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The evolution of basic physical geography, 1892-1967 : an analysis of American physical geography textbooks

Michael S. DeVivo
University of Tennessee

To the Graduate Council:

I am submitting herewith a thesis written by Michael S. DeVivo entitled "The evolution of basic physical geography, 1892-1967 : an analysis of American physical geography textbooks." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Geography.

Theodore H. Schmudde, Major Professor

We have read this thesis and recommend its acceptance:

Accepted for the Council:
Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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We have read this thesis
and recommend its acceptance:

James R. Carter

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Date 6 May 1988

THE EVOLUTION OF BASIC PHYSICAL GEOGRAPHY, 1892-1967:

AN ANALYSIS OF AMERICAN PHYSICAL GEOGRAPHY TEXTBOOKS

A Thesis

Presented for the

Master of Science

Degree

The University of Tennessee, Knoxville

Michael S. DeVivo

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Dedicated to

Geoffrey J. Martin

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ABSTRACT

The emergence of geography in public school curriculum in the late nineteenth century was followed by the publication of numerous physical geography textbooks, especially by physiographers. These texts reflected the "physiography and causation" paradigm of the time. A majority of material was devoted to geomorphology, though some texts included discussion that attempted to relate physiography to the human dimension of geography. By the early 1920s, however, the physical component of geography was in decline. In the two decades prior to 1936, no new texts in physical geography were published and no revised editions appeared after 1926. Elements of Geography, authored by Finch and Trewartha and published in 1936, marked the end of the earlier era of texts on basic physical geography and the beginning of a new era that still persists.

This study examines American physical geography textbooks published between 1892 and 1957. Those published before 1936 were of two types, Physiographies and Elementary Texts, the former devoted principally to

geomorphology and the latter consisting mostly of nomenclature relating to the earth sciences. Elements of Geography and its successive editions redefined the content and treatment of physical geography in comparison to the pre-1936 period. Moreover, it set a structure adopted by authors of the most successful texts since.

TABLE OF CONTENTS

CHAPTER I

INTRODUCTION

In the evolution of a discipline, "new" theories and methods develop as "old" ones go out of favor. Textbooks which represent the accepted state of the art reflect this evolutionary process. Moreover, textbooks may offer structure and direction for the field they cover. From time to time, a textbook appears that restructures the content of a subject area compared to earlier texts and impacts the content of texts for a subject area for a time thereafter. Review of physical geography texts published in the United States between 1892 and 1967 indicates that Finch and Trewartha's Elements of Geography, published in 1936, established a model which characterized the content of subsequent physical geography texts. Mikesell noted that this book was the most widely used textbook of the post-World War II period (Mikesell 1985). Furthermore, Elements of Geography seems to have imposed nearly a consensus as to what constitutes the field of basic physical geography.

The purpose of this study is to examine the character of textbooks prior to the publication of the

1936 edition of Elements of Geography, to determine the content inherited from its antecedents, to evaluate the new major components introduced in 1936 by Finch and Trewartha, and to assess developments in physical geography textbooks in the thirty years which followed introduction of the Elements of Geography textbook. Geography was formalized as an academic discipline in 1892. The last edition of Elements of Geography was published in 1967.*

Virtually all physical geography textbooks published in the United States between 1892 and 1967, and listed in The United States Catalog: Books in Print and Cumulative Book Index: A World List of Books in the English Language (published since 1912 by the H.W. Wilson Company in New York) under the heading Physical Geography were examined for this study (see Appendix A). Those texts which were likely to be used in introductory physical geography courses at the college level were surveyed (see Appendix B for a list of texts evaluated).

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* This study examines textbooks of three paradigms in American geographic thought identified by Martin (1985): "physiography and causation" (1892-1925), "field and region" (1925-1957), and "eclectic pluralism" (1957-present).

Three criteria were used to evaluate the physical geography textbooks: topical coverage, topic ordering, and conceptual development. Topical coverage is the proportion of material devoted to each section, topic ordering is the relative placement of each section within the text, and conceptual development refers to the major ideas offered for each subfield. These traits are believed to indicate the importance placed on particular subdivisions within basic physical geography. The major topical divisions of each book appear to reflect the subfields of physical geography, recognized at the time, and the number of chapters in each division seem proportionate to the relative importance of each subfield at the time. Topical coverage evolved quite rapidly, especially during the first third of this century.

A review of the conditions which brought forth Elements of Geography provides a background for the evaluation. During the nineteenth century, three books focused primarily on physical geography: Arnold Guyot's The Earth and Man (1849), Edwin J. Houston's The Elements of Geography (1893), and Mathew Fontaine Maury's Physical Geography (1873). The latter two volumes were revised and published into the twentieth century, but became largely inadequate for students of

physical geography, especially after the formalization of the geographic discipline in the 1890s.

In 1892 a Committee of Ten was appointed by the National Education Association to examine the related problems of precollege level school programs and college entrance requirements. After completion of the study, the Committee submitted the following recommendation:

> Physical geography should include elements of botany, zoology, astronomy, commerce, government, and ethnology, and ... it should take on a more advanced form and should relate specifically to the features of the earth's surface, the agencies that produce and destroy them, the environmental conditions under which these act, and the physical influences by which man and the creatures of the earth are so profoundly affected (James and Martin 1981, 290).

Publication of the Committee's report was followed by a flurry of textbooks on physical geography. Ralph Stockman Tarr's Elementary Physical Geography (1895) was the first to address the Committee's suggestions, and nine editions were published; Tarr also published First Book in Physical Geography, in 1897, which was published in eight editions. Tarr wrote a third textbook, New Physical Geography (1903), in which he attempted "to solve the problem of how best to present the subject to

beginning students" (Tarr 1903, vi). In the meantime, William Morris Davis, Tarr's mentor, published Physical Geography in 1898 and Elementary Physical Geography, largely a revision of his earlier work, in 1902. Charles Redway Dryer published Lessons in Physical Geography in 1901, Grove Karl Gilbert and Albert Perry Brigham coauthored An Introduction to Physical Geography in 1902, and Harold W. Fairbanks' Practical Physiography appeared in 1906. Perhaps the most notable text of this era was Rollin Salisbury's Physiography, published in 1907 and revised in 1919, which was described as "a presentation in book form of his highly popular course of the same name at Chicago" (Pattison 1982). Thomas Cramer Hopkins published Elements of Physical Geography in 1908, also revised in 1919. Isaiah Bowman's Forest Physiography came out in 1911 and Ralph S. Tarr's College Physiography was published posthumously in 1914 under the editorship of his former student, Lawrence Martin. At the end of this intensive period of textbook writing, another of Tarr's former students, O.D. von Engeln, authored the successive "revised" editions of New Physical Geography (1926). In 1936, a decade after the publication of von Engeln's revision in 1926, Finch and Trewartha'sElements of Geography was published. Glenn Trewartha wrote of the period:

> The content and quality of the then-available textbooks in physical geography were unsatisfactory. A rigorous new text, involving both description and genesis of the earth's physical environment, would do much to strengthen our position vis-a-vis the other sciences (Trewartha 1979, 20).

Neither Finch nor Trewartha had the desire to write a text, but they were unsuccessful in attempts to persuade their colleagues at the University of Wisconsin to produce one. Consequently, they wrote the first edition of Elements of Geography (1936), which represented a considerable change in the content of physical geography texts. The manuscript was prepared between 1934 and 1935, and in 1935 a publishing house in Ann Arbor, Michigan, produced a soft cover version for use in the authors' classes. After initial trial use of the text, some of the content was revised and the book was published by McGraw-Hill in 1936 (Trewartha 1979,

20). Elements of Geography represented a reasonable attempt to broaden physical geography and treat it with some balance.*

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*The 1936 edition of Elements of Geography was organized into two parts, physical and cultural. Subsequent editions published in 1942, 1949, 1957, and 1967, concentrated strictly on physical geography and were appropriately titled Physical Elements of Geography. For the purpose of this thesis, only the physical part has been examined.

