and *Publications of the Geological Survey*. Search of Perloff's (1957) review of regionally organized research, and Berry's (1963) comprehensive review of economic regions likewise proved largely unproductive.

II. DISCUSSION

A. GENERAL

Available information on research, literature, and state of knowledge applicable to desert regional types is discussed in this section. The main body of the discussion is by major geographical areas, treating the major deserts in sequence from southern Africa, across northern and eastern Africa and southern Asia to India, thence from Turkestan northeast to China, followed by Australia, South America, and North America.

B. KALAHARI-NAMIB

1. South West Africa

Aside from the accounts of early explorers and more recent travelers, invariably in the narrative form and involving personalized description, regional descriptions of South West Africa are not plentiful. Only one writer (Logan, 1958) has attempted to present a regional description of the whole territory. The collected works of Jaeger, republished in 1965, give regional descriptions of a number of areas. Schinz (1891), in an account of his travels, gave excellent descriptions of a number of areas in various parts of the Territory (South West Africa).

Prior to the establishment of a German hegemony in South West Africa, the area was explored sporadically and described in print by several travelers and traders, notably Galton (1853), Andersson's excellent work of the 1850's and 1860's, Baines (1864), Chapman (1868), and McKiernan (1954) in the 1870's. Each of these gives a fine description of the country and its inhabitants, usually in a narrative fashion. None was a trained scientist; the work is far from scientific in its approach and standards, and these areal descriptions should not be classified as studies of desert regional types. Nevertheless the publications are of value in presenting a picture of the area at that time.

Overall studies of South West Africa produced during the quarter-century in which the Germans were in control include those of Volz (1891), Dove (1896), Hassert (1899), Rohrbach (1907), Heilborn (1908), Passarge (1908), and Schultze (1910). Between the two world wars only a few studies of the whole area were produced. One, by Barth (1926), was an excellent geographical presentation of the country. In addition, Waibel (1928) presented an interesting study of the physical and cultural transition from desert to rainforest in both South West Africa and in other African areas.

Studies of a number of specific "regions" within the Territory have been made. In the extreme north the area from the Kunene River to the Zambeze River was described by Baum in 1903, with an emphasis on natural history, and at a later date by Taljaard (1938). The Kaokoveld was described to some extent by Hartmann (1897) and Kuntz (1912), and briefly by Van Warmelo (1951). General descriptions of Ovamboland were produced by Hartmann (1902), Angebauer (1926), and Wellington (1938). The Okavango has received considerable attention: from Andersson between 1855 and 1863, Passarge (1919), Stigand (1923), Schönfelder (1935), Curson (1947), and Wellington (1949, 1952). Wellington has also written on the Etosha Plain (1938).

The northern and central Namib have been described by Stapff (1887), who worked on the lower Kuiseb valley; Maack (1923, 1924), who explored the Brandberg; Martin (1957), who wrote a literary masterpiece describing his years in the Inner Namib during World War II; and Logan (1960*a*), who presented a comprehensive description of the central Namib. The southern Namib was exhaustively described by Kaiser in many publications, some of which were criticized by Jaeger (1927).

The Kalahari has been described by several authors: Debenham (1952, 1953), du Toit (1926), Range (1911, 1912), Schwarz (1926, 1928), and Rey (1932).

The central portion of the Territory is by far the best-known area, yet it has had the least written about it. Modern regional descriptions are lacking for nearly all parts.

2. Botswana

This nation is inhabited entirely by native tribesmen, for the most part in their original primitive state. Aside from occasional reports of a reconnaissance, very little research has been done or published on its desert areas. None could be classified as a study of desert regional types.

3. Angola

In the Portuguese territory of Angola, which bounds South West Africa on the north, virtually no desert research has been carried out except for a few reconnaissance studies conducted by outsiders, chiefly Germans and South Africans. None could be classified as a study of desert regional types.

4. Bibliographies

Bibliographies dealing with Africa as a whole are fairly common and include the list of American doctoral dissertations on Africa compiled by the African Studies Association (1961), the list of theses on Africa compiled by the Standing Committee on Library Materials on Africa (1964), the list of German dissertations on Africa compiled by Köhler (1962), Duignan's lists of U. S. and Canadian publications on Africa (1963) to date, Holdsworth's (1961) compilation of Soviet studies on Africa, the rather incomplete list of German Africana since 1914 by Plaat (1951), and the excellent regional bibliography produced by the Tenri Central Library of Japan (1960). Unique among these bibliographies is the bibliography and analysis of African atlases, produced by Dahlberg and Thomas (1962, 1963). These bibliographies are the better sources for Africa.

5. Textbooks, Compendia, and General References

South West Africa and its principal parts are described in most encyclopedias and other books of reference; in this category, by far the best source of information is in Westermann's *Lexicon der Geographie* prepared by Abel (1965).

Other compendia of information on the Territory include the works of Clough (1930, 1933), an excellent source of information for that period; Dove (1896), another excellent source, although badly out of date; the Union-Castle handbook edited by Gordon-Brown (1950-) and issued annually; an issue of "Focus" by Logan (1960*b*); a brief factual resumé by De Blij (1958), and the excellent geographic study by Schultze (1910).

The standard textbooks on Africa devote varying amounts of space and attention to the Territory: De Blij (1962) treats it very generally; Church *et al.* (1964) ignore it completely; Cole (1961) has very little on it; Hance ignored it in 1958 but includes a short but good account in 1964; Stamp (1964) includes a cursory two pages. Wellington, in his 2-volume work on southern Africa (1955), includes very good information on the Territory, although it is blended in with the treatment of other areas. Hailey, in *An African Survey* (1938, rev. 1957), refers repeatedly to South West Africa, although, in keeping with the format of the survey, no systematic treatment of the Territory is made.

Three semipopular books give good pictures of the Territory: Olga Levinson's *Ageless Land* (1961) and Lawrence Green's *Lords of the Last Frontier* (1952) present factual backgrounds for the interested layman. Frank Haythornthwaite's *All the Way to Abenab* (1956) gives a fine view of the present-day central portion of the Territory.

6. Summary

This survey disclosed no works on desert regions in Botswana and Angola that could be classified in any strict sense as studies of desert regional types. The Kalahari has been described by several authors, and studies have been made of several specific "regions" in South West Africa, but again these studies have been for the most part largely qualitatively descriptive rather than exemplary of study of desert regional types as conceived in the present work.

C. SAHARA AND SOMALI-CHALBI

1. Sahara

Despite the large amount of scientific research that has taken place in the arid lands of Northern Africa, it appears from a review of this research that little attention has been given to the study of desert regional types. For the few attempts at regionalization we must look to the work of several geographers who have made at least some effort in the direction of defining the Sahara regionally and subregionally. As in most other deserts of the world there was some attempt at regionalization on the part of early explorers; such regions were in every instance those of the single-feature variety, but such regionalizing was of secondary importance to the explorer and was by way of locating explored areas more than anything else.

In recent years the semiarid fringe lands of the Sahara have received the bulk of effort by investigators because of their importance to human settlement. This has led to regionalization of these areas in some detail. But in the extremely arid and arid portions of the desert this has not been the case. Much of what regionalization has been done has been in former colonial holdings of the European powers, in particular France and Great Britain.

It is probably the French geographers who have contributed most to the application of the regional concept in the Sahara. But, of course most of their work is restricted to parts of the desert once under French control. Thus Algeria and the former French West African territories have been better researched in terms of desert regional types than other parts of the Sahara. Among the early works dealing with the French holdings in the Sahara is that of Gautier (e.g., 1926, 1935). His regional divisions were based primarily on physical geography. One should not overlook the work of Bernard (1939) in the series edited by Vidal de La Blache and Gallois; Bernard's chapter includes a section on political divisions and natural regions of the Sahara. In more recent times the great study, *Le Sahara Francais* by Capot-Rey (1953) is the source for the most recent development of regional types in the former French areas. In his book, Capot-Rey discusses the desert portions of Morocco, Algeria, Tunisia, Mauritania, Chad, Niger, and the Fezzan, which is now part of Libya. The fact that little by way of effective regionalization had been done before this work is evidenced by Capot-Rey's statement that scientists engaged in field work in the Sahara in earlier times failed to see distinctive characteristics of various regions, and especially failed to see these characteristics integratively. They rather concentrated on such single-features as climate, vegetation, and the like.

In his chapter titled "Les Divisiones Regionales" Capot-Rey uses both cultural and physical elements in combination to define his regional types. His technique is integrative, and his criteria include not only such phenomena as climate and vegetation, but also cultural elements that were not previously considered by earlier workers. Among these cultural elements are pastoral activities, types of irrigation, variations in products, types of peoples, and number and relative prosperity of oases.

In general, geographers interested in regionalizing the Sahara have not followed the techniques of Capot-Rey, but have restricted themselves to definitions based on single features, especially surface configuration. Some researchers have organized political units into regions and subregions on the basis of single features. An exception to this is the study by Barbour (1961). In his regional geography of the Sudan Barbour stated:

> The regional geographer must define his own regions, using as seems appropriate to him such criteria as climate, geology, soils, vegetation, human types, or dominant ways of life. The number of regions he selects will depend also on the ease or difficulty of handling the material available to him and on the degree of detail into which he proposes to go.

For the desert portions of the Sudan, Barbour's regionalization is on a mixed basis. He uses soils, surface configuration, and cultural activities as criteria.

At least part of the Sahara has been the subject of regional division, especially the former French holdings, but there is a need for further work beyond the grand divisions of the few regional studies now available. The central factor in the problem of regionalization in the Sahara is the general lack of data.

2. Somali-Chalbi

This desert area is one which, due to the limitations imposed by time and money, could not receive the attention it deserves insofar as a discussion of regionalization is concerned. Some information can be presented here, however, as a base for investigators who may wish to pursue the subject in some depth in the future.

As is reviewed in Chapter I of this inventory series, delineations of the Somali-Chalbi vary according to scientists. Trewartha (1954), in his application of Köppen's system, extended the *BW* (desert) climate classification in a narrow band along the African shores of the Red Sea and Gulf of Aden and, in a slightly wider band, southward along the east coast bordering the Indian Ocean to just south of the equator, with an extension inland near the southern extremity. Meigs (1966), with his brief but excellent discussion, includes an area along the coast of the Red Sea extending northward to approximately 12° north latitude. The western boundary of his *A* (arid) area starts at the coast at approximately 40° east and extends southward, bearing slightly to the east, to a point at approximately 10° N, then eastward nearly to Cape Guardafui, then in a southwesterly direction, following along the western boundary of Somalia and extending into Kenya to the south. He also shows an *A* area surrounding Lake Rudolf. The works of Trewartha (1954) and Pichi-Sermolli (1955*b*) should also be consulted.

Viney's (1947) 10-page bibliography for this area, mentioned by L. K. Lustig in his chapter of the present inventory series, lists several geographic and early-traveler-type reports, and Puri (1961) should not be neglected. As far as the Somalia coasts are concerned, Dr. Schreiber's chapter in this inventory series gives Blondel (1935) and Dainelli (1943) as sources on "general topics." According to Schreiber, Hunt's (1942) work on the Zeila Plain, in the former British Somaliland, is a little more specific in its coverage of the coastal area. Pallister (1963) has written a short but excellent discussion of the land strip between Zeila and

Basaso on the Gulf of Aden. The papers that treat the subject of vegetation patterns in Somalia commonly provide basic information in addition to photographs. Thus, they are relevant to this report as sources of available information. Macfadyen (1950), Greenwood (1957), and Boaler and Hodge (1962, 1964) are worth consulting for this reason.

Of the material discussed by author Lustig, reports of interest for Ethiopia, in addition to Dainelli's (1943) previously noted, include Mohr (1964), Voute (1959) on the Assab region, Tatu (1964), Murphy (1959), and Gouin and Mohr (1964). The Awash Valley region, marginal to the arid territories, was the subject of considerable study; see United Nations Special Project (1964) and Mariam (1964).

Division of the Somali-Chalbi into eight regions based upon vegetation types was essayed by Pichi-Sermolli (1955*a*,*b*; see chapter in this inventory series by W. G. McGinnies). The maritime type can be explored by consulting Beguinot (1915, 1918), Ciferri (1939), Gilliland (1952) and Meigs (1966). Traveling scientists describing the desert type are Chiovenda (1929-1936), Edwards (1940), Gilliland (1952), and Popov (1957) on the Socotra area. Another type Pichi-Sermolli names is the subdesert shrub and grass; he believes on the basis of available information that the type covers large areas: in French Somaliland, in areas flanking French Somaliland to the northwest (Dankalia, now part of Ethiopia) and to the southeast (former British Somaliland, now part of Somalia), and in northern and eastern Kenya. The type is also present in Socotra. Pichi-Sermolli's subdesert shrub with trees type is found on the slopes of the Danakil Alps, the Ethiopian plateau, the mountains of northern Somalia, and Socotra, where the type attains its greatest growth and covers a large part of the hill slopes.

The subdesert scrub type, according to Pichi-Sermolli, is found in the Danakil-Dancalla region, in the territories formerly known as Italian and Ethiopian Somaliland, and in part of French Somaliland. It extends into Kenya southeastward from Lake Rudolf nearly to Garissa. Some limited areas have also been reported in Tanganyika by Gillman (1949). The desert bushland thicket type is well represented in the northern part of the Somali-Chalbi area. Xerophilous open woodland covers a great part of the arid zone. It is present in the Danakil-Dancalla region, throughout Somalia, and extends into Kenya, where it covers all the areas of the arid zone not occupied by types of vegetation described above. The last type mentioned by Pichi-Sermolli is vegetation of sites where water is present.

For the above discussion of vegetation types, which may be used as an element in regionalization studies of the future, I am indebted to W. G. McGinnies and his chapter in this series. Pichi-Sermolli and McGinnies discuss the temperature, rainfall, and, to an extent, soils on which these types are found.

D. ARABIAN, IRANIAN, AND THAR

1. Arabian Desert

The geography of the portion of the Near East occupied by the great civilizations in the Nile Valley and the Fertile Crescent has been extensively described and documented. The Arabian Desert has been classified in slightly different ways by Meigs (1953) and Emberger *et al.* (Unesco, 1963); this desert, for the purposes of the present study, is defined to include the Syrian, Saudi, Aden, and Tihama deserts and the very dry Rub' al Khali. It lies within the Arabian peninsula and Iran, Iraq, Israel, and Syria, and is roughly a rectangle, with its longer axis extending from southeast to northwest through the Arabian Peninsula to the Mediterranean Sea.

Many writers, influenced by imagination and religious zeal, recorded their observations of landscapes and people of the Arabian Desert somewhat casually. Since the beginning of the 19th century, however, historians, naturalists, archaeologists, and geographers have conducted their investigations more rationally and meticulously. Worthy of mention are the reports of Philby (1922; 1928; 1933*a*,*b*), Thomas (1932) and Thesiger (1946-47, 1948, 1949, 1950). Quite often topical and regional studies are cooperative achievements of many scientists and scholars. One textbook, Fisher (1963), should be mentioned here; it includes a general treatment of geology and physical geography of the Middle East. For information on the climate, geology, geomorphology, soils, and vegetation, see U. S. Army Quartermaster Research and Development Command (1954) and U. S. Army Engineer Waterways Experiment Station (1960).

Despite the achievements of these investigators there has not been much effort in the field of regionalization. Where the division of the deserts of the Near East into regions has been attempted, it has in almost every case been on the basis of a single criterion, surface configuration. In their volume on the geography of Israel, Orni and Efrat (1964) establish regions of the Negev Desert using physiographic terms such as the Negev coast, the Negev Hills, Paran Plateau, and Beersheva Plain. With the advent of the Zionist movement, knowledge of the geography of Israel assumed greater

meaning and comprehensive regional planning was begun involving widespread and intensive knowledge of geology, geomorphology, meteorology, sociology, and economic geography; this work has enabled Israel to evaluate systematically and develop its physical and human resources. But it has not brought about the scientific definition of desert regional types in Israel.

As Lustig, in his chapter in this inventory series points out, Thesiger (1950) treats Muscat and Oman; Carter (1857) and Lees (1928) discuss the southeastern coastal area. Beydoun (1960) and Geukens (1960) cover Aden and Yemen, and Evans *et al.* (1964) deal with the coastal features of the Trucial Coast: Owen (1938) and Swartz and Arden (1960) treat the Red Sea coast and Pilgrim (1906), Emery (1956) and Sugden (1963*a*,*b*) the Persian Gulf coast. Vesey-Fitzgerald (1955; 1957*a*,*b*), according to McGinnies' chapter of this series, studied the west coast and the interior, the latter dominated by the sand areas: An Nafud, Ad Dahna', and Rub'al Khali. Popov and Zeller (1963) should be consulted on he interior of the Arabian Peninsula.

2. Iranian Desert

The Iranian Desert, which includes parts of Iran, Afghanistan, and Pakistan (the Baluchistan area), is one of the smallest desert areas and one of the least known. Meigs (1953) and Petrov (1966-1967) are sources of information; this desert is arid with cool winters, winter precipitation, and warm-to-hot summers. It includes five major units: the Dasht-e-Kavir in the northwest, the Kavir-i-Namak in the north, the Dasht-e-Lut in the southwest, the Dasht-i-Naomid in the east, and the Dasht-i-Margo in the southeast. General references are Spate and Learmonth (1967), Mehdiratta (1954), and Humlum (1959).

In his work on southwest Asia, the geographer Cressey (1960) makes no philosophical argument for regionalization, but proceeds to use the historically recognized desert names. He mentions the arid lands of Afghanistan only in this way, stating that the Dasht-i-Margo (the desert of death) is on the right bank of the Helmand River and that the Registan desert is on the left.

In seeking information on this desert, Pabot (1964), Boyko (1954, 1955, 1966), and Monod (1957, 1964) should not be overlooked, as they provide material relevant to regionalization (as do the authors mentioned below). Early descriptions were furnished by Todd (1844), Blanford (1873, 1876), McMahon (1897), McMahon and McMahon (1897) and Griesbach (1886). Gansser (1955), Harrison (1943) and Furon (1936, 1941) have investigated surficial features of the Iranian Desert. Geographic reports on the Afghanistan portion have been made by Trinkler (1928), Merzbacher (1925) and Ryshtya (1947). Except for the work of Bobek (1953-1954, 1959) and Gabriel (1934, 1938, 1942, 1952, 1957), the interior basins of central Iran have been largely ignored, while Zaman (1951) has outlined the desert areas of Afghanistan.

Many of the supplementary references cited above, although not regionalization works, are supplied from the investigations of W. G. McGinnies and L. K. Lustig as set forth in their chapters in the present series, in an effort to provide here material relevant to regionalization.

3. Thar

The Thar, sometimes called the Indian Desert, includes the arid portions of western India and eastern West Pakistan. Some authors identify the area eastward to the Aravalli Range and southward into Sind as arid. There is some question, however, as to how much of this area is naturally arid and how much of its arid appearance has resulted from the activities of man (Carter, 1954; Mulay, 1961; Raychaudhuri, 1964).

Bharucha (1955), in a review, uses the 10-inch isohyet for the limit of the desert. He locates the Rajasthan Desert mostly north and west of the Aravalli Hills and notes that two-fifths of Rajasthan is sandy and has precarious rainfall. Useful references are Spate and Learmonth (1967), Chhibber (1945), Mehdiratta (1954), Pithawalla (1952), and Bharadwaj (1961).

The entire desert consists of level to gently sloping plains broken by some dunes and low barren hills. For the Thar as a whole, interspersed sandy and medium- and fine-textured surface materials are dominant. Gravelly and skeletal soils are restricted to mountains, hills, footslopes, and watercourses, none extensive. Soil salinity is high in the uncultivated fine-textured soils and in much of the irrigated land. Sand dunes occur within the Thar Desert area of the Indus plain and more widely outside the plain.

The Thar lies near the eastern end of the Saharo-Sindian region. The vegetation is influenced strongly by edaphic conditions, with communities varying distinctively among sand, gravel, and rock areas. This vegetation can be divided into five plant communities: salt desert, clay desert, stone desert, sand desert, and riverside thickets.

As far as regionalization goes a situation similar to that of the Arabian Desert occurs in the Thar Desert of Pakistan. Perhaps the most lucid exposition of conditions in the area is presented by Spate

in his general and regional geography of Pakistan (Spate, 1967). The Thar occupies 100,000 square miles of Pakistani territory; despite this it has been generally ignored in terms of desert regionalization. The boundaries of the desert are ill-defined except where the desert borders the Aravalli Range. Spate divides the Thar into two subregions, the Pat and the Thar Proper, these being developed on the basis of physical geography alone. He states his position regarding regionalization (p. 353), with application to the Thar:

> For practical purposes regions exist, and if they did not they would have to be invented to obtain manageable units of study. But rigid definition is impossible, and even a modest precision will take years of detailed study.

Pithawalla (1939) has classified the physiographic provinces of India and Ahmad (1947) of the Punjab plain.

Some of the references given above, furnished by W. G. McGinnies and L. K. Lustig from their chapters in this series, are presented not as regionalization works but as sources of information for those who wish to pursue the regionalization concept further. A great deal needs to be done in the collecting and collating of data regarding the Arabian, Iranian, and Thar deserts. The foremost regionalists have not been able to give much attention to the problem for lack of such data. Regionalization requires the correlation of data from many fields; in some cases this data exists, in many other cases it is not available. Until such time as this data problem is solved there will not be much accurate, scientific regionalization of this large part of the World's deserts.

E. TURKESTAN DESERT

1. Environmental Studies

Since World War II Soviet scientists have been delving deeply into all aspects of the natural environment of their country. Much of the scientific investigation has been related to the identification and use of natural resources. Studies on the deserts of the country are overwhelmingly concerned with greater agricultural use of the land; this focuses interest on climate because in general the soils are more than adequate. Heat and moisture are the two components of climate that can be dealt with as agricultural resources in quantitative ways: in terms of radiation balance at the Earth's surface, as sums of temperatures above critical threshold values, as soil moisture indexes, and so forth. Numerous studies have been carried on by the Soviets to establish better indexes of heat and moisture as they apply to plant growth and to devise precise controls over these two elements as they are affected by ameliorative means such as shelter belts, irrigation, snow protection devices, and fall plowing to facilitate water percolation into the soil. Certainly during the past two decades the Soviets have investigated the exact relationships of heat and water balance and their controls more extensively than has any other group of scientists in the world.

Outstanding among the Soviet scientists in these fields are M. I. Budyko and his staff at the Main Geophysical Observatory, and E. F. Davitaya, who for a number of years served as chief of the department of agroclimatology in the administration of the hydrometeorological service of the U.S.S.R. in Moscow, and who now serves as Chief of the Institute of Geography in the Georgian branch of the Academy of Sciences in Tbilisi (Tiflis). A great number of other well-known Soviet scientists have been engaged in similar work, and many of them have made significant contributions to the general fields of heat and moisture studies, but I believe the cumulative work of Budyko and Davitaya is preeminent. Many of the other well-known scientists have been associated with one or the other of these two men in general projects conducted under the auspices of either the Main Geophysical Observatory or the Academy of Sciences.

Budyko's work has been largely of a theoretical nature; he has tried to fit results of experimentations into classical formulas to determine the exact proportions of the components of heat balance at the Earth's surface and in the atmosphere, in order to establish a theoretical basis for the great range of practical uses that such information might be put to. Much of his early work and that of his associates was embodied in his monumental monograph entitled *Heat Balance of the Earth's Surface*, (Budyko, 1956) which was translated under the joint sponsorship of the U. S. Weather Bureau, the U. S. Army's Snow, Ice, and Permafrost Research Establishment, and the Army Quartermaster Research and Development Command and distributed in the United States in 1958. Since the publication of this monograph, many refinements of theory and observation have been added, and a fine atlas of heat balance of the Earth's surface was published under Budyko's direction in 1963 (Budyko, 1963). Clearly, such general works that attempt to formulate theoretical relationships applicable to any area of the Earth do not exclusively concern arid lands; however, theoretical studies lay the groundwork for particularly significant practical applications in arid lands with their precarious balances of climatic

components. In the arid lands, where man's living and economy are often marginal, improvements are most significant. Also, the heat-balance studies of Budyko and others are particularly applicable to the U.S.S.R., which is the country most concerned with agricultural production in an environment limited severely by lack of heat.

The studies cited below on related fields have their origins in the theoretical works developed by Budyko and others and cannot be considered entirely apart from them. Precursor to some of Budyko's work was that of A. A. Grigoryev, past Head of the Institute of Geography, Academy of Sciences, Moscow (Grigoryev and Budyko, 1956, 1960; Grigoryev, 1962). Grigoryev was concerned with the entire "outer geographical envelope" and the regionalization of the Earth's surface on the basis of an integration of all physical geographic factors. He and Budyko collaborated on some articles that dealt with the idea of soil-vegetation complexes that form a periodically recurring pattern within the general climatic zonations of the Earth. This pattern of regionalization was based upon radiation balance and a so-called "radiation-aridity index." Again, this type of study does not focus on arid regions, but has served to illuminate certain interrelationships among components of the natural environment and to place the arid zones and their associated vegetation and soils in some perspective.

Davitaya's work has been almost entirely of an agroclimatic nature; it is relevant to our study of arid lands because much of it relates previously determined theoretical work to the problems of land utilization and agricultural development in steppe and desert regions of the U.S.S.R. Particularly noteworthy have been Davitaya's studies preliminary to the opening up of virgin lands in western Siberia and northern Kazakhstan which culminated in the monograph, *Agro-Climatic and Water Resources in the Regions of the Reclamation of the Virgin and Idle Lands* (Davitaya, 1955). A main contribution in this work was the discovery that the Ukraine and the Virgin Lands are approximately one-half wave length apart (waves in the upper atmosphere), so that when one region is experiencing drought, the other is usually experiencing above-average precipitation. This finding has led to the basic governmental policy of justifying the Virgin Lands Project on an insurance basis, in that with both that area and the Ukraine in production, the U.S.S.R. is assured of a good grain crop in at least one major region each year. Davitaya has also written some significant review articles summarizing arid-zone studies in the U.S.S.R. as well as some more general summaries of work on climatic and agricultural resources in the U.S.S.R. and their use. Two such summary articles have been translated and published in the translation journal *Soviet Geography: Review and Translation* in the issues for June, 1960 and February, 1961 (Davitaya, 1961; Davitaya, Drozdov, and Rubinshteyn, 1960).

For nearly ten years Davitaya has been main editor of a monumental multivolume atlas of climatology. Publication of this work has been long delayed, although preliminary publication notices were issued as early as 1960. Some of the maps preliminary to this work have appeared in the agricultural atlas of the U.S.S.R., published in 1960 (*Atlas Sel'skogo Khozyaystva SSSR*, 1960), and the physical-geographical atlas of he world, published in 1964 (Gerasimov, 1964). Davitaya has also been a main figure in the publication of a great number of agroclimatic handbooks (published in the last decade or so) on the many oblasts and other divisions of the U.S.S.R. Between 1956 and 1959 more than 60 of these handbooks were published on political units that lie within the arid zones of the U.S.S.R. These embody many detailed statistics and insights on the climate of relatively small areas and thereby lay the foundation for much practical work on agricultural and other land-use problems. Probably the best of these handbooks are those prepared for regions in the steppe and desert lands of the country, because that is where much of the potential for agricultural expansion lies, where the soil is quite fertile, and where climatic resources are precariously balanced with land use. In such areas the fullest use of the rich soils would depend heavily upon the climatic resources, creating a very precarious relationship between climate and land use that can result in extensive crop failure when the climatic resource falls below the required minimum in a particular year.

2. Land-Use Studies

Land-use studies in the Soviet Union have centered overwhelmingly upon the problem of bringing more land under agricultural production. Such studies generally involve development of large regions or river basins through the construction of multipurpose dams with water reservoirs for irrigation, widespread plantings of shelter belts, tapping of underground water supplies, and proper cultivation and adaptation of crops in marginal areas. Frequently the Academy of Sciences or a related organization has sponsored a special expedition into a region to survey and analyze completely the resources of the area for development. A few permanent field stations have been set up

under different environments in different parts of the country to carry on scientific investigations of aspects of the natural environment in those areas. These have been summarized in *Arid Lands Research Institutions: A World Directory* (Paylore, 1967). Some special studies have been made of such regions as the deltas of the Volga, the Danube, and the Amu-Dar'ya. These swampy deltas in dry country, with their rich growths of reeds and other mixtures of vegetation, tantalize the imagination of Soviet scientists and officials, and various schemes have been devised to use the reeds, drain the swamps, irrigate the land, and put it into agricultural production. So far there has been little application of these ideas.

Some land-use studies and some all-purpose expeditions have gone beyond the study of the resource base for agriculture and have included mineral and other resources as the bases for urban settlement and industrialization. A number of works on Kazakhstan and Central Asia have focused upon the unique problems of transport in this area and attempted to specify logical locations for certain types of industrial development, based upon such criteria as relative locations of mineral resources, population centers, and existing transportation lines. Most such studies, however, are still in infancy; they are undoubtedly one of the weakest links in the present status of research and literature on the dry lands of the Soviet Union. Most such studies are rudimentary and unsophisticated, dealing more in descriptive and allusive terms than in quantitative-analytical ones, and often these writings are colored very strongly by local biases and government policy. Nikol'skiy's (1961) work on transportation is the outstanding Soviet effort of this type to date.

3. Basic Reference Works

Several regional geographies have been written, mostly under the auspices of some branch of the Academy of Sciences, and published by either the Academy of Sciences or the Geographical Press in Moscow. Such volumes generally give good summaries of all geographic factors in the areas covered, both physical and cultural, and are oriented particularly toward analyses of the resources of the regions and their ultimate development. The regional geographies on the Central Asian republics and Kazakhstan are relatively good. Volumes of this general type and of special note are Alampiev (1959), Chupakhin (1964), Dolgopolov, Pokshishevskiy, and Ryazantsev (1957), Kerzhenevskiy (1956), Luknitskii (1954, 1957), Nazarevskiy (1957), Narzikulov (1956), Semenova (1959), Skosyrev (1956), Vitkovich (1954). Some regional studies have been of a more specific nature, such as that by Nikolayev and Tyurdeneva (1960) on physical-geographical regions of the delta of the Volga River and their future.

