tario with 498,021; a drop of about 11,000 is recorded by Nova Scotia.

THE Alliance nationale pour l'accroissement de la population française, in a study it has recently published on the vital statistics of France for 1931, points out, according to the Paris correspondent of the *Journal* of the American Medical Association, that the birth rate fell off sharply toward the close of the year. A comparison of the birth rate for the corresponding quarters of 1930 and 1931 shows the following differences: first quarter, increase 937; second quarter, decrease 3,537; third quarter, decrease 4,907; fourth quarter, decrease 11,155; for the entire year, decrease 18,662. The number of marriages, furthermore, having diminished by more than 16,000 it is to be feared that the reduction in the number of births may be still greater in 1932. If one notes that, of the 730,000 births in 1931, 55,000 were of children of foreigners, whereas, of the 680,000 deaths, there were only 30,000 deaths of foreigners, it will be seen that the French excess of births over deaths in 1931 was only 25,000. This small excess runs the risk of being transformed next year into a permanent deficit unless something energetic is done to promote a better birth rate. Finally, since the number of emigrants in 1931 exceeded the number of immigrants by more than 25,000, the population of France has in reality diminished, the first time that that has happened since the war.

A 6,000-ACRE experimental forest, to be used as a "laboratory" for forestry experiments and research, has been established in the Lassen National Forest in California. The tract contains over 3,000 acres of red and white fir timberland on which both mature and small trees are available for future experiments in forestry methods of timber cutting, logging and slash disposal. One fifth of the area is covered with brush fields, the result of repeated fires. Here reforestation will be undertaken by the planting of stock grown at the Forest Service nursery at Susanville, in order to convert those brush fields into commercial forest. Later, one or more portions of the experimental forest will be selected and designated as "natural forests" and will be left unmolested for the purposes of scientific study. The Swayne Mountain Experimental Forest, the first to be established in California, will be under the supervision of the California Experiment Station of the Forest.

DISCUSSION

PHYSIOGRAPHY AND THE DYNAMIC CYCLE

INTRODUCTION

IN an article in SCIENCE and in other recent papers Waldo S. Glock[1] has presented theoretical discussions of several aspects of the physiography of the lands. Contributions to the theory of a relatively new subject are especially welcome, for whether or not they lead to definitive conclusions they incite students to more careful reflection on fundamental principles of their science.

Glock suggests the division of physiography into two phases, an active or dynamic phase which he would call geodynamics, and a static or passive phase, called geomorphology. "Physiography may be approached from a purely dynamic view-point." Accordingly he discusses a "dynamic cycle" supposed to be measurably independent of and in any case different from the "geographic cycle."

The "dynamic cycle of stream systems" is contrasted with the "geographic cycle" of landforms. "A stream is never young, never mature, and never old in a strictly dynamic sense, for the processes, although they vary in intensity, vary little if at all in quality." In the dynamic cycle streams first pass through a phase of extension, "a time of conquest and minute invasion"; later through a phase of integration, "a time of withdrawal and consolidation," in which tributaries are eliminated "until merely a skeletonized framework remains to care for drainage." These two phases are not necessarily distinct but may overlap, at least locally.

Geomorphology is regarded as static or passive, and "is concerned with the details of surface configuration expressed first by the origin of that form and second by the influence of lithology and rock structure. The method of origin has interest only because it explains and rationalizes important lineaments in the composition of the landscape." The geographic cycle "stands out as the quintessence of geomorphological description."

WHAT IS PHYSIOGRAPHY?

In 1869 Huxley delivered a series of twelve lectures on natural phenomena under the auspices of the London Institution. To distinguish his subject from the elementary works on physical geography of his day he borrowed the term "physiography" which had long been applied, in a different sense, to a department of mineralogy. The lectures were published in 1878 under the title "Physiography, an Introduction to the

[1] Waldo S. Glock, "Dual Nature of Physiography," SCIENCE, n. s. 72, pp. 3–5, 1930; "The Development of Drainage Systems and the Dynamic Cycle," *Ohio Jour. Sci.* 31, pp. 309–334, 1931; "The Development of Drainage Systems: A Synoptic View," *The Geogr. Rev.*, 21, pp. 475–482, 1931.