CHAPTER II

THE FINCH AND TREWARTHA MODEL

After an overview of the historical context for Finch and Trewartha's first edition of Elements of Geography, this chapter examines the authors' approach presented in their physical geography text. The essential components of the text that constituted their version of the "physical elements of geography" are described in detail.

The Historical Perspective

Events and circumstances which occurred in American geography before the publication of Finch and Trewartha's Elements of Geography in 1936 provided the historical context for its content and character.

During the formative years of geography as an academic discipline, geographers focused principally on physiography. The prevalence of the physical component no doubt was influenced by W.M. Davis, who "head and shoulders above his contemporaries ... was authoritative and authoritarian" (James and Martin 1978, 8). Davis was the central figure in the founding of the

Association of American Geographers, the professional organization of the discipline, and he was instrumental in the selection of its members. The case of J.R. Smith exemplifies the discipline's bias towards physical geography. Smith was denied membership to the association in 1904 because he did not show evidence of adequate training in physical geography (James and Martin 1978, 36).

Further evidence is offered by the papers read at the annual meetings of the Association of American Geographers during the pre-World War I years. At the first meeting of the association in 1904, 80 percent of the papers were devoted to physical geography. Many contributions were authored by Davis and his former students, including R.S. Tarr, L. Martin, and I. Bowman, all prominent authors of physical geography texts (DeVivo 1987).

The notion of causation also typified prevalent thought in American geography at the time. Dryer stated, "The most notable phrase in the English language is 'physiographic control and organic response'" (Dryer 1920, 8). Examples of environmental determinism were exhibited by professional papers offered before the Association as well as in physical geography textbooks.

Concurrent with the rise of physical geography, attempts were made to map the United States, delimiting physiographic regions. The first such effort was made by J.W. Powell in 1896, W.M. Davis accomplished a similar task in 1899, and W.L.G. Joerg followed in 1914. Joerg delimited "natural regions" which he defined as "any portion of the earth's surface whose physical conditions are homogenous." In 1914, N.M. Fenneman published a study of physiographic boundaries of the United States. The Association of American Geographers appointed a committee to study the subject and prepare a new map which was completed in 1916 (James and Martin 1981, 303-304; Rich 1945).

Regionalizing on maps was grasped by students of commercial geography as well. The outbreak of World War I brought about an urgent demand for knowledge of agricultural, mineral, and industrial resources. Economic regions were delimited (for example, Dryer 1915) and economic geography burgeoned.

While economic geography expanded, physical geography (essentially physiography) went into decline. By 1925, papers in physical geography amounted to only 12 percent of the Association's annual program (DeVivo 1987). Determinist doctrine fell under attack and was regarded as unscientific. Perhaps the factor

most responsible for the demise of physical geography, however, was the lack of leading physiographers and physical geographers to author textbooks. R.S. Tarr and WJ McGee died in 1912, G.K. Gilbert in 1918, F.P. Gulliver in 1919, R.D. Salisbury in 1922, R.W. Pumpelly in 1923, A.H. Brooks in 1924, C.R. Dryer and W. Libby in 1927, A.P. Brigham in 1932, and W.M. Davis in 1934. Although I. Bowman and L. Martin lived until the 1950s, both left academia before 1920.

By 1920, physiography had declined in the public schools where instructors had insufficient knowledge to teach physical geography. A number of geography teachers who had acquired an adequate background in physical geography (for example, M.K. Genthe) opposed the limitation of geography to physiography. They preferred to stress the significance of the human side of geography (Hartshorne 1981, 144-145). James wrote that in the early 1900s, physical geography was described as "a dry uninteresting subject" (James 1969, 476). Thus, physical geography fell out of favor in the public schools. The National Education Association responded by integrating geography into the "social studies" and instituting a new course, "general science," which incorporated a few concepts contained within physical geography (James 1969, 476).

In summary, physiography declined from its predominant position by the 1920s because of its deterministic stance, the deaths of notable physiographers, the inadequate instruction of physiography in the public schools, and the rise of commercial geography. Concurrent with its decline, relatively few up-to-date physical geography textbooks were available. The only one remaining in widespread use was von Engeln's revision of Tarr's New Physical Geography (1926). Although reprinted until the 1940s and labelled as revisions, the issues after 1926 were virtually identical. A void existed in the publication of physical geography texts. It was at the time of this void that Elements of Geography, published in 1936 by Finch and Trewartha, offered the first new text on physical geography in more than a decade. By comparison to earlier texts, Elements of Geography redefined the content of physical geography and became a model which still dominates the structure of basic texts.

The Content of the Physical Part of Elements of Geography

The primary elements of physical geography emphasized by Finch and Trewartha include the earth as a planet, climate, landforms, biotic resources, and

soils. A discussion of each physical element follows Figure 1 which displays the components recognized in the book's table of contents.

Elements of Geography (1936), Finch and Trewartha

Introduction
The Field of Geography: Its Content, Method and Point of View
The Earth and Its Planetary Relations
Maps and Their Interpretation

Section A The Elements of Weather and Climate
Air Temperature (Including Insolation)
Atmospheric Pressure and Winds
Atmospheric Moisture and Precipitation
Storms and Their Associated Weather Types

Section B Climatic Types and Their Distribution
The Tropical Rainy Climates
The Dry Climates
The Humid Mesothermal Climates
The Humid Microthermal Climates
Polar and Highland Climates

Section C Processes Concerned With the Origin of Landforms
Earth Materials and Their Tectonic Processes
The Agents and Processes of Gradation

Section D Landforms
Plains of Stream Degradation
Plains of Stream Aggradation
Glaciated Plains
Plains in Dry Climates
The Shore Features of Plains
Plateaus
Hill Lands
Mountains

Section E Earth Resources
Water Resources of the Land
The Biotic Resource: Original Vegetation Cover and Associated Animal Life
Soils: Their Nature and Classification
The Principal Soil Groups of the World
The Mineral Fuels
Ores and Other Economic Minerals

Figure 1. Physical elements of geography as recognized by Finch and Trewartha.

Introduction. This section of the text explained the nature of geographical study and introduced earth-sun relations. It included an examination of the form of the earth (i.e., its spherical shape), earth motions (rotation, revolution), and location (latitude and longitude). A discussion on the use of maps and map scale also is included. Specific map projections and thematic maps are explained in detail.

Section A: The Elements of Weather and Climate. Finch and Trewartha separated the study of climate into two equivalent parts: an analysis of climatic elements and their distribution, and climatic classification.

Following an introduction to the elements of weather and climate, the Finch and Trewartha text presented a chapter on each of the following: Air Temperature, Atmospheric Pressure and Winds, Atmospheric Moisture and Precipitation, and Air Masses, Fronts, and Atmospheric Disturbances.

The chapter on air temperature dealt primarily with the processes responsible for atmospheric heating and cooling. Major subtopics included solar radiation, earth-sun relations and the distribution of insolation

over the earth's surface, the heating and cooling processes of the atmosphere, the vertical distribution of temperature, and global patterns of temperature.

The chapter on atmospheric pressure and winds included an explanation of atmospheric pressure, an analysis of the vertical and horizontal distribution of atmospheric pressure, cyclonic and anticyclonic circulation, a detailed discussion of surface winds, and a section on the general circulation of the atmosphere. The climatic significance of ocean drifts and currents was discussed as well in this chapter. In contrast, earlier physical geography textbooks devoted a separate chapter to the seas and treated tides, sea water composition, ocean bottom topography, and ocean currents, but largely ignored the climatic significance of the oceans.