Other very important regionally oriented series are the many statistical handbooks published in the Soviet Union since 1956. These range from annual volumes of national scope to irregularly published volumes on smaller areas (such as a specific oblast, kray, or autonomous republic). Handbooks have also been published that embody statistics on certain aspects of the Soviet Union, such as industry, foreign trade, and transportation. Although such handbooks cover the entire country, they include information on the arid lands. Generally, statistics are given by union republics. Complete lists of all these statistical handbooks have been compiled and are included in the journal *Soviet Studies* (volume 10 and subsequent volumes), usually annually in the third issue each year. Often a brief synopsis is made of the previous year's publication. Although these handbooks leave much to be desired, particularly in terms of regional breakdowns, they have served as an invaluable basis for cultural and economic studies of various areas of the Soviet Union, and they represent an improvement over the period before 1956 when no such statistical information was available.

One very great limitation to outside research on the Soviet Union is the nonexistence or nonavailability to the Western reader of adequately detailed large-scale maps and aerial photographs. The Soviets have published a rather wide array of physical, political, and economic maps for classroom use, but most of these are quite general and at small scales. These are often available to the public outside the Soviet Union, although one has to watch the ordinary market channels in order to acquire them. Maps of quite a number of individual oblasts have been published, and these may give some of the detail desired for certain studies, but nothing exists corresponding to the large-scale topographic maps of the U.S.A.

The U. S. Army Map Service has compiled several series of maps that cover the Soviet Union at scales of from 1:250,000 to 1:1,500,000 and others that cover scattered areas at larger scales; these maps are based on information from Soviet sources, either directly or through the use of maps captured by the German army and then recaptured by the U. S. Army during World War II. Most such maps are general, inaccurate, and out of date. They are not listed here, because the information can be obtained in more concise form from the U. S. Army Map Service.

On the other hand, some excellent atlases

have been published during the last decade. Outstanding among atlases of the world and the U.S.S.R. are the physical-geographical atlas of the world (Gerasimov, 1964), the atlas of agriculture of the U.S.S.R. (Atlas Sel'skogo Khozyaystva SSSR, 1960), and the atlas of the U.S.S.R., published in 1962 (Atlas SSSR, 1962). A great number of regional atlases covering either union republics or smaller political subdivisions of the U.S.S.R., have also been published. For example, there is an atlas for each of the Central Asian Republics and Kazakhstan. These are all beautifully done in great detail and cover all aspects of the geography, both physical and economic. Within Kazakhstan, as well as in some of the other larger union republics of the U.S.S.R., atlases have been published on individual oblasts, krays, and autonomous republics. Among the pertinent atlases are Atlas Kustanayskoy Oblasti (1963) and Atlas Uzbekskoy Sovetskoy (1963).

4. Summary and Availability

A few people in the United States and elsewhere outside the U.S.S.R. have done some significant work with regard to various geographic aspects of the dry areas of the U.S.S.R. Lydolph (1959, 1963, 1964) has published on the dry sukhovei winds, on climate and soil amelioration schemes, and on Fedorov's complex method in climatology, particularly as it applies to crop adaptation in new areas. Jackson (1956) has published articles on the agricultural potentials and levels of production in the Virgin Lands, as well as the general possibilities of wheat cultivation in the Soviet Union. Field (1954) and Lewis (1962) have studied water resources in Central Asia and the feasibility of grandiose projects planned by the Soviets. Taaffe (1960, 1962) has concentrated on the transportation problems in the Soviet Union, particularly as they have affected the economic development of Soviet Central Asia.

Studies about aspects of economic development have already been mentioned. The sum total of regional studies is rather meager, which reflect the difficulty that outsiders have had in acquiring enough basic facts and statistics to draw significant conclusions.

Generally the regional studies mentioned for the Soviet Union and included in the Pertinent Publications list are readily available to the public. This statement is particularly true of the various climatic studies involving heat and water balance, amelioration schemes, water and land utilization, and so forth. Most libraries have found it difficult if not impossible to acquire complete series of these items, because they have been published irregularly in limited printings and have appeared on and disappeared from the market so quickly that only libraries with well worked-out systems of advance ordering have been assured of accessions.

The Library of Congress, again, is the chief depository of most of this information. The New York City Public Library holds voluminous Russian materials, and certain university libraries, such as those of the University of California (Berkeley), Harvard University, Columbia University, the University of Illinois, the University of Indiana, and the University of Kansas are also substantial holders.

Not generally available to Western researchers are the original statistics upon which analytical research can be based and the opportunity to go into the field and gather one's own facts. Although a few exchanges of scientists have been made and certain Americans have been able to spend a few months or a year in the Soviet Union working on some specific research project, these individuals *in toto* represent only a fraction of a per cent of the total research effort in this country devoted to problems of the Soviet Union, and those few often have found access to Russian works difficult. It is quite academic to specify what research should be done, and even more so to lay out specific research projects; basic research in the Soviet Union is going to be done in very large part by the Soviets themselves, and outsiders will be limited to the results of that research.

F. TAKLA-MAKAN AND GOBI AREA

1. History of Regional Study

In general, scientific regional study of the northwestern areas of China can be considered in four stages. In the first stage, from the mid-nineteenth century until shortly after the First World War, most exploration was by Westerners whose aim was to discover landforms, geographical features, and possible transportation routes (Huntington, 1910; Lattimore, 1928, 1929). The chief result of these expeditions was basic mapping of the area but little in the way of regionalization. In the second stage, roughly from 1928 until the Second World War, Chinese and Westerners cooperated in missions which were intended to make scientific analyses of physical features and archeological materials. During the third stage, i.e., during the Second World War when China was cut off from the outside world except for the Burma Road and the northwest routes to the Soviet Union, the Academia Sinica sent out exploration groups to study road construction, oil, and water resources related to war needs. The fourth stage is that since the present government was established in 1949.

During this period scientific institutions have been established in the northwest, and "comprehensive expeditions" have been sent out to study practical problems such as water resources, geological survey of mineral resources, land utilization, soil improvement, plant exploitation, and erosion control.

The last two stages are emphasized in this report in order to give an account of the scope and directions of recent and present research on the northwest regions.

The single most important source of information for this report has been the "Ko Hsueh Tung Pao" (General Report of Scientific Work), which gives the most complete coverage of current scientific work on the mainland of China; all articles on the northwest regions appearing in the last 16 years have been examined.

2. Explorations During World War II

During World War II, when the government had moved to Chungking, China had access to the rest of the world only through the Burma Road and the northwest regions. Thus, there was great interest in the northwest, and three groups sent expeditions to explore its various features, especially those of Sinkiang, which provided a bridge to the Soviet Union.

The Academia Sinica was most interested in collecting information on all facets of Sinkiang geography, economy, and culture. One of its research groups left Chungking in August, 1943, and returned in January, 1944; this group spent a month in Urumchi (Ti-hua), the capital of Sinkiang, and then moved to southern Sinkiang for further study. Upon its return, it published reports on all facets of the observations.

While the Academia Sinica research was intended to gather information on existing conditions, the groups sent out by the Central Planning Board were to plan ways for Sinkiang to develop economically. Various reports were issued by this organization on the different phases of proposed development. The Industrial Planning Board had somewhat similar aims in sending out geographers and economists to study the desert regions, but the scope of its planning was more sharply focused on industrial development. This is reflected in the reports issued by these study groups.

During this time of urgent national needs for the war effort, interest in the northwest was strong, but as can be seen from the kind of research which was done, this interest was largely concentrated on fields directly relevant to the war needs.

3. Work Under the Present Government (Since 1949)

Since the establishment of the present regime in China in 1949, interest in Sinkiang and the northwest has been concentrated on practical problems related to the national economy. No longer is Sinkiang an isolated outpost to be explored almost as a foreign territory. Rather, its strategic importance vis-à-vis the Soviet Union and its rich mineral resources have caused its leaders to view it as an integral part of China, (Chia Chen-hsiu, 1953). Experimental stations, colleges, and research offices have been established in the territory of the northwest, and research institutions in Peking study materials brought back from Sinkiang, all as part of a large coordinated effort to develop the economy and natural resources of this area (Chang Te-sheng, 1954). "Comprehensive expeditions" organized by Academia Sinica (Chung-kuo K'o-hsueh Yuan), have gone out to study every facet of the desert environment which could be related to economic development (Academia Sinica, 1959, 1960).

In recent years, one of the highest priority projects for all China has been the control of the Hwang Ho (Yellow River), and the key to this control is halting the erosion of the yellow loess soil in the northwest which fills the riverbed with silt and causes frequent flooding. Thus, studies of the loess soil, of planting to control erosion, and of construction to control erosion have figured largely in study of the northwest. At the same time, there has been a demand to transform the desert into an agriculturally productive area, and research has gone on in improvement of soil, developing new kinds of plants to resist desert conditions, and developing a livestock industry. Water is, of course, the major problem involved in reclaiming desert lands, and the research on water resources has included attempts to melt snow from the mountains, create artificial rain, study the geologic structure of underground water areas, build a system of irrigation canals, and even to divert water from the Yangtze to the Hwang Ho. The desire to exploit Sinkiang's rich mineral resources has led to geological surveys and analyses of the area. Geological studies have also been essential in preparing for construction of railroads and dams.

The diversity of the attack on the problem of developing Sinkiang is reflected in the variety of articles in the "Ko Hsueh Tung Pao" (General Report of Scientific Work), which report both on work in progress and on the formation of many research and experimental groups to deal with the multifaceted work of making this province an integral part of the Chinese nation (Li Chien-chieh,

1957, Shih Ya-feng *et al.*, 1957; Li Wen-yen, 1959).

4. Summary

In recent years an increased effort has been devoted to scientific study of the extensive hitherto largely isolated and nonproductive arid lands of China, but work on desert regional types in a strict sense has received little attention, as far as has been discovered in this survey. The research that has been done in almost every case has been directed toward solving specific problems of national economic development, including such matters as sand-stabilization and other requirements of increasing herding and agriculture. Almost all of the work by Westerners was done prior to World War II, political conditions making it impossible for Western research workers to do field work in mainland China at the present time (Montagu, 1955).

G. AUSTRALIAN DESERT

1. Development of Regional Study

A rather paradoxical situation exists in Australia with regard to regional studies in general. Because academic geography developed very late (in 1950 there was only one university with a chair of geography) there has been no tradition of regional study either as an end in itself or as a training device for geographers. Consequently, a great deal of what might be termed "basic geography" has not been done, work which in North America and Europe was often accomplished in the course of regional studies. By and large the research of a "regional" nature which has been undertaken in Australia has not been done by geographers, but by workers from widely differing disciplines for widely differing purposes. There are still thousands of square miles of the continent that have never been described physically in anything but the most general terms.

Geography in Australia has expanded greatly since 1950, there are now 13 universities with chairs of geography and the attendant staff. Nevertheless, the situation with regard to regional studies has scarcely improved because most of the individuals coming to staff the new departments have been specialists in one aspect or another of the discipline and have not taken up the older tradition of regional study. Hence the hiatus still exists. This is not to say that Australian geographers are unaware of regional geography; they simply are not greatly interested in it.

It is peculiarly the task of the geographer to describe the Earth's surface and its use and alteration by man. This has not yet been done for most of the Australian continent; thus few greater opportunities exist in Australian geography, if for no other reason than to gain a reasonably accurate idea of what the continent looks like. No one, geographer or otherwise, has made a serious attempt to produce an in-depth account of Australia's geography since Griffith Taylor's pioneering efforts. Such a work is long overdue.

The idea of the region, however, has long been well-established among all classes of Australians who lived, worked, or had any connection whatever with the land. Regional terms came into use early, and as the arid and semiarid areas were penetrated such terms were applied with increasing frequency; examples of regionalization are of Sturt's Stony Desert, the Macdonnell Ranges, the Channel country, and the "Top End" (used to refer to the northernmost portion of the Northern Territory.) Probably most Australians also thought of the interior in rather vague regional terms (Madigan, 1937, 1938, 1944).

When scientific investigators began to work in these areas they also used a regional concept to delimit their areas of study; it was, after all, a convenient way to refer to a particular portion of a largely unknown and unmapped country. Such regions were invariably physical ones, and scientific papers often bore titles attesting to the prevalence of the regional idea. Even now, a "region" in Australia is generally a physical entity. Cultural, social, economic, and other sorts of regions involving man and his institutions are acknowledged to exist, but they have not been studied to any extent.

Until after World War II, no truly regional studies, geographical or otherwise, had been made, although it was recognized that the continent could be conveniently divided into a few or even some scores of physical regions, depending upon the reasons for the division and the criteria used.

Shortly after the conclusion of World War II, much interest was generated at both federal and state levels in planning the economy and development of the New Australia, which, it was generally felt, would inevitably evolve; as a result planning became almost a goal in itself. A new federal department was formed, the Department of Post-War Reconstruction, within which a Division of Regional Planning was established, and most states set up similar departments. It is doubtful if these bodies thought very deeply about the word "regional" or what it might imply; they used it largely in a physical sense simply to designate particular

parts of the Commonwealth. For example, the Federal Division of Regional Planning, with the help of the states, prepared a map on which the continent was divided into 97 "Regions for Development and Decentralization." The criteria for this subdivision were a combination of natural, political, statistical and demographic boundaries.

It appears that these initial planning bodies accomplished relatively little, although they did attract a good deal of attention to the idea of planning. In most cases the planning activities have developed into permanent bureaucratic units, both state and federal, which have been most active in the areas of denser population and intensive development; their activities in the arid zone have been negligible.

2. Regional Planning Bibliographies

One of the most useful productions of the federal planning body was a series of Regional Planning Bibliographies which brought together references to most of the important titles published before 1947. Preliminary editions of these bibliographies appeared for all mainland states, but the work was never completed nor were the preliminary editions brought up to date. Publication was in mimeograph form, and since distribution was limited, copies of these useful bibliographies are rare even within Australia.

Since World War II Australia has become acutely aware of the fact that large areas of the continent are relatively undeveloped and nearly empty of human inhabitants. The reasons for concern over this situation are varied and of little importance to this report, but the concern they have generated is very real. These underdeveloped areas, generally spoken of as "northern Australia" but in reality including also most of central and western Australia, have become the subject of extensive investigation, and it is in this connection that regional studies in the arid regions have seen their first real application.

3. Division of Land Research and Regional Survey

In 1945 the federal government, in conjunction with the governments of Queensland and Western Australia, formed a Northern Australian Development Committee to investigate and recommend possible lines of development. On the whole the committee itself accomplished little, but realizing the dearth of factual information concerning the north and center, it was instrumental in instituting a series of surveys aimed at making an inventory of the physical characteristics and potential of the most promising portions. The unit established for this purpose eventually became the Division of Land Research and Regional Survey of the Commonwealth Scientific and Industrial Research Organization (C.S.I.R.O.), and this group has conducted virtually the only regional studies undertaken in the arid regions. Their work emphasized the physical aspects, although in some instances they have become deeply involved in the economics and methods of development (Christian, 1952, Christian *et al.*, 1954; Perry *et al.*, 1962; Speck *et al.*, 1964).

In 1965 renewed criticism of the slow progress being made in the development of northern and central Australia prompted the federal government to form a new Northern Development Committee within the framework of the Department of National Development. As an advisory body the committee has had difficulty in getting its recommendations implemented.

4. Summary

The position with respect to regional studies in Australia's arid lands is as follows: (1) The concept of physical regions is well known and has been used in many studies of research projects; (2) The only true regional work has been that of the Division of Land Research and Regional Survey of the C.S.I.R.O., and even this has been largely limited to the physical characteristics of the areas examined; (3) There is a real need for detailed regional work on almost any scale in most parts of arid Australia, but there is little indication that much work of this nature will be accomplished by Australian agencies in the near future.

H. SOUTH AMERICAN DESERTS

1. General

South American desert regional types, distinguished in accordance with natural or physical environmental criteria, include the tropical and subtropical coastal dry zone, between the Andes and the cold-current ocean; the cool temperate, rain-shadow plains of Patagonia and western Argentina; the bleak high plateau of the Puna, along the Andean axis of Bolivia and northern Chile; the tropical, summer-dry "polygon" of northeastern Brazil; and the tropical, trade-wind coast of Venezuela and northeastern Colombia. Delimitation of regions on cultural criteria will broadly follow the above categories, but may separate the north Chilean from the north Peruvian coast; Patagonia from the northwest Argentine oases; the Guajira and Paraguana from the La Guaira coast.

Caveats about the handicaps of researching "regional types" have been adequately expressed earlier in this chapter. The intent of identifying,

characterizing, and describing, inherent in regionalization, is typically associated with two stages of geographic research. In the first phase of exploration and reconnaissance, writers strive to impart the flavor, the character, the nature of the lands they are describing; the attention is focused on the unfamiliar, the different, the distinctive. The process is one of perceptive differentiation. And, since the evolution of geographic landscapes proceeds from definite physical and cultural processes, the intuitively described regions are very often valid ones. Later, at an advanced state of knowledge, scientists may engage in an effort of synthesizing the multivariate array of data, deriving earth-space regions with high correlations of homogeneity in the distribution of as many characterizing variables as possible. In this process, scientists often rediscover the "common-sense" regions intuitively perceived by the earlier geographers. Between these synthesizing periods is a span of time during which scholars concentrate on the accumulation of quantitative data about the various parameters that characterize the environment. Geographic study of the South American desert regions is now largely at this second stage.

A volume of data is now being assembled in various research institutions both in South America and outside it. At least thirty national research organizations and institutions are active in aridlands research in South America, and important studies are being conducted by international and foreign organizations. But almost the totality of this research is focused on component elements of the desert regional environments. Almost none of it is directed toward regionalization.

Because of this situation, the best studies or more accurately, the best descriptions of desert regional types in South America are often found in the regional geography textbooks.

2. Regional Geography Textbooks

Perhaps the leading text in the English language is Professor Preston E. James' *Latin America* (1959). James' primary organization is political: according to nation states. But a subdivision within the discussion of each pertinent political entity usually describes the encompassed arid zone. Sometimes this description is slighted, as in the case of northeastern Colombia; sometimes the description is expanded, as in the case of northeastern Brazil.

Much more satisfactory, from the aspect of regionalization of desert environments types, is Oscar Schmieder's great *Die neue welt* (1962). Schmieder's work is organized by landscapes, or regional units, which cut across the boundaries of political units wherever necessary. The decisive criteria for regionalization employed by Schmieder were cultural ones. Yet, Schmieder's criteria were too broad for our purpose. His "Northern Andes" unit, for example, includes the Andean highlands from Ecuador northwards, comprising the bulk of Colombia and coastal Venezuela, and incorporating both the very humid Choco coast and the arid Caribbean coast. The rationale for recognizing such a regional unit is the predominant character of highland culture in pre-Hispanic times, and the historic course of Colonial and subsequent development in which the seats of power and the origins of cultural processes of greatest importance in the landscape evolution in this area lay in the north Andean highlands. Colombia outside of the Amazon basin, and Venezuela north of the Orinoco *llanos*, in other words, constituted for Schmieder a distinctive cultural region with sufficient uniformity to distinguish it as a principal component unit in the human geography of South America, yet without separating wet from dry. Cultural regions recognized by Schmieder which correspond to the South American desert environments mentioned above are: "the Arid West Coast" from Chimu to Copiapó, "Eastern Patagonia," "Northeastern Argentina," and "Northeastern Brazil." The arid Puna is encompassed in his "Central Andes" region, together with the moister Peruvian cordilleras and the humid *yungas*; the arid Guajira, Paraguaná and La Guaira coasts, as mentioned, are included in his "Northern Andes" region. The "Chaco" is also distinguished by Schmieder as a primary landscape unit, but this seasonally dry region is not arid enough to qualify as a desert.

Regional descriptions can be found in less comprehensive texts, including national geography textbooks published in the South American countries themselves. Textbook regionalization is not a product of primary research, and need not be further elaborated here.

3. Other Sources

Aside from regional geography texts, discussion of desert regional types is quite rare. Older works, (especially, in the case of Chile, those written around the end of the 19th century) emphasize regional description. Occasionally, a more recent paper will undertake the effort. The majority of research publications, including those generated by geographic institutes, is more properly assigned to systematic disciplines other than regional geography.

This conclusion was reached after correspondence with South American geographic research

institutes, personal discussion with geographers of Latin America active in the United States, and an analysis of the geographic literature.

For the literature analysis the library of a leading American research center (University of California, Berkeley) was searched for holdings on the desert regions of South America. Only books and journal articles available in the library collection were included. Entries referred to in bibliographies and reference lists, but not themselves available in the research library, were excluded. With this constraint, some 250 entries were indexed as "regionally geographic." Of these, only 69 could be even broadly classified as description or discussion of desert regional types. These 69 entries, furthermore, included textbooks, multiple publications of essentially the same paper, either in translations or with revisions (e.g., Alexander, 1958, originally published in 1954, and Aschmann, 1960, previously published in 1951 and 1956), and continual productions by the few individuals (e.g., six publications of regional nature by Emmanuel de Martonne).

A detailed distribution of these 69 entries acceptable as studies of South American desert regional types, according to language of publication and country studied, is given in table I. Because of the small sample size the figures and the percentages computed from them should be taken only as relative distributional indicators.

4. State of Knowledge

Attention may be called to the absence of material on Bolivian arid regional types, the heavy French and German emphasis on Argentina, and, curiously, the scarcity of Spanish language work on Brazil and of Brazilian work on Spanish South America. The arid region most heavily represented in this literature sample is the Caribbean coast of northern South America (8 entries for Colombia and Venezuela combined, or 12% of the sample).

It is obvious that research work on desert regional types in South America has been peripheral, both literally and figuratively. Much more work has to be done in the arid regions of the continental interior to approach anywhere near a balance between areal extent of the dry lands and share of the scholarly effort.

The general conclusion is equally apparent. Support of further research in regionalization of South American desert environments will be a productive investment. Such research is needed to provide two kinds of information: (1) succinct, descriptive intelligence that can brief the reader as to the environmental characteristics to be expected in a given region; (2) detailed, comparative or homologue data that can guide planning and decision making.

The state of the field, in respect to these two kinds of desired data, is that of gross inadequacy. Little encouragement is apparently given to regional studies. Too many geographic research institutions are engaged in disparate programs of data compilation on various environmental parameters to the exclusion of integrated environmental studies.

On the assumption that the library holdings of a first-ranked university reasonably reflect the availability of research material, the results of a search of the University of California, Berkeley, library are germane: a trained geographer could locate only 250 holdings that could be reasonably described as regional-geographic, out of some 1200 entries initially screened. The vast majority of holdings covering research in South American desert regions were more properly assigned to systematic disciplines rather than to integrative regional geography. Of the 250-odd regional geographic studies, only some 69 could be properly considered descriptions of desert regional types, and these 69 entries include textbooks and multiple publication. Perhaps 20 of these are satisfactorily integrative environmental studies. (Alexander, 1958; Almeyda Arroyo, 1965; Aschmann, 1960; Aubert de la Rüe, 1957, 1962; T. de Booy, 1918; Chaves, 1953; Crist, 1958; Czajka, 1957*a*,*b*; Dresch, 1961; Fróis Abreu, 1943; Fochler-Hauke, 1950-1951; Freise, 1938; James, 1927, 1952; Katzer, 1902; Koepcke and Koepcke, 1951; de Martonne, 1934*a*; Mortensen, 1933; Reparaz, 1958; Waibel, 1955.)

I. NORTH AMERICAN DESERTS

1. General

This section deals with the arid and extremely arid areas of the U. S. and Mexico as delimited by Meigs (1953). Primary emphasis is placed upon regional studies which attempt to portray in a professional manner the interplay of various natural and cultural elements within an area studies which embrace both natural and cultural elements, a moderate preciseness in defining the region, and a rather complete devotion to describing and explaining the spatial and functional relationships among its components. Due to limitations of time and money, the U. S. is emphasized and little material is presented on regional studies of the Mexican desert areas.

Investigation shows that except for the simple classifications of textbooks very few geographical studies deal specifically with the problem of defining deserts in North America. In a brief article,

Table 1

DISTRIBUTION OF DESERT REGIONAL TYPE STUDIES ON SOUTH AMERICA, UNIVERSITY OF CALIFORNIA (BERKELEY) LIBRARY

Language used / Country	ENGLISH	FRENCH	GERMAN	PORTUGUESE	SPANISH	OTHER EUROPEAN (excl. Russ.)	TOTAL (by country)
ARGENTINA	4 (6%)	5 (7%)	5 (7%)	—	1 (1%)	—	15 (22%)
BOLIVIA	—	—	—	—	—	—	—
BRAZIL	4 (6%)	1 (1%)	3 (4%)	6 (9%)	—	—	14 (20%)
CHILE	3 (4%)	1 (1%)	—	—	3 (4%)	1 (1%)	8 (12%)
COLOMBIA	3 (4%)	—	—	—	2 (3%)	—	5 (7%)
PERU	1 (1%)	1 (1%)	1 (1%)	—	2 (3%)	—	5 (7%)
VENEZUELA (incl. Netherlands Antilles)	5 (7%)	—	—	—	4 (6%)	2 (3%)	11 (16%)
GENERAL	3 (4%)	2 (3%)	2 (3%)	—	4 (6%)	—	11 (16%)
TOTAL (by language)	23 (33%)	10 (14%)	11 (16%)	6 (9%)	16 (23%)	3 (4%)	69 (100%)

Note: Percentages rounded to nearest whole number; totals may differ from component sums due to rounding.

Thomas (1955) directs attention to the inexact use of the terms "desert" and "steppe" and their application to areas in the United States that differ from areas of the Old World. He argues that both natural and cultural elements should be used as criteria in renaming and redefining the desert regions of the United States. He further suggests that arid lands be divided into regions of tanezroufts, deserts, semideserts, and steppes on the basis of six natural elements and the intensity of land use, especially grazing. Under such a regional concept, the term "desert" in the United States, as elsewhere, would apply to those areas with little but seasonal grazing, less than 5 inches of precipitation, vegetation of little value to stock, desert soils, and desert landforms such as erg, reg, and hamada. Thomas provides an extensive bibliography, and refers to the need for verification of boundaries through field inspection. He notes that his results correspond "roughly" with those of Meigs (1953). Unfortunately, the map accompanying Thomas' text is on a very small scale; however, the study in general is of value, since it provides specific indicators and analogs and a procedure for testing and expanding its results.

In *Aridity and Man* MacPhail (1963) divides the "arid" lands of the western United States into four major "natural regions" and a host of subordinate regions. Regionalization is based upon natural elements, mainly physiography, vegetation, and terrain or landform features. He defines one of the major divisions, the "Intermountain Region," on the basis of physiography, but subdivides it on the basis of vegetation into a northern subregion dominated by sagebrush (*Artemisia*) and a southern subregion dominated by creosotebush (*Larrea*). These subregions are said to correspond with cold and warm winters. The two subdivisions are further divided into smaller units based on physiographic provinces, or landform features such as the Colorado plateaus and Columbia basin. The latter is further subdivided into sagebrush and short grass subregions. Following the pattern of popular works, the southern areas within the creosotebush

regions are divided according to vegetation into the Mojave and Sonoran deserts, Chihuahuan desert, and into a composite Rio Grande Border. MacPhail elevates a single predominant characteristic of an area to that of a criterion for regional delineation and then notes in a most general fashion those natural and land-use elements found within the "region." Not all elements are treated in every subdivision, the author presumably reserving space for the more areally discrete features. It is not always clear whether a given element is limited to a certain region. The study is valuable in part because it enables one to judge in a limited fashion the extent to which the deserts designated by Meigs and followed in this survey relate to areas about them. In this one sense the study is externally discriminating, even if it does not delineate the deserts as classified by Meigs.

Two recent studies of large parts of the arid southwestern United States are of limited use from the standpoint of regionalization. It is difficult to assess the regional characteristics of deserts when material is presented in a topical manner. The volume edited by Zierer (1956) deals with California, Nevada, Utah, and Arizona in 33 topical chapters by almost as many authors. California receives the bulk of the attention, but coverage is uneven. Logan (1961) treats the arid lands west of Texas in a topical fashion, concentrating on industries and economies.

One of the most useful sources of information for this survey was the U. S. Geological Survey (U.S.G S.) and its numerous publications. Perhaps the most valuable of all the publications were the U.S.G.S. Water-Supply papers. The abstracts of each article provide excellent summaries of the physical nature of individual areal units and to a lesser degree their economic aspects. Although there is a question as to whether these individual studies may be called regional, the fact remains that they often provide the only known study of a given river basin or valley. Much of the information they contain comes from field work. Their treatment of geography is primarily physical, although there is some use made of economic data, mainly in the form of small-scale land-use studies. The maps in this series are excellent.

In 1950 the President's Water Resources Policy Commission published *Ten Rivers in America's Future*, in which the Columbia, Snake, Colorado, and Rio Grande valleys were treated. The human elements were neglected. The reports of the U. S. National Resources Planning Board produced in the 1930's and early 1940's parallel the Water-Supply papers of the U.S.G.S., being concerned with the physical environment of river basins and water resource utilization.

Another series of publications dealing with areas and forming "regional" studies (in the sense that they represent a compilation of topical material) are the "project papers" published by the U. S. Congress as House or Senate Documents whenever Congress approves a Corps of Engineers or Bureau of Reclamation proposal. These papers include surveys of the natural environment and economic development.

