force of the magnet material used. We made no attempt to reestablish or disprove the Hamilton Rule as quoted by Professor McKeehan, as it has no bearing whatever on this magnet design. If we cared to be critical, we would ourselves object to the "160 man—72,000 pound weight" statement, as lifting and holding are obviously not the same thing.

We have no objection to Professor McKeehan's academic statements as such, but to title them as he has, or to refer to our design of magnet assembly in that connection implies a lack of fundamental knowledge on our part that is hardly justified. With the interested lay reader the terms coercive force, residual, and maximum available energy may be assumed to have little concrete meaning, but to say that a magnet of a certain size and design will hold 100 pounds conveys something quite real even though only comparative. It was never intended as an absolute measure of magnetic quality.

WATSON DAVIS

SCIENCE SERVICE
WASHINGTON, D. C.

ROGER BACON WAS MISTAKEN

IN a recently published, and in general commendable, book I find the following:

> These ancient volumes said that hot water would freeze more quickly than cold water; . . . These are just samples of some of the drivel that was accepted by "learned" men. . . . But Bacon had little regard for authority. He was an experimenter. So he took two vessels exactly alike and filled one with cold water and one with hot. It was a bitter cold day. He set the vessels out of doors. When the cold water froze first Bacon decided that the ancient author was a liar.

But if Bacon had taken a pint of drinking water from his kitchen and a pint of boiling water from his teakettle, had put each pint in similar open tin dishes, and had set them outdoors in zero weather he would have found that the hot water was the first to freeze. The hot water would have cooled very rapidly, partly on account of the rapid evaporation and partly on account of the rapid loss of heat by radiation. The cold water would have evaporated slowly and cooled slowly. Consequently, the hot water would have reached the temperature of the cold water several degrees above the freezing point, and, since a large amount had evaporated, the smaller of the two masses of water was the first to freeze.

Those despised ancients knew a thing or two.

JOSEPH O. THOMPSON

AMHERST COLLEGE

SCIENTIFIC BOOKS

POLITICAL GEOGRAPHY

The Earth and the State, A Study in Political Geography. By DERWENT WHITTLESEY. xvii + 618 pp. New York: Henry Holt and Company, 1939. $3.75.

GEOGRAPHERS investigate the characteristics that differentiate areas of the earth, whereas historians deal with the differentiation of periods in the time sequence of human events. Space and time, whether in physics or in the study of man, can not in the final synthesis be separated; but because of the widely different techniques, geography and history have developed as separate disciplines. Inevitably they must remain distinct; yet all the more is it essential that scholars in both these fields constantly attempt to reunite them in practice.

Professor Whittlesey's book on political geography is highly successful in maintaining its essentially geographic objectives while making use of historical balance. The book deals with the processes and characteristics which differentiate political areas; and these are traced over a sufficient background of history to provide an adequate interpretation of present conditions.

This new geographical approach to the study of political areas endows such areas with new meaning. The territory of every state or nation includes organic parts that are characteristic of all states. Each state, for example, may be differentiated into such parts as a nuclear core, constituent or administrative regions, problem areas, vulnerable zones, capitals, strategic spots and boundaries.

Professor Whittlesey's discussion of the inherent differentiation of political areas is far from academic. In the chapters on certain specific modern states, an important and readable contribution has been made to an understanding of the problems which trouble the present-day world. New light is thrown on the chaos of Europe—on the relations of Great Britain, France, Germany, Italy and other political units whose struggles are affecting the whole world. It is imperative that the free citizens of our own country should attempt to understand and formulate a policy regarding conditions in Europe, and to this end Professor Whittlesey's book makes a notable contribution.

The thesis is presented that the success, perhaps even the chance for survival, of a state is affected by the pattern of arrangement of the various parts of the political area and of the relations of these parts to the underlying qualities of the land. That the territory which is now Italy has been unified in one state only for 70 years in the modern period, and only for 500 years under Roman rule, whereas this territory was subdivided during the rest of the 2,500 years of Italian history, suggests, "a serious weakness of geopolitical structure not apparent from the map." Pro-

fessor Whittlesey's analysis of the Italian state presents an important interpretation of this weakness which is not solely a poverty of agricultural land and mineral resources.