Three factors were emphasized in the atmospheric moisture and precipitation chapter: humidity, condensation, and processes and patterns of precipitation. The chapter on air masses, fronts, and atmospheric disturbances discussed and classified air masses and fronts on a global scale, but with particular reference to the United States. The atmospheric disturbances discussed were cyclones and anticyclones, tropical disturbances, and thunderstorms.

Section B: Climatic Types and Their Distribution.

The portion of the book on climatic classification comprised about 15 percent of its length and dealt primarily with a description of each climatic type according to the Koeppen system (1931). The adoption of the Koeppen system in Elements of Geography (1936) represented its first use in a physical geography textbook, and was a new component for texts on physical geography. Texts of the earlier period, which tended to use schemes based on latitude (for example, zones of heat--frigid, temperate, and tropical), focused mainly on atmospheric processes related to weather with little regard for synthesizing these processes into discernible climatic patterns. Consequently, Finch and Trewartha's treatment of climate was much different and more thorough than that which had heretofore appeared in basic texts. (Chapter III will illustrate the relative proportion of material devoted to climate.) Not only was greater emphasis placed on climate in the Finch and Trewartha text, but it was presented first and the discussion culminated in a world regional classification.

Section C: Processes Concerned With the Origin of Landforms. The discussion of landforms in Finch and Trewartha's text was divided into two sections: Processes Concerned with the Origin of Landforms, and Landforms. The authors stated that although

> the student of geography is interested primarily in the shapes and patterns of the surface features of the land and in their human utility as elements of the regional equipment, a clear understanding of them is best reached through at least a brief survey of the substances of which they are made, of the agents that are involved in their origin, and of the processes by which they originate or by which their shaping is accomplished (Finch and Trewartha 1936, 271).

The section on processes consisted of two parts: Earth Materials and the Tectonic Processes and The Agents and Processes of Gradation. The former included material on the three major classes of rocks--igneous, sedimentary, and metamorphic; tectonic processes; and vulcanism. The authors also presented an illustration of volcanic and diastrophic activities on a global scale.

Gradational processes were treated under seven headings: static processes, mobile processes, ground water and its gradational processes, running water and its gradational processes, moving ice and its

gradational processes, the gradational processes of waves and currents, and the gradational processes of the wind.

The static processes dealt primarily with chemical and mechanical weathering, and the mobile processes elaborated on the gravitational forces responsible for the abrasion, picking up, transportation, and deposition of earth material. The section on ground water concentrated on its effects on landforms via solution and the redeposition of dissolved minerals, with special mention of Karst topography.

Gradational processes of running water constituted the most extensive discussion of processes involved with landform development. The erosional work of streams and resultant depositional features was presented, as well as consideration of the ideas of young and mature stages of landform development. The section on moving ice covered both mountain glaciers and continental glaciers, with additional material on glacial erosional processes and their resultant land surface features. The erosional and depositional processes of both waves and currents, and winds, received brief mention at the conclusion of the section on gradational processes.

Section D: Landforms. Landforms were distinguished principally by relief and classified as plains, plateaus, hill lands, and mountains. These groups were further subdivided into surface features of smaller orders and sizes. The five chapters devoted to plains were titled Plains of Stream Deposition, Plains of Stream Aggradation, Glaciated Plains, Plains in Dry Climates, and The Shore Features of Plains. Each of three remaining chapters was devoted to Plateaus, Hill Lands, and Mountains. The description of land surface features constituted 26 percent of the text, while the section devoted to landform processes comprised only 8 percent of the text.

Section E: Earth Resources. Water Resources of the Land was the title of the first chapter in Finch and Trewartha's Earth Resources section, which was divided into two parts: The Ground-water Supply and the Surface-water Supply. The first section discussed ground water quality and availability, springs, and wells. Attention to surface water supply focused principally on the several uses of surface water, for example, municipal supply, irrigation, water power, inland navigation, and recreation, with further reference to their assets and limitations.

Finch and Trewartha titled their chapter on biogeography, The Biotic Resource: Original Vegetation Cover and Associated Animal Life. Fauna was discussed only briefly in relation to certain vegetation groups, and flora comprised the bulk of the chapter, which contained six parts:

1) Physical Conditions Affecting Plant Life,
2) The Great Plant Associations,
3) Types of Forests and Their Distribution,
4) Types of Grasslands and Their Distribution,
5) Desert Shrub (Including Tundra), and
6) Resources of the Sea.

The first section introduced the concept of plant associations and discussed various elements of the physical environment, including temperature, light, water, and soil, that influence vegetation. The next section dissected vegetation into three principal classes: forest, grasslands, and desert shrub (including tundra). Classification rested primarily on form, with precipitation being a critical indicator. Offered under the discussion of each plant association was a description of several plant communities. The last section on marine resources was devoted primarily to fisheries, with an explanation of plankton followed by a discussion of fishing regions. A brief overview of sea mammals concluded the discourse on biotic resources.

Finch and Trewartha's two chapters on soils were titled Soils: Their Nature and Classification, and The Principal Soil Groups of the World. The first chapter described the fundamental characteristics of soils with particular attention to their chemistry and physical properties. Soil chemistry included material on the critical soil elements and the means by which these elements are supplied to and removed from the soil. Also included were discussions on organic matter and acidity and alkalinity.

The discussion of physical properties focused primarily on texture, moisture, structure, and color. Soil color was determined to be a soil property because, according to the authors:

> The prevalent color of the soil of a region is ... some indication of the general nature of the physical and chemical properties of the soil there, and it is used as a convenient designation for soils of the different major soil groups of the world (Finch and Trewartha 1936, 537).

The soil classification scheme used by Finch and Trewartha was adopted from Marbut. Major classes of mature soils were determined by their soil-making processes (for example, podzols and laterites), but the classification also relied heavily on the dominant

vegetation associated with the soil group (for example, humid forest land, subhumid grasslands and deserts, and tundra). Each soil type was described with respect to color, content of organic and mineral material, and fertility. Soil conservation and the reduction of soil erosion concluded the section on soils. The in-depth treatment of soils by Finch and Trewartha was a major addition compared to earlier texts and became an essential element of physical geography by authors of subsequent texts.

The two chapters on mineral fuels and economic minerals completed the section on earth resources, and were the last topics considered under the elements of physical geography. Extensive discussions of the geologic structure of coal and petroleum occurrence and the patterns of location were covered in the chapter on mineral fuels.

The second chapter on economic minerals was devoted principally to iron ores and metallic minerals. The physical associations of metallic minerals, for example, gold, iron, bauxite, and their world patterns of distribution were discussed. Perhaps most importantly, however, was the authors' emphasis on iron ore deposits and coal fields in relation to steel-producing and industrial regions. Nonmetallic minerals

included a brief examination of crude minerals for construction and utensils, and mineral raw materials for the chemical industries.

Summary

Finch and Trewartha redefined the content of physical geography by their choice and organization of material included in the first edition of Elements of Geography (1936). This text soon became the model and dominant physical geography text. Earlier texts on physical geography dropped from use. Finch and Trewartha introduced an extensive amount of material on earth resources and classification schemes, which represented an innovation in the content of physical geography textbooks. Their approach to water and minerals as resources, for example, differed in concept from the processes and descriptions of the other physical elements.