The National Park Service, Bureau of Indian Affairs, Bureau of Land Management, and Bureau of Reclamation have gathered information which has been published, but not in any truly regional form.

2. Studies of Individual Deserts

Following the procedure established for this compendium, areas of North America possessing an arid or extremely arid climate under the Meigs classification were recognized as desert regions. These quantitatively established climatic regions are grouped under the general area names adopted for the compendium. The nature of the regional source material makes it useful to group the U. S. literature by states. The Great Basin Desert Type includes portions of Washington, Oregon, Nevada, Utah, Wyoming, northern Arizona, northwestern New Mexico, and the San Luis Valley of south central Colorado. The Mojave and Sonoran deserts have been divided between Arizona and California, and the Chihuahuan between New Mexico and Texas. These desert areas are considered below.

Great Basin Desert Type

The physiographic province of the Great Basin has not been studied as a unit. Cline (1963) examines the history of man's knowledge of the physiographic unit and provides a traditional review of the natural elements, but her research objective was to consider the history of an idea and its association with human use. Jackman and Long (1965) provide another adequate but traditional review of the natural elements and a history of human occupation, but there is no attempt to establish accordant relationships between phenomena, and as a result no regionalization.

The Oregon Department of Planning and Development (Oregon, 1964) distributes a combination text, atlas, and statistical summary of natural and cultural data that is not duplicated by other states. Information is entirely from secondary sources, it is not related in any way

that might be termed regional and usually provides fewer details for desert areas. Nevertheless, researchers requiring extensive data on surface conditions in the Oregon desert will have to depend to a great extent upon this source, pending professional field work and analysis.

Macinko (1961, 1963) provides a general review of the natural and cultural elements of the Columbia Basin of Washington, but his work is for the most part oriented toward an evaluation of successful agricultural occupance, not the identification of regional interrelationships and degrees of internal and external discrimination. *The Atlas of the Pacific Northwest* (Highsmith, 1962) provides information about a variety of natural and cultural items, but without sufficient specific attention to the associations and interrelationships that form the basis of regional work.

No regional study (in the strict sense) treating the Great Salt Lake desert portion of the Great Basin could be located. A better-than-average regional study has been made of the Dugway area just outside this desert (Ives, 1949). It includes information about the seasonal utility of roads, wind speeds, subsurface water supply, and surface conditions. The text is accompanied by excellent photographs, maps, and profiles. The author is a geographer. Woolley (1930) describes the natural and cultural elements of the Green River.

Gregory (1938), discusses most of the natural and cultural elements of southeastern Utah; settlement is dealt with very briefly. Another paper in this series, by Miser (1924), reviews the varied elements of the San Juan Canyon of Utah. An older paper by Gregory (1916) describes and in part relates the natural elements and some cultural elements of the Navajo country. So many changes in settlement have occurred on the Navajo reservation that only the portion dealing with the natural environment can be used with any confidence. Hack's (1942) study of the Hopi area remains useful as a source for physical geography.

Fortunately the desert of the San Luis Basin of Colorado has received attention as a unit. A better-than-average doctoral dissertation in geography (Lantis, 1950), treats the natural and cultural elements within an historical framework.

Studies of the Big Horn and Red Desert basins of Wyoming originate from different sources than studies in the states discussed above. The Division of Business and Economic Research at the University of Wyoming issues a series of economic regional surveys that includes general surveys of the natural environment in a traditional manner (Wyoming, 1964). The report on the Big Horn Basin by Harmston and Scovel (1959) is more thorough than the above and includes specially prepared maps of population density, housing, and crops, based in part upon field work. It lacks, however, any treatment of vegetation and is more of an inventory of the natural elements than a regional study. A similar study covers the counties included in the Red Desert of southwestern Wyoming (Lund, 1962). An earlier work (Wyoming, 1937) treats the physical geography of the Green River Basin.

Sonoran and Mojave Deserts of California

Southeastern California contains a large area in which there are arid, and in some cases extremely arid, climatic conditions. This area is commonly divided into the Mojave, Colorado, and Great Basin deserts. The arid exclave in western Kern County at the south end of the San Joaquin Valley carries no common desert designation. A textbook organized according to regions by Lantis, Steiner, and Karinen (1963) provides both external and internal discrimination of desert areas, using climate, landforms, and human activity as criteria for regionalization. The work emphasizes occupance, but gives varying degrees of emphasis to other elements, depending upon their functional and areal importance. There is no systematic treatment of environmental associations and covariants. Information comes from works listed in an extensive bibliography, plus the authors' field observations. Earlier studies of California have been published by Durrenberger (1959), Griffin and Young (1957), and Baugh (1955).

Two works dealing with southern California include the eastern arid lands (Bailey, 1954; Thomas, 1959). Bailey's work relates the patterns of the natural elements to each other briefly, and to land use in more detail. He comes much closer to a study of areal relationships, covariations, and the development of indicators than most studies reviewed, but the article is brief.

In reviewing the history of man's occupance of Southern California, the several authors in the Thomas (1959) article generally fall short of true regionalization. Aschmann provides an estimate of the amount of desert remaining in a "wild state," but unfortunately his results are derived from rough estimates without the benefit of field measurements.

The only regional study of the arid southern end of the San Joaquin Valley is that of Wells (1953). He reviews the natural setting topically

and then devotes most of his attention to agriculture. Among numerous works treating Death Valley, only Glendinning's (1940) concise treatment need be mentioned here as being useful. Following traditional geographic procedures, but without the benefit of field mapping, he describes the natural and cultural elements with sufficient clarity to portray local landscapes. Interrelationships are not emphasized and the culture is obviously out of date. It is unfortunate that the author did not treat the subject in a more extensive article.

Theses and dissertations provide the best sources for regional studies of the Mojave and Sonoran deserts of California. Garrison's (1960) study illustrates the difficulties of establishing boundaries by presenting twelve different eastern boundaries for the Mojave. After treating the natural setting, the author provides maps and textual discussion of various types of land uses, including military, utility, transportation, mining, agriculture, recreation, and urban. The same author presents a detailed picture of the natural environment around Barstow, California (Garrison, 1953), in which occupance forms and patterns are subordinated to function. Stones' thesis (1964) reviews in considerable detail the landforms, climate, soils, vegetation, animals, minerals, and water resources of Antelope Valley.

Several theses and a published article comprise the major sources of information on the California Sonoran desert. Glendinning's (1949) work on the Coachella Valley treats relief, major and minor landforms, and surface conditions, and relates these to vegetation and to soil. He is more concerned than most authors with internal discrimination. A superior thesis dealing with the Borrego Valley (Curti, 1955) describes the settlement features in considerable detail and relates them to patterns of the natural elements. Darnell (1959) presents a standard review of the Imperial Valley. Rumage (1956) uses a regional framework to discuss long-term irrigation difficulties in the Palo Verde Valley. Brown's (1923) Salton Sea Water-Supply paper should be mentioned also.

Sonoran and Mojave Deserts of Arizona

Lack of interest in regional studies is clearly evident in materials dealing with the Sonoran desert of southern Arizona. A great deal has been written about the Indian populations and, subordinately, about the areas they occupy. A sizeable number of works deal with prehistoric people and environments. One volume (Cross, Shaw, and Scheifele, 1960) presents a topical survey in which coverage is uneven. Each topic stands alone with little spatial or thematic integration. Renner (1954) presents a more regionally organized work that covers most elements, including settlement. In general his text emphasizes historical origin and function at the expense of form and pattern.

Several studies dealing with limited areas of southern Arizona are of a traditional regional nature. Frazer (1959) employs an historical approach to an arbitrarily defined Salt River Valley "region." Subregions are not designated. Detailed field mapping appears in a sample study of the Glendale area. Generalized land use maps based on Maricopa County Planning Board studies are also included.

Two older but thorough regional studies, primarily of the natural elements, are found in Water-Supply papers written in the 1920's (Bryan, 1925; Ross, 1923). Bryan attempts to relate the pattern of each element to the others.

Chihuahuan Desert of New Mexico and Texas

The U. S. National Resources Planning Board (1938, 1942) prepared sufficiently comprehensive and integrated studies of the Pecos and Rio Grande areas to warrant inclusion as regional-type studies. They relate climate, surface water, landforms, geology, vegetation, and land use to watershed management, flood problems, recreational use, and wild life. In some cases, tables are used rather than maps to summarize areal data. In the absence of truly regional materials, the review of physical conditions by the U. S. Soil Conservation Service (1947) should be mentioned. Unfortunately, this series has been discontinued.

The now defunct *Texas Geographic Magazine* published a series of regional divisions of the state, the last of which included the arid lands (Chambers, 1948). The regional divisions were based upon landforms, but the study also discussed vegetation, climate, and human use. Johnson (1939) considered soil and settlement as well as the above elements and developed the concept of a "Southwest border zone" which includes the arid lands under review.

Mexico

Both coastal and interior deserts are included in the northern third of Mexico's territory, with occasional localized extensions occurring also in central Mexico. According to Shreve (1942), desert areas extend southward along the eastern coast of northern Baja California, in the lee of the (mountain ranges) Sierra de Juarez and Sierra de San Pedro Martir. South of these ranges desert extends across the peninsula as far south as the northern end of Sierra de la Giganta; farther southward, it is limited to the Pacific coast, a very narrow strip

along the coast of the Gulf of California, and parts of the lower elevations in the Cape San Lucas region at the tip of Baja California. On the mainland of Mexico, it occupies the lowlands of Sonora as far south as the delta of the Yaqui River. East of that area, desert extends southward from the U. S. border continuously through eastern Chihuahua state and nearly all of Coahuila, being broken only by a few higher mountains and elevated areas of grassland. Farther south, desert is confined to eastern Durango, northern Zacatecas, the western margin of Nuevo León, and the northern part of San Luis Potosí. In addition, small regions of desert exist in lee shadows and other areas of localized aridity such as the northern zone of the valley of Mexico or the zone of the Tehuacan in the State of Pueblo.

Unfortunately, regionalization of the aridlands of Mexico does not receive the amount of attention the subject deserves in the present chapter, due to difficulties in allocating time, money, and priorities. A number of potentially useful references can be cited here, however, for the investigator who wishes to pursue the matter in some detail. For much of the information obtained from other chapters in this inventory series, I am indebted to L. K. Lustig, J. F. Schreiber, Jr., and W. G. McGinnies.

Works that can be investigated in connection with desert regional types of Mexico include basically general studies, such as Meigs (1966), especially for Baja California, Putnam *et al.* (1960), who describe the Sonoran desert type and illustrate the coastal desert, and textbook treatments of Mexican regions, such as Tamayo (1962), Vivó (1958), Schmieder (1962), James (1959) and Pfefferkorn (1949). Specific studies such as Robles Ramos (1948) or Osorio-Tafall (1948) are few and far between. As in most other areas, Mexican interest has been less on regionalization and regional description than on systematic, analytic studies which are referred to in the present compendium series under separate disciplinary chapters.

Aschmann (1967) was not available at the time this chapter was written, but information on its contents is furnished as an annotation in the Pertinent Publications list.

The report of arid-zone research in Mexico by Fourrier d' Albe (1960) and Wallén's discussion of rainfall variability (1956) also should be mentioned as general references, and the review of arid-zone problems by the Instituto Mexicano de Recursos Naturales Renovables (1955) provides a good outline of the arid areas of Mexico in terms of an evapotranspiration map and basic information on water resources, vegetation, and similar subjects. In addition to work of Thayer (1916), Galindo y Villa (1926-1927) has provided a general geographic treatise on Mexico, and Sanders (1921), Ordóñez (1936), and Gonzáles Reyna (1956), among others, have discussed the physiographic provinces of Mexico. Staub (1923) has provided an early treatment of the geography of northern Mexico, Porter (1932) has described an area in northeastern Mexico that he termed "the Coahuila physiographic province," Pfeifer (1939) has written on the Sinaloan and Sonoran provinces, Dios Bojorquez (1946) has also treated the geography of Sonora, and Blásquez (1956) has provided an outline of the physiography of western Mexico.

Descriptions of Baja California are also available. Beal (1948) has treated the entire peninsula in connection with an investigation of petroleum possibilities in the region, Engerrand and Paredes (1913) gave an early description of some of the channels and valleys of north Baja California, Tamayo (1940) has discussed the geography of the southern part of this area, and Bonillas and Urbina (1913) have described on the Colorado Delta region, as have Kniffen (1932) and Sykes (1937).

3. Availability

Among the more than 2,000 titles surveyed for the U.S.A., only a small number can be said to be regional studies in a strict sense, as defined above. Hundreds of articles and books bear regional titles, but on investigation they proved to be without value for this study. Numerous studies classified as "regional" precede their topical discussion with a brief description of the physical, and sometimes the cultural, setting. Such descriptions are almost always very general and are obtained almost verbatim from classical sources, such as Fenneman's (1931) *Physiography of the Western United States*. The most valuable sources for regional and regional-type studies of the U.S.A. are theses and dissertations, most of which are not microfilmed. Most are available on interlibrary loan. The only depository considered particularly outstanding is the Library of Congress, Washington, D. C.

4. Summary

There is no systematic, scientific regional study of the extremely arid and arid portions of the United States or the United States and Mexico considered as an areal unit. Moreover, there is inadequate coverage in large-scale studies of subregions. Faculty and graduate students of the University of California at Los Angeles have concentrated their studies on the California deserts, giving this area better coverage than any other.

Only very small areas receive complete coverage, and these are generally defined as regions by terrain configuration or through common usage. Studies covering larger areas are older and mostly physical surveys produced under the auspices of the federal government (Bryan, 1925). Work is of the traditional inventory type employing *a priori* regional schemes. It is exceptional for a regional-type study to employ holistic subregions, topical treatment being the usual technique employed. Indicators remain general and close to those of the more generalized textbook. Field observation without detailed mapping and the use of secondary sources for topical information are the rule.

Desert regional type studies in the strict sense are practically nonexistent for deserts of the United States. Since true regional studies are more than an assemblage of topical inventories, which may have no relationship other than proximity, most titles barely qualify as regional-type studies. The bulk of the research reported does little more than repeat established general relationships. Field mapping using unit area techniques has not been employed. The reports do not establish a quantitative measurement of distributional patterns, nor a statistical measure of their internal relationships. There is no discussion of alternative regional divisions using the same data with different classification or class parameters, and the varied relationships, or patterns, these alternative schemes would produce. As a rule only the theses and dissertations deal with the landscape on a scale allowing the reader to anticipate the combinations of elements occurring at a given location. External discrimination is usually neglected, leaving the reader in doubt as to how much of the area outside the study region is similar to it. Internal discrimination is extremely spotty. Averages for an entire region may hide wide ranges within the region.

None of the larger desert areas have been regionalized. The Columbia Basin, the Great Basin, and the Green River Basin in particular are poorly covered. The remaining areas have better coverage, but much of it consists of old inventories done under auspices of the U. S. Geological Survey or the National Resources Planning Board.

5. Current Research

Those familiar with the several decades of disinterest in regional studies on the part of American geographers will not be surprised to learn that none are currently being prepared on desert regional types. Researchers contacted by letter, and in several cases interviewed, were not at present interested in the type of research that might be included in this inventory.

Lantis recently revised his San Luis study and plans to have it published under the title *Cloud Desert*. Most scholars contacted evinced interest in topical research, not in regional work.

III. CONCLUSION

A. STATE OF KNOWLEDGE

1. General

The present state of knowledge of desert regional types and of the application of regional studies to desert environments is very inadequate. There are numerous studies that treat in some way some particular parts of desert areas, and many employ the term "region" in their title or discussion, but very few of these are regional studies in any strict and useful sense. Few are soundly based on quantitative procedures or tend to satisfy other desirable basic criteria for substantial regional studies, noted in section I.D.1. above (Desirable Criteria) and including: careful definition of the region in terms of select related measurable phenomena; initial explanation of the criteria phenomena, why they were selected and theoretical relationships among them; rather precise delimitation of the region according to the criteria phenomena; analysis and explanation of spatial and functional relationships among the criteria phenomena and other elements considered; and a degree of simplicity amenable to quantitative analysis with available techniques. As Whittlesey has summarized elsewhere,

> The regional method . . . is a method common to all phases of geographic study. Yet in the entire body of publications on the region that were examined (during a review) no comprehensive analysis of the elements and characteristics of the region was discovered. The prime objective in regional study in North America has been the presentation of the characteristics of particular regions, a natural tendency in a world and continent where thousands of presumptive areal homogeneities challenge inquiry and interpretation. The studies produced have treated different categories and ranks of regions with little or no thought of their relations to each other and with no attempt to formulate a systematic method of handling them. (Whittlesey, 1954, p. 30).

The studies are of great variety, for there are no commonly accepted "laws" of regions or procedures for regional study, however, most of the work to date has been more general than precise, more qualitatively descriptive than analytical, and too expansive for reliable quantitative analysis of the subject.

Commonly, studies have been undertaken with some special need or interest overshadowing the point that collection of adequate data for quantitative analysis of the subject phenomena was either not feasible or not possible. In many desert areas, notably of Australia, Israel, the U.S.S.R., the U.S.A., and mainland China, the classification of regional types has been a by-product of government-inspired planning studies and most often produced by a team of scientists of several disciplines. Such work is based upon the economic needs of the parent countries and, thus, in only a few cases is concerned with the more rigorous aspects of scientific regionalization.

Inadequate basic information is one of the central problems of this topical field, especially a lack of data on the cultural environments, but even in areas for which some basic data have been gathered, often no attempt at regional analysis has been made.

Notably lacking but desirable are accurate syntheses of information on specific desert regions, based upon quantitative and other careful scientific techniques and prepared by researchers with extensive field experience in the area of research. Obviously, an enormous amount of work remains to be done to apply effective regional studies to the desert environments of the Earth and to analyze desert regional types.

The deficiencies noted above are not limited to any one continent but prevail generally for all desert areas of the Earth. Most desert areas have been the subject of extremely few concerted regional studies as described in this chapter. At present few large desert regions have been defined on other than climatological, physiographic, or vegetation terms; the cultural element, especially settlement, transportation, and land use has generally been neglected.

2. Basic Data Requirements

Regional studies generally apply to extensive areas, and desert regional studies especially tend to apply to vast, remote areas that have been relatively (sometimes extremely) inhospitable to travel or extended occupance by man. The problem of

acquiring adequate data has generally provided an impossible barrier to application of quantitative description and analysis to desert regions. This prevailing barrier has doubtless contributed to the extensive disinterest among geographers toward quantitative procedures in regional studies, and to a lesser extent towards regional studies in general, which commonly suffer from the lack of quantitative data and procedures.

Remarkable advances in technology during recent years hold great promise for breaching the barrier against extensive data acquisition in inhospitable areas, and, thus, for extending rigorous regional analysis into all the desert environments of the Earth.

B. POTENTIAL OF DESERT REGIONAL STUDIES

1. New Possibilities

Recent remarkable advances in technology promise revolutionary advances in the methods, quantity, and speed of acquiring quantitative data for the surface of the Earth. Some of the conventional uses of aerial photography are already well known. Other techniques of remote sensing are continually being added and improved, owing in part to space and satellite programs, and include the sensing of various radiations including infrared and radar and the use of a variety of infrared color films.

Various remote-sensing techniques during rapid overflights can detect and measure conditions such as temperature, moisture, and the distribution and various conditions of plants, even the incidence and severity of disease. Several techniques and applications of remote-sensing techniques are discussed in the Proceedings of a *Symposium on Remote Sensing of Environment* (1966). Properly designed instrumentation carried by satellites will be able to provide vast amounts of basic data for desert environments regardless of their degree of impenetrability by ground travel.

Such remote-sensing techniques can be calibrated and complemented by arrays of telemetering instrument packages on the ground (probably air-droppable and possibly powered by solar or other continuous means) and by manned scientific stations and expeditions as required.

Such new methods can be used to provide the data required for quantitative analysis of various phenomena of desert regions. Data on locational distribution of various phenomena could be superimposed in exact locational register in computers, building up regional analogs which could be systematically analyzed electronically to disclose locational (and suggest physical) interrelations of various phenomena.

2. General Sequence Indicated

Regions can be defined and studied on a scale of complexity, as outlined by Whittlesey, from a very few select phenomena up to the very many phenomena of a "total region." Although various types of regional studies can be useful, it would seem desirable that extensive effort be concentrated in the near future towards using and mastering:

1) remote sensing, in effective combination with other modern and useful types of data acquisition,
2) quantitative procedures, and
3) procedures for developing and analyzing regional analogs by automatic data processing.

It would seem most feasible that the earliest efforts concentrate on studies of simple regional types defined in terms of only a few selected variables as criteria. Quantitative analysis, isolation of variables, and so forth will be most easily applied at first in situations entailing use of few (2-4) variables. After basic concepts and successful and accurate procedures are developed and mastered at the "few-variable" level, as methodology permits it will be desirable that the number of variables dealt with simultaneously in each study be gradually increased.

It should prove very useful to superimpose the locational quantitative distributions of numbers of phenomena, probably in a computer, thus building up rather comprehensive analogs of various desert regional type which can then be systematically analyzed by proper programming.

3. Contributions to the Knowledge of Desert Environments

The study of desert regional types, although not yet generally very effectively employed, holds great promise of increasing the knowledge of desert environments if employed as discussed above in ways that quantitative procedures and contemporary technology now permit.

General Applicability

The approach outlined here, as mastered, may be focused upon many types of measurable phenomena and upon any desired desert environment. Careful selection and areal delimitation of measurable phenomena and the use of quantitative procedures to analyze spatial relationships between such phenomena can provide a sound base upon which to build precise definitions, terminology, and concepts, helping to obviate the ambiguity prevailing heretofore and to clarify communication among the many and far-flung researchers studying desert environments.

Precision

Throughout this compendium are noted extensive problems of ambiguity in the study of desert environments. Disagreement and inconsistent use of terms, definitions, and criteria contribute to the inefficiency of communication and cooperation among the world's scientists and researchers studying deserts. Such ambiguity doubtless prevails partly because of the relative lack of a sound foundation of adequate measurable basic data and the use of quantitative procedures.

Selection of measurable phenomena, measurement by modern means, and the application of quantitative procedures to description of the phenomena and to determining their extension, distributions, and relationships in space will provide more explicit data and concepts than have been available at the basic level of description of phenomena. This situation, in turn, may be expected to generate more explicit concepts, terms, and definitions, to permit more precise description of various desert regions, and to contribute toward more unequivocal communication among the many scientists studying the world's desert environments.

Analysis

After sufficient basic data are collected, the areal (and quantitative) distributions of the selected phenomena can be mapped, individually or in combinations for specific studies or analogs. Also, the areal distributions of selected phenomena can be superimposed, in exact locational register, probably by computer; then, the computer-contained spatial "analog" of a given area may be systematically analyzed (without further field work) by proper programming of the computer.

The computer could be programmed to compare the distributions of phenomena, thus disclosing (or measuring) tendencies toward areal congruence of different environmental elements. Thus, hypotheses regarding interrelationships among different environmental elements would tend to be strengthened, weakened, or even initially generated (in the case of congruencies being disclosed that were not previously suspected). A coextension of certain phenomena might not be readily observable to a scientific observer moving about within a subject area, but the computer, properly programmed, could automatically disclose the tendency toward congruence, suggesting a relationship that could then be investigated further.

Analysis of such a locationally-registered quantitative analog would also permit isolation of individual environmental elements to determine their effects. This basic scientific procedure is often relatively easy within the laboratory: physically isolate a simple environment with a few subject variables, adjust one variable while holding the others constant, and observe the result. In a "wild" outdoor situation saturated with innumerable and various interrelated phenomena, however, the matter of isolating variables has been most difficult – but once adequate basic data have been collected into a spatial analog within a computer, it should be feasible to isolate and investigate the effects of a given variable by means of selective comparisons of the locational distributions of a group of related phenomena.

Such spatial-analog computer analysis of physical and/or cultural environments, as mastered, could be applied to analysis of any desert (or other) environment.

Indicators

Quantitative analysis can also be expected to determine the degree of reliability with which certain phenomena within a region may serve as indicators of less discernible phenomena; as one example, certain plants identifiable by remote spectral analysis by overflight may prove to indicate reliably the presence of subsurface water (at a certain depth) not otherwise so readily detectable.

4. Relation to Geography

Revolutionary new techniques, notably remote sensing, now permit collection of vast quantities of data for large areas of the Earth's surface – far beyond anything possible in prior decades, especially for inhospitable areas such as some deserts – and computer technology is available to render feasible the processing and analysis of such vast quantities of data. It is most likely that these powerful new techniques of research will soon be very widely used, revising and vitalizing regional study. Specialists are beginning to employ such techniques in their respective fields, for example in agriculture, to observe rapidly or investigate crop conditions over large areas.

These new techniques for regional study, however, by proper selection of appropriate elements to be observed, can be applied (like many techniques of geography) to the subject matter of each of many scientific disciplines treating observable phenomena on the surface of the Earth, such as rainfall and other elements of weather, tides, terrain features, and plant distribution and conditions. Thus, it seems reasonable that these powerful general-purpose new approaches to regional study will fall within the province of geography.

Geography attends to the observation, description, and analysis of the spatial distribution of

phenomena over the surface of the Earth. Historically, much of the observation was by eye, much of the description by building up relatively sketchy analogs of colors and symbols on paper (maps) and of words (text descriptions), and much of the analysis by intuitive hypothesis and only occasionally by mathematics, checked to varying degrees by further investigation. Geography has commonly been plagued by the lack of adequate data for rigorous quantitative analysis. Aerospace technology would appear to now permit the development of techniques of an aerospace geography, which would employ observation from aerial overflights and from satellites in space, as well as other means. The large amounts of data so obtained would permit quantitative description and analysis not heretofore commonly possible, thus increasing the rigor of geography as a science. Large quantities of data on the spatial distributions of many types of phenomena could be collected within "geographical computers" into "geographical" or "regional" analogs (i.e., "computer maps") of the subject regions. The "computer maps" could contain many times more data on each region than could several paper maps, and in a form more readily subject to a wide range of analysis. (As just one theoretical example of the possible uses of comprehensive computer maps, once developed: with a minimum of delay, a geographer working with a geographic computer could analyze its "map" of a given desert region in terms of such elements as topography, settlements, surface materials, and subsurface water, and could rapidly provide a number of alternative routes for a planned expedition or a proposed new road through the desert.)

C. RECOMMENDATIONS

To further the theory and the methods of regional study, and to advance the knowledge of desert regional types, programs should be developed to accomplish the following tasks:

1) Determine the types of data on desert environments that can be obtained in quantity by use of remote sensing (and the degree of augmentation required by other means for various types of data).
2) Determine the types of data required for various desirable programs applicable to various desert environments, considering the relative need for the programs; kinds of programs to be considered would probably include: agricultural development, water development, human settlement, economic development, mineral development health, military capability and survival, development of transportation and communication, and recreation.
3) Determine the most needed types of data that are feasible to obtain, and select coherent families of data that can be meaningfully grouped and dealt with together, composing and defining various desert regional types.
4) Develop integrated overall programs to obtain the desired data for various desert environments (using present sensing equipment and developing sensing equipment needed to fill gaps; using the most efficient combination of remote sensing by satellite and aircraft, aerial photography, air-droppable telemetering sensors, research expeditions, permanent stations, existing data, etc.; and, for efficiency, using joint operations, multipurpose equipment, pools of equipment, etc. whenever possible).
5) Gather quantitative data on the physical and cultural environments of desert areas.
6) Classify the data; make categories of data and corresponding maps available for use of those engaged in various projects in various desert regions.
7) Develop required procedures, and then collect categories of data that may have meaningful interrelationships, in exact locational register, probably in computers, thus building up computer analogs or "maps" of the desert regions. Thereafter, the computer maps should be systematically analyzed to disclose the degree of interrelationship among various elements, and the computer should be programmed to investigate its contained "map" in any desired way.
8) Use quantitative techniques and/or automatic data processing to define and determine the extension of various desert regional types. (The degree of similarity or analogy *between* different desert regions, each defined by computer from quantitative data, could be fairly accurately determined.)
9) Produce maps (including computer-printed maps) and compile atlases, defining and locating important desert regional types, for the varied use of the scientific community.

PERTINENT PUBLICATIONS

This section combines an annotated bibliography and a more inclusive reference list. Many of those works which it has been possible to determine are of particular significance or interest to this study within the limitations discussed in the chapter are annotated. Other competent works and best-available works on specific subjects and areas are listed without annotation; lack of annotation should not be construed as *necessarily* indicating a less important publication.

Abel, H.

1965 Angola und Südwest Afrika. George Westermann Verlag, Branschweig.

A portion of Westermann's Lexicon der geographie. Filled with excellent informative material, with a good bibliography attached to each heading. No pagination.

Academia Sinica

1959 Conference of the working plan of the Desert Control Expedition (translated title). Ko Hsueh Tung Pao 3. 99 p.

Report on meeting held January 16-23, 1959, by delegates from Inner Mongolia, Sinkiang, Kansu, Ch'ing-hai, Shensi, and Ning-hsia, to discuss future plans for: 1) studies of the desert regions to increase understanding of natural conditions and to make progress in reclamation possible; 2) work on specific experimental projects on desert control through research stations in the areas covered; and 3) work on such specific problems as the origin of deserts, system of shifting sand dunes and holding sand by windbreaks, survival of plants seeded by airplanes, uses of grasslands, groundcover in sandy areas and patterns of change, special characteristics of desert plants and animals, methods of holding sand and planting trees and grass, uses of arid area agriculture, reclamation and utilization of Gobi Desert, utilization of water resources and improvement of salt lands, new techniques for utilizing solar and wind energy.