Of the eighteen chapters in the book, six are devoted to Europe. The process of the formation of the nation-states is illustrated by a discussion of Great Britain, France and Germany. The chaotic mid-Danube is presented through an interpretation of the capitals. The conflict of interests in the Mediterranean Basin is set forth as a background for the treatment of Italy. The strong unitary tradition of France is interpreted in terms of the interaction of land and people, as the various constituent parts of the country were one by one attached to the nuclear core. If some scholars find fault with the actual extent of territory included in the Ile de France, this need not detract seriously from the strength of the argument regarding the origin of this strongly coherent state. In contrast stands Germany. "Confusing disintegration paralleled by surprising unification" is the phrase used to describe the process of state formation on the other side of the Rhine, in a land "which is made up of a crude gridiron of lines of travel, and in which neither boundaries nor internal environment set a decisive mold for plastic statecraft." The essential contrast between western industrial Germany and eastern feudal Germany throws light on the problems which that state must face in its struggle to remain coherent.

One chapter is devoted to Africa and five to the Americas. Here the essential contrast in the process of state formation becomes apparent between the accretion of areas around a central nucleus, and the expansion of colonies from a primary settlement center. In Great Britain, France or Germany the people of the nuclear core for one reason or another were able to conquer and attach to the original political area the people of bordering areas. This, indeed, was the process by which such great Indian states as the Empire of the Incas was formed. But it is not the process by which the modern states of the Americas were developed. The nuclear core of colonial states has a geopolitical function which differs profoundly from that of, let us say, France. Even where the native people remain in considerable numbers, as in Peru or Mexico, they are scarcely incorporated in the colonial states, as the people of the various parts of France were brought into the coherent French state. From primary centers of settlement, other colonies are sent out, producing, after a time, a pattern composed of clusters of population surrounded by areas of scantily occupied land. When states were formed, not by a slow process but suddenly by revolt from the mother country, the boundaries were commonly drawn through the thinly populated areas between the nuclear cores. Compared with Europe, the structure of such states is relatively simple. The process, however, is so different that some question might be raised concerning the advisability of applying the same terms to both.

Among the other chapters in Professor Whittlesey's book, two are of outstanding importance and interest. One discusses the political geography of colonies as related to highly localized commercial production. Three products, rubber, sugar and wheat, are treated. The historical geography of sugar, from the fabulous days of the Portuguese planters on the coast of north-eastern Brazil, through the scramble for sugar colonies in the West Indies, to the rise of modern Cuba and Java is set forth with a coherence which places this section of the book, in the reviewer's opinion, foremost among the brief treatments of this subject. Impressive, also, is the treatment of the modern importance of the oceans in relation to routes of communication and colonial expansion.

These chapters will be of interest to non-professional readers as well as to students of political geography, for they present in admirable form the contribution of this branch of geography to the problems of the modern world. The book will also be of considerable importance as a step forward in the formulation of both content and theory in the newly developing field of political geography. The importance of the interpretations and the logic of the view-point need not be obscured by such unfortunate blemishes as are produced by the failure of a draughtsman to learn well the place geography of South America. No more important book in the field of geography has appeared in recent years.

PRESTON E. JAMES
UNIVERSITY OF MICHIGAN

NATURALISTS IN SOUTH AMERICA

The Great Naturalists Explore South America. By PAUL R. CUTRIGHT. xii + 340 pp.; 42 full-page illustrations; bibliography and index. New York: The Macmillan Company. $3.50.

THIS book, by a professional zoologist with experience in the tropics, will be read with intense interest by the general reader and by the many zoologists who still have an interest in the habits of animals as well as in their morphology, physiology, etc.

From the title it might have been expected that rather more space would have been devoted to the experiences of the "great naturalists"—from Humboldt, Wallace and Darwin to those still living; but Part II is so thoroughly readable that one would not have any of it omitted.

About a dozen of the typical South American mammals, such as the vampire, the tapir and the manatee, are described and sometimes figured with excellent photographs.