Classification schemes for climate and soils were available by the 1930s, and were incorporated into the first edition of Elements of Geography. In addition, Finch and Trewartha created their own version of classifications for landforms and vegetation. Offering classification schemes with related global maps for each major subdivision of physical geography constituted a

notable innovation and introduced material not part of earlier physical geography textbooks. For example, Elements of Geography was the first physical geography text to use Koeppen's classification for regionalizing world climates.* Earlier texts classified climate, for the most part, according to zones of heat--frigid, temperate, and tropical. Finch and Trewartha also offered a landform classification scheme, albeit on a gross scale. Four principal classes of landforms dominated world landform regions--plains, plateaus and tablelands, hill lands, and mountains. Earlier authors attempted no such classification. For soils they used the scheme based on the work of the Russian soil scientist, Glinka, available in translation by Marbut. Previous soil classifications had used texture almost exclusively. Finch and Trewartha offered classification of vegetation which was somewhat more elaborate than those presented in the earlier texts. Influenced by the works of Hardy, Haviland, Hayeks, Martonne, Rubner, Schimper, Warming, and Zon and Sparhawk, Finch and Trewartha regionalized world vegetative associations.

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*Preston James' Outline of Geography (1935) incorporated Koeppen's scheme, but was labelled a cultural text.

The introduction of classifications for each of the four integral components of physical geography gave a different perspective to these topics from that of earlier texts. On the one hand the classification schemes systemized the descriptive knowledge, but on the other hand gave each topic its own distinctive identity that tended to set it apart from the other topics. This was the first time that detailed world maps of the elements of physical geography were incorporated in a physical geography text, no doubt in part because most such classification schemes only appeared in the literature familiar to American geographers in the decade before 1936. In any event, the application of classification schemes to world maps was an innovation for basic physical geography texts.

CHAPTER III

ANALYSIS OF TEXTBOOK CONTENT

The content of texts published between 1892 and 1967 is analyzed in this chapter and compared to the content of Elements of Geography (1936). The texts of the earlier period (1892-1926) may be separated into two categories, Physiographies and Elementary Texts, based on content and treatment of topics. The Physiographies, devoted principally to process-oriented geomorphology, were more advanced than the Elementary Texts. Four texts are in this group: Salisbury's Physiography (1907, 1919), Bowman's Forest Physiography (1911), and Tarr and Martin's College Physiography (1914). Bowman's text differed from the other three in that it was a regional physiography in which the chapters were organized around physiographic regions, rather than on systematic topics. Comments by the authors and reviews of these textbooks in geographical journals indicate that the Physiographies were most appropriate for use in colleges and universities.

The Elementary Texts, on the other hand, were widely used in upper level college-preparatory secondary

school programs and normal schools, and only marginally used on the university level. This group includes those authored by Tarr, Davis, Dryer, Gilbert and Brigham, Fairbanks, and Hopkins. Although also devoted primarily to geomorphology, these texts contained a more diverse body of material than the Physiographies. Whereas the Physiographies were analytical, all Elementary Texts, with the exception of Fairbanks' Practical Physiography (1906), consisted largely of rudimentary encyclopedic explanations of earth processes. Fairbanks' text was more advanced than other texts in this group and went into greater detail. The text was divided into two parts, with one-third devoted to General Physiographic Processes and two-thirds devoted to The Physiography of the United States.

Elements of Geography (1936) and fifteen texts published afterward make up the third category for comparative purposes. Four of the fifteen books included in this group were revisions of the 1936 volume and one was an abridged version. The remaining nine were authored by Seeman, Strahler, Kendall and Glendinning, Van Riper, Powers, and McIntyre. The latter three texts met with marginal success and will be discussed in greater detail later in the chapter. Seeman's text may be considered an anomaly, because it

offered general descriptions of physical phenomena in relation to human activities using previously published case studies as examples. Strahler ultimately followed the conceptual framework offered by Finch and Trewartha, but his initial volume differed slightly in terms of topical coverage and topic ordering. Kendall and Glendinning's initial edition followed rather closely the format and framework established by Finch and Trewartha's Elements of Geography. Even though later editions preceded climate with landforms, their Introduction to Geography was largely a clone of Elements of Geography.

Analysis of Textbooks 1892-1967

The following topics constitute the primary elements of physical geography represented in the textbooks under examination:

Earth as a Planet
Atmosphere and Climate
Oceans
Landforms
Soils
Biogeography

This classification is somewhat arbitrarily chosen; other schemes might be devised, because certain texts have included additional topics as principal components and/or excluded some of the above. The classification

is useful, however, because it represents the majority of topics discussed in the physical geography texts and, consequently, provides a sound basis for comparison. Similarities and differences in topical coverage and topic ordering between the Finch and Trewartha model and the earlier physical geography texts can be determined using this classification.

Data used to evaluate the topical coverage and ordering in the texts is presented in tabular form below. Table 1 is an assessment of the proportion of content devoted to major elements within each text of the earlier period. Appendix C displays the tables of contents for Tarr and von Engeln's 1926 New Physical Geography and Salisbury's 1907 Physiography, representing examples from the Elementary Texts and the Physiographies, respectively. Also included in the appendix are comparisons of tables of contents for Finch and Trewartha's 1936 Elements of Geography and Strahler's 1951 Physical Geography.

Topical Coverage

Earth as a Planet. With the exception of Fairbanks' Practical Physiography (1906), Bowman's Forest Physiography (1911), and Powers' Physical

Table 1

Physical Geography Textbooks, 1895-1936:
Percentage of Material Devoted to Major Segments

YEAR	AUTHOR	EA %	CL %	OC %	LF %	SO %	BI %	PP	ORDER
1895	Tarr	4	26	7	41		5	419	1,2,6,3,4
1897	Tarr	4	35	8	40		5	370	1,2,6,3,4
1898	Davis	2	9	7	68			427	1,2,3,4
1901	Dryer	6	16	6	40		7	462	1,4,3,2,6
1902	Davis	5	18	8	46		2	401	1,2,3,4,6,
1902	Gilbert*	8	13	10	51		7	380	1,4,2,3,6
1903	Tarr	3	15	6	35		7	457	1,4,2,3,6,
1906	Fairbanks		9	3	78		3	542	4,3,2,6
1907	Salisbury	2	25	3	61			770	4,1,2,3
1908	Hopkins	8	10	5	59		7	473	4,3,2,6,
1911	Bowman				85	15		759	Regional Synthesis
1914	Tarr*	4	12	8	70			837	1,4,3,2
1919	Salisbury	3	27	6	59			676	4,1,2,3
1919	Hopkins	6	10	6	63		6	518	1,2,3,4,6,
1926	Tarr*	2	13	5	52		7	669	1,4,3,2,6,
1936	Finch*	1	34		34	5	5	605	1,2,4,6,5

EA=EARTH AS A PLANET; CL=ATMOSPHERE AND CLIMATE;OC=OCEANS; LF=LANDFORMS;
SO=SOILS; BI=BIOGEOGRAPHY; PP=PAGES.
ORDER. 1-Earth as a Planet, 2-Atmosphere and Climate, 3-Oceans,
4-Landforms, 5-Soils, 6-Biogeography.
*More than one author. See Appendix B for complete citations.

Geography (1966), all texts included a section on the earth as a planet. The texts of the earlier period devoted an average of about 4 percent of their content to the subject; Finch and Trewartha offered only a brief overview, devoting less than 2 percent to the subject. This chapter generally included a brief discussion on the nature of geography before elaborating on the form of the earth (spherical shape), earth motions (rotation, revolution), and location (latitude, longitude). Although the Elementary Texts discussed other planets in the solar system, texts in the other two categories did not. The Finch and Trewartha Model included an explanation of scale and elaboration on thematic maps, topics which the earlier texts did not discuss. Strahler considered cartography an essential ingredient of physical geography and consequently his text devoted a good deal of material to the subject (18 percent) while discussing the earth as a planet. In 1957, an introduction to aerial photography was added in the fourth edition of Elements of Geography, and ten years later, the fifth edition discussed land survey systems.