Study of Nature." While no attempt was made to present a complete or balanced treatise, we find chapters on the figure of the earth, its movements, and the sun; on the atmosphere, rain and dew, snow and ice, and evaporation; on the sea and its work, coral land, and the distribution of land and water; and on the land and land waters, earthquakes and volcanoes. Huxley did not present his chapters in the order given above, nor name the groupings of chapters actually employed; but it is clear that for him "physiography" in its newly adopted usage comprised the earth as a globe in the solar system, the atmosphere, the oceans and the lands.

In the latter part of the nineteenth century the term "physiography" began widely to be substituted for physical geography, particularly for the more advanced study of physical geography, including everything commonly comprised by the double term. The literature of this period contains frequent repetitions of the expression "physical geography, or physiography," thus showing how fully the two terms were regarded as identical. As Davis[2] wrote in 1902, "In recent years there has been a tendency to compress the name (physical geography) into the single word 'physiography'"; and the content of the subject he thus sets forth: "The four chief divisions of physiography are the earth as a globe, the atmosphere, the oceans, and the lands."

This conception of the term "physiography" has endured to the present time, and of six general textbooks on physiography before me, all but one treat the four standard subdivisions of the subject as enumerated above by Davis. The one exception treats three out of the four subdivisions. It is true that certain regional physiographies deal only with physiography of the lands or of the lands and the atmosphere (especially climate). It is equally true that in America, where instruction in physiography has commonly been given in departments of geology and where the physiography of the lands has been emphasized as of particular interest to geological students, some geologists have come to think of physiography as relating only to the lands. But these exceptions should not blind us to the fact that "physiography" has enjoyed wide-spread and long-established usage as a convenient term by which to denote the serious scientific study of man's physical environment in its fourfold character. Our dictionaries and encyclopedias recognize this usage as the standard one, and it is exceptional when one records the fact that the term is "limited by some to that branch of the subject dealing with the land."

[2] W. M. Davis, "The Progress of Geography in the Schools," First Year Book National Society for the Scientific Study of Education, Part II, pp. 7–49, 1902.

The four subdivisions of physiography have grown to dimensions justifying special names. The earth as a globe is perhaps more often treated under the not wholly satisfactory terms "astronomical geography" or "mathematical geography," than under more technical but possibly more satisfactory names. Physiography of the atmosphere has become the modern meteorology and climatology. Physiography of the oceans is often called oceanography, or physical oceanography, to distinguish it from biologic aspects of the sea. For physiography of the lands the term geomorphology has gained wide usage here and abroad.

It is with these general considerations in mind that the reader should weigh Glock's suggestions regarding physiographic terminology and methods of physiographic study. Apparently Glock would restrict the term "physiography" to physiography of the lands. Even when he employs the older term "physical geography" he tells us that "physical geography has a dual nature," and divides it into two parts only just as he does physiography, with both its "active" and "passive" phases relating to land surfaces. The readers must therefore consider first whether it is wise to restrict the term physiography to a single field, the lands. If so, what name should one give to the unified advanced study of man's fourfold physical environment, now commonly called physiography?

Dynamic Geology and Physiography

As Glock points out, it is possible to study processes from the purely dynamic point of view, without taking account of the resulting land forms. Such studies have long been prosecuted, and have usually been considered a part of dynamic geology. Undoubtedly much more remains to be accomplished in this field. The only questions to be considered are whether it is wise to classify these studies in dynamic geology as a branch of physiography of the lands; and, if so, as to whether this branch should be called "geodynamics" instead of "dynamic geology." If the writer correctly understands Glock, there are no topics which would ordinarily be included in his geodynamics (where forms are not to be considered and where processes are to be viewed from the dynamic standpoint alone) which would not fall naturally and necessarily into the field of dynamic geology. Nor does geodynamics seem a less inclusive term than dynamic geology. If the two terms are essentially synonymous, this particular question is reduced to a choice between an older and a proposed newer usage.