Academia Sinica. Sand Control Team

1960 Experimental research in controlling deserts (translated title). Ko Hsueh Tung Pao 4:123-125.

Important accomplishments noted for the period covered by this report (1959) include evaluation of conditions in the important deserts and basins in the Northwest and Inner Mongolia, classification of desert landforms, reports and maps on landforms, hydrology, geology, climate, faults, vegetation, grasslands, and progress in planning for desert control. Of the three major tasks of the Sand Control Team, determination of the origin of sand on each desert, determination of vegetation in the deserts, and accurate measurement of the size of deserts, the following major results of research were stated: better understanding of wind transportation of sand, construction of sand barriers to stop wind erosion, tree planting to hold shifting sands, successful use of airplanes in experimental planting, development of improved varieties of grass cover, and improved development and use of water sources.

Ackerman, E. A.

1958 Geography as a fundamental research discipline. University of Chicago, Department of Geography, Research Paper 53.

African Studies Association

1961 American doctoral dissertations concerned with Africa. African Studies Bulletin 4(1).

A valuable and complete listing.

Ahmad, K. S.

1947 Physiography of the Punjab plain. Punjab Geographical Review 2:2-7.

Alampiev, P.

1959 Soviet Kazakhstan. Foreign Languages Publishing House, Moscow. 185 p.

The book begins with a general description of the landscape and the natural resources of the republic. A topical survey of the republic is made, covering primarily the industrial, agricultural and transportation development. A section on the life and culture of the people is presented and describes how happy the people are to be Soviet citizens. Finally, Kazakhstan is discussed from a regional viewpoint, with the republic broken down into northern, southern, eastern, and western regions. A geographical comparison is made between the economic development before and after the October Revolution, mainly to impress the reader with the progress made since the Soviets moved into Kazakhstan.

Alexander, C. S.

1958 The geography of Margarita and adjacent islands, Venezuela. University of California, Publications in Geography 12(2):85-191.

High quality monographic treatment of physical and cultural landscape evolution in the small, arid Caribbean islands off the Venezuelan mainland. Original maps from field work.

Almeyda Arroyo, E.

1965 El desierto de Atacama. Sociedad Argentina de Estudios Geográficos, Boletín 16:57-64.

General description of the region of the Atacama desert of Chile.

Amiran, D. H. K.

1955-1956 The geography of the Negev and the southern limit of settlement in Palestine. Israel Exploration Society, Bulletin 20:108-117.

A thorough study of the historical and settlement geography of the Negev up to the beginning of the recent

period of organized and intensive regional settlement developments in the arid southern half of Israel.

Andersson, C. J.

1855 Explorations in South Africa, with route from Walfish Bay to Lake Ngami, and ascent of the Tioge River. Royal Geographical Society, Journal 25:79-107.

A fair narrative account with an interesting map.

1856 Lake Ngami, or, Explorations and discoveries during four years' wanderings in the wilds of South Western Africa. Hurst and Blackett, London. 536 p.

Maps and numerous illustrations. An excellent narrative.

1858 Reisen in Südwest-Afrika bis zum See Ngami in den Jahren 1850 bis 1854. Coftenoble, Leipzig, 2 vols.
(Travels in South West Africa as far as Lake Ngami in the years 1850 to 1854)

Excellent original narrative account by the first visitor to much of the area. Fine descriptions and observations.

1861 The Okavango River: a narrative of travel, exploration and adventure. Hurst and Blackett, London. 364 p.

An excellent narrative account of early exploration.

1863 Der Okavango-strom. Entdeckungsreisen und jagdabenteuer in Südwest-Afrika. Deutsch von Hugo Hartmann. Gerhard, Leipzig. 258 p.
(The Okavango River. Exploring expeditions and hunting adventures in South West Africa)

An excellent and informative narrative.

1875 Notes of travel in South Africa. Edited by L. Lloyd. Hurst and Blackett, London. 338 p.

An excellent narrative.

Angebauer, K.

1926 Ovambo: fünfzehn jahre unter Kaffern, Buschleuten und Bezirksamtmännern. Scherl, Berlin. 257 p.
(Ovambo: fifteen years under Bantu, Bushmen, and District Officers)

A narrative account, probably with much material but lacking totally in organization. Good photos.

Anonymous

1955 A bibliography of African bibliographies, covering territories south of the Sahara. 3rd rev. ed. South African Public Library, Cape Town, Grey Bibliographies 6. 169 p.

An excellent listing of bibliographies, topically arranged, to 1955.

Aschmann, H.

1960 Indian pastoralists of the Guajira Peninsula. Association of American Geographers, Annals 50(4): 408-418.

Short, but well-done study of human ecology in the dry peninsula of Colombia and Venezuela. Suggests two physically distinctive landscapes, i.e., Alta and Baja Guajira.

1967 The central desert of Baja California: Demography and ecology. Manessier Publishing Company, Riverside, California. 315 p.

This work appeared originally in 1959 as Ibero-Americana 42. The reprint includes some changes, mostly additions to bibliography, p. 269-282, and in the number of plates. Text covers physical character of the Central Desert, ecology of the Central Desert Indians, as well as discussions of the aboriginal population and some historical perspective. Maps, plates, figures.

Atlas of Agriculture of the U.S.S.R.

1960 Atlas Sel'skogo Khozyaystva SSSR. Glavnoye Upravleniye Geodezii i Kartografii Ministerstva Geologii i Okhrany Nedr SSSR, Moskva. 309 p.

An extensive, detailed, complete atlas of the agriculture of the Soviet Union. Besides agriculture, the distributions of the natural conditions affecting agriculture are also given. Livestock is also taken into account. The coverage is both at the Union level as well as for each republic.

Atlas of Kustanay Oblast

1963 Atlas Kustanayskoy Oblasti. Moskovskii Gosudarstvennyy Universitet, Geograficheskiy Fakul'tet i Akademiya Nauk Kazakhskoy SSR. Glavnoye Upravleniye Geodezii i Kartografii Gosudarstvennogo Geologicheskogo Komiteta SSSR. Moskva. 80 p.

Complete coverage of the natural conditions and the resources of this northern Kazakhstan oblast. Agriculture, industry, population, and transportation are also covered.

Atlas of the U.S.S.R.

1962 Atlas SSSR. Glavnoye Upravleniye Geodezii i Kartografii Ministerstva Geologii i Okhrany Nedr SSSR, Moskva. 185 p.

This is a general political, economic, and physical atlas of the Soviet Union. One of the best features of this atlas is an index at the end (pp. 149-195), which gives the location of all place names in the Soviet Union. An English translation of all legends and map titles in this atlas was made by Telberg Book Co., New York, under the title "English Key to the Atlas of USSR," (1963).

Atlas of the Uzbek Soviet Socialist Republic

1963 Atlas Uzbekskoy Sovetskoy Sotisialisticheskoy Respubliki. Akademiya Nauk Uzbekskoy SSR, Glavnoye Upravleniye Geodezii i Kartografii Ministerstva Geologii i Okhrany Nedr SSSR, Tashkent-Moskva. 53 p.

A physical atlas of the Uzbek SSR covering the geology, geomorphology, soils, vegetation, hydrology, and the climate.

Aubert de la Rue, E.

1957 Brésil aride, la vie dans la Caatinga. Gallimard, Paris. 247 p. (Geógraphie Humaine, 29)

Description of the Sertao, its human geography and landscape character. Emphasizes the contrast of city and countryside in the dry northeast of Brazil, in the French *paysage* tradition.

1962 Caatinga, the dry country of northeast Brazil. Landscape 12(1):18-24.

Condensation and English translation of *Brésil Aride*, re-emphasizing dichotomy of coast and backland, sedentary and migrant peoples.

Bailey, H.
1954 Climate, vegetation, and land use in southern California. California Department of Natural Resources, Division of Mines, Bulletin 170: 31-44.

Baines, T.
1864 Explorations in South West Africa. Longmans, London. 535 p.
A very good narrative account, with much information of a geographical nature.

Balashova, Y. N., O. M. Zhitomirskaya,
N. M. Karaul'shchikova, and I. G. Sabinina
1963 Klimaticheskoye opisaniye Zeravshanskogo rayona. Gidrometeorologicheskoye Izdatel'stovo, Leningrad. 118 p.
(Climatic description of the Zeravshan region)
A very useful climatography of the Zeravshan Valley. The authors analyze the factors of climate, such as precipitation, temperature, winds, and evaporation, the distribution of these factors, their variability and their effect on agriculture in the Zeravshan Valley. A regionalization of the climate is presented along with a section on the agroclimatic conditions for the successful raising of cotton. It has a wealth of information and climatic data.

Barbour, K. M.
1961 The Republic of the Sudan; a regional geography. University of London Press, London. 292 p.

Barth, P.
1926 Südwestafrika. Meinert, Windhoek. 304 p.
An excellent geographical study of the whole territory.

Baugh, R. E.
1926 The Antelope Valley. Clark University. (Ph. D. dissertation)

———
1955 The geographic regions of California; a syllabus for the study of the geography of California. Pacific Books, Palo Alto, California. 76 p.

Baum, H.
1903 Kunene-Sambezi expedition. Verlag des Kolonial-Wirtschaftlich Komitees, Berlin. 593 p.
Excellent natural history, particularly on the Angola side of the border, but still of great interest in South West Africa.

Beal, C. H.
1948 Reconnaissance of the geology and oil possibilities of Baja California, Mexico. Geological Society of America, Memoir 31.

Beguinot, A.
1915 Missione scientifica Stefanini-Paoli nella Somalia meridionale (1913). Frutti e semi della formazione delle Mangrovie raccolti lungo la costa somala. Reale Società Geografica Italiana, Bollettino, ser. 5, 4(1):7-30.

———
1918 Sulla constituzione dei boschi di mangrovie nella Somalia Italiana. Reale Società Geografica Italiana, Bollettino, ser. 5, 7(3-4).

Bernard, A.
1939 Sahara, Afrique occidentale. *In* P. Vidal de La Blache et L. Gallois, Geographie universelle, t. 11, pt. 2. Librarie Armand Colin, Paris. 529 p.
Chapter 11: Divisions politiques et régions naturelles, p. 357-394. Includes discussions on (1) le Sahara central, (2) le Sahara septentrional, (3) le Sahara oriental, (4) le Sahara occidental, (5) l'Archipel des Canaries, and (6) le Sahara meridional. Illustrated with photographs and maps. Bibliography: p. 393-394.

Berry, B. J. L. and T. D. Hankins
1963 A bibliographic guide to the economic regions of the United States. University of Chicago, Department of Geography, Research Paper 87. 101 p.

Beydoun, Z. R.
1960 Synopsis of the geology of east Aden Protectorate. International Geological Congress, 21st, Copenhagen, Report 21:131-149.

Bharadwaj, O. P.
1961 The arid zone of India and Pakistan. *In* L. D. Stamp, ed., A history of land use in arid regions. Unesco, Paris. Arid Zone Research 17:143-174.
A general geographic study of land forms, climatic change, land tenure and agricultural land use, and soil problems. Author suggests additional research into methods of improved land use and soil conservation methods. Little information on indigenous vegetation types.

Bharucha, F. R.
1955 Afghanistan, India and Pakistan. *In* Plant ecology, reviews of research. Unesco, Paris, Arid Zone Research 6:19-34.

Bielschowsky, L.
1949 A list of books in German on South Africa and South West Africa, published up to 1914. University of Cape Town, Cape Town. 84 p.
Good – as far as it goes, but far from complete.

Blanford, W. T.
1873 On the nature and probable origin of the superficial deposits in the valleys and deserts of central Persia. Geological Society of London, Quarterly Journal 29:495-501.

———
1876 Geology. *In* Eastern Persia, an account of the journeys of the Persian Boundary Commission, 1870-72, vol. 2. London, Oxford. 2 vols.

Blasquez, L. L.
1956 Bosquejo fisiográfico y vulcanológico del occidente de México.
Congreso Geológico Internacional, 20th, México. Excursion A-15.
(Outline of the physiography and volcanology of western Mexico.)

Blondel, F.
1935 La geologie et les ressources minérales de l'Ethiopie, de la Somalie et de l'Eritrée. Chronique des Mines Coloniales 4(43):306-317.

Boaler, S. B. and C. A. H. Hodge
1962 Vegetation stripes in Somaliland. Journal of Ecology 50:465-474.

———
1964 Observations on vegetation arcs in the northern region, Somali Republic. Journal of Ecology 52:511-544.

Bobek, H.
1953-1954 Klima und landschaft Irans in vor- und fruhgeschichtlicher zeit.
Geographischer Jahresbericht aus Osterreich 25:1-42.
(Climate and landscape of Iran in pre- and early historic time.)

Bobek, H.

1959 Features and formation of the Great Kawir and Masileh. University of Tehran, Arid Zone Research Centre, Publication 2. 63 p., 16 pl., map.

Bogardus, J. F.

1930 The Great Basin. Economic Geography 6:321-337.

An economic regional study based upon aridity and interior drainage, largely out of date.

Bol'shaia sovetskaia entsiklopediia.

1950- Bol'shaia sovetskaia entsiklopediia.
1958 2-e izd. Moskva.
(Great Soviet encyclopedia)

The standard reference for a great range of topics on the Soviet Union, as well as for the rest of the world. Since 1957 kept up-to-date by annual supplements.

Bonillas, Y. S. and F. Urbina

1913 Informe acerca de los recursos naturales de la parte norte de la Baja California, especialmente del Delta de Río Colorado. Instituto de Geología de México, Parergones 4:162-235.
(Report on the natural resources of northern Baja California, particularly the Colorado River Delta.)

Booy, T. de

1918 The western Maracaibo lowland, Venezuela. Geographical Review 6(6):481-500.

Report of field excursion on the borders of the dry Maracaibo lowland. Emphasizes physical landscape delimiting three zones of (1) arid coast, (2) dry forest, and, (3) savana.

Boyko, H.

1954 A new plant-geographical subdivision of Israel (as an example for Southwest Asia). Vegetatio: Acta Geobotanica 5-6:309-318.

———

1955 Iran, Israel and Turkey. *In* Plant ecology, reviews of research. Unesco, Paris. Arid Zone Research 6:40-76.

———

1966 Salinity and aridity, new approaches to old problems. W. Junk, The Hague. 408 p. (Monographiae Biologicae 16)

Brett, E. A.

1959 Tentative list of books and pamphlets on Southern Africa published in the United States and Canada. Public Library, Johannesburg. 48 p.

A bibliography covering a very narrow field, and author arranged only (no cross-indexing). Of limited value.

Brown, J. S.

1923 The Salton Sea region, California. U. S. Geological Survey, Water Supply Paper 497. 292 p.

Bryan, K.

1925 The Papago country, Arizona. U. S. Geological Survey, Water Supply Paper 499. 436 p.

Budyko, M. I.

1956 Teplovoi balans zemnoi poverkhnosti. Gidrometeorologicheskoye Izdatel'stov, Leningrad. 255 p. Translated, 1958, by Nina A. (Stepanova) Zikeev, as "Heat balance of the Earth's surface," U. S. Weather Bureau, Washington, D. C.

The most valuable monograph on heat balance yet produced anywhere.

———

1963 Atlas teplovogo balansa zemnogo shara. Moskva. (Atlas of the heat balance of the earth)

This atlas is a complete revision of the 1955 publication, *Atlas of Heat Balance* (translated title), published by the Main Geophysical Observatory in Leningrad. It contains some 69 maps depicting the various components of the heat balance over the world. All of the maps are at a scale of 1:70,000,000.

Capot-Rey, R.

1953 L'Afrique blanche française. II: Le Sahara français. Presses Universitaires de France, Paris. 564 p.

Carter, D. B.

1954 Climates of Africa and India according to Thornthwaite's 1948 classification.
Johns Hopkins University, Laboratory of Climatology, Publications in Climatology 7(4):453-474. Contract Nonr-248(40), Final Report.

Carter, H. J.

1857 Memorandum on geology of the southeastern coast of Arabia. p. 33-34, 94-95. *In* Geological Papers on Western India, including Cutch, Sinde, and south-east coast of Arabia; to which is appended a summary of the geology of India generally. Edited for the Government by H. J. Carter.

Chambers, W. T.

1948 Geographic regions of Texas. Texas Geographic Magazine 12:7-15.

Chang Te-sheng

1954 Progress in the scientific study of the Northwest to serve our country's socialist beginnings (translated title); a report given at the founding meeting of the Academia Sinica's Northwestern Division Research Committee, July 16, 1954. Academia Sinica, Peking, Ko Hsueh Tung Pao 9:1-4.

Outlines plans for organizations to be established in Lanchow and Sinkiang to aid industry in the Northwest through detailed study of natural conditions, especially liquid and fuel resources; and to aid agriculture, forestry, water conservation, and livestock, with emphasis on soil and water conservation on the middle and upper Yellow River.

Chapman, J.

1868 Travels in the interior of South Africa. London. 2 vols.

An excellent narrative account.

Chaves, M.

1953 La Guajira: una región y una cultura de Colombia. Revista Colombiana de Antropología 1(1):123-195.

Pedestrian anthropological essay on conditions of land and life in the arid Guajira Peninsula of Colombia and Venezuela.

Chenery Library, Boston

1960 Catalog of African Government documents and African area index.

A good resume of publications by the various African governments.

Chhibber, H. L.

1945 India. Part 1: Physical basis of the geography of India. Nand Kishore, Benares. 282 p.

Chia Chen-hsiu
1953 Natural conditions in the Tibetan plateau (translated title). Academia Sinica, Peking, Ko Hsueh Tung Pao 8:51-58.
Report on the findings of a 2-year expedition to Tibet. Major areas of research were physical geography and topography, climate, soil, and distribution of vegetation.

Chiovenda, E.
1929-1936 Flora Somala. Pt. 1, Sindicato Italiano Arti Grafiche, Rome. 437 p. Pt. 2, Forli, Valbonesi. 482 p. Pt. 3, raccolte Pollacci *et al.* Università di Pavia, Instituto Botanico, Atti ser. 4. 7:117-160.

Christian, C. S.
1952 Regional land surveys. Australian Institute of Agricultural Science, Journal 18:140-146.

Christian, C. S. *et al.*
1954 Survey of Barkly region, Northern Territory and Queensland, 1947-48. C.S.I.R.O. Land Research series 3. 182 p.

Chupakhin, V. M.
1964 O teoreticheskikh i metodicheskikh osnovakh skhemy kompleksnogo fiziko-geograficheskogo rayonirovaniya Kazakhstana. Izvestiya Vsesoyuznogo Geograficheskogo Oschchestva 96(6):459-470.
(About the theoretical and methodological basis for a scheme of a complex physical-geographic regionalization of Kazakhstan)
The variety of the natural characteristics peculiar to the territory of Kazakhstan as a whole, and observed on relatively large and small scales, contains the conditions for the formation of a multitude of physical-geographic complexities. The landscape complexity of Kazakhstan, due to a number of reasons, calls for an objective exposure of the existing features of the landscape and the processes involved in shaping them. Included is a map of the complex physical-geographic regionalization of Kazakhstan, followed by the scheme of classification.

Church, R. J. H., *et al.*
1964 Africa and the islands. Wiley, New York. 494 p.
A textbook on Africa that almost completely ignores South West Africa.

Ciferri, R.
1939 Le associazioni del litorale marino della Somalia meridionale. Rivista di Biologia Coloniale 2:5-42.

Cline, G. G.
1963 Exploring the Great Basin. University of Oklahoma Press, Norman, Oklahoma. 254 p.

Clough, O., ed.
1930 South West Africa. Report on African Affairs 2:161-183.
An excellent compendium for its period.

———
1933 South West Africa. Report on African Affairs 5:179-201.
An excellent compendium, rich in statistics.

Cole, M. M.
1961 South Africa. Dutton, New York; Methuen, London. 696 p.
Thorough, essentially topical. Does not separate regions until the very end. Very little on South West Africa.

Cressey, G. B.
1958*a* Qanats, Karez, and Foggaras, Geographical Review 48:27-44.
The best and most thorough study of the typical irrigation system of Iran from an engineering point of view as well as the effect on urban and agricultural water supplies of the distribution of qanats. Cost comparisions with pipe line systems.

———
1958*b* The Shatt al Arab Basin. Middle East Journal 12:448-460.
A regional study of Southern Iraq with a detailed study of irrigation systems, crops, salinity problems, and geomorphology of the delta lands.

———
1960 Crossroads; land and life in southwest Asia. Lippincott, Chicago 593 p.

Crist, R. E.
1958 The land and people of the Guajira Peninsula. Smithsonian Institution, Annual Report, 1957. Publication 4324:339-355.
Colorful description of the harsh physical environment of the Guajira peninsula, stressing the activities of the inhabitants and the quality of life in this arid landscape.

———
1959 Acculturation in the Guajira. Smithsonian Institution, Annual Report, 1958. Publication 4370:481-499.
Cultural transition of Indians in the arid Guajira peninsula, including comments on land tenure, agricultural and household activities, diet, and other social characteristics.

Cross, J. L., E. H. Shaw, and K. Scheifele, eds.
1960 Arizona, its people and resources. University of Arizona Press, Tucson. 385 p.

Curson, H. H.
1947 Notes on the eastern Caprivi Strip. South African Journal of Science 43:124-157.
An excellent geographical study with a good bibliography.

Curti, G. P.
1955 The Borrego Valley, California: the birth of a desert community. University of California, Los Angeles (M.A. thesis)

Czajka, W.
1957*a* Das inselbergproblem auf grund von beobachtungen in nordost-Brasilien. Petermanns Geographische Mitteilungen, Erganzungsheft 262:321-333.

———
1957*b* Die Serra do Ataripe; ein tafelgebirge in nordost-Brasilien. Die Erde 88(3-4): 320-333.
Not oriented toward arid zone, but a competent work on geomorphology.

Dahlberg, R. E. and B. E. Thomas
1962 An analysis and bibliography of recent African atlases. African Studies Bulletin 5(11): 22-33.
An excellent listing and review of recent atlases, with its supplement by the same authors (1963).

———
1963 Supplement #1. African Studies Bulletin 6(May):6-9.

Dainelli, G.
1943 Geologie dell' Africa orientale. Vol. I: Il progresso delle conoscenze, 464 p.; Vol. II: L'imbasamento cristallino e la serie sedimentaria Mesozoica, 704 p.; Vol. III: La successione Terziaria e i fenomeni del Quaternario, 748 p.; Vol. IV: Tauole, 10 plates and geologic map. Reale Accademia d' Italia, Centro Studi per l' Africa Orientale Italiana, Rome.

Darnell, W. I.
1959 The Imperial Valley: its physical and cultural geography. San Diego State College (M.A. thesis).

Davitaya, F. F., ed.
1955 Agroklimaticheskiye i vodnyye resursy rayonov osvoyeniya tselinnykh i zalezhnykh zemel'. Gidrometeorologicheskoye Izdatel'stvo, Leningrad. 464 p.
(Agroclimatic and water resources in the regions of the reclamation of the virgin and idle lands)
A detailed examination of the climatic factors affecting the virgin and idle land region. Also included are landforms, water resources, and the agroclimatic factors affecting various crops.

Davitaya, F. F.
1959 Nauchnye osnovy bor'by s zasukhoi po prirodnym zonam SSSR. Izvestiia Akademii Nauk SSSR, Seriya Geograficheskaya 1959 (1):7-29.
(Scientific bases of drought prevention by natural zones of the U.S.S.R.)
Maps are included to show productive moisture supplies in the first meter of the soil under various farming practices, annual variation in precipitation and snow cover, spring surface runoff, differences between potential and actual evaporation, etc. Methods of ameliorating the climatic hazards to agriculture are discussed. The article is a very valuable presentation.

1961 Arid-zone studies in the USSR, 1956-1960. Soviet Geography. Review and Translation 2(2): 69-71.
A review of Soviet studies dealing with the general theoretical principles of the interaction between the lithosphere, biosphere, hydrosphere, and atmosphere in the arid zones of the USSR that was prepared for the I.G.U. Arid Zone Commission.

1962 Transformation of nature in the steppes and deserts, p. 281-289. *In* Geograficheskoe Obshchestvo SSSR, Soviet geography, accomplishments and tasks; a symposium of 50 chapters, contributed by 56 leading Soviet geographers and edited by a committee of the Geographic Society of the USSR, I. P. Gerasimov, Chairman. Translated from the Russian by Lawrence Ecker. English edition edited by C. D. Harris. American Geographic Society, New York. 409 p.
A reliable account of the possibilities for climatic amelioration in the arid regions of the U.S.S.R.

Davitaya, F. F., O. A. Drozdov, and Y. S. Rubinshteyn
1960 Study of the climatic resources of the USSR and their economic utilization. Soviet Geography: Review and Translation 1(6):11-34.
A detailed evaluation of climatic components as resources. Recommendations are made for complete utilization of the rather limited climatic resources of the U.S.S.R.

Debenham, F.
1952 The Kalahari today. Geographical Journal 118:12-23.
A good review and prophecy for the Bechuanaland (now Botswana) Kalahari.

1953 Kalahari sand. G. Bell and Sons, London. 189 p.
A very good narrative account of Bechuanaland (now Botswana) by a top English geographer.

De Blij, H. J.
1958 Notes on the geography of South West Africa. Journal of Geography 57(7):333-341.
An informative article, compiled from library sources, covering the whole territory.

1962 Africa South, Northwestern University Press, Evanston, Illinois. 399 p.
Has only a rather general coverage of South West Africa.

Dios Bojorquez, J. De
1946 Descripción de Sonora. Sociedad Mexicana de Geografía y Estadística, Boletín 61:11-35.

Dolgopolov, K. V., V. V. Pokshishevskiy, and S. N. Ryazantsev, eds.
1957 Povolzh'e; ekonomiko-geograficheskaya kharakteristika. Akademiya Nauk SSSR, Institut Geografii, Gosudarstvennoye Izdatel'stvo Geograficheskoy Literatury, Moskva. 463 p.
(The Volga region; economic-geographical characteristics)
This is a good, detailed regional economic geography of the Volga River region. The first part systematically treats the region, discussing the physical geography, the population, and the main characteristics of the economy, and also gives an historical outline of the development of the region. The second part divides the region into oblasts and analyzes each subregion from a systematic viewpoint. Maps are included, but the book contains very few tables, graphs, etc., that are worthwhile. However, the book is one of the best treatments of the geography of the Volga River region.

Dove, K.
1896 Deutsche Südwestafrika. Perthes, Gotha. 93 p.
A fine, imaginative treatment of the country with a view to its uses, by the Director of Land Settlement of the German Colony.

Dresch, J.
1961 Observations sur le désert cotier du Perou. Annales de Géographie 70(378):179-184.
Brief comments on the geomorphological features of the desert littoral of Peru.

Dugnan, P., ed.
1963- U.S. and Canadian publications on Africa in to date 1961- to date. Hoover Institution on War, Revolution, and Peace, Stanford University, Bibliographic series 14 (1961), 15 (1962), 20 (1963), and 25 (1964)
This annual topical bibliography, compiled since the issue covering the year 1963 by Liselotte Hofmann, is thorough and excellent. An earlier number for the year 1960 was issued by the Library of Congress, Washington, D. C.

Dunbier, R.
1968 The Sonoran desert, its geography, economy and

people. University of Arizona Press, Tucson. 426 p.

Published too late for review here. Said to be "a fresh approach to the regional study. Through vastly different histories and contrasting technologies, the Mexican and American sectors of the hottest North American desert have evolved in distinctive ways. Explores both the cultural diversity and underlying geographical unity. With a selective eye . . . focuses on the uses of and conflict over what is at first glance an uninviting terrain." Contents: The Desert and Desert Landforms, Climate, Soils, Vegetation, Water, Social Evolution, the Mission Period, Westward Crossings — Discovery, and Development, Water Resource Development, the Native Economy, the Mexican Economy, the American Economy, Political Factors, A Pattern of Settlement.

Dundas, C.

1946 South West Africa — the factual background. South Africa Institute of International Affairs, Johannesburg. 52 p.

Excellent background, especially historical and political.

Durrenberger, R. W.

1959 The geography of California in essays and readings. Brewster Publications, Los Angeles. 196 p.

du Toit, A. L.

1926 The Mier Country. South African Geographical Journal 9:21-26.

An excellent geographical description of a south Kalahari area.

Edwards, D. C.

1940 A vegetation map of Kenya. Journal of Ecology 28(2):377-385.

Emery, K. O.

1956 Sediments and water of the Persian Gulf. American Association of Petroleum Geologists, Bulletin 40:2354-2383.

Engerrand, J. and T. Paredes

1913 Informe relativo a la parte occidental de la region norte de la Baja California. Instituto de Geologia de Mexico, Parergones 4:278-306.

(Report on the western part of northern Baja California.)

English, P. W

1966 City and village in Iran. University of Wisconsin Press, Madison. 208 p.

Results of the author's field work on the Kirman Basin among communities to show diversity and their functional integration in a complex regional organization. Disproves popular idea that Middle East villages are self-sufficient and isolated. Considerable data on climate, soils, crops, land and water ownership. Very scholarly work.

Evelegh, W

1915 South-West Africa. Unwin, London. 260 p.

Very simple and brief — but worth reading for general impressions of that period. Out of date.

Evans, G. *et al.*

1964 Origin of the coastal flats, the sabkha, of the Trucial Coast, Persian Gulf. Nature 202:759-761.

Fedorov, B. V.

1953 Agromeliorativnoye rayonirovaniye zony orosheniya Sredney Azii. Izdatel'stvo Akademii Nauk Uzbekskoy SSR, Tashkent.

(Agricultural ameliorative regional zones of irrigation in Central Asia)

Fel'dman, Y. I.

1960 Osobennosti zasushlivoy i vlazhnoy v rayonakh tselinnykh i zaleshnykh zemel'severnogo Kazakhstana i Altayskogo kraia, p. 147-169. *In* Akademiya Nauk S.S.S.R., Institut Geografii, Gidroklimaticheskiy rezhim lesostepnoy i stepnoy zon S.S.R. v zasushlivye i vlazhnye gody. Moskva.