Atmosphere and Climate. The proportion of content devoted to weather and climate was slight in the earlier

texts, averaging approximately 17 percent of the total content. A few texts devoted more than one-fourth of their content to the atmosphere and climate, for example, the subject comprised 27 percent of content in the 1919 edition of Salisbury's Physiography. Four of the ten Elementary Texts devoted 10 percent or less to the topic. When Elements of Geography was introduced in 1936, 34 percent of the volume was devoted to climate, increasing the subject's coverage to that of landforms. Yet Strahler, in 1951, devoted only 26 percent of his text to climate.

With regard to the elements of weather and climate, all authors covered the same topics with some minor differences. Types of precipitation (convectional, orographic, convergence) were not discussed in any of the earlier texts examined. An entire chapter on weather maps was included in Salisbury's Physiography. Methods of approach also differed. Elementary Texts mostly consisted of terms and related definitions as explanation for the workings of the physical environment. The Physiographies, on the other hand, elaborated at length on the specifics of process.

Although climatic classification and a description of world climates were of paramount importance in the

Finch and Trewartha Model, these topics were only marginally addressed in earlier texts. Classification had been generally based on zones of heat, and in Salisbury's text, for example, contributed to only 3 percent of the entire text. Bowman's 1911 text incorporated a climate map based on vegetation using Koeppen's scheme, modified by Ward. This was not, however, Koeppen's more popular version presented in the first edition of Elements of Geography, but it was all that was available when Bowman wrote.* Strahler, in 1951, stated that temperature, precipitation, and vegetation were inadequate for forming a basis for climatic classification. He emphasized a scheme based on airmass source regions, movements, and frontal zones, but did not attempt to set boundaries.

With the presentation of the second edition of Elements of Geography, in 1942, came the introduction of the hydrologic cycle and "the intertropical front." Finch and Trewartha's third edition, published in 1949,

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*Initially using only temperature distinctions, Koeppen made several attempts at climatic classification between 1884 and 1918. Using both temperature and precipitation, a new classification was published in 1918 which continued to be revised until 1936 (James and Martin 1981, 182).

acknowledged that one of the most important climatic functions of the winds is "the maintenance of a heat balance between the higher and lower latitudes in spite of their radiation unbalance" (Finch and Trewartha 1949, 46).

The 1957 edition of Elements of Geography illustrated some major advancements, largely attributed to progress in the atmospheric sciences during the postwar period. For example, the formerly accepted notion of low-latitude zonal uniformity of winds and weather was discarded for

> it [had] been discovered recently that tropical latitudes are affected by many more types of weather disturbances, or storms, than was formerly suspected, so that constancy of weather is by no means so characteristic as was previously thought to be the case .... A second circumstance which has obliged the revision of previous concepts is the discovery that the really steady and uniform trades occupy only a fraction of the total oceanic area within the tropics (Finch et al. 1957, 57).

The winds of the equatorial convergence zone also received a good deal of elaboration as did the distribution of average annual precipitation and atmospheric disturbances. Of great importance was the introduction of the concept of the jet stream, which had been discovered in 1944. The 1967 edition of Elements

of Geography gave greater emphasis to solar radiation, energy exchange, and air-mass characteristics.

Oceans. Study of the oceans comprised about 6 percent of the content in the texts of the earlier era. These texts focused largely on the climatic significance of ocean drifts and currents, as well as tides, sea water composition, ocean bottom topography, and marine life. Finch and Trewartha devoted only five pages (1 percent) of their initial volume to oceans under the section on weather and climate. Strahler's 1951 text also devoted only a negligible amount of material to the subject. By 1957, however, the fourth edition of Finch and Trewartha's Elements of Geography recognized oceans as a primary element of physical geography and devoted two chapters to the subject, which amounted to about 4 percent of the text. This volume incorporated the material of previous texts, but differed in that a global scheme of oceanic circulation was maintained as an integral part, with particular reference to biotic resources of the sea.

Landforms. The volumes of the earlier period generally devoted more than half their content to landforms, and five of the fourteen texts devoted more

than 60 percent to this topic. Geomorphology and landforms comprised proportionately less of the content in the Finch and Trewartha and Strahler texts, with 34 percent and 38 percent respectively.

Only the Physiographies emphasized relief features of the first and second order (for example, continents, mountains) while introducing geomorphology. The Elementary Texts simplified the processes involved in land surface sculpting and limited most of their discussion to an encyclopedic rendition of terms and explanations. The Physiographies discussed the work of surface molding forces (for example, "The Work of Snow and Ice," "The Work of Ground-Water"), giving the impression of a dynamic, rather than static, physical environment, and going into great detail on process geomorphology.

Strahler incorporated a good deal of Davisian geomorphology in his texts, with particular emphasis on the "cycle of erosion." Although the Finch and Trewartha texts incorporated Davisian theory, the authors clearly indicated that the terms "youth, maturity, and old age" referred simply to stages of development, not years.

With regard to landform description, the books differed immensely. The Elementary Texts used a

collection of technical terms and the Physiographies emphasized the forms as results of dynamic processes. Strahler, in 1951, attempted to classify major relief features with the incorporation of numerous block diagrams seeking to explain landscape features as results of process. Although Finch and Trewartha attempted to map and classify land surface features on a global scale in 1936, a more reasonable description of terrain was offered in the 1957 edition, after E.H. Hammond became a co-author. A rationale was established for dissecting land surface features into classes on the basis of terrain elements (slope, surface material, arrangement, and dimensions). The concept of terrain analysis based on description rather than process proved to be quite an innovation, and was further modernized in 1967 with the publication of the fifth edition of Elements of Geography.

Biogeography. Discussion of biotic resources varied considerably among the texts. With the exception of Bowman's Forest Physiography (1911), which provided an extensive description of forest regions in the United States, the Physiographies ignored the field of biogeography altogether. The Elementary Texts generally devoted about 5 percent of their content to the topic

and tended to concentrate primarily on the distribution of plants and animals, usually dissecting material on flora and fauna into two different chapters. Interestingly, maps depicting vegetation zones were generally not offered, despite De Candolle's work in the nineteenth century and publication of Life Zones and Crop Zones of the United States by C.H. Merriam in 1898. Among the Elementary Texts, only Fairbanks' Practical Physiography (1906) considered the human uses of plants and animals more than superficially. Fairbanks devoted entire chapters, entitled "Forests and Forestry" and "Irrigation," to the topics. Elementary Texts also generally included a map of the global distribution of animals divided into three major realms: Northern, South American, and Australian.

Finch and Trewartha's text focused principally on vegetation in about 5 percent of the book and brought greater consideration to the factors which affect plant life (for example, light, moisture, temperature, soil requirements). Types of animal life were correlated with vegetative associations in the 1936 volume, indicating the relationships between flora and fauna in the various biomes. Strahler, in 1951, devoted only a negligible amount of material to the subject, defining dominant vegetative associations with reference to

climatic classification. By 1965, however, Strahler devoted 7 percent of his text to biota and offered a world map of vegetation by Jerosch. As with soils, Finch and Trewartha viewed floral and faunal associations as resources rather than simply as landscape traits. The authors attempted to simplify and refine vegetative classification. By 1957, tundra became recognized as a separate class of vegetation, distinct from the grasslands with which it had was formerly included. The 1967 edition of Elements of Geography included a world map based largely on the work of Eyre and Kuchler.

Soils. Earlier texts generally incorporated a few brief statements on the subject of soils, treating it merely as material which came about as a result of certain geologic processes. Thus, soils were given little mention--often less than a paragraph--in earlier texts. Only three authors made more than cursory remarks on the topic. Fairbanks (1906) and Hopkins (1919) elaborated on residual soil, soil derived from bedrock, and transplanted soil of deposition, and discussed the need for soil conservation. Bowman's text was an anomaly in a sense. His Forest Physiography devoted 15 percent of its total content to soils with

special reference to forestlands, and he adopted the soil classification scheme based on texture used by the U.S. Bureau of Soils.* After Finch and Trewartha included a considerable amount of material to the subject in the 1936 volume--two chapters in 5 percent of the text--attention to soils increased in subsequent texts. The 1942 Elements of Geography offered a world map of the great soil groups based on C.E. Kellog's work (Yearbook of U.S. Department of Agriculture, 1938). In 1951, Strahler introduced the concept of base exchange; and in 1957, Finch, et al. elaborated on the role of pan layers. An attempt was made to view soils as a resource, and not merely the by-product of geomorphic processes and the 1967 edition of Elements of Geography introduced the 7th Approximation.