On the more fundamental question as to whether purely dynamic geological studies should be classed as physiography, opinions may differ. Certainly some texts on physiography have so far emphasized

the study of forces as to leave only secondary and partial emphasis on the study of the resulting forms. Not a few physiographers have voiced the criticism that such works are really treatises on dynamic geology rather than on physiography. Such criticism reflects the prevailing tendency to consider studies of processes from the purely dynamic point of view as lying outside the field of physiography, and to call such studies by the time-honored name "dynamic geology."

PHYSIOGRAPHY OF THE LANDS AND GEOMORPHOLOGY

For most workers in the subject, "physiography of the lands" and "geomorphology" are synonymous terms. Neither term implies the study of processes of and for themselves, any more than either implies the study of geologic structures of and for themselves. Such studies are left to workers in the classic fields of dynamic geology and structural geology. The physiographer (of the lands), or geomorphologist, does of course concern himself much with processes and structures, just as does the economic geologist, the stratigrapher and workers in other branches of geologic science. But he deals with both merely as factors in the evolution of land forms, which latter is the real object of his study. He touches lightly or leaves untouched many aspects of dynamic geology which are vitally important from the dynamic point of view, but which throw relatively little light on the evolution of the earth's surface features. So also in structural geology he is forced to pass by many fascinating questions which concern him less directly than other aspects of that field.

In short, the geomorphologist recognizes the existence and the importance of two vast fields, dynamic geology and structural geology, each well worth cultivating for itself alone, but each quite distinct in objectives, methods and in much of its subject matter, from his own field—physiography of the lands. From those neighboring fields he draws what he needs for the understanding of his special problems, just as he expects the dynamic geologist and the structural geologist to take from geomorphology everything which will help to elucidate their problems. But he does not forget that there is a real independence as well as an interdependence of the three fields of investigation.

THE NATURE OF GEOMORPHOLOGY

The content of geomorphology is reasonably well established, both by definition on the part of experts in the subject and by common usage of workers in the field. It comprises the study of the origin and evolution of the surface features of the earth in terms of "structure, process and stage." Of the three terms of this trinity, elaborated by Davis in many of his writings, *structure* is the only static or passive element. The *process* is the active vitalizing factor without which there could be no cycle of land-form evolution; and the *stage* of the cycle is a transitory phase of the ever-changing record of the extent to which the active process has operated.

In a day when the only scientific geography was physical geography or physiography, it was perhaps natural that the cycle of land-form evolution should be called "the geographic cycle." To-day "geographic" has a very different connotation. Modern geographers may not agree as to the scope of their subject; but a large proportion of them define its essence, in one form or another, in terms of the relation of organic life to physical environment. The geographer thus puts emphasis not only upon life and its relations, but also upon physical environment as it is to-day. For him the physical environment may perhaps be said to represent the static or passive phase of his study. The cycle of land-form development is not "geographic" in this modern sense of the term. It is "geomorphic," however, and can perhaps best be called the *geomorphic cycle.*

Since the geomorphologist is dealing, in terms of structure, process and stage, with ever-changing cycles of land-form evolution, his point of view can never be static or passive. He studies the effects of geologic processes operating upon geologic structures throughout significant periods of geologic time. Only thus can he understand and interpret the evolution of the earth's surface features. Whether or not the dynamic geologist can afford to ignore surface form in his dynamic studies, it would seem that the geomorphologist must always think in terms of progressive changes effected by dynamic action.

DOUGLAS JOHNSON
COLUMBIA UNIVERSITY

AN APPEAL TO ANTHROPOLOGISTS

AVAILABLE information on the color of the iris at birth is meager and inaccurate. The popular generalization that "all white infants have blue eyes" is still widely quoted, although any obstetrician, midwife or nurse who has noticed the irises of many new-born infants can recall that some are totally brown, some are blue-green and some are mixed brown and blue or blue-green. It is well known also that during infancy significant changes in iris coloration occur, especially in those which are initially some type of blue. No positive information seems to be available as to whether the initially brown irises desaturate, and whether in the extremes of such cases they become finally some type of blue with or without partial brown patterns (in streaks, flecks or rings surround-