(Peculiarities of arid and humid weather in the reclamation lands of northern Kazakhstan and Altai Territory)

Drought in the regions of the virgin and idle lands of northern Kazakhstan and the Altai Territory are the result of the fact that during the growing season these regions receive two to three times more solar radiation heat than that expended in evaporation of the annual amount of precipitation in these regions. The remaining heat warms the lower layer of the atmosphere so that frequently sukhovei-drought weather occurs during May to August. The unfavorable relationships of heat and moisture during the growing seasons of the abnormally dry years of 1951 and 1955 were manifested as a high frequency of sukhovei winds and a very small amount of precipitation. Extensive data and synoptic maps are presented and the weather successions in 1954 and 1955 are illustrated by means of the "complex" classification of Chubukov-Fedorov.

Fenneman, N. M.

1931 Physiography of western United States. New York. 534 p.

Feygin, L. Y.

1964 Problems of improving inter-regional productive relationships of the Central Asian economic region. Soviet Geography: Review and Translation 5(6):3-10

Because of the remoteness of Central Asia from other economically developed areas of the Soviet Union and the high costs of transportation, it is proposed that Central Asia achieve a higher degree of regional and local integration and economic self-sufficiency through fuller utilization of natural resources. The region is envisaged as a potential producer of cotton textiles for the national market.

Field, N. C.

1954 Amu-Darya: a study in resource geography. Geographical Review 44:528-542.

The author investigates the possible extension of irrigated acreage in Central Asia based on water from the Amu-Dar'ya. The basic elements in the use of the river for irrigation are the resource of land suitable for irrigation, the volume of water required for the irrigation of a unit area, and the means of adjusting the flow through storage regulation. In discussing the above elements in relation to the planned irrigation projects proposed by the Soviets, the author concludes that there is insufficient water in the Amu-Dar'ya to fulfill all their plans.

Fisher, W. G.

1963 The Middle East. 5th ed. Methuen, London.

Fisk, E.

1952 Dujaila: Iraq's pilot project for land settlement. Economic Geography 28:343-354.

Results of the application of land reform law to the Dujaila Pilot Project near the Kut Barrage. New methods

of land survey and allocation of plots in regard to irrigation channels. A successful example for other development projects.

Fitzgerald, W.
1961 Africa; a social, economic and political geography. 9th ed., rev. Methuen, London; Dutton, N. Y. 511 p.

Fochler-Hauke, G.
1950-1951 Zur abgrenzung, orographie und morphologie der argentinischen Puna. Die Erde 2(1):167-177.
Defines the limits, characteristics, and glacial and fluviatile forms in the Puna de Atacama, an upland of northwestern Argentina.

———
1952 Das Campo de Velasco; naturlandschaftkundliche skizze eines NW-argentinischen bolsons. Erdkunde 6:234-247.
Regional study of the natural landscape of an arid upland basin. Excellent coverage of natural vegetation types within the bolson.

Fournier d' Albe, E. M.
1960 Arid zone research in Mexico. Arid Zone [Newsletter] 8:11-16.

Frazer, W. J.
1959 Changing patterns of land utilization within the Salt River Valley of Arizona. University of Michigan (Ph. D. dissertation) 390 p.

Freise, F. W.
1938 The drought region of northeastern Brasil. Geographical Review 28(3):363-378.
Excellent short study focussed on the dry northeast of Brazil, and the problems of climate and hydrology therein. Significant contribution is the use of the term "drought triangle" to define arid region.

Freykin, Z. G.
1963 Oroshayemoye zemledeliye Sredney Azii i ego geograficheskiye osobennosti. Geografiya v Shkole 1963(5):7-17.
(Irrigated agriculture in Central Asia and its geographic features)
In the U.S.S.R., the desert and subdesert regions occupy 13.1 per cent of the total territory. With irrigation the very properties of the desert climate will allow the production of two crops per year as well as the specialization of crops. Many problems are connected with proper irrigation. Some crops, like cotton, need to be watered 7-8 times per year, while other crops like wheat and oats need to be watered only 2 or 3 times. The characteristics of the rivers are very important for utilization in irrigation. The amount of water and the regime of flow can be determined beforehand in order to see if irrigation is feasible. Another problem is the construction of canals, reservoirs, etc. and the prevention of water loss through evaporation and seepage. Irrigated crop yields are seriously affected by problems of alteration of the soil by salts. Other problems are also discussed.

Frois Abreu, S.
1943 Nordeste do Brasil. Boletim Geografico 1(5): 15-31.
Regional description of northeastern Brazil, especially the Sertão "dry triangle." Largely repetitious of other published works on the region.

Furon, R.
1936 Premiers resultats d' une exploration geologique du grand desert Iranien. Académie des Sciences, Paris, Comptes Rendus 203(9):494-496.
(Preliminary results of a geological exploration of the great Iranian desert.)

———
1941 Géologie du plateau iranien (Perse, Afghanistan, Béloutchistan). Muséum National d' Histoire Naturelle, Paris, Mémoires 7(2):177-411.
(Geology of the Iranian plateau: Persia, Afghanistan, Baluchistan.)

Gabriel, A.
1934 Beobachtungen in Wüstengürtel Innerpersiens 1933. Geographische Gesellschaft, Wien, Mitteilungen 77 (1-6):53-77.
(Observations in the desert belt of Inner Persia.)

———
1938 The southern Lut and Iranian Baluchistan. Geographical Journal 92:193-210.

———
1942 Die Lut and ihre wege. Zeitschrift für Erdkunde 19:423-442.
(The Lut desert and its roads.)

———
1952 Die erforschung Persiens. Vienna.
(The exploration of Persia.)

———
1957 Zur oberflächengestaltung der pfannen in den trockenräumen zentralpersiens. Geographische Gesellschaft, Wien, Mitteilungen 99(2-3): 146-169.
(On the surface form of the pans in the dry regions of central Persia.)

Galindo y Villa, J.
1926-1927 Geografía de la República Mexicana. 2 vols. Sociedad de Edición y Librería Franco Americana, México.)

Galton, F.
1853 Narrative of an explorer in tropical South Africa. Murray, London. 314 p.
An excellent descriptive narrative.

Ganssen, R.
1960 Landschaft und Boden in Sudwestafrika. Die Erde 91(2):115-131.
An excellent, thorough treatment of the relation between soil and the regional use of the land, well based on field studies.

Gansser, A.
1955 New aspects of the geology in central Iran. World Petroleum Congress, 4th, Rome, Proceedings, Sec. 1:279-300.

Garrison, J. J.
1953 Barstow, California: a transportation focus in a desert environment. Economic Geography 29:159-167.

———
1960 An analysis of the livelihood of the Mohave Desert. University of California, Los Angeles, Department of Geography (Ph. D. dissertation)

Gautier, E. F.
1926 The Ahaggar, heart of the Sahara. Geographical Review 16:378-394.

Gautier, E. F.

1935 Sahara, the great desert, Columbia University Press, N. Y. 264 p.
Translated from the 2nd French edition of 1928, and from hitherto unpublished material supplied by the author.

Gellert, J. F.

1948 Klimabedingtheit und wirtschaftsgeographische struktur der farmwirtschaft und farmsiedlung in Sudwestafrika. Erdkunde 2(4/6):282-302.
(Climatic limitation and economic-geographic structure of the farm economy and farm settlement in South West Africa)
An excellent treatise in a comprehensive manner.

Gerasimov, I. P.

1956 Aridnye i semiaridnye oblasti SSSR i ikh geograficheskiye analogi. Voprosy Geografii, Sbornik Statey dyla XVIII Mezhdunarodnogo Geograficheskogo Kongress, M-L., Moskva.
(Arid and semi-arid regions of the U.S.S.R. and their geographical analogues)

Gerasimov, I. P., ed.

1964 Fiziko-geograficheskiy atlas mira. Akademiya Nauk SSSR i Glavnoye Upravleniye Geodezii i Kartografii GGK SSR, Moskva. 298 p.
(Physical-geographic atlas of the world)
An elaborate, detailed, and comprehensive atlas covering the physical aspects of geography for the various regions of the world. All legends and text have been translated into English and published in the May-June 1965 issue of "Soviet Geography: Review and Translation."

Geukens, F.

1960 Contribution à la géologie du Yémen. Université de Louvain, Institut Géologique. Mémoires 21:117-180.

Gilliland, H. B.

1952 The vegetation of eastern British Somaliland. Journal of Ecology 40:91-124.

Gillman, C.

1949 A vegetation-type map of Tanganyika Territory. Geographical Review 39(1):7-37.

Gilpin, L.

1949 The Rio Grande, river of destiny. An interpretation of the river, the land and the people. Duell, Sloan and Pearce, New York. 243 p.

Glendinning, R. M.

1940 The role of Death Valley. Economic Geography 16:299-311.

1949 Desert contrasts illustrated by the Coachella Valley. Geographical Review 39:221-229.

Gonzales Reyna, J.

1956 Aspectos fisiograficos de Mexico. *In* Riqueza Minera y Yacimientos Minerales de Mexico. Congreso Geologico Internacional, 20th, Mexico, p. 19-29.
(Physiographic aspects of Mexico.)

Gordon-Brown, A., ed.

1950 The year book and guide to southern Africa. Sponsored by the Union-Castle Steamship Company, Ltd. R. Hale, Ltd., London.
The last word in factual compendia on southern Africa. Issued annually. Accurate

Gouin, P. and P. A. Mohr

1964 Gravity traverses in Ethiopia. University College of Addis Ababa, Geophysical Observatory, Bulletin 3(3).

Green, L.

1952 Lords of the last frontier. Timmins, Cape Town. 369 p.
A layman's introduction to South West Africa — popular, chatty, informal, yet full of material in an unorganized manner, and giving a good impressionistic view of the Territory.

Greenwood, J. E. G. W.

1957 The development of vegetation patterns in Somaliland Protectorate. Geographical Journal 123:465-473.

Gregory, H. E.

1916 The Navajo country, a geographic and hydrographic reconnaissance of parts of Arizona, New Mexico, and Utah. U. S. Geological Survey, Water Supply Paper 380. 219 p.

1938 The San Juan country: a geographic and geologic reconnaissance of southeastern Utah. U. S. Geological Survey, Professional Paper 188. 123 p.

Griesbach, C. L.

1886 Afghan and Persian field notes. Geological Society of India, Records 19:48-65.

Griffin, P. F. and R. N. Young

1957 California, the new empire state; a regional geography. Fearon Publishers, San Francisco. 325 p.

Grigoryev, A. A.

1962 Soviet plans for irrigation and power: a geographical assessment. Geographical Journal 118:168-179.
The Stalin Plan for transforming the arid regions of the U.S.S.R. and of building great hydroelectric power projects on the rivers flowing in arid regions such as the southern Ukraine, the northern Caucasus, the Volga River region, and Central Asia is examined in detail. The plan is based on the utilization of water power, which will involve radical reconstruction of the lower reaches of the Dnepr, Don, Volga, Amu-Dar'ya, Syr-Dar'ya, and many other lesser rivers. The enormous water resources of these rivers will be used not only to obtain electric energy, but also to irrigate and supply water to the wide areas through which they flow. Water will be transported to distant points by means of canals resembling artificial rivers. Another means of combating aridity is the afforestation of the steppe zones. This will entail vast plantings of shelter belts. Some of these projects have since come to fruition, others have been abandoned as being unfeasible.

Grigoryev, A. A. and M. I. Budyko

1956 O periodicheskom zakone geograficheskoy zonalnosti. Doklady Akademii Nauk SSSR 110:129-132.
(On the periodic law of geographic zonality)
A matrix is set up with a zonal coordinate represented by the radiation balance at the Earth's surface and a second coordinate represented by a "radiation-aridity" index. By means of this matrix, it is demonstrated that in latitudinal belts having different values of radiation balance regions similar in soil and natural vegetation recur periodically with identical values of the radiation-aridity index.

Grigoryev, A. A. and M. I. Budyko

1960 Classification of climates of the USSR. Soviet Geography: Review and Translation 1(5):3-24.

A very good presentation of a classification scheme for climate in the U.S.S.R. Scheme is based on sums of surface temperatures above 10°C and an aridity index relating precipitation and radiation balance.

Hack, J. T.

1942 The changing physical environment of the Hopi Indians of Arizona. Report no. 1 of the Awatovi expedition. Harvard University, Peabody Museum of American Archaeology and Ethnology, Papers 35(1). 85 p.

Haggett, P.

1966 Locational analysis in human geography. St. Martin's Press, New York. 339 p.

Hailey, W. M. H., baron

1938 An African survey, a study of problems arising in Africa south of the Sahara. Oxford University Press, London. 1837 p.

A famous, comprehensive, thorough study of the British Commonwealth in Africa. Many references to South West Africa, but not in a separate section. Revised edition, 1676 pages, appeared in 1957.

Halperin, H.

1963 Agrindus. Integration of agriculture and industries. Routledge and Kegan Paul, London. 214 p.

Dr. Halperin is Professor of Agricultural Economics at Hebrew University. This is a very readable idealization of the philosophy of the regional settlement plan in Israel's arid regions — the integration of agriculture and industry. His plan encourages establishment of villages around an industrial center, the latter containing agriculture-related industries, but living areas would remain in nearby villages to prevent excessive rural to urban movement. A critical analysis of various settlement schemes, including an outline for settling the Besor Region in the Negev and the ideal type of regional center. Does not point out in detail some of the relevant information available on water, soil, and vegetation types that affect settlement types.

Hance, W. A.

1964 Geography of modern Africa. Columbia University Press, New York. 653 p.

A very good, short review of South West Africa.

Harmston, F. K. and V. L. Scovel

1959 A study of the resources, people, and economy of the Big Horn Basin, Wyoming. Wyoming Natural Resource Board, Cheyenne. 153 p.

Harrison, J. V.

1943 The Jaz Murian depression, Persian Baluchistan. Geographical Journal 101: 206-225.

Hartmann, C.

1897 Kaoko gebiet in Deutsche Sudwestafrika auf grund eigener reisen und beobachtungen. Gesellschaft fur Erdkunde zu Berlin, Verhandlungen 24: 113-141.

(The Kaoko district in German South-West Afrika on the basis of his own journeys and observations)

Excellent descriptions of the physical geography and of the inhabitants of this little-known area.

1902 Das Amboland auf grund seiner letzten reise im jahre 1901. Gesellschaft fur Erdkunde zu Berlin, Zeitschrift, p. 215-230.

(Ovamboland on the basis of his latest journey in 1901)

A short, information-packed account of a journey into the north, with some information on the Kaokoveld Coast, all in technical-narrative form.

Hassert, K.

1899 Deutschlands kolonien. Erwerbungs-und entwickelungs-geschichte, landes-und volkskunde und wirtschaftliche bedeutung unserer schutzgebiete. Seele, Leipzig. 332 p.

Bibliography: p. 301-320.

Haythornthwaite, F.

1956 All the way to Abenab. Faber and Faber, London. 288 p.

A friendly, informal, popular description of central South West Africa by the local Anglican rector.

Heilborn, A.

1908 Die deutschen kolonien (land and leute), zehn vorlesungen. 2. verb. u. verm. aufl. Aus Natur u. Geisteswelt 98. 170 p.

Hevel Besor

1961, 1964 Settlement of the Besor region. Jewish Agency, Settlement Department, Beersheva.

Two bulletins presenting the procedure of settlement for the Besor Region in the Northwestern Negev. Includes detailed descriptions of climate, soil types, and existing and planned settlements; suggestion for crop types; estimation of costs, and several detailed maps of soils and farm units unavailable elsewhere. In Hebrew only. Useful for agronomists and settlement agents as well as the regional planner.

Highsmith, R. M., ed.

1962 Atlas of the Pacific northwest: resources and development. 3d ed. Oregon State University Press, Corvallis. 168 p. 97 maps.

Useful because of the absence of regional studies for much of the Columbia Basin desert.

Holdsworth, M.

1961 Soviet African studies, 1918-1958; an annotated bibliography. Distributed for the Royal Institute of International Affairs by Oxford University Press. 2 parts.

Excellent, well-annotated, well-arranged

Horecky, P. L., ed.

1962 Basic Russian publications, an annotated bibliography on Russia and the Soviet Union. University of Chicago Press, Chicago. 313 p.

A good selection of Russian publications on all aspects of the Soviet Union. Pages 25-48 constitute chapter II, entitled "The Land." Other chapters deal with people, economy, social structure, etc.

Humlum, J.

1959 La geographie de l'Afghanistan. Scandinavian University Books, Oslo. 421 p.

(The geography of Afghanistan.)

Hunt, J. A.

1942 Geology of the Zeila-Lam, British Somaliland. Geological Magazine 79: 197-201.

Huntington, E.

1910 Problems in exploration — Central Asia. Geographical Journal 25: 395-418.

This article is intended to throw light on the changing

nature of exploration — from mapping new lands to explaining how and why physical and cultural features have developed. The author's experience concentrated on Central Asia, and he presented problems of the structure and formation of the surface, the distribution of physical types, and the relation of physical environment to the grouping and character of people, animals and vegetation in terms of his experience in Central Asia. This is a highly informative article.

Instituto Mexicano de Recursos Naturales Renovables
1955 Problems de las zonas áridas de México. Biblioteca Central de la Ciudad Universitaria. 262 p.

Israel Delegation
1964 Regional development in Israel. Report submitted to the Organization for Economic Cooperation and Development, Seminar on regional development at Herzlia. 46 p. maps.
Summary of methods of planning regions on the national and regional level and their relationship. Delineation of regions and methods of coordination of physical, economic, and cultural factors in planning. Development of the Lakhish Region.

Ives, R. L.
1949 Resources of the Dugway area, Utah. Economic Geography 25:55-67.

Jackman, E. R. and R. A. Long
1965 The Oregon desert. Caxton Printers, Caldwell, Idaho. 407 p.

Jackson, W. A. D.
1956 Virgin and idle lands of Western Siberia and Northern Kazakhstan: a geographic appraisal. Geographical Review 46:1-19.
The author evaluates the physical landscape and the climatic conditions of this region in relation to the Soviet plans for expanding the wheat acreage.

Jaeger, F.
1925 Die landeskundliche erforschung Sudwestafrikas wahrend der deutschen herrschaft. Geographische Zeitschrift 31:280-289.
(Regional geographic research in South West Africa during the German period)
A critical review of the status of research in South West Africa at the end of the German time (physical geography only).

1927 Das Windhuker hochland. Koloniale Studien, Hans Meyer Festschrift, p. 109-131.
(The Windhoek upland)
An excellent geomorphic-geographic study.

1965 Geographische Landschaften Sudwestafrikas: Wissenschaftliche Forschung in Sudwestafrika. Sudwestafrika Wissenschaftliche Gesellschaft.
(Geographic landscapes of South West Africa: scientific research in South West Africa)
A series of selected studies in central and southern South West Africa, very thoroughly done from the physical viewpoint, with a fair appraisal of the human occupance at the end of the German time, or during the early years of the Mandate, many reprinted from earlier, and hard to find, German sources.

James, P. E.
1927 Iquique and the Atacama Desert. Scottish Geographical Magazine 43(4):203-215.
Description of settlement of Iquique and its arid surroundings, especially the nitrate district of the Atacama desert.

1952 Observations on the physical geography of northeast Brazil. Association of American Geographers, Annals 42(2):153-176.
Short essay concerning the physical geography, especially surface configuration, vegetation, and climate, of the dry zone of Brazil. Including several original maps from field observations. Followup to work of Friese.

1959 Latin America. p. 189-201. 3rd ed. Odyssey Press, New York. 942 p.
Spate, in the 3rd edition to *India and Pakistan* (Spate and Learmonth, 1967) pays tribute in the acknowledgments to the inspiration he received from James's *Latin America*, "the best regional geography in English known to me."

Jodha, N. S.
1966 A semi-nomadic farm family, Rajasthan. Agricultural Development Council. Inc., New York. 15 p.
A study of a village and family in Nagaur district of Rajasthan by a technical assistant in Human Factor Studies Division of Central Arid Zone Research Institute, Jodhpur, India, Excellent intensive study of a farm family with description of soils, water, crops, land tenure, and animal husbandry.

Johnson, E. H.
1931 The natural regions of Texas. University of Texas, Bureau of Business Research, Research monograph 8. 148 p.
Regions based primarily upon landforms and moderately well described. Land use out of date.

1939 Toward an understanding of the geography of Texas. Texas Geographic Magazine 3:47-69.

Kaiser, E.
1927 Die diamantenwuste Südwestafrikas. Dietr. Reimer Verlag, Berlin. 2 vols.
Kaiser's great work — a meticulous study of the extremely arid desert of the southern coastal Namib, in infinite detail, with real imaginative thinking. Sections by many other writers, but largely the work of Kaiser.

Katzer, F.
1902 Der landschaftliche carakter von Ceara. Globus 82(1):1-5.
Journalistic description of the physical landscape of arid Ceará, Brazil. Of historical interest only.

Kerzhenevsky, N. N., ed.
1956 Uzbek SSR. State Geographical Publishing House, Moscow. 470 p.
A fairly detailed description of the natural conditions and resources of the Uzbek Republic. The characteristics of the population and the economy are also reviewed. The last half of the book is a regionalization of the Republic by oblasts.

Klute, F.
1930 Südwestafrika. *In* F. Klute, L. Wittschell, and A. Kaufmann, Afrika in natur, kultur and wirtschaft. Handbuch der geographischen wissenschaft. Akademische Verlagsgesellschaft Athenon, Potsdam.

A good encyclopedic treatment, with no research but many facts.

Knetsch, G. and P. Gounot
1963 Arid zone research in Iraq. Unesco. Paris. Arid Zone [Newsletter] 22:9-18.
A good though brief geographical description of the deserts and rivers of Iraq. Precipitation data. Great need of arid lands research here. Little organized research.

Kniffen, F. B.
1932 The natural landscape of the Colorado Delta. University of California, Publications in Geography 5:149-244.

Koepcke, H. W. and M. Koepcke
1951 División ecológica de la costa peruana. Ministerio de Agricultura, Lima, Revista Pesca y Caza, ser. de Divulgación Científica 3. 24 p.
Regional divisions of the cool, dry coast of Peru, indicating the ecological parameters for regionalization.

Köhler, J.
1962 Deutsche dissertationen über Afrika; ein verzeichnis für die jahr 1918-1959. K. Schroeder, Bonn.
Covers period 1918-1959 in an excellent manner, with a topical arrangement.

Komarova, M. V.
1965 Rayonirovaniye territorii yugo-zapadnogo prichernomor'ya po stepeni aridnosti klimata. Izvestiya Vsesoyuznogo Geograficheskogo Obshchestva 97(1):66-70.
(Regionalization of the territory of the southwestern Black Sea region according to the degree of the aridity of climate)
The degree of moisture over a region depends on a series of meteorological factors, most important of which are precipitation, evaporation, and transpiration. The use of precipitation alone furnishes a poor index of aridity. Quantitative indexes are constructed by the author to ascertain the degree of aridity over the southern region of the Soviet Union near the Black Sea. He arrives at a subdivision of the area into an arid region with a negative moisture balance (potential evaporation is greater than yearly precipitation), subarid region where the two factors come into an equilibrium. In the arid zone no agriculture can be carried on without irrigation.

Kunin, V. N.
1952 Karakumskie zapiski. Gosudarstvennoye Izdatel'stvo Geograficheskoy Literatury, Moskva. 264 p.
(Notes on the Kara-Kum)
The Kara-Kum Desert is discussed in detail as to the possible uses of the desert. Since the main problem to be overcome before any utilization of this desert by man can be accomplished is the availability of water, most of the book is an examination of the present local water reserves in the region. The Turkmen Canal and the Uzboy project are examined as to whether or not they are feasible.

Kuntz, J.
1912 Über die geologischen verhaltnisse des Kaokofeldes. Deutsche Geologische Gesellschaft, Zeitschrift, Monatsbericht 17.
(On the geological relations of the Kaokoveld)
A fairly good article on the geology of the northwestern part of the Territory.

Lantis, D. W.
1950 The San Luis Valley, Colorado: sequent rural occupance in an intermontane basin. Ohio State University, Department of Geography (Ph. D. dissertation)

Lantis, D. W., R. Steiner, and A. E. Karinen
1963 California: land of contrast. Wadsworth Publishing Company, Belmont, California. 509 p.

Latham, J. P.
1963 Methodology for an instrumented geographic analysis. Association of American Geographers, Annals 53(2):194-209.

Lattimore, O.
1928 Caravan routes of Inner Asia. Geographical Journal 72:497-531.
This is a description of Lattimore's own experiences on his 1600-mile camel journey from Peking to India across Inner Asia. The author's primary interest was in the courses and movement of trade, both past and present. Although he did not have any formal geographical training, he was an observant traveler, and this account includes reports on such factors as climatic variations, soil differentations, vegetation stratification, topography and human culture.

1929 The desert road to Turkestan. National Geographic Magazine 55:661-702.
This is an account of the author's travels through Inner Asia along caravan trails which once connected China with the medieval West. The purpose of the journey was to compare ancient and modern channels of caravan trade. Command of the Chinese language, knowledge of affairs, trade, manners and customs helped him to travel inconspicuously. The article includes a number of photographs.

Lees, G. M.
1928 The physical geography of south-eastern Arabia. Geographical Journal 71:441-470.

Levinson, O.
1961 The ageless land. Tafelberg, Cape Town. 154 p.
Excellent background material, pleasantly written, in a popular style.

Lewis, R. A.
1962 Irrigation potential of Soviet Central Asia. Association of American Geographers, Annals 52:99-114.
Crop acreage under irrigation in the Soviet Union has increased from 7 million acres in 1913 to 18 million acres in 1957. Most of this expansion has been, and will continue to be, in Central Asia. Planners hope to expand the irrigated acreage in Central Asia to 50 million acres. Evaluation of the physical capacity of the rivers to allow such an expansion is determined by ascertaining the irrigation potential of the region. Most of the irrigation water is presently drawn from the smaller rivers, whereas the larger rivers, such as the Amu-Dar'ya and Syr-Dar'ya, have been utilized only to 20 per cent of their capacities. The irrigation potential was ascertained by calculating the total irrigation diversion requirements for the irrigable land and the total amount of water available for irrigation. Under present Soviet conditions, the author estimates that only 22 million acres can be brought

under irrigation as compared to Soviet estimates of some 50 million acres.

Leyzerovich, Y. Y.

1964 Ekonomiko-geograficheskoye polozheniye i nekotoryye voprosy promyshlennogo razvitija Zapadnoj Turkmenii. Izvestiya Vesesoyuznogo Geograficheskogo Obshchestva 96(3):206-212. (Economic-geographical situation and several questions of the industrial development of western Turkestan)

Western Turkestan is one of the least developed regions of the U.S.S.R. There is, however, a projected growth in the output of oil and, by the utilization of water brought in by the Kara-Kum Canal, a sizeable increase in agricultural acreage. The economic-geographical situation of the Turkmen S.S.R. has been favorable for the development of transportation facilities for the movement of goods east to west and vice versa. The present condition of industry is discussed with emphasis on minerals (oil, sulfur, and salts), structure, production, and the future prospects of development. Water is the key to any extensive expansion of industrial as well as agricultural production. Water problems and means of solving them are also discussed.

Li Chien-chieh

1957 Preliminary report on Sinkiang Expedition (translated title). Academia Sinica, Peking, Ko Hsueh Tung Pao 4:120-121.

Report on research done in Sinkiang, July-November 1956. The general aims of the expedition, to study natural conditions and resources and the means for utilizing such resources, were carried out in five areas of research: topography, native plants and plant resources, soil geography and soil resources, existing agricultural and livestock situation, utilization of solar and water sources and the initiation of projects to utilize underground water.

Li Wen-yen

1959 The work of the Kansu and Chinghai Complex Expedition in the past year (translated title) Academia Sinica, Peking, Ko Hsueh Tung Pao 7:242-243.

The expedition was organized in 1958 to work during 1958-1960 on studies of natural economic resources in Chinghai and Kansu and to prepare long-range plans for the utilization of these resources, especially in the Tsaidam and Kilien Shan (Ch'i-lien Shan) areas. Different groups studied soil, agriculture, water sources and conservation, animal resources, structural geology, and sand control. Maps and reports were submitted in November 1958, with work continuing in 1959.

Logan, R. F.

1958 Die Landschaften Südwestafrikas. Geographische Rundschau 10(9):321-331. (The regions of South West Africa)

A regional appraisal of South West Africa, covering all phases of its geography.

1960*a* The central Namib Desert, South West Africa. National Academy of Sciences / National Research Council, Publication 758. 162 p. (Office of Naval Research, Foreign Field Research Program, Report 9.)

A detailed study of the total geography of the Namib, from Walvis Bay and Swakopmund inland.

1960*b* South West Africa. Focus 11(3):1-6.

A concise general survey of the Territory.

1961 Post-Columbian developments in the arid regions of the United States of America. *In* L. D. Stamp, ed., A history of land use in arid regions. Unesco, Paris, Arid Zone Research 17:277-297.

A generalized, selective treatment of the arid lands between the coast range of California and the Rocky Mountains Divide (omits Texas). Treats natural setting, history of settlement, land laws, land use, grazing, dry farming, irrigation agriculture, economy of the desert Indian, recreation, and urbanization. Imperial-Coachella Valley is used as a representative area, dealing mainly with water distribution and agricultural land use. Treats historical and technical explanation of present land use, also settlement features. Discusses: ranch fencing; pipeline; tanks; modern advantages at Manchstead (electricity, telephone, radio, running water); various means of water diversion, storage, and irrigation; crops and rotational schemes; new towns and centers of recreation; and tracts of new urban desert-loving dwellers. "Rurban" expansion is expected to be large in the future with remaining land used for livestock. Only solar energy could change the general picture. Industrialization is also foreseen.

Luknitskii, P. N.