Man and Nature; Resources. Hartshorne noted that, traditionally, the field of physical geography has included man as an essential element. He stated, "Only in the present century has the chapter on 'man' dropped

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*Bowman's Forest Physiography was organized into two parts: The Soil and The Physiography of the United States. The latter part constituted about 85 percent of the text's content and synthesized the elements of physical geography on a region by region basis.

out" (Hartshorne 1959, 67-68). Neither the Physiographies nor Finch and Trewartha included discussion of man and nature. Although it was included as an integral component in the Elementary Texts, it comprised only between 2 percent and 6 percent of the total content.

Finch and Trewartha's 1936 volume included other items not commonly considered inherent elements of physical geography in the texts of the earlier period. For example, two chapters were devoted to mineral fuels and economic minerals, comprising more than 6 percent of the text, and a chapter on water resources was included as well. These were subjects heretofore largely ignored by earlier writers.

Comments on Post-1936 Textbooks

Table 2 assesses the proportion of material devoted to specific topics and the sequence of topics in the sixteen texts published between the initial volume of Elements of Geography (1936) and the fifth and last revision (1967). Based on number of new editions or versions, texts authored by Finch and/or Trewartha dominated during the three decades following the publication of the first edition of Elements of

Table 2

Physical Geography Textbooks, 1936-1967:

Percentage of Material Devoted to Major Segments

YEAR	AUTHOR	EA %	CL %	OC %	LF %	SO %	BI %	PP	ORDER
1936	Finch*	1	34		34	5	5	605	1,2,4,6,5
1942	Finch*	3	34		32	5	5	641	1,2,4,6,5
1942	Seeman		14	5	34	10		439	2,4,5,3
1949	Finch*	3	34		32	5	5	466	1,2,4,6,5
1951	Strahler	18	26		38	5		442	1,4,2,5
1951	Kendall*	2	22	1	20	4	5	477	1,2,4,3,5,6
1957	Finch*	4	34	3	33	5	5	501	1,2,4,3,6,5
1960	Strahler	17	18	5	45	4		534	1,3,2,5,4
1961	Trewartha*	6	34	3	30	3	4	409	1,4,2,3,6,5
1962	Van Riper	6	20	6	17	10	13	637	1,4,2,6,5,3
1962	Kendall*	12	27	10	26	6	7	345	1,3,4,2,5,6
1965	Strahler	8	23		38	5	7	455	1,2,5,6,4
1965	McIntyre	10	32	7	26	7	11	403	1,2,6,5,4,3
1966	Powers		32		38	3	3	566	4,2,5,6
1967	Kendall*	13	22	9	22	5	6	416	1,3,4,2,5,6
1967	Trewartha*	8	29	6	31	7	3	517	1,2,4,3,6,5

EA=EARTH AS A PLANET; CL=ATMOSPHERE AND CLIMATE; OC=OCEANS; LF=LANDFORMS; SO=SOILS; BI=BIOGEOGRAPHY; PP=PAGES.

ORDER. 1-Earth as a Planet, 2-Atmosphere and Climate, 3-Oceans, 4-Landforms, 5-Soils, 6-Biogeography

*More than one author. See Appendix B for complete citations.

Geography.* Six texts written under the authorship of Finch and/or Trewartha accounted for nearly 40 percent of the basic physical geography textbook titles produced during this period. Strahler and Kendall and Glendinning were the next most successful, each accounting for approximately 20 percent of the titles published; and Seeman, Van Riper, Powers, and McIntyre collectively accounted for about 40 percent of the titles.

Among the basic physical geography texts published between 1936 and 1967, it is noteworthy that the 1951 edtion of Strahler's text did not follow the Finch and Trewartha organization of topics. He placed landforms before climate and devoted a rather significantly higher proportion of material (38 percent) to landforms and to

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*Textbook publishers do not make available data on the number of copies sold for particular volumes. Therefore, it is suggested that one measure of success is the number of revised editions. Between 1936 and 1967 only Finch and Trewartha, Strahler, and Kendall and Glendinning authored texts which underwent revision. Van Riper's text was revised in 1971, nearly a decade after publication of the first edition and McIntyre published three revisions in 1973, 1980, and 1985, since 1967.

the earth as a planet (18 percent) than his contemporaries, while offering less coverage on climate (26 percent) and biotic resources (negligible). This initial deviation in organization of topics by Strahler was replaced in subsequent editions by a sequential ordering of topics similar to that of the Finch and Trewartha texts. (See Tables 2 and 3 for the percentage of material devoted to major segments. Appendix C shows the tables of contents for Strahler's 1965 text and the 1967 edition of Elements of Geography.)

Curiously, when Trewartha, Robinson, and Hammond published Fundamentals of Physical Geography in 1961, landforms preceded climate.* An important addition to the 1957 edition was material which indicated the authors' recognition of oceans as a primary element of physical geography, to which they devoted almost 4 percent of the text.

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*Fundamentals of Physical Geography was intended for use in a one semester physical geography course. Subsequent editions, published in 1968 and 1977, treated climate before landforms. The authors stated, "[O]rganization [was] changed to what seems to be a more logical way of presenting the material" (Trewartha, Robinson, and Hammond 1968, v).

Table 3

A Representative Sample of Physical Geography Textbooks, 1967-1987: Percentage of Material Devoted to Major Segments

YEAR	AUTHOR	EA %	CL %	OC %	LF %	SO %	BI %	PP	ORDER
1968	Trewartha*	6	31	3	30	5	4	389	1,2,3,4,6,5
1969	Strahler	13	23	3	35	3	5	733	1,3,2,5,6,4
1973	McIntyre	10	28	7	31	6	6	480	1,2,6,5,4,3
1974	Muller*	9	25	5	26	4	10	517	1,2,5,6,4,3
1974	Patton*	9	39	13	27	6	5	393	1,4,3,2,6,5
1975	Kolars*	18	20		18	3	3	344	1,2,4,6,5
1975	Gabler*	11	23	7	24	4	2	801	1,2,6,5,3,4
1976	Strahler*	4	29		36	3	7	469	1,2,5,6,4
1977	Gardner	10	18	7	32	9	12	571	1,2,3,6,5,4
1977	Trewartha*	6	30	4	36	6	5	376	1,2,3,4,6,5
1978	Muller*	8	25	5	25	6	8	590	1,2,6,5,4,3
1980	McIntyre	9	29	8	30	9	6	507	1,2,6,5,4,3
1983	Strahler*	6	26		34	5	7	532	1,2,4,5,6
1984	McKnight	7	27		34	6	10	488	1,2,6,5.4
1987	McKnight	7	27		34	6	10	539	1,2,6,5,4

EA=EARTH AS A PLANET; CL=ATMOSPHERE AND CLIMATE; OC=OCEANS; LF=LANDFORMS; SO=SOILS; BI=BIOGEOGRAPHY; PP=PAGES.

ORDER. 1-Earth as a Planet, 2-Atmosphere and Climate, 3-Oceans, 4-Landforms, 5-Soils, 6-Biogeography.

*More than one author. See Appendix B for complete citations.

Topic Ordering

Finch and Trewartha developed topical coverage in Elements of Geography in the following sequence: 1-Earth as a Planet, 2-Atmosphere and Climate, 3-Landforms, 4-Biotic Resources, 5-Soils. This topic ordering represented a departure from the earlier books, with particular reference to the placement of climate before landforms.

As did most of the early authors, Finch and Trewartha proceeded with a discussion of the earth as a planet. Salisbury was the exception and did not treat the subject initially, but rather placed it after landforms. Bowman, Fairbanks, and Powers largely ignored the topic.

Finch and Trewartha's placement of the atmosphere and climate before landforms constituted a major difference between their text and the texts of the earlier period. Of the fourteen earlier texts, only five placed climate before landforms; four of these were published during the period 1895-1902. After 1936, most physical geography texts placed climate before landforms. Of the sixteen physical geography textbooks published between 1936 and 1967, ten discussed climate before landforms. The representative sample of fifteen

texts published since 1968 showed only one book that discussed landforms before climate. Strahler's 1951 volume placed landforms before climate, but each one of his subsequent physical geography texts inverted the order.

The ordering of topics likely was determined by the authors' particular interests or area of expertise. Furthermore, it seems that the proportion of material devoted to a subject is related to the order in which it appears in the text. With few exceptions, authors of texts during the earlier period were trained in Davisian geomorphology, and these authors considered landforms of paramount importance. When climatologist Trewartha co-authored the 1936 volume, the study of climate was awarded precedence. Climate and landforms normally constituted the principal elements of physical geography and were often presented in lengthy discussions within the first half of the text. Soils, vegetation, and the oceans, topics which generally received minor treatment, were commonly discussed in shorter chapters near the end of the text.

Summary

Instrumental changes occurred in the treatment of topics in physical geography with the publication of Finch and Trewartha's Elements of Geography in 1936. In earlier texts, all other elements were subordinate to landforms. With Finch and Trewartha's first edition, the study of climate was expounded upon and discussed at a length equal to landforms and preceded landforms within the text's framework. All physical geography texts tended to devote the overwhelming majority of their content to climate and landforms. Other topics, such as the oceans, soils, and biotic resources, were generally awarded only brief and shallow treatment. Water resources and mineral resources were noticeably absent topics in all texts, except those authored by Finch and/or Trewartha. The man and nature theme, which tended to perpetuate the notion of causation with declarations of the physical environment's influence on man, was an integral component in the Elementary Texts, but was excluded from both Physiographies and the Finch and Trewartha Model. It would appear that, topically, the Finch and Trewartha text and those of the earlier period are quite similar. This is deceptive, however, because the earlier texts were much more uneven in coverage and rather encyclopedic. Finch and Trewartha's

texts were explanatory and interpretive. They treated climate more thoroughly than their predecessors and placed it before landforms, discarded the man and nature theme, treated water as a resource, and culminated each systematic discussion of a physical element with a classification scheme and accompanying map. The publication of Elements of Geography essentially revolutionized the content and format of physical geography textbooks and perhaps, as a result, the content and format of physical geography instruction.

CHAPTER IV

CONCLUSION

At the end of the nineteenth century, two divergent branches of geography existed, "one being primarily interested in the origins and characteristics of landforms, and the other in the discovery of relationships between man and the physical earth" (Finch and Trewartha 1936, 4). The discipline was formalized after the Committee of Ten met in 1892, and the physiographic component was accentuated. Physical geography emerged as an assemblage of earth sciences, with strong ties to geomorphology. It is little wonder therefore, that physical geography textbooks were rapidly published in large numbers by leading geomorphologists including, for example, R.D. Salisbury, W.M. Davis, and G.K. Gilbert. Two types of texts have been identified which came into being, Elementary Texts and Physiographies. Elementary Texts were generally collections of nomenclature on earth science. The Physiographies were devoted principally to process-oriented geomorphology.

The subfield had declined by the early 1920s, a result of inactivity in the profession by eminent physiographers (either because of death or retirement), the failure of public schools to maintain physiography in their curricula, and the onset of World War I with the consequent rise of economic geography. These circumstances resulted in a time of uncertainty in physical geography. Subsequently, the geographic discipline discarded landform study and environmental relationships as primary emphases, and focused on the human component. This new approach stressed geography as the "comparative study of the earth's regions" (Finch and Trewartha 1936, 4).

Consequently, the texts of the earlier period were largely inadequate for physical geography instruction. No new text was written in the decade following 1926. By writing a quality text that filled a void, Finch and Trewartha restructured the content of physical geography and brought balance to the field. Elements of Geography was published in 1936, providing a model which proved instrumental in redefining the content of physical geography.

With widespread use of Elements of Geography, certain measures were adopted which provided increased opportunity for physical geographers to integrate their

work with the rest of the discipline. The authors sought to advance the concepts of earth resources and regions, perhaps because of the change in paradigms in American geographic thought. With the emphasis having turned away from "physiography and causation" and toward "field and region" (Martin 1985), geographers pursued different types of studies than were conducted previously. For example, Finch and Trewartha included an entire section in their text on earth resources. Moreover, the authors offered classification schemes for each integral element of physical geography and mapped climate, landform, soil, and vegetation regions on a global scale. The classification schemes, theoretically, assisted geographers in geographical interpretation, with particular reference to examining the relationships of physical phenomena.

The impact of the 1936 edition of Elements of Geography on basic physical geography was pervasive. It became the content standard for basic physical geography and influenced the perception of what constitutes physical geography for both teachers and students. The use of classification schemes for each separate component of physical geography advanced the notion that such schemes are inherent to the structure of physical

geography textbooks.* Their approach and emphasis reduced physical geography into separate elements, at the expense of the synthesis among the elements. Consequently, a pattern of thought was introduced and developed which continues today. Essentially, their book was quite a departure from all physical geography texts that preceded it and, furthermore, it established a standard for subsequent texts. Physical geography textbooks that have deviated from the Finch and Trewartha model, including, for example, Strahler's 1951 edition, Trewartha's 1961 edition, and those texts authored by Seeman, Powers, and Van Riper, either were revised to the model or ceased to remain in use. Quite a resurgence occurred in the publication of textbooks in the last three decades and although new concepts have

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*Strahler, in 1951, deviated from the standard established by Finch and Trewartha. His Physical Geography incorporated the Koeppen system, but a climatic classification scheme based on air mass source regions was given greater emphasis. Also in the 1951 volume, Strahler discussed landforms before climate. He did not establish a new standard, however, and his later texts accentuated the Koeppen scheme and the discussion of climate preceded landforms.

been introduced, such as plate tectonics and biogeochemical cycling, and books have become more decorative in appearance,* the basic content and framework of physical geography texts have remained essentially unchanged.

The last edition of Elements of Geography was published in 1967, and Strahler's texts, which have dominated since then, are presently experiencing major competition. Interestingly, unlike the early years of the discipline, the eminent physical geographers of today have largely refrained from writing textbooks, perhaps because textbooks are not accepted as "scholarly" contributions.

One might wonder how well the Finch and Trewartha model serves physical geography. The model has lasted a half century, a decade longer than the standard it replaced, but alternatives are available. The traditional approach advanced by the Finch and Trewartha model suggests that physical geography is more or less

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*Perhaps Elements of Geography and Fundamentals of Physical Geography declined because the books became less decorative in appearance while competing texts became increasingly ornamental.

an overview of earth and atmospheric sciences. If physical geographers are content with this approach and wish to pursue an understanding of the earth's physical systems, then greater consideration might be given to the topic of oceans. Oceans cover 71 percent of the earth's surface and the ocean floor has become a highly significant data source for understanding tectonic landform development.