1954 Soviet Tajikistan. Foreign Languages Publishing House, Moscow. 254 p.

A relatively informative book; a good description of the landscape, economy, and the people. The main industries of Tadzhikistan — cotton, livestock, mining, and fruits — are discussed in reference to where, what, and how much. Great attention is paid to the valleys of the republic where most of the population live and where practically all the agriculture is carried on. A whole chapter is devoted to the Hissar Valley which is the most important one. The republic is also examined from a regional viewpoint.

1957 Tadzhikistan. Geograficheskaya nauchnokhudozestvennaya seriya: Nasha Rodina. Izdaltel' stvo TS. K.V.L.K.S.M. "Molodaya Gvardiya," Moskva. 494 p.

A good analysis of the Tadzhik Republic. Practically every aspect of geography is covered by the book: industry, population, agriculture, irrigation, transportation, etc. These elements are discussed both on the republic level and according to regions. Emphasis is placed on the valleys where most of the people live and most of the economy is situated. The cities are also examined in comparatively good detail, especially the capital of the Republic, Stalinabad (Dushanbe).

Lund, R. E.

1962 A study of the resources, people, and economy of southwestern Wyoming. Wyoming Natural Resource Board, Cheyenne. 112 p.

Region not defended or explained. It is based on counties.

Lydolph, P. E.

1959 Fedorov's complex method in climatology. Association of American Geographers, Annals 49:120-144.

Describes the 40 years of work by Fedorov and his students of the development of a scheme of climatic classification based on weather types. Includes complete code tables and analysis of classification scheme and discussion of practical applications to agriculture.

1963 Schemes for the amelioration of soil and climate in the U.S.S.R. p. 204-212. *In* R. D. Laird, Soviet agricultural and peasant affairs. University of Kansas Press, Lawrence.

Covers Soviet efforts to integrate the study of "the outer geographic envelope." Concentrates on considerations of general lack of heat in the U.S.S.R. and lack of moisture in the better farming areas. Summarizes theoretical bases for significant alterations of heat and moisture balance in various portions of the U.S.S.R.

1964 Russian sukhovey. Association of American Geographers, Annals 54:291-309.

A condensation of all Russian work on the desiccating flows of air that so strongly affect the agriculture of the U.S.S.R.

Maack, R.

1923 Der Brandberg: ein beitrage zur landeskunde von Sudwestafrika. Gesellschaft Für Erdkunde zu Berlin, Zeitschrift, p. 1-14.

A very fine report, very heavily geological and geomorphic. Excellent map.

1924 Die Tsondab-Wuste und das randgebirge von Ababis in Deutsch-Sudwestafrika. Gesellschaft für Erdkunde zu Berlin, Zeitschrift, p. 13-29.
(The Tsondab-desert and the escarpment ranges of Ababis in South West Africa)

An excellent geological-geomorphic study of the Namib border and the Great Escarpment – very local but very good. Excellent map.

Macfadyen, W. A.

1950 Vegetation patterns in the semi-desert plains of British Somaliland. Geographical Journal 116:199-211.

Macinko, G.

1961 Types and problems of land use in the Columbia Basin Project area, Washington, University of Michigan, Department of Geography (Ph. D. dissertation) 201 p.

1963 The Columbia River Basin Project: expectations, realizations, implications. Geographical Review 53:185-199.

MacPhail, D.D.

1963 Regional setting. *In* C. Hodge and P. C. Duisberg, eds., Aridity and man. American Association for the Advancement of Science, Publication 74:21-53.

Madigan, C. T.

1937 Review of the arid regions of Australia and their economic potentialities. Australian and New Zealand Association for the Advancement of Science, Report 23:375-397.

1938 The Simpson Desert and its borders. Royal Society of New South Wales, Proceedings 71:503-535.

1944 Central Australia. 2nd ed. Oxford University Press, Cambridge. 316 p.

Maichel, K.

1962-1964 Guide to Russian reference books. Hoover Institution on War, Revolution, and Peace, Stanford University Press. 2 vols.

Volume 1 lists general bibliographies and reference books; the second volume contains bibliographies published in the fields of Soviet history, world history, auxiliary historical sciences, ethnography, and geography. This is one of the most exhaustive, up-to-date bibliographies of its kind. Annotated.

Mariam, M. W.

1964 The Awash Valley. Ethiopian Geographical Review 2(1):18-27.

Martin, H.

1957 The sheltering desert. Kimber, London. 234 p.
(A translation of: Wenn es krieg gibt, gehen wir in die wüste [When the war came, we went into the desert], Stuttgart, 1956; also in Afrikaans as "Eine Robinsonade in der Namib")

Account of two geologists Korn and Martin, who spent two years living primitively in the Namib. Excellent descriptions of the desert.

Martonne, E. de

1934*a* The Andes of north-west Argentina. Geographical Journal 84:1-16.

Fundamental essay on the arid zones of western South America; contains several original ideas and maps such as "the index of aridity" and the "endoreic-areic regions."

1934*b* Les régiones arides du nord Argentin et Chilien. Association de Géographes Français, Bulletin 79:58-62.

A pioneer work in identifying the dry lands of the Puna and Atacama; description of the physical characteristics and causes of the deserts in Chile and Argentina.

Maslov, E. P., A. I. Gozulov, and S. N. Ryazantsev, eds.

1957 Severnyy Kavkaz. Akademiya Nauk SSSR, Institut Geografii, Gosudarstvennoye Isdatel'stvo Geograficheskoy Literatury, Moskva. 508 p.
(Northern Caucasus)

This is a good, comprehensive geography of the Northern Caucasus region. The first half is a systematic analysis of the physical landscape, resources, history, and all the various aspects of the economy. Included within this section are many maps showing the distribution of the systematic elements treated, with emphasis on the distribution of agricultural products. The lengthy second part is a regionalization of the Northern Caucasus region. Larger regions are first discussed, then the geography of smaller divisions, such as the krays, oblasts, and rayons, are studied in great detail. This is probably the best overall geography of the Northern Caucasus region available.

Maslov, Y. P.

1962 Voprosy razvitiya sel'skokhozyastvennogo Severo-Kavkazskogo ekonomicheskogo rayona. Izvestiya Akademii Nauk SSSR, Seriya Geograficheskaya 1962(6):50-59.
(Problems in the development of the agricultural North Caucasus economic region)12.

The effectiveness of the specialization of agriculture is possible only with the rational combination of the various

branches of agriculture, and their planned and proportional development. A general survey of the regionalization of agriculture is given. Horticulture, fruits, tobacco, corn, wheat, sugar beets, etc. are discussed in relation to their distribution and acreage. The Kuban region receives particular emphasis. Greater use is being made of irrigation for specialized crops, especially in the Kuban, and further expansion of irrigated acreage should take place along the Don, Kuban, and Terek rivers. Finally, with the changes in the structure of agriculture here, with the introduction of corn, the development of livestock is greatly improving.

McKiernan, G.
1954 The narrative and journal of Gerald McKiernan in South West Africa, 1874-1879. Edited, with introduction, notes and map, by P. Serton. Van Riebeeck Society, Cape Town, Publication 35. 197 p.
A detailed narrative account of life in South West Africa in pre-German time. Packed with information.

McMahon, A. H.
1897 The southern borderlands of Afghanistan. Geographical Journal 10:393-415.

McMahon, A. H. and C. A. McMahon
1897 Note on some volcanic and other rocks which occur near the Baluchistan-Afghan frontier. Royal Geological Society of London, Quarterly Journal 53:289-309.

Mehdiratta, R.C.
1954 Geology of India and Pakistan for intermediate and degree students of Indian universities. Atma Ram, Delhi.

Meigs, P.
1953 World distribution of arid and semi-arid homoclimates. *In* Reviews of research on arid zone hydrology. Unesco, Paris. Arid Zone Programme 1:203-209.

1966 Geography of coastal deserts. Unesco, Paris. Arid Zone Research 28. 140 p., 15 maps.

Merzbacher, G.
1925 Afghanistan. Geographische Zeitschrift 31:289-293.

Minshull, R.
1967 Regional geography, theory and practice. Hutchinson and Co., London, 168 p.; Aldine Publishing Co., Chicago, 172 p.
Minshull concludes that use of subjectively defined regions is not a fault but a necessity.

Miser, H. D.
1924 The San Juan Canyon, southeastern Utah, a geographic and hydrographic reconnaissance. U. S. Geological Survey, Water Supply Paper 538. 80 p.

Mohr, P. A.
1964 The geology of Ethiopia. University College of Addis Ababa Press.

Monod, T.
1957 Les grandes division chrologiques de l' Afrique. Commission for Technical Co-operation in Africa/Scientific Council for Africa. Publication 24. 147 p.
(The large mapping divisions of Africa)

1964 A propos de deux publications du Professor M. Zohary. Institut Français d' Afrique Noire, Bulletin, sér. A. 26(4):1403-1428.

Montagu, I.
1955 Mongolian visit. Geographical Magazine 28:119-129.
This is another account of personal experiences rather than a scientific study of Mongolia, but it gives much descriptive information on the economic, religious, educational, occupational, cultural, and physical setting of the country. The author seeks to characterize Mongolian life and society as a blend of ancient and modern features and ideological concepts.

Moritz, E.
1911 Reisestudien aus Südwest-Afrika. Gesellschaft für Erdkunde zu Berlin, Zeitschrift, p. 213-252.
(Travel studies in South West Africa)
An excellent study of selected areas throughout South West Africa.

Mulay, B. N.
1961 Patterns of plant distribution in Rajasthan. Indian Botanical Society, Memoirs 3:9-12.

Muller, D. J.
1953 The Orange River from the confluence of the Vaal and Orange Rivers to the mouth of the Orange in the Atlantic Ocean; a bibliography. University of Cape Town, School of Librarianship. 21 p.
An excellent bibliography.

Murphy, H. F.
1959 A report on the fertility status of some soils of Ethiopia. Imperial Ethiopian College of Agriculture and Mechanic Arts, Experiment Station, Bulletin 1.

Murzaev, Z.
1957 Srednyaya Aziya; fiziko-geograficheskiy ocherk. Gosudarstvennoye Izdatel' stvo Geograficheskoy Literatury, Moskva. 270 p.
(Central Asia; physical-geographical essay)
The book consists of 2 parts, with the first part dealing with the region in a general manner -- emphasizing the population pattern and diversity. An historical outline is given of the region along with a discussion of geographical place names. Included is an index of place names according to the spelling and pronunciation in each of the local languages. The second part outlines the physical geography of the region. A lengthy chapter on the relief of the region goes into considerable detail on landform pattern and formation. Climate, glaciation in the mountains, and water resources are covered in individual chapters.

Narzikulov, I. K., ed.
1956 Tadzhikskaya SSR, ekonomiko-geograficheskaya kharakteristika. Gosudarstvennoye Izdatel' stvo Geograficheskoy Literatury, Moskva. 226 p.
(Tadzhik SSR; an economic-geographical characteristic)
This is a good geographical description of the Republic. The geography is examined from both a systematic and a regional view. The first third of the book deals with the physical aspects and resources of the region. The relief, climate, rivers, lakes, minerals, soils, vegetation, and fauna are covered. The history of the Tadzhik people is

reviewed, and the population is studied in relation to culture, density, distribution, etc. Transport, industry, and agriculture are studied systematically, but few figures and maps are given. The last third analyzes the Republic from a regional view. It is divided into eight regions and all of the previous elements of the systematic treatment are examined in greater detail.

Nazarevskiy, A., ed.
1957 Kazakhskaya SSR; ekonomiko-geograficheskaya kharakteristika. Gosudarstvennoye Izdatel' stvo Geograficheskoy Literatury, Moskva. 733 p.
(Kazakh SSR: economic-geographic characteristic)
A good, detailed, and comprehensive geographical analysis of the Kazakh Republic. The first section of the book is a general description of the physical geography, the present-day economy, the population, and an historical sketch of the republic. The lengthy second part is a study of the republic by regions. Each region is discussed on a systematic basis of its general characteristics and then the analysis is carried down to each oblast within the larger region. Many maps of industry and agriculture are included, but few statistical tables are given. A very extensive bibliography is found on pages 701-732.

Nikolayev, V. A. and S. A. Tyurdeneva
1960 Fiziko-geograficheskiye rayony del' ty reki Volgi i ikh budushcheye. Izvestiya Vsesoyuznogo Geograficheskogo Obshchestva 92(2):107-114.
(Physical-geographical regions of the delta of the Volga River and their future)
The delta of the Volga is divided into five regions. The physical characteristics are discussed for each region, including formation, local relief, vegetation, etc.

Nikol'skiy, I. V.
1961 Geography of transportation of Kazakhstan. Soviet Geography: Review and Translation 2(3):44-54.
A description of railroad, waterway, and truck transportation. Freight movements, type and quantity of commodities shipped, flow movements, etc., are discussed for each mode of transport. A description of the various types of hubs or centers within the transportation network is also included. Nikol'skiy is the outstanding authority on transportation geography in the U.S.S.R.

Ordóñez, E.
1936 Principal physiographic provinces of Mexico. American Association of Petroleum Geologists, Bulletin 20:1277-1307.

Oregon. Department of Planning and Development
1964 Resources for development. Salem. 144 p.

Orni, E. and E. Efrat
1964 Geography of Israel. 2nd ed., rev. Israel Program for Scientific Translations, Jerusalem. 344 p.

1966 Geography of Israel. 2nd ed., rev. Israel Program for Scientific Translations, Jerusalem. 344 p.
The first geography of Israel in English, translated from Hebrew. Comprehensive and particularly well done are the sections on physical geography. Valuable though brief information on the Negev is dispersed throughout the text. Translation is sometimes substandard, and maps and photos not too clear. Includes a useful bibliography.

Osorio-Tafall, B. F.
1948 La Isla de Cedros, Baja California. Sociedad Mexicana de Geografía y Estadística, Boletín 66: 319-402.

Owen, L.
1938 Origin of the Red Sea depression. American Association of Petroleum Geologists, Bulletin 22:1217-1223.

Pabot, H.
1964 Phytogeographical and ecological regions. p. 30-40. *In* M. L. Dewan and J. Famouri, The soils of Iran. FAO, Rome.

Pallister, J. W.
1963 Notes on the geomorphology of the northern region, Somali Republic. Geographical Journal 129(2):184-187.

Passarge, S.
1904 Die Kalahari. Die Reimer, Berlin. 822 p., plus atlas of 10 fold. pl., 12 maps.
The great and famous old work on the Kalahari.

———
1908 Südafrika. Quelle and Meyer, Leipzig. 335 p.
An excellent, thorough study of southern Africa in the German time, and including South West Africa.

———
1919 Die Steppenflusstalung des Okawango im Tro[illegible]-enwald-Sandfeld der Nordkalahari. Geographische Gesellschaft, Hamburg, Mitteilungen 32:1-40.
(The Steppe river-valley of the Okovango in the dry forest sand country of the northern Kalahari).
An excellent geographic account of a small area.

Pavlenko, V. F.
1961 Ob osnovkykh napravleniyakh razvitiya proizvoditel' nykh sil Sredney Azii. Izvestiya Akademii Nauk SSSR, Seriya Geograficheskaya 1961(2):53-60.
(Main trends in the development of the productive forces of Central Asia)
Central Asia belongs to the number of regions with an expressed specialization. Of primary importance to the Soviet Union is the region's cotton production, which accounts for 90% of the cotton utilized in the Soviet Union. The cotton zone is discussed with emphasis on the acreage of irrigated cotton. However, Central Asia is also a very important producer of silk, fruit, wine, and sugar beets. The region is also rapidly becoming an important industrial center, with the rise of a domestic textile industry, light metallurgy, and the extraction of minerals.

Paylore, P.
1967 Arid-lands research institutions: a world directory. University of Arizona Press, Tucson. 268 p.

Perloff, H. S.
1957 Regional studies at U. S. universities: a survey of regionally oriented research and graduate education activities. Resources for the Future, Inc., Washington, D. C. 118 p. mimeo.

Perry, R. A. *et al.*
1962 General report on lands of the Alice Springs area, Northern Territory, 1956-57. C.S.I.R.O. Land Research series 6. 280 p.

Petrov, M. P.

1966-1967 Pustyni TSentral'noi Asii. Nauka, Leningrad. 2 vols (Translation of Vol. 1 available from JPRS as 39:145; of Vol. 2 as 42,772). (The deserts of Central Asia).

Pfefferkorn, I

1949 Sonora, a description of the province; translated and annotated by Theodore E. Treutlein. University of New Mexico Press, Albuquerque. 329 p. (Coronado Cuarto Centennial Publications, 1540-1940, v. 12)

A translation of Beschreibung der Landschaft Sonora samt andern Merkwürdigen Nachrichten , , , (Köln am Rheine, 1794-95), 2v. For an account of this work, see Treutlein's article in Mid-America, 1938, v. 20:229-252.

Pfeifer, G.

1939 Sinaloa und Sonora. Geographische Gesellschaft in Hamburg, Mitteilungen 41.

Philby, H. S.

1922 The heart of Arabia. Constable, London. 2 vols.

———

1928 Arabia of the Wahhabis. Constable, London. 422 p.

———

1933*a* The Empty Quarter. Constable, London. 433 p.

———

1933*b* Rub' al Khali. Geographical Journal 81:1-26.

Pichi-Sermolli, R. E. G.

1955*a* The arid vegetation types of tropical countries and their classification. *In* Plant ecology, proceedings of the Montpellier Symposium. Unesco, Paris. Arid Zone Research 5:29-32.

1955*b* Tropical east Africa (Ethiopia, Somaliland, Kenya, Tanganyika). *In* Plant ecology, reviews of research. Unesco, Paris. Arid Zone Research 6:302-360.

Pilgrim, G. E.

1906 The geology of the Persian Gulf and adjoining portions of Persia and Arabia. Geological Survey of India, Memoir 34(4).

Pithawalla, M. B.

1939 Physiographic divisions of India. Madras Geographical Association, Journal 14:423-434.

1952 The great Indian desert, a geographic study. *In* Symposium on the Rajputana Desert, Proceedings. National Institute of Sciences, India, Bulletin 1:137-150.

Plaat, A. F.

1951 List of books and pamphlets in German on South Africa and South West Africa published after 1914, as found in the South African Public Library, Cape Town. University of Cape Town, School of Librarianship. 61 p.

A good bibliography but far from complete.

Poller, R. M.

1964 Swakopmund and Walvis Bay: a bibliography. University of Cape Town. 29 p.

Excellent, cross-referenced.

Popov, G. and W. Zeller

1963 Ecological survey: report on the 1962 survey in the Arabian peninsula. United Nations Special Fund Desert Locust Project, Progress Report. FAO, Rome. 99 p. (UNSF/DL/ES/6)

Popov, G. B.

1957 The vegetation of Socotra. Linnean Society of London, Journal, Botany 55(362):706-720.

Porter, W. W.

1932 The Coahuila piedmont, a physiographic province in northeastern Mexico. Journal of Geology 40:338-352.

Puri, R. K.

1961 Bibliography relating to geology, mineral resources, paleontology, etc., of the Somali Republic. Somali Republic, Survey Report RKP/1, Hargeisa.

Putnam, W. C. *et al.*

1960 Natural coastal environments, of the world. University of California, Los Angeles, for U. S. Office of Naval Research, Washington, D. C., Contract Nonr-23306. 140 p., maps. (Also cited as AD-236 741)

Range, P.

1911 Die deutsche Süd-Kalahari. Gesellschaft für Erdkunde zu Berlin, Zeitschrift, p. 291-310.

An excellent all-around article.

———

1912 Topography and geology of the German south Kalahari. Geological Society of South Africa, Transactions 15:63-73.

An excellent regional-geography and geomorphology study.

Raychaudhuri, S. P.

1964 Land resources of India, vol. 1. Committee on Natural Resources, Planning Commission, New Delhi.

Renner, G. T., III

1954 Geography of the state of Arizona. Columbia University, Teachers College (Ed. D. dissertation)

Reparaz, G. de

1958 La zona arida du Perou. Geografiska Annaler 40(1):1-62.

An outstanding analysis of the physical causes of the Peruvian arid coast by head of Unesco research team. Overview of man's occupation and economic uses of the natural resources of the desert littoral.

Rey, C. F.

1932 Ngamiland and the Kalahari. Geographical Journal 80:281-307.

Robles Ramos, R.

1948 La desertizacion de la Republica Mexicana Ingeniera Hidraulica en Mexico 2(2):5-67.

Rohrbach, P.

1907 Deutsche Kolonialwortschaft. I. Sudwestafrika. Schoeneberg, Berlin.

A good geographical treatment with the first part regional and the second an economic history.

Rokach, A.
1964 Regional rural development. Israel Today Series 32. Jerusalem Post Press. 31 p.
A detailed summary of regional settlement plans in Israel with particular attention to the Lakhish Region. Well illustrated with photos and diagrams of settlement bloc plans, and individual farm units. An enclosed map of the Lakhish Region locates and classifies agricultural settlement types and shows roads, railways, and water pipelines. Only brief reference to the actual Negev.

Ross, C. P.
1923 The lower Gila region, Arizona; a geographic, geologic, and hydrologic reconnaissance, with a guide to desert watering places. U. S. Geological Survey, Water Supply Paper 498. 237 p.

Roukens de Lange, E. J.
1961 South West Africa, 1946-1960, a selective bibliography. University of Cape Town, School of Librarianship. 51 p.
332 references. *See* Welch (1946) for 1919-1946.

Rumage, K. W.
1956 The Palo Verde Valley a geographic analysis of land-use development in the Lower Colorado River Valley, California. University of California, Los Angeles, Department of Geography (Ph. D. dissertation)

Ryshtya, S. Q.
1947 L'Afghanistan au point de vue géographique. Afghanistan 2(1):16-22.
(Afghanistan from geographic consideration.)

Sanders, E. M.
1921 The natural regions of Mexico. Geographical Review 11:212-226.

Schinz, H.
1891 Deutsch-Sudwest-Afrika. Schulzesche Hofbuchh., Oldenburg. 568 p.
An excellent work, partly narrative, partly organized, accurate throughout.

Schmieder, O.
1962 Die neue welt. Keyser, Heidelberg. (Geographische Handbucher)
The original 3-volume work, published 1932-34, was also issued in a Spanish-language translation as "Geografia de America," 1946, by Fondo de Cultura Economica, Mexico. This 1962 revised edition, like the first, covers "Mittel- und Sudamerica" (572 p.) and "Nordamerica." Illustrations, maps, bibliography.

Schonfelder, F. von
1935 Sudost Angola und der westliche Caprivi Zipfel. Petermanns Mitteilungen 81:49-52, 87-89.
An excellent account of the area, with a good map.

Schultze, L. S.
1910 Sudwestafrika p. 131-295. *In* H. H. J. Meyer, Das Deutsche kolonialreich, vol. 2. Leipzig.
A very thorough, excellent geographical work.

Schwarz, E. H. L.
1926 The northern Kalahari. South African Geographical Journal 9:32.
Excellent geographical description.

1928 Kalahari and its native races. Witherby, London. 344 p.
A brief survey of the tribal groups and a narrative of a trip by the famous professor.

Seiner, F.
1905 Der Omuramba Omatako und die Omatako Berge. Globus 88:9-14.
An excellent, local, detailed study of part of the northeast and central parts of the country.

Semenova, M. I.
1959 Priroda i khozyaystvo Yuzhno-Kazakhstanskoy oblasti. Izdatel' stvo Akademii Nauk Kazakhskoy SSR, Alma-Ata. 144 p.
(Nature and economy of the Southern Kazakhstan region)
This is a relatively good, although general, description and analysis of the geography of the Southern Kazakhstan region. The larger portion of the book systematically treats the natural conditions and resources of the region, from geology to vegetation and fauna. Industry, transportation, population, and the agricultural background of the area, including irrigation, are discussed briefly. The last part is a regional analysis, with the area being divided into four regions: The Chimkent, the Turkestan, the cotton-island, and the Karatual regions.

Shantz, H. L. and C. F. Marbut
1923 Vegetation and soils of Africa. American Geographical Society, Research Series 13. 263 p.
The standard American reference on the subject. Does not cover South West Africa to any extent merely the generalized regionalization derived from library sources.

Shih Ya-feng, *et al.*
1957 A preliminary investigation of physical geography (mainly on geomorphology) of Kukunop Lake and its neighboring regions (translated title). Academia Sinica, Peking, Ko Hsueh Tung Pao 23:727.
Description of the land, rainfall, and geologic history of the southeastern Kilien Shan (Ch' i-lien Shan) area.

Shreve, F.
1942 The desert vegetation of North America. Botanical Review 8(4):195-246.

Skosyrev, P. G.
1956 Soviet Turkmenistan. Foreign languages Publishing House, Moscow. 231 p.
The book is a geography of the Turkmen Republic with a regional approach. Starting along the Caspian coastal region, the author takes the reader through Nefyanaya Mountains, the Kopet Dag Mountains, Ashkhabad, the valleys of the Tedzhen and Murgab, across the Kara-Kum Desert, and finally along the Amu-Dar'ya. In each section he points out the more outstanding features of each region be it people, oil, or water. It is a general, but still an informative, description of the republic.

Spate, O. H. K. and A. T. A. Learmonth
1967 India and Pakistan, a general and regional geography. 3rd ed., rev. Methuen and Co., Ltd., London. 877 p.
Essentially an up-dated version of Spate (1957) *India and Pakistan, A general and regional geography*. Methuen, London.

Speck, N. H., *et al.*
1964 General Report on lands of the west Kimberley area, Western Australia. C.S.I.R.O. Land Research series 9. 220 p.

Spohr, O. H.
1950 Catalogue of books, pamphlets and periodicals published in German relating to South Africa and

South West Africa. University of Cape Town. 71 p.

A rather selective work, but well worth consulting.

Stamp, L. D.
1964 Africa, a study in tropical development. 2nd ed. John Wiley, N. Y. 534 p., maps.

Standing Committee on Library Materials on Africa
1964 Theses on Africa accepted by universities in the United Kingdom and Ireland. W. Heffer, Cambridge. 74 p.

Very comprehensive in its narrow field.

Stapff, F. M.
1887 Karte des unteren Kuisebtales. Petermanns Mitteilungen 33.

An excellent account of the lower Kuiseb River Valley, with a fine geologic map.

Staub, W.
1923 Beiträge zur landeskunde des nordlichen Mexiko. Gesellschaft fur Erdkunde zu Berlin, Zeitschrift 64.
(Contributions to the geography of northern Mexico.)

Stevens, P.
1947 Bechuanaland bibliography. University of Cape Town. 27 p.

An excellent bibliography, listing 305 references.

Steward, A.
1963 South West Africa: the sacred trust. De Gama, Johannesburg. 46 p.

A review of the background of South West Africa and a survey of the recent developments and accomplishments.

Stigand, A. G.
1923 Ngamiland. Geographical Journal 62:401-419.

Stones, A.
1964 Antelope Valley, Mojave Desert, California: a geographical analysis. University of California, Los Angeles, Department of Geography (M.A. thesis)

Sugden, W.
1963*a* The hydrology of the Persian Gulf and its significance in respect to evaporite deposition. American Journal of Science 261:741-755.

1963*b* Some aspects of sedimentation in the Persian Gulf. Journal of Sedimentary Petrology 33:355-364.

Suslov, S. P.
1961 Physical geography of Asiatic Russia. Translated from the Russian by H. D. Gershevsky and edited by Joseph Williams. W. N. Freeman and Co., San Francisco. 594 p.

Contains several extensive and detailed chapters on the physical geography of Central Asia and Western Siberia.

Swartz, D. H. and D. D. Arden, Jr.
1960 Geologic history of the Red Sea area. American Association of Petroleum Geologists, Bulletin 44:1621-1637.

Sykes, G.
1937 The Colorado Delta. American Geographical Society, Special Publication 19.

Symposium on Remote Sensing of Environment
1966 Proceedings of the Fourth Symposium, April 12-14, 1966. Conducted by the University of Michigan's Institute of Science and Technology for the U. S. Office of Naval Research, Geography Branch, and AF Cambridge Research Laboratories. Ann Arbor. 871 p.

Taaffe, R. N.
1960 Rail transportation and the economic development of Soviet Central Asia. University of Chicago, Department of Geography, Research Paper 64. 186 p.

A very good historical and analytical account of rail development in Soviet Central Asia and its economic impact on the region.

1962 Transportation and regional specialization: the example of Soviet Central Asia. Association of American Geographers, Annals 52:80-98.

The role of transportation in the transformation of Soviet Central Asia from an isolated and relatively self-sufficient region into a zone of highly specialized economic activity has been great. Results of the railroad building program since tsarist times have been the intensification of commercial and highly specialized agriculture based on cotton processing, and a comparatively rapid urbanization due to a large Slavic migration into the region. Regional specialization, however, has substantially increased the long-haul distance of shipments to over 800 kilometers. Various methods have been applied by the Soviets to decrease this distance, but all have failed due to the forces of specialization in the Soviet economy.

Taljaard, M. S.
1938 The Kunene from Fort Rossadas to Swartbooisdrift. *In* M. S. Taljaard, On the physiography of an area in Northern South-West Africa, B. University of Stellenbosch, Annals 16, A(1).

A geographical description of the river valley.

Tamayo, J. L.
1940 Datos para la geografía de la Baja California, particularmente del Distrito Sur. Revista Mexicana de Geografía 1:117-140.
(Data on the geography of Baja California, particularly the southern part.)

1962 Geografía general de México (Geografía física). 2nd ed. Instituto Mexicano de Investigaciones Economicas, Mexico. 4 volumes.

Tatu, K.
1964 Rainfall in Ethiopia. Ethiopian Geographical Review 2(2):28-36.

Tenri Central Library
1960- Africana; catalogue of books relating to Africa in the Tenri Central Library. Tenri Central Library, Tenri, Japan, Library Series 24- and continuation.