In the United States, however, geographers have had problems in "demonstrating what, if any, function there is for physical geography beyond its introduction" (Carter, Schmudde, and Sharpe 1972, 5) and a more radical alternative for the study of the subfield has been suggested. Some physical geographers have argued that the traditional approach is inadequate because it does not satisfactorily integrate the elements of physical geography and it largely ignores man-environment interactions. It has been proposed, therefore, that geographers discard the notion of physical geography as a collection of earth and atmospheric sciences and, instead, concentrate on the earth's interface system as the home of, and modified by, man (Carter, Schmudde, and Sharpe 1972).

The concept of resources offers an avenue that enables physical geography to relate to the rest of the

discipline by focussing on the role of the physical environment in the human occupancy of the earth. Treatment of landforms and soils provide examples that illustrate this approach. Currently, physical geography tends to emphasize the geomorphology of the land surface and the pedologic properties of soils, but such emphases are inappropriate with reference to human activity, such as agriculture. Examination of the surface configuration of the land and agronomic properties of soils could be much more useful in this context and would seem more appropriate for geographic understanding.

The field may be vulnerable because of a lack of synthesis. Authors of physical geography textbooks have been concerned with consolidating several distinct process-oriented topics, with little effort to unify these subjects or indicate their relevance to man's activities on the face of the earth. No textbook has successfully combined the elements of physical geography in a manner to distinguish it from merely a rendition of "earth science." Such a synthesis is not only appropriate, but may be essential for the revitalization of physical geography as a whole.

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APPENDIXES

APPENDIX A

SOURCES FOR LISTS OF PHYSICAL GEOGRAPHY TEXTBOOKS PUBLISHED IN THE UNITED STATES

1912-1917. The United States Catalog: Books in Print. H.W. Wilson Company: New York.

1918-1927. The United States Catalog Supplement. H.W. Wilson Company: New York.

1928-1987. Cumulative Book Index: A World List of Books in the English Language. H.W. Wilson Company: New York.

APPENDIX B

LIST OF PHYSICAL GEOGRAPHY TEXTBOOKS EXAMINED

Physical Geography Textbooks:1895-1936

Bowman, Isaiah. 1911. Forest Physiography. New York: John Wiley and Sons.

Davis, William M. 1898. Physical Geography. Boston: Ginn and Company.

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Dryer, Charles R. 1901. Lessons in Physical Geography. New York: American Book Company.

Fairbanks, Harold W. 1906. Practical Physiography. Boston: Allyn and Bacon.

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Gilbert, Grove Karl, and Brigham, Albert Perry. 1902. An Introduction to Physical Geography. New York: D. Appleton and Company.

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Physical Geography Textbooks: 1936-1967

Finch, Vernor, and Trewartha, Glenn. 1936. Elements of Geography. New York: McGraw-Hill.

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Trewartha, Glenn T.; Robinson, Arthur; Hammond, and Edwin. 1967. Elements of Geography. New York: McGraw-Hill.

Van Riper, Joseph E. 1962. Man's Physical World. New York: McGraw Hill.

Physical Geography Textbooks: 1967-1987

Gabler, Robert E.; Sager, Robert; Brazier, Sheila; and Pourciau, Jacqueline. 1975. Introduction to Physical Geography. San Francisco: Rinehart Press.

Gardner, James S. 1977. Physical Geography. New York: Harper's College Press.

Kolars, John F. and Nystuen, John D. 1975. Physical Geography: Environment and Man. New York: McGraw-Hill.

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Trewartha, Glenn T.; Robinson, Arthur; Hammond, Edwin; and Horn, Lyle. 1977. Fundamentals of Physical Geography. New York: McGraw-Hill.

Physiography (1907), Salisbury

Chapter	
	LANDFORMS
1.	Relief Features
2.	The Work of the Atmosphere
3.	The Work of Ground-Water
4.	The Work of Running Water
5.	The Work of Snow and Ice
6.	Lakes and Shores
7.	Vulcanism
8.	Crustal Movements, Diastrophism
9.	Origin and History of Physiographic Features
10.	Terrestrial Magnetism
	EARTH AS A PLANET
11.	Earth Relations
	ATMOSPHERE AND CLIMATE
12.	General Conception of the Atmosphere
13.	Constitution of the Atmosphere
14.	Temperature of the Air
15.	The Moisture of the Air
16.	Atmospheric Pressure
17.	General Circulation of the Atmosphere
18.	Weather Maps
19.	Climate
	OCEANS
20.	General Conceptions
21.	Composition of Sea-Water
22.	The Temperature of the Sea
23.	The Movements of Sea-Water
24.	The Life of the Sea
25.	Materials of the Sea Bottom
26.	Relation of the Sea to the Rest of the Earth

New Physical Geography (1926), Tarr and von Engeln

Chapter	
	EARTH AS A PLANET
1.	The Earth as a Planet
	LANDFORMS
2.	General Features of the Earth
3.	Changes in the Earth's Crust
4.	Rivers and River Valleys
5.	Plains, Plateaus, and Deserts
6.	Mountains
7.	Volcanoes, Earthquakes, and Geysers
8.	Glaciers and the Glacial Period
9.	Lakes and Swamps
	OCEANS
10.	The Ocean
11.	Shore Lines
	ATMOSPHERE AND CLIMATE
12.	The Atmosphere
13.	Winds and Storms
14.	Weather and Climate
	BIOGEOGRAPHY
17.	Distribution of Plants
18.	Distribution of Animals
	OTHER
15.	Physiography of the United States
16.	Rivers of the United States
19.	Man and Nature

Figure 2. Physical Geography Textbooks' Tables of Contents. The tables of contents have been classified according to the topics discussed in Chapter III: EARTH AS A PLANET, ATMOSPHERE AND CLIMATE, OCEANS, LANDFORMS, SOILS, BIOGEOGRAPHY.

Elements of Geography (1936), Finch and Trewartha

Chapter

EARTH AS A PLANET

1. The Field of Geography: Its Content, Method and Point of View
2. The Earth and Its Planetary Relations
3. Maps and Their Interpretation

ATMOSPHERE AND CLIMATE

4. Air Temperature (Including Insolation)
5. Atmospheric Pressure and Winds
6. Atmospheric Moisture and Precipitation
7. Storms and Their Associated Weather Types
8. The Tropical Rainy Climates
9. The Dry Climates
10. The Humid Mesothermal Climates
11. The Humid Microthermal Climates
12. Polar and Highland Climates

LANDFORMS

13. Earth Materials and Their Tectonic Processes
14. The Agents and Processes of Gradation
15. Plains of Stream Degradation
16. Plains of Stream Aggradation
17. Glaciated Plains
18. Plains in Dry Climates
19. The Shore Features of Plains
20. Plateaus
21. Hill Lands
22. Mountains

BIOGEOGRAPHY

24. The Biotic Resource: Original Vegetation Cover and Associated Animal Life

SOILS

25. Soils: Their Nature and Classification
26. The Principal Soil Groups of the World

OTHER

23. Water Resources of the Land
27. The Mineral Fuels
28. Ores and Other Economic Minerals

Physical Geography (1951), Strahler

Chapter

EARTH AS A PLANET

1. Form of the Earth; the Geographic Grid
2. Map Projections
3. Illumination of the Globe
4. Time
5. Moon and Tides

LANDFORMS

6. Planimetric Maps
7. Topographic Maps
8. Introduction to Landforms
9. Rocks and the Earth's Crust
10. Weathering, Mass Wasting, and Ground Water
11. Landforms Made by Streams
12. The Cycle of Landmass Denudation
13. Landforms Made by Glaciers
14. Landforms Made by Waves
15. Landforms Made by Wind
16. Coastal Plains, Horizontal Strata, and Domes
17. Folds, Faults, and Fault Blocks
18. Crystalline Masses and Volcanic Forms

ATMOSPHERE AND CLIMATE

19. Weather Elements and Air Temperature
20. Air Pressure, Winds, and Ocean Currents
21. Moisture, Clouds, and Precipitation
22. Storms