An excellent thorough regional bibliography

Thayer, W. N.
1916 The physiography of Mexico. Journal of Geology 24:61-94.

Theal, G. M.
1912 Catalogue of books and pamphlets relating to Africa south of the Zambezi, in the English, Dutch, French, and Portuguese languages. Cape Times Limited, Cape Town. 408 p.

A bibliography by author, with a very poor subject and geographical index.

Thesiger, W.
1936 A new journey in southern Arabia. Geographical
1947 Journal 108:129-145, 110:188-200.

———
1948 Across the Empty Quarter. Geographical Journal 111:1-21.

———
1949 A further journey across the Empty Quarter. Geographical Journal 113:21-46.

———
1950 Desert borderlands of Oman. Geographical Journal 116:137-171.

———
1964 The marsh Arabs. E. P. Dutton & Company, Inc., New York. 242 p.
An intimate anthropological study of the primitive Arabic tribes inhabiting the extensive marshlands near the confluence of the Tigris and Euphrates Rivers. Excellent account of peoples, occupance, vegetation, and wild life.

Thomas, B.
1931 A camel journey across the Rub' al Khali: A paper read at the meeting of the [Royal Geographical] Society, 18 May 1931. Geographical Journal 78(3):209-242.
Appendices: Regional sands and waterholes (p. 223-226), notes on the natural history collections (p. 227-238).

1932 Arabia Felix; across the "empty quarter." C. Scribner's Sons, N. Y. 397 p.

Thomas, B. E.
1955 Limits for American deserts and oases. Association of Pacific Coast Geographers, Yearbook 17:39-45.

Thomas, W. L., ed.
1959 Man, time, and space in Southern California; a symposium. Association of American Geographers, Annals 49(3, pt. 2). 120 p.

Thompson, D. G.
1929 The Mohave Desert region, California; a geographic, geologic, and hydrologic reconnaissance. U. S. Geological Survey, Water Supply Paper 578. 759 p.

Todd, N.
1844 Report from a journey from Herat to Simla via Candahar and Kabul. Asiatic Society of Bengal, Calcutta, Journal 13:339.

Tonnesen, T.
1917 The South-West Africa Protectorate. Geographical Journal 49:282-300.
A general brief view of South West Africa at the end of the German time.

Trewartha, G. T.
1954 An introduction to climate. 3rd ed. McGraw-Hill Book Company, Inc., New York. 402 p.

Trinkler, E.
1928 Afghanistan. Petermanns Geographische Mitteilungen, Erganzungsheft 196. 80 p.

Twitchell, K. S.
1958 Szudi Arabia, with an account of the development of its natural resources. 3rd ed. With the collaboration of E. J. Jurji and R. B. Winder. Princeton University Press. 281 p.

Unesco
1963 Bioclimatic map of the Mediterranean zone, explanatory notes. Unesco, Paris. Arid Zone Research 21. 60 p.

United Nations, Special Project
1964 Survey of the Awash River basin, preliminary report to the Imperial Ethiopian Government. Addis Ababa. 17 p.

U. S. Army Engineer Waterways Experiment Station
1960 Analogs of Yuma terrain in the Middle Eastern Desert. Technical Report 3-630, Report 4. Also cited as AD-478 848.

U. S. Army. Quartermaster Research and Development Command. Environmental Protection Division
1954 Analogs of Yuma climate in the Middle East. Research Study Report RER-1.

U. S. National Resources Committee
1938 Regional planning. VI: The Rio Grande joint investigation in the upper Rio Grande basin in Colorado, New Mexico, and Texas, 1936-1937. 2 vols.

U. S. National Resources Planning Board
1942 Regional planning. X: The Pecos River joint investigation in the Pecos River basin in New Mexico and Texas. Summary, analyses, and findings. 207 p. and atlas of 34 plates.
Deals with the whole Pecos valley and the attempt of planners to integrate it.

U. S. President's Water Resources Policy Commision
1951 Ten rivers in America's future. Report, vol. 2. Washington, D. C.
Among the rivers discussed are the Columbia, the Colorado, the Rio Grande, and the Sacramento - San Joaquin of California.

U. S. Soil Conservation Service
1947 Physical land conditions in the Rio Grande watershed of southern New Mexico: Rincon Valley and Mesilla Valley. Physical Land Survey 42. 28 p.

Van Royen, W.
1949 Desert regions of southwestern United States. U. S. Department of the Army, Office of the Quartermaster General, Military Planning Division, Research and Development Branch, Environmental Protection Section, Special Report 17. 8 p.

Van Warmelo, N. J.
1951 Notes on the Kaokoveld, South West Africa, and its people. Republic of South Africa, Department of Bantu Administration, Ethnological Publication 26. 64 p.
A good but cursory account of the area and people, still very incomplete.

Vesey-Fitzgerald, D. F.
1955 Vegetation of the Red Sea coast south of Jedda, Saudi Arabia. Journal of Ecology 43:477-489.

1957*a* The vegetation of central and eastern Arabia. Journal of Ecology 45:779-798.

1957*b* The vegetation of the Red Sea Coast north of Jedda, Saudi Arabia. Journal of Ecology 45:547-562.

Viney, N. M.
1947 A bibliography of British Somaliland. War Office, London.

Vitkovich, V.
1954 Tour of Soviet Uzbekistan. Foreign Languages Publishing House, Moscow. 246 p.
A generalized, descriptive geography of Uzbekistan primarily of the main oases of Uzbekistan. The industry, agriculture, customs, and present day economic development are discussed for the Tashkent oasis and the surrounding region, the Fergana Valley, the Zeravshan, the southern valleys, the Khorezem region, and the Aral Sea region. It is light, but quite informative reading.

Vivó, J. A.
1958 Geografía de México. 4th ed. Fondo de Cultura Económica. 349 p.

Volz, B.
1891 Unsere kolonien: land und leute. Brockhaus. Leipzig. 369 p., maps.

Voute, C.
1959 The Assab region, its geology and history during the Quaternary period. University College of Addis Ababa, Geophysical Observatory, Bulletin 1:73-101.

Waibel, L.
1928 Vom urwald zur wuste. natur-und lebensbilder aus Westafrika. F. Hirt, Breslau. 206 p.
(From forest to desert: nature and living pictures from West Africa)
Originally published in 1921 as "Urwald, veld, wuste." A study of landscapes and peoples in Kamerun and South West Africa, and an excellent cross section from forest to desert.

———
1955 As zonas pioneiras do Brazil. Revista Brasileira de Geografia 17:389-417.
Excellent study of settlement, but does not emphasize arid zone.

Wallén, C. C.
1956 Fluctuations and variability in Mexican rainfall. *In* G. F. White, ed., The future of arid lands. American Association for the Advancement of Science, Publication 43:131-135.

Weitz, R.
1966 Regional cooperation in Israel. National and University Institute of Agriculture, Rehovot. Publications on Problems of Regional Development 1. 148 p.
A work of the Settlement Study Center of the Department of Agriculture, Hebrew University. Rationale for regional planning and cooperation. A recent investigation into the present forms in order to ascertain advantages and disadvantages and to clarify future goals.

Welch, E. J.
1946 South-West Africa, a bibliography (1919-1946). University of Cape Town, School of Librarianship. 33 p.
343 references. See Roukens de Lange (1961) for 1946-1960.

Wellington, J. H.
1938 The Kunene River and the Etosha Plain. South African Geographical Journal 20:21-32.
Excellent study of the hydrography of the area

1946 A physiographical regional classification of southern Africa. South African Journal of Geography 28:64-86.
Excellent, similar to his book on the subject

———
1949 A new development scheme for the Okovango delta. Geographical Journal 63:66-67.
Wellington's plan for irrigating the Ngami area.

———
1952 Niger and Okovango; physical and human factors in their development. South African Geographical Journal 34:38-47.
Comments on the potential development schemes of the two rivers.

———
1953 A tentative land classification for southern Africa. South African Geographical Journal 35:16-25.
Brief, cursory and not too good.

———
1955 Southern Africa: a geographical study. Cambridge University Press, Cambridge. 2 vols.
A geographical study of southern Africa excellent on the physical side, spotty and often mediocre on the human side.

Wells, H. W.
1953 Large-scale farm operations in the upper San Joaquin Valley, California. University of California at Los Angeles, Department of Geography (M.A. thesis).

Whittlesey, D.
1954 The regional concept and the regional method. p. 21-68. *In* P. E. James and C. F. Jones, eds., American geography, inventory and prospect. Syracuse University Press, for the Association of American Geographers. 590 p.

Willmott, S. G., *et al.*
1964 Conservation survey of the southern highlands of Jordan. Durham University Survey Team, Monograph.
A land-use study of the Edom highlands by British scholars made as a basis for practical recommendations for better conservation practices. Includes useful tables, photos, and a complete bibliography. An excellent microstudy of a small area of Jordan.

Woolley, R. R.
1930 The Green River and its utilization. U. S. Geological Survey, Water Supply Paper 618. 456 p.

Wyoming. Natural Resource Board
1964 Resources and economy: Big Horn, Hot Springs, Park, Sweetwater, Uinta, and Washakie counties. University of Wyoming, Division of Business and Economic Research.

Wyoming. State Planning Board
1937 Report on irrigation and lands: Upper Colorado River drainage-basin, Green River Basin in Wyoming. 179 p.

Zaman, M.
1951 The regions of drybelts in Afghanistan. Afghanistan 6(2):63-68.

Zeiger, C. M., ed
1956 California and the Southwest. John Wiley and Sons, New York.

Zohary, M.
1962 Plant life of Palestine: Israel and Jordan. Ronald Press Company, New York. 262 p.
An admirable job of describing vegetation and relating it

to the land. Very good introduction to the regional geography of Israel and Jordan. Deals with individual species and their affinities, as well as with plant communities. Topography, soils, and climate are closely related. Treats ecological characteristics. Includes good photographs and drawings of species, and pictures of landscapes. Five black-and-white maps show: districts of Israel and Jordan, soils, rainfall, plant-geographical territories, and vegetation. Extensive bibliography and detailed index add to the value of the book.

An Annotated Bibliography On CULTURE FEATURES Of Desert Environments

For the purposes of this inventory, the contracting agency specified that culture features material should contain information on such items as highways, railroads, waterways, airfields, and other urban and nonurban culture features. Factors to be considered were distribution, density, physical characteristics, function, and significance. Agriculture was not to be emphasized.

Accordingly, the bibliography that follows concentrates on documents dealing with the works of man as distinct from his values and attitudes; although any given document may contain a preponderance of the latter class of information, it is included because it contains some of the former. Lack of annotation should not be construed as indicating a less important publication.

Abramsky, S.

1963 Ancient towns in Israel. World Zionist Organization, Youth and Hechalutz Department, Jerusalem. 278 p.

A scholarly work in the emergence of various towns representative of various regions in Israel. Historical surveys describe the specific character of each town, stressing geographical aspects that have influenced their development and decline. Among the early Negev settlements analyzed are: Ein Gedi, Sedom, Beersheba, and Elat, and bordering the Negev: Lakhish, Ashkelon, and Ashdod. Brief but useful history of the Negev and Ha'arava (Aravah) valley.

Alampiev, P.

1959 Soviet Kazakhstan. Foreign Languages Publishing House, Moscow. 185 p.

The book begins with a general description of the landscape and the natural resources of the republic. A topical survey of the republic is made, covering primarily the industrial, agricultural, and transportation development. A section of the life and culture of the people is presented and describes how happy the people are to be Soviet citizens. Finally, Kazakhstan is discussed from a regional viewpoint with the republic broken down into northern, southern, eastern, and western regions. A geographical comparison is made between the economic development before and after the October Revolution, mainly to impress the reader with the progress made since the Soviets moved into Kazakhstan.

Alexander, C. S.

1956 The geography of Margarita and adjacent islands, Venezuela. University of California, Publications in Geography 12(2):85-191.

High quality monographic treatment of physical and cultural landscape evolution in the small, arid Caribbean islands off the Venezuelan mainland. Original maps from field work.

Amiran, D. H. K.

1955-1956 The geography of the Negev and the southern limit of settlement in Palestine. Israel Exploration Society, Bulletin 20:108-117.

A thorough study of the historical and settlement geography of the Negev up to the beginning of the recent period of organized and intensive regional settlement developments in the arid southern half of Israel.

Amiran, D. H. K. and U. Ben-Arieh

1963 Sedentarization of Beduin in Israel. Israel Exploration Journal 13:161-181.

A brief account of traditional Bedouin nomadism in Israel and transition to seminomadism and reasons for this trend. Ecology of the Bedouins is examined in reference to crops, animals, and types of settlement.

Anonymous

1953 The Northwestern people's methods of protecting soil and water (translated title). Ko Hsueh Tung Pao (General Report of Scientific Work, Academia Sinica, Peking) 9:75-76.

Report on conservation work being carried out in the Northwest, including improved farming methods: terracing, irrigation ditches, improved tilling methods: building low walls to hold water in the fields, planting in earthenware bowls, covering sandy fields; methods for farming on hillsides and holding water on the plains: storing water in narrow gullies, damming wide gullies to hold water, flood ponds; conserving soil and water in desert gullies; building mud banks.

Atencio, T. C.

1964 The human dimensions in land use and land displacement in northern New Mexico villages. *In* C. S. Knowlton, ed., Indian and Spanish adjustments to arid and semiarid environments. American Association for the Advancement of Science, Southwestern and Rocky Mountain Division, Committee on Desert and Arid Zone Research, Contribution 7:44-52.

Atlas of Kustanay Oblast

1963 Atlas Kustanayskoy Oblasti. Moskovskii Gosudarstvennyy Universitet, Geograficheskiy Fakul'tet i Akademiya Nauk Kazakhskoy SSR. Glavnoye Upravleniye Geodezii i Kartografii Gosudarstvennogo Geologicheskogo Komiteta SSSR, Moskva. 80 p.

Complete coverage of the natural conditions and the resources of this northern Kazakhstan oblast. Agriculture, industry, population, and transportation are also covered.

Bailey, H. P.

1954 Climate, vegetation, and land use in southern California. California Department of Natural Resources, Division of Mines, Bulletin 170:31-44.

Bailey, W. C.
1950 A typology of Arizona communities. Economic Geography 26:94-104.

Bauer, F. H.
1959*a* Historical geographic survey of part of northern Australia. I: Introduction and the eastern Gulf region. C.S.I.R.O. Division of Land Research and Regional Survey, Report 59/2.

———
1959*b* Sheepraising in northern Australia, an historical review. Australian Geographer 7:169-180.

———
1964 Historical geography of white settlement in part of northern Australia. II: The Katherine-Darwin region. C.S.I.R.O. Division of Land Research and Regional Survey, Report 64/1.

Beyer, J. L.
1957 Integration of grazing and crop agriculture; resources management problems in the Uncompahgre Valley Irrigation Project. University of Chicago, Department of Geography, Research Paper 52. 125 p.

Bharadwaj, O. P.
1961 The arid zone of India and Pakistan. *In* L. D. Stamp, ed., A history of land use in arid regions. Unesco, Paris. Arid Zone Research 17:143-174.
A general geographic study of land forms, climatic change, land tenure and agricultural land use, and soil problems. Author suggests additional research into methods of improved land use and soil conservation methods. Little information on indigenous vegetation types.

Boone, A. R.
1935 Colorado River's newest dam. Scientific American 153:308-309.
Parker Diversion Dam.

Bruwer, J. P. van S.
1957 Die Bantoe van Suid-Afrika. Afrikaanse Pers Boekhandel, Johannesburg. 240 p.
(The Bantu of South Africa)
A fine survey of the ethnology of southern Africa. Contains a very brief mention of the Herero and Ovambo (pp. 25-28).

———
1959 The Kuanyama of South West Africa, a preliminary study. University of Stellenbosch (unpublished).
A partially completed detailed study of the ethnology of a group of the Ovambo peoples.

Buyanovskiy, M. S.
1961 On the question of iron and steel plant location in Kazakhstan. Soviet Geography: Review and Translation 2(9):44-59.
Among the iron ore deposits of Kazakhstan, attention is focused on the deposits of central Kazakhstan as a raw-material source for the Karaganda steel plant. Also discussed is the potential utilization of a third iron ore area situated on the north shore of the Aral Sea.

Calef, W. C.
1951 The salines of southeastern California. Economic Geography 27:43-64.
Shows towns, borax mines, methods of mining, and routes of shipment. Rather old.

California. Department of Water Resources
1928- Report on irrigation and water storage districts in to date California.

———
1963 Desert areas of southeastern California; land and water use survey, 1958. Bulletin 101. 74 p.

Campbell, K.
1935 The Colorado River aqueduct. Military Engineer 27(152):125-129.

Carlson, A. W.
1961 Rural settlement patterns in the San Luis Valley, Colorado. University of Minnesota (M.A. thesis).

Carter, D.
1959 Bridge at Glen Canyon. Arizona Highways 35(8):1-3.

Chang Chi-yi
1949 Land utilization and settlement possibilities in Sinkiang. American Geographical Review 39:57-79.
The natural resources Sinkiang are surveyed with the idea of future development for an influx and expansion of population. The author believes that multiple urban problems would result.

Chen Mo-ch'a
1959 Application of the Kan Er Jing (Underground Spring) Water Conservancy Systems, Sinkiang (translated title). Ko Hsueh Tung Pao (General Report of Scientific Work, Academia Sinica, Peking) 14:461-462.
This is a report on underground spring wells in Sinkiang; their special feature is a capacity to move water directly to fields to be irrigated. Author discusses practical implications of these wells: relationship between slope of ground, slope of water table, and slope of well very important; ways in which all Sinkiang can use this kind of irrigation / water conservation system profitably; appropriate geological and hydrological conditions for this type of well in Kansu, Ho-hsi Tso-lang area.

Christian, C. S., C. M. Donald, and R. A. Perry
1960 Pasture map of Australia. *In* The Australian environment. 3rd ed. C.S.I.R.O., Melbourne.

Coates, W. P. and Z. K. Coates
1951 Soviets in Central Asia. Lawrence and Wishart, London. 288 p.
The first part of the book deals with the ancient history of the people in Central Asia and of the development of Muslim states. The impact of Russian expansion and conquest of the Khanates during Tsarist time is examined. The second part depicts the life in the republics today and "shows what the Soviet national policy has accomplished." Each of the Asian republics is discussed in terms of industrial development, irrigation, and the general culture and life today.

Conway, A. W.
1952 Village types in the Southwest. Landscape 2(1):14-19.

Cragin, C. C.
1930 Mormon Flat Dam, Salt River Project, Arizona. New Reclamation Era 21:110-112.

Cramer, L. F.
1939 The Coachella branch of the All-American Canal. Reclamation Era 29:273-275.

Cressey, G. B.

1958*a* Qanats, Karez, and Foggaras. Geographical Review 48:27-44.

The best and most thorough study of the typical irrigation system of Iran from an engineering point of view as well as the effect on urban and agricultural water supplies of the distribution of qanats. Cost comparisons with pipe line systems.

1958*b* The Shatt al Arab Basin. Middle East Journal 12:448-460.

A regional study of southern Iraq with a detailed study of irrigation systems, crops, salinity problems, and geomorphology of the delta lands.

Davidson, B. R.

1961 The distribution of agricultural land in Australia. Australian Institute of Agricultural Science, Journal 27:203-212.

Deitch, L. I.

1966 Tucson house types. University of Arizona, Department of Geography (M.A. thesis).

Doke, C. M.

1925 The Qhung Bushmen of the Kalahari. South African Geographical Journal 8:39-45.

A simple brief description of parts of South West Africa and of the Qhung.

Duggan-Cronin, A. M.

1942 The Bushman tribes of southern Africa. McGregor Museum, Kimberley. 14 p.

A brief but fairly good text, with many pictures and a poor map.

Dvoskin, B. Y.

1962 Problemy razvitya i razmeshcheniye proizvoditel' nykh sil Kazakhskoy SSR v general' noy perspective. Akademiia Nauk SSSR, Izvestiya, ser. Geograficheskaya 1962(5):48-58.
(Problems in the development and distribution of the productive forces of the Kazakh Republic in a general perspective)

A general discussion of the economic situation in Kazakhstan with particular emphasis on industry. By 1980, Kazakhstan will become the most important raw material source for the development of heavy industry in the Far East. Especially important is the development of a satisfactory electrical grid over the republic. Of general concern, also, is the growth of foodstuffs. A great increase in the production of grain, meat, and wool is expected in the next decade. The most limiting factor in both the industrial and agricultural sectors is the availability of water. Even now there is insufficient water supply in several areas. Thus the problem of water will receive as much attention as industrial and agricultural development.

Edwards, E.

1961 Lost oases along the Carrizo. Westernlore Press, Los Angeles. 126 p.

Description and bibliography of area in the Colorado desert done in popular and uneven fashion.

Fiselen, F.

1947 The Central Valley project. 1947. Economic Geography 23:23-31.

English, P. W.

1966 City and village in Iran. University of Wisconsin Press, Madison. 208 p.

Results of the author's field work on the Kirman Basin among communities to show diversity and their functional integration in a complex regional organization. Disproves popular idea that Middle East villages are self-sufficient and isolated. Considerable data on climate, soils, crops, land and water ownership. Very scholarly work.

Estermann, C.

1931 Ethnographische beobachtungen über die Ovambo. Zeitschrift für Ethnologie 63:40-45.
(Ethnographic observations on the Ovambo)

A brief, cursory treatment of some aspects of the Ovambo peoples.

Fang Cheng-san *et al.*

1957 The design of bench terrace in the Loess Plateau (translated title). Ko Hsueh Tung Pao (General Report of Scientific Work, Academia Sinica, Peking) 14:439-440.

This is a discussion of techniques of building the "bench" type of terrace in the Loess Plateau where most slopes are steeper than 7 degrees. The two main divisions of subject matter are estimation of amount of water outflow; and use of tree roots as foundation for the terrace wall because of a lack of stones, including many diagrams and equations.

Fisk, B.

1952 Dujaila: Iraq's pilot project for land settlement. Economic Geography 28:343-354.

Results of the application of land reform law to the Dujaila Pilot Project near the Kut Barrage. New methods of land survey and allocation of plots in regard to irrigation channels. A successful example for other development projects.

Fitchett, D. A.

1964 Cadastral systems on the northern coast of Peru; some problems and prospects. Journal of Inter-American Studies 6(4):537-547.

Fourie, L.

1928 The Bushmen of South West Africa. *In* C. H. L. Hahn, L. Fourie, and H. Vedder, Native tribes of South West Africa. The Cape Times, Cape Town. 211 p.

A fair account of the ethnography of the Bushmen.

Freykin, Z. G.

1961 Vazhneyshiye izmeneyniya v geografii khozyaystva respublik Sredney Azii. Geografiya v Shkole 1961(1):8-19.
(Most important changes in the geography of the economy of the Central Asian Republics)

Central Asia is a region of a specialized economy producing crops like cotton, silk, rice, fruits, etc., that have national significance. Particularly important has been the tremendous expansion of irrigated acreage which has allowed this region to specialize in certain crops. While agriculture has received the greatest emphasis, especially irrigation projects, industry has been developed simultaneously. The machine for cotton picking, and certain types of textile and mineral extraction machinery are also produced. The author takes each republic and surveys the economy, showing the changes brought about under Soviet rule. Particular emphasis is placed on agriculture and irrigation. A map of irrigated agriculture is included.

Gabriel, A.
1942 Die Lut and ihre wege. Zeitschrift für Erdkunde 19:423-442.
(The Lut desert and its roads.)

Garrison, J. J.
1953 Barstow, California: a transportation focus in a desert environment. Economic Geography 29:159-167.

Gault, H. J.
1933 The All-American Canal. Military Engineer 25(143):379-382.

Gellert, J. F.
1948 Klimabedingtheit und wirtschaftsgeographische struktur der farmwirtschaft und farmsiedlung in Südwestafrika. Erdkunde 2(4/6):282-302.
(Climatic limitation and economic-geographic structure of the farm economy and farm settlement in South West Africa.)
An excellent treatise in a comprehensive manner.

Gildersleeve, C. R.
1964 A comparison of land use in three Arizona communities. University of Arizona, Department of Geography (M.A. thesis). 76 p.

Glendinning, R. M.
1945 Desert change: a study of the Boulder Dam area. Scientific Monthly 61:181-193.

Gregg, D. O. *et al.*
1961 Public water supplies of Colorado, 1959-1960. Colorado Agricultural Experiment Station, Ft. Collins, General Series 757. 128 p.

Gregor, H. F.
1963 Spatial disharmonies in California population growth. Geographical Review 53:100-122.

Grunsky, C. E.
1929 The head-works of the Imperial Canal. American Society of Civil Engineers, Transactions 93:262-269.

Hackenberg, R. A.
1964 Changing patterns of Pima Indian land use. *In* C. S. Knowlton, ed., Indian and Spanish American adjustments to arid and semiarid environments. American Association for the Advancement of Science, Southwestern and Rocky Mountain Division, Committee on Desert and Arid Zone Research, Contribution 7:6-15.

Hahn, C. H. L.
1928 The Ovambo. *In* C. H. L. Hahn, L. Fourie, and H. Vedder, Native tribes of South West Africa. The Cape Times, Cape Town. 211 p.
An excellent description of the ethnography of Ovambo, written by the first European commissioner to the tribe, and son of the first missionary to the tribe.

Hailey, W. M. H., baron
1938 An African survey, a study of problems arising in Africa south of the Sahara. Oxford University Press, London. 1837 p.
A famous, comprehensive, thorough study of the British Commonwealth in Africa. Many references to South West Africa, but not in a separate section. Revised edition, 1676 pages, appeared in 1957.

Halperin, H.
1963 Agrindus: Integration of agriculture and industries. Routledge and Kegan Paul, London. 214 p.
Dr. Halperin is Professor of Agricultural Economics at Hebrew University. This is a very readable idealization of the philosophy of the regional settlement plan in Israel's arid regions – the integration of agriculture and industry. His plan encourages establishment of villages around an industrial center, the latter containing agriculture-related industries, but living areas would remain in nearby villages to prevent excessive rural to urban movement. A critical analysis of various settlement schemes, including an outline for settling the Besor Region in the Negev and the ideal type of regional center. Does not point out in detail some of the relevant information available on water, soil, and vegetation types that affect settlement types.

Harris, G. L.
1957 Iraq, its people, its society, its culture. Human Relations Area File Press, New Haven. 350 p.

———

1958 Jordan, its people, its society, its culture. Grove Press, Inc., New York. 246 p., maps.
A comprehensive summary of all phases of Jordanian life, with emphasis on national life, changing through social, political, and economic reforms. An interdisciplinary appraisal. More materials on cultural than on physical geography.

Hoernle, A. W.
1923*a* The expression of the social value of water among the Nama of South West Africa. South African Journal of Science 20:514-526.
A very interesting, worthwhile article.

———

1923*b* South West Africa as a primitive culture area. South African Geographical Journal 6:14-28.
A very good resume of the area at that time.

Hoover, J. W.
1929 The Indian country of southern Arizona. Geographical Review 19:38-60.

———

1930 Tusayan: the Hopi country of Arizona. Geographical Review 20:425-444.

———

1935 House and village types of the Southwest as conditioned by aridity. Scientific Monthly 40:237-249.

Hsi Ch'eng-fan
1954 Yellow loess hills not suited for extensive construction of terraced fields (translated title). Ko Hsueh Tung Pao (General Report of Scientific Work, Academia Sinica, Peking) 12:73-74.
The author takes the position that there are few terraces in northern Shensi because the people know from experience that the land is not suitable for terracing. His own observations support this view, because he finds the soil too coarse and gravelly for cohesion, hills too high and steep for efficient terracing and lack of rocks for building terrace walls. He argues that the problem of erosion must be dealt with on many fronts with consideration for the special features of each area. Among the areas for erosion prevention work: improving agricultural production, increasing livestock industry, planting forests, replacing ground cover, rotating crops, planting grass.

Hsi Ch' eng-fan

1955 Further discussion on the problem of constructing terraced fields in the Loess Hills areas (translated title). Ko Hsueh Tung Pao (General Report of Scientific Work, Academia Sinica, Peking) 4:73.

This article is in disagreement with the same author's earlier publication (Hsi Ch'eng-fan, 1954) in which he contended that yellow loess hills are not suitable for terracing. The most serious obstacle to terracing in loess hills is the problem of protecting the construction, but the author now believes this can be done. He further states that terrace construction must be planned to fit in with overall water and soil conservation work and that results will come slowly but surely.

Hsin Hua She (New China Society)

1953 First steps in solving the problem of diverting Yellow River water into the Hou-t'ao Canal (translated title). Ko Hsueh Tung Pao (General Report of Scientific Work, Academia Sinica, Peking) 8:107.

A news report on the successful application of Russian advice on the problem of making water flow regularly into the Hou-t'ao canal. Grass was used as a binder for the indigenous mud in building a firm channel which then allowed water to flow freely and be used for irrigation.

Huang Wen-hsi

1959 Ten years of the achievements of hydraulic sciences in China (translated title). Ko Hsueh Tung Pao (General Report of Scientific Work, Academia Sinica, Peking) 20:686-689.

A generalized history of the CCP's accomplishments in hydraulics. Special emphasis is placed on hydrology experimental stations, river currents, changes in water systems as a result of conservation, improvement in reporting water conditions, sand and mud control in the Yellow River and Northeast and Northwest, canals, reservoirs, waterworks, rapid waters, strengthening weak banks, waterpower and electricity, and supplying water to arid regions.

Hudson, A. E.

1938 Kazakh social structure. Yale University Publications in Anthropology 20. 109 p.

A detailed anthropological study on the Kazakhs in relation to their economic activity, family characteristics, class stratification, and political groupings. Mongol culture and society are also studied in relation to their effect on Kazakh society. The book is profusely footnoted and has an extensive bibliography at the end.

Jaeger, H.

1920 Die kulturgeographische wandlung von Sudwestafrika wahrend der deutsche herrschaft. Geographische Zeitschrift 1920:305-316.

(The cultural-geographic transformation of South West Africa during the German administration)

A good discussion of the changes in South West Africa during the German time, as well as a review of the research done in that field at that period.

1955 Das endingen der europaischen kolonialkultur in Sudwestafrika. Geographische Rundschau 7:455-459.

(The penetration of European culture into South West Africa)

A good study of the origins of German settlement in South West Africa.

James, P. E.

1927 Iquique and the Atacama Desert. Scottish Geographical Magazine 43(4):203-215.

Description of settlement of Iquique and its arid surroundings, especially the nitrate district of the Atacama desert.

Jensen, T. A.

1954 Palm Springs, California, its evolution and function. University of California, Los Angeles, Department of Geography (M.A. thesis).

Jodha, N. S.

1966 A semi-nomadic farm family, Rajasthan. Agricultural Development Council, Inc., New York. 15 p.

A study of a village and family in Nagaur district of Rajasthan by a technical assistant in Human Factor Studies Division of Central Arid Zone Research Institute, Jodhpur, India. Excellent intensive study of a farm family with description of soils, water, crops, land tenure, and animal husbandry.

Jones, J. D. R. and C. M. Doke, eds.

1937 Bushmen of the southern Kalahari. Papers [by various authors] reprinted from Bantu Studies, together with some additional material. University of Witwatersrand Press, Johannesburg. 282 p.

An excellent symposium.

Karinen, A. E. and D. W. Lantis

1961 The population of California: 1950-1961. Association of American Geographers, Annals 51: 413-414. (Abstr.)

Keet, J. D. N.

1949 Report of the Long Term Agriculture Policy Commission. South West Africa Administration.

A practical consideration of the physical elements in the formulation of a policy regarding allotment of farming area, subsidies, lines to be developed, etc.

Kelley, W. D.

1955 Settlement of the middle Rio Grande Valley. Journal of Geography 54:387-399.

Kern, I. J.

1955 The fabulous fishing industry, facts and figures. South West Africa Annual, Windhoek. p. 15-21.

A good account, with statistics.

Khromov, M. N.

1961 Changes in the geography of population centers in connection with the creation of the Tsimlyansk Reservoir. Soviet Geography: Review and Translation 2(10):57-64.

A discussion of the problems involved in the resettlement of population from lands flooded by the construction of the Tsimlyansk Reservoir. A comparison of prior settlement, village patterns, transportation, and agriculture with the result brought about by relocation.

Kohler, O

1956 The stage of acculturation in South West Africa. Sociologus 6:130-153.

An excellent study of the cultural situation of the native groups on a good, solid basis.

1958 A study of the Karibib District (South West Africa). Union of South Africa, Department of

Native Affairs, Ethnological Publication 40. Government Printer, Pretoria. 116 p.
An economic-ethnographic study of the native groups of the area, statistically well-founded.

1959*a* A study of Cobabis District (South West Africa). Union of South Africa, Department of Bantu Administration and Development. Ethnological Publication 42. Government Printer, Pretoria. 108 p.
An economic-ethnographic study of the native groups of the area based on good statistical and field information.

1959*b* A study of Grootfontein District (South West Africa). Union of South Africa, Department of Bantu Administration and Development, Ethnological Publication 45. Government Printer, Pretoria. 85 p.
An economic-ethnographic study of the position of the natives in the area, based on field and statistical research.

1959*c* A study of Omaruru District (South West Africa). Union of South Africa, Department of Bantu Administration and Development, Ethnological Publication 43. Government Printer, Pretoria. 113 p.
A very fine ethnographic-economic study of the position of the native in the area concerned, based on field search and statistics.

1959*d* A study of Otjiwarongo District (South West Africa) Union of South Africa, Department of Bantu Administration and Development, Ethnological Publication 44. Government Printer, Pretoria. 98 p.
An economic-ethnographic study of the position of the natives in the area, based on field and statistical research.

Krader, L.
1963 Peoples of central Asia. University of Indiana Press, Bloomington, 319 p.
Ethnology, history, geography, language, religion, demography, and cities of Central Asia and Kazakhstan.

Krogh, D. C.
1955 Economic aspects of the karakul industry in South West Africa. South African Journal of Economics 23:99-113.
A very sound discussion, from the purely economic aspect, of the major output of the pastoral economy of the Territory.

Lebzelter, V.
1934 Rassen und kulturen in Sudafrika (Wissenschaftliche ergebnisse einer forschungsreise nach Sud- und Sudwestafrika in den jahren 1926-1928). II Eingeborenenkulturen in Sud-und Sudwestafrika Hiersemann, Leipzig. 306 p.
(Native cultures of South and South West Africa)
A fine study of the tribal groups in South West Africa.

Lee, D. H. K.
1963 Human factors in desert development *In* C. Hodge and P. C. Duisberg, eds., Aridity and man. American Association for the Advancement of Science, Publication 74. 339-367.
Foremost authority on tropical housing states that mechanical heating and cooling are substituted for design modification in dwellings of hot and dry United States. Bibliography p. 365-367 (30 refs.)

Lehmann, F. R.
1954 Die anthropogeographischen verhaltnisse des Ambolandes im nördlichen Südwestafrika. Zeitschrift für Ethnologie 79:8-58.
(The anthropogeographic relations of Ovamboland)
A very thorough anthropo-geographic study of the principal tribe of the northern part of the Territory.

Lin Hua-fu
1955 Concerning the problem of constructing terraced fields in the Loess Hills area (translated title). Ko Hsueh Tung Pao (General Report of Scientific Work, Academia Sinica, Peking) 2:81-82.
According to this author, existing terracing in northern Shensi has been successful and conditions are now conducive to expansion. The problem of coarse and non-cohesive soil can be dealt with by doing the construction work during the rainy season. The problem of steep slopes and erosion can be handled by mixing forests, pastures, and fields and using new planting methods. Terracing is essential to use these hilly areas profitably.

Liu Shan-chien
1953 First steps in the analysis of the records of erosion at T'ien-shui (translated title). Ko Hsueh Tung Pao (General Report of Scientific Work, Academia Sinica, Peking) 12:59-65.
Report on the state of erosion studies at T'ien-shui covering basic conditions: method and objectives of measurements, compilation of materials; simple analysis: erosion and the slope of the land, slope and agricultural production, erosion and force of rainfall, erosion and amount of waterflow per year, erosion and agricultural methods, unified research on erosion; conclusions and recommendations: erosion is caused by lack of ground cover and poor farming methods, not by the slope of the hillsides. In research work the article recommends further study, especially on improved farming methods and the actual process of erosion with special attention to the following topics: (a) weather measurement; (b) soil types; (c) gullies and hills and flood prevention; (d) artificial irrigation; (e) publicity for results of experimentation; (f) improvement of techniques.

Loeb, E. M.
1962 In feudal Africa. Indiana University Research Center in Anthropology, Folklore, and Linguistics, Bloomington, Publication 23. 383 p.
A very thorough ethnologic study of the Kuanyama, with an aim to proving their feudal antecedents.

Logan, R. F.
1955 The shifting patterns of travel in the Southwest deserts. Association of American Geographers, Annals 45. 199. (Abstr.)

1956 Suburbia in the deserts. Association of American Geographers, Annals 46. 259. (Abstr.)

1961*a* Land utilization in the arid regions of southern Africa. II. South West Africa. *In* L. D. Stamp, ed., History of land use in arid regions. Unesco, Paris. Arid Zone Research 17. 331-338.
A resume of the pastoral-agricultural history of South West Africa.

1961*b* Post Columbian developments in the arid regions

of the United States of America. *In* L. D. Stamp, ed., A history of land use in arid regions. Unesco, Paris, Arid Zone Research 17:277-297.

A generalized, selective treatment of the arid lands between the coast range of California and the Rocky Mountains Divide (omits Texas). Treats natural setting, history of settlement, land laws, land use, grazing, dry farming, irrigation agriculture, economy of the desert Indian, recreation, and urbanization. Imperial-Coachella Valley is used as a representative area, dealing mainly with water distribution and agricultural land use. Treats historical and technical explanation of present land use, also settlement features. Discusses: ranch fencing; pipeline; tanks; modern advantages at Manchstead (electricity, telephone, radio, running water); various means of water diversion, storage, and irrigation; crops and rotational schemes; new towns and centers of recreation; and tracts of new urban desert-loving dwellers. "Rurban" expansion is expected to be large in the future with remaining land used for livestock. Only solar energy could change the general picture. Industrialization is also foreseen.

Luknitskii, P. N.

1954 Soviet Tajikistan. Foreign Languages Publishing House, Moscow. 254 p.

A relatively informative book; a good description of the landscape, economy, and the people. The main industries of Tadzhikistan — cotton, livestock, mining, and fruits — are discussed in reference to where, what, and how much. Great attention is paid to the valleys of the republic where most of the population live and where practically all the agriculture is carried on. A whole chapter is devoted to the Hissar Valley which is the most important one. The republic is also examined from a regional viewpoint.

———

1957 Tadzhikistan. Geograficheskaya nauchnokhudozestvennaya seriya: Nasha Rodina. Izdaltel'stvo TS. K.V.L.K.S.M. "Molodaya Gvardiya," Moskva. 494 p.

A good analysis of the Tadzhik Republic. Practically every aspect of geography is covered by the book: industry, population, agriculture, irrigation, transportation, etc. These elements are discussed both on the republic level and according to regions. Emphasis is placed on the valleys where most of the people live and most of the economy is situated. The cities are also examined in comparatively good detail, especially the capital of the Republic, Stalinabad (Dushanbe).

Luttig, H. G.

n.d The religious system and social organization of the Herero: a study in Bantu culture. Kemink en Zoon, Utrecht. 121 p.

A remarkable, thorough study of the Herero from the ethnological viewpoint.

Mahoney, J. R

1964 Navigability of the Green River, management of its waters for resource development. University of Utah, Bureau of Economic and Business Research, Studies in Utah's Resources and Regional Development. 86 p.

Unexpected source of detailed analysis of flood plain and some aspects of surrounding country as well as the river bed.

Maslov, Y. P.

1962 Voprosy razvitiya sel'skokhozyastvennogo Severo-Kavkazskogo ekonomicheskogo rayona. Izvestiya Akademii Nauk SSSR, Seriya Geograficheskaya 1962(6):50-59.
(Problems in the development of the agricultural North Caucasus economic region.)

The effectiveness of the specialization of agriculture is possibly only with the rational combination of the various branches of agriculture, and their planned and proportional development. A general survey of the regionalization of agriculture is given. Horticulture, fruits, tobacco, corn, wheat, sugar beets, etc., are discussed in relation to their distribution and acreage. The Kuban region receives particular emphasis. Greater use is being made of irrigation for specialized crops, especially in the Kuban, and further expansion of irrigated acreage should take place along the Don, Kuban, and Terek rivers. Finally, with the changes in the structure of agriculture here, with the introduction of corn, the development of livestock is greatly improving.

Matthias, N. A.

1941 The Los Angeles flood control project. Military Engineer 33(191):382-388.

McCleneghan, T. J. and C. R. Gildersleeve

1964 Land use contrasts in a border economy. University of Arizona, Bureau of Business and Public Research, Special Study 23. 12 p.

McCollam, A. E.

1958 The California Water Plan. Military Engineer 50(335):203-207.

Meigs, P.

1952 Map M-97: core areas and marginal areas of deserts. U. S. Department of the Army, Office of the Quartermaster General, Environmental Protection Branch, Natick, Massachusetts.

Meinig, D. W.

1965 The Mormon culture region; strategies and patterns in the geography of the West, 1847-1964. Association of American Geographers, Annals 55(2).

The Mormons, a distinctive American subculture, have long dominated a large area of the Far West, but the extent of the region and the geographic relationships between Mormons and Gentiles (non-Mormons) have never been satisfactorily presented. Historical analysis of expansions, contractions, and reexpansions from the original Utah nucleus and of concurrent Gentile movements into and around Mormon colonies provides the basis for a refined definition of the Mormon culture region. That region is interpreted as having a core in the Wasatch Oasis, a domain over much of Utah and southeastern Idaho, and a sphere extending from eastern Oregon to Mexico. The most recent and important movement has been to the Pacific Coast cities, producing modifications in theology as well as geography, and suggesting the emergence of a Salt Lake City-Los Angeles axis as a pattern of profound influence in the present and future of Mormondom.

Narzikulov, I. K., ed.

1956 Tadzhikskaya SSR, ekonomiko-geograficheskaya kharakteristika. Gosudarstvennoye Izdatel'stvo Geograficheskoy Literatury, Moskva. 226 p.

(Tadzhik SSR; an economic-geographical characteristic.)

This is a good geographical description of the Republic. The geography is examined from both a systematic and a regional view. The first third of the book deals with the physical aspects and resources of the region. The relief, climate, rivers, lakes, minerals, soils, vegetation, and fauna are covered. The history of the Tadzhik people is reviewed, and the population is studied in relation to culture, density, distribution, etc. Transport, industry, and agriculture are studied systematically, but few figures and maps are given. The last third analyzes the Republic from a regional view. It is divided into eight regions and all of the previous elements of the systematic treatment are examined in greater detail.

Nei Meng Ku Tengk'ou Hsien Jen Min wi Yüan Hui (Inner Mongolia Tengk'ou County People's Committee)

1958 Tengk'ou County has firstly conquered wind, sand and flood (translated title). Ko Hsueh Tung Pao (General Report of Scientific Work, Academia Sinica, Peking) 23:717-718.

This is a report on work done in Tengk'ou County to control severe sandstorms, wind, and Yellow River floods. Windbreak and grass planting has been carried out since 1951, and 43 irrigation canals have been built to make this possible. As a result, sand was held down and 100,000 mou of grasslands were protected from being covered by sand. Livestock has increased, fields are productive, floods have been controlled, and wind force has been decreased by the windbreaks.

Nelson, A.

1898 The Red Desert of Wyoming and its forage resources. U. S. Department of Agriculture, Division of Agrostology, Bulletin 13. 72 p.

Nelson, H. J.

1959 The spread of an artificial landscape over Southern California. Association of American Geographers, Annals 49(3:2):80-100.

Largely marginal to desert areas.

Nelson, L.

1952 The Mormon village: a pattern and technique of land settlement. University of Utah Press, Salt Lake City. 296 p.

Nikol'skiy, I. V.

1961 Geography of transportation of Kazakhstan. Soviet Geography: Review and Translation 2(3): 44-54.

A description of railroad, waterway, and truck transportation. Freight movements, type and quantity of commodities shipped, flow movements, etc., are discussed for each mode of transport. A description of the various types of hubs or centers within the transportation network is also included. Nikol'skiy is the outstanding authority on transportation geography in the U.S.S.R.

O'Neal, L.

1957 A peculiar piece of desert, the story of California's Morongo Basin. Westernlore Press, Los Angeles, California.

A lay discussion of many facets of a basin twenty miles north of Palm Springs.

Passarge, S.

1907 Die Buschmanner der Kalahari. Reimer, Berlin. 144 p.

A good study of the Bushmen of the northern Kalahari.

Pavelnko, V. F.

1963 The transport-geography situation and the interregional links of Central Asia. Soviet Geography: Review and Translation 4(9):27-33.

The author analyzes Central Asian inter-regional traffic by commodities, and major economic regions as of 1960; he predicts that bulk freight will gradually diminish in importance as Central Asia's industry expands. He urges more intensive utilization of the Caspian-Volga waterway in addition to rail routes linking Central Asia and other regions.

Perry, R. A.

1960 Pasture lands of the Northern Territory, Australia. C.S.I.R.O. Land Research series 5. 55 p.

Perry, R. A. *et al.*

1963 Preliminary assessment of ground water suitable for irrigation in the Alice Springs area, and its agricultural significance C.S.I.R.O. Land Research and Regional Survey, Technical Paper 21. 28 p.

Range, P.

1937 Südwestafrika: geologie und bergbau. Deutsche Geologische Gesellschaft, Zeitschrift 89:468-509.

A general presentation of the geology and the mining of the whole territory.

1943 Zur wasserwirtschaft in Südwestafrika. Beiträge zur Kolonialen, Berlin, vol. 5.

An excellent discussion with a fine map.

Raup, H. F.

1956 The United States in professional geographic literature. Association of American Geographers, Annals 46:140-149.

Maps show location of studies between 1920 and 1954.

Reuss, L. A. and G. T. Blanch

1951 Utah's land resources. Utah Agricultural Experiment Station, Special Report 4. 66 p.

Contains many maps.

Reynolds, G. W.

1950 The aloes of South Africa. The Trustees, Aloes of South Africa Book Fund. Johannesburg. 520 p.

An exhaustively thorough reference book.

Rokach, A.

1964 Regional rural development. Israel Today Series 32. Jerusalem Post Press. 31 p.

A detailed summary of regional settlement plans in Israel with particular attention to the Lakhish Region. Well illustrated with photos and diagrams of settlement bloc plans, and individual farm units. An enclosed map of the Lakhish Region locates and classifies agricultural settlement types and shows roads, railways, and water pipelines. Only brief reference to the actual Negev.

Rumage, K. W.

1956 The Palo Verde Valley a geographic analysis of land-use development in the Lower Colorado River Valley, California. University of California, Los Angeles, Department of Geography (Ph. D. dissertation)

Sami, B. S.

1962 Housing in the hot and tropics. Architectural Science Review 5:3-12.

1965 Housing for the developing areas of Australia and

the Pacific. Australian and New Zealand Association for the Advancement of Science, 38th Congress, August 1965, Paper presented to Section H (Engineering and Architecture). 12 p.

Sanford, T. E.
1950 The architecture of the Southwest. W. W. Norton and Company, Inc., New York.
One example of a large number of titles which proved to treat eclectic, architect-designed buildings or historic shrines almost exclusively.

Sasaki, T. T.
1964 Changes in land use among the Navajo Indians in the Many Farms area of the Navajo Reservation. *In* C. S. Knowlton, ed., Indian and Spanish American adjustments to arid and semiarid environments. American Association for the Advancement of Science, Southwestern and Rocky Mountain Division, Committee on Desert and Arid Zone Research, Contribution 7:34-37.

Schapera, I.
1930 The Khoisan peoples of South Africa: Bushmen and Hottentots. Routledge and Kegan Paul, London. 445 p.
The old thorough source of information on these peoples. Slightly out of date, but still excellent.

Schneider, K. R.
1962 Urbanization of the California Desert, signs of ultimate dispersion. American Institute of Planners, Journal 28:18-23.

Seeman, A. L.
1938 Communities in the Salt Lake Basin. Economic Geography 14:300-308.

Shantz, H. L.
1945 Agricultural regions of Africa. Reprinted from a series of 9 articles in Economic Geography, v. 16-19, 1940-1943, by the Author. Santa Barbara. 269 p.
A generalized survey of the whole continent.

Shen Hsi Sheng Shui-li so
(Shen Hsi Provincial Water Conservation Department)
1958 Conduct Yutung Canal for irrigation in the desert area (translated title). Ko Hsueh Tung Pao (Academia Sinica, Peking) 23:715-716.
In addition to carrying on existing projects of planting grass and trees, the people of Yuteng have also built a canal to begin desert irrigation. When completed, the canal will be about 90 miles (U. S.) long. In the building process, the water to run in the canal was used to speed construction work. Water was allowed to flow into each section as it was built; this helped keep the channel open, firm the sand, fix the slope of the canal, and pierce sand dunes. In 1958 a portion had already been completed and vegetation was improving.

Siciliano, S. A.
1953 Saga of the Wellton-Mohawk. Arizona Highways 29(10):2-9.

Sinkiang Daily News
1951 Great effort in Sinkiang to finish the Hung Yen ch'ih reservoir (translated title). Ko Hsueh Tung Pao (General Report of Scientific Work, Academia Sinica, Peking) 5:548
According to this news article of December 6, this reservoir, which was begun in 1943, will be completed between September 1, 1950 and late March 1952. The reservoir is formed on three sides by mountains, and a dam is being built on the west side; the final result will be a 5,050,000 square meter lake which will irrigate 100,000-120,000 mou of farmland and remedy the chronic shortages in the Ti hua area.

Smit, P.
1963 Die ontwikkeling van die vis nywerheid by Walvis baai. Tydskrif vir Aardrykskunde (Journal for Geography), Stellenbosch, 2(2):41-51.
(The development of the fisheries at Walvis Bay)
A good economic study of the fishing industry.

Sollas, W. J.
1924 Ancient hunters and their modern representatives. Macmillan, New York. 689 p.
An excellent but outdated work. Bushmen discussed at length on pages, 452-494.

South West Africa Administration
n.d. Water Supply in Ovamboland. Water Affairs Branch, Water Supply Brochure 13.
A survey of the current situation of Ovamboland and proposals for large scale diversions.

Stanley, R. W.
1954 Political geography of the Yuma Border District. University of California, Los Angeles, Department of Geography (Ph. D. dissertation).

Stengel, H. W.
1963 Water affairs in South West Africa. Afrika-Verlag der Kreis, Windhoek.
An excellent symposium of the water supply problems of South West Africa.

Stevens, J. P.
1964 Changes in land tenure and usage among the Indians and Spanish Americans in northern New Mexico. *In* C. S. Knowlton, ed., Indian and Spanish American adjustments to arid and semiarid environments. American Association for the Advancement of Science, Southwestern and Rocky Mountain Division, Committee on Desert and Arid Zone Research, Contribution 7:38-43.

Story, R.
1958 Some plants used by the Bushmen in obtaining food and water. Botanical Survey of South Africa, Memoir 30.
An excellent study of the plants and their uses.

Taaffe, R. N.
1960 Rail transportation and the economic development of Soviet Central Asia. University of Chicago, Department of Geography, Research Paper 64. 180 p.
A very good historical and analytical account of rail development in Soviet Central Asia and its economic impact on the region.

1962 Transportation and regional specialization: the example of Soviet Central Asia. Association of American Geographers, Annals 52:89-98.
The role of transportation in the transformation of Soviet Central Asia from an isolated and relatively self-sufficient region into a zone of highly specialized economic activity has been great. Results of the railroad building program since tsarist times have been the intensification of commercial and highly specialized agriculture based on cotton processing, and a comparatively

rapid urbanization due to a large Slavic migration into the region. Regional specialization, however, has substantially increased the long-haul distance of shipments to over 800 kilometers. Various methods have been applied by the Soviets to decrease this distance, but all have failed due to the forces of specialization in the Soviet economy.

Thomas, B. E.
1960 Transportation and physical geography in West Africa. Prepared for the Human Environments in Central Africa Project, NAS/NRC, Division of Anthropology and Psychology, and issued as a Special Technical Report, Quartermaster Corps Contract DA19-129-QM-1309. 54 p. Also cited as AD-236 244.
The Sahara (p. 12-23): surface features of the desert; the stony (hamada), sandy (erg), and gravel (reg) deserts; climate and transportation in the Sahara. Maps.

Thomas, E. M.
1959 The harmless people. Knopf, New York. 267 p.
A very fine, sensitive, and accurate reporting of the life and environment of the Bushmen of the northern Kalahari.

Thomas, F. H.
1960 The Denver & Rio Grande Western Railroad; a geographic analysis. Northwestern University, Department of Geography, Studies in Geography 1. 269 p.

Titiev, M.
1944 Old Oraibi, a study of the Hopi Indians of Third Mesa. Harvard University, Peabody Museum of American Archaeology and Ethnology, Papers 22(1). 277 p.

Tolstov, S. P.
1962 Transport in Azerbaydzhan. Central Asian Review 10:129-146.
A generalized description of present day transportation facilities. Railroad, sea transport, passenger car, and air travel are examined in relation to present capacities, utilization, and prospects.

Tremblay, M.-A., J. Collier and T. T. Sasaki
1954 Navaho housing in transition. América Indígena 14:187-219.
Describes types of housing in Fruitland settlement but does not give percentage to which they are representative. No maps.

U. S. Bureau of Reclamation
1934 Engineering report on Verde Project, Arizona. looseleaf, mimeo. v.p.
Phoenix-Salt River Valley Irrigation District, measurements of water available, laws affecting it, the canal system, pumping plants and power plants.

1936 Construction of Boulder Dam, prepared in collaboration with the Department of the Interior, Bureau of Reclamation. Boulder Dam Services Bureau, Inc., Boulder City, Nevada. 47 p.
Very technical, with dimensions, drawings, etc., but also some material about the immediate area.

1941*a* General information concerning the Salt River Project, Arizona. 6 p.

1941*b* The story of Boulder Dam. Conservation Bulletin 9. 72 p.

1946 The Colorado River . . . a comprehensive report on the development of the water resources of the Colorado River Basin for irrigation, power production, and other beneficial uses in Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming. 295 p.

1953 Report (and supplement) on water supply of the Lower Colorado Basin Project; planning report. Boulder City, Nevada. 213, 126, 89 l.
Maps, climatological data, historic stream flow, irrigated areas, stream depletions, and various appendices.

1955 Davis Dam and powerplant; technical record of design and construction, Davis Dam Project, constructed 1942-1953. Denver. 414 p.
Detailed and technical information on the dam, with drawings, sketches, etc. Precise measurements given.

1959*a* Glen Canyon Bridge; technical record of design and construction. Constructed 1957-1959. Colorado River Storage Project, Arizona - Colorado - New Mexico - Utah - Wyoming. Denver. 163 p.
Detailed and technical information on settlement features.

1959*b* Tracy Pumping Plant, and intake canal and discharge lines, constructed 1947-1951, Central Valley Project, California; technical record of design and construction. Denver. 181 p.

1963*a* Prineville Dam, constructed 1958-1961, Crooked River Project, Oregon; technical record of design and construction. Denver. 154 p.

1963*b* Steinaker Dam, constructed 1959-1961; Central Utah Project, Utah: technical record of design and construction. Denver. 132 p.

Van Warmelo, N. J.
1951 Notes on the Kaokoveld, South West Africa, and its people. Republic of South Africa, Department of Bantu Administration, Ethnological Publication 26. 64 p.
A good but cursory account of the area and people, still very incomplete.

Wagner, G.
1954 Some economic aspects of Herero life. African Studies 13:118-130.
An excellent appraisal of the native situation.

1957 A study of the Okahandja District. Union of South Africa, Department of Native Affairs, Ethnological publication 38.
Excellent, thorough study of the natives and their living conditions.

Walter, H. and O. H. Volk
1954 Grundlagen der weidewirtschaft in Südwestafrika. E. Ulmer, Stuttgart. 281 p.
(Basis of the grazing economy of South West Africa)
An excellent study of the pasture resources of South

West Africa with an appendix on the classification of the grasses.

Wang Hua-yün
1959 Initial researches about the rerouting of water from the southern rivers to the northern (translated title). Ko Hsueh Tung Pao (General Report of Scientific Work, Academia Sinica, Peking) 8:245-247.
This article discusses proposals to divert water from the Yangtze and Yellow River sources to the arid lands of the Northwest. It is treated under the following headings: reasons for rerouting water; possibility of rerouting water: water abundant in the south, sources of Yellow River and Yangtze higher than areas needing water; study of possible routes along which to channel the water; relationships of this project to the national economy and to the scientific study of conservation and water utilization.

Watson, A. C.
1930 The Guano Islands of Southwestern Africa. Geographical Review 20:631-641.
An historical account of the islands, especially from the view of American sealers and whalers.

Weinrich, F. R.
1958 Railroads map the West. Special Library Association, Geography and Map Division, Bulletin 32:7-16.

Weitz, R.
1963 Agriculture and rural development in Israel; projection and planning. National and University Institute of Agriculture, Rehovot, Publication 68. 148 p.
A comprehensive study of all aspects of agriculture in Israel by the director of the Settlement Department of the Jewish Agency. Detailed information on agricultural know-how, agricultural economics, farm types and crops, and water requirements. One of the few detailed descriptions of the Besor Region in the Negev with information on microclimate, soils, and crop types and yields.

Wells, H. W.
1953 Large-scale farm operations in the upper San Joaquin Valley, California. University of California at Los Angeles, Department of Geography (M.A. thesis).

Wiens, H. J.
1951 Geographical limitations of food production in the Mongolian Peoples Republic. Association of American Geographers, Annals 41(4):348-369.
Russia's interest in Mongolia concerns political and strategic benefits and not economic returns for either country. Geographical factors limit economic expansion in Mongolia.

Wolle, M. S.
1953 Bonanza trail. Indiana University Press, Bloomington. 711 p.
Most scholarly and reliable study of abandoned or near abandoned urban settlements.

Woodbury, R. B. and N. F. S. Woodbury
1964 The changing patterns of Papago land use. Congreso Internacional de Americanistas, Mexico, 1962, Actas y Memorias 2:181-186.
A general review of land use with brief preliminary setting.

Yellow River-Kuei-te Exploratory Expedition
1953 Records of the Exploratory Expedition along the Yellow River from Kuei-te to Ning-hsia (translated title). Ko Hsueh Tung Pao (General Report of Scientific Work, Academia Sinica, Peking) 7:21-24.
Report on work done by the expedition from August to December 1952, giving a step-by-step account including many anecdotal details. The main accomplishment was a better understanding of the Yellow River's main course between the upper reaches of the Ch'ing-hai Lung-yang gorge and the Ning-hsia Ch'ing-tung gorge, lower reaches. Discussion includes rainfall measurement, soil and rock foundations suitable for building a dam and reservoir, detailed description of land features, transportation on the river. The explorers examined every gorge in the area studied.

Young, R. W., ed.
1961 The Navajo yearbook, 1951-1961, a decade of progress. The Navajo Agency, Window Rock, Arizona, Report 8. 609 p.

Young, W. R.
1933 The Boulder Canyon project. Military Engineer 25(142):296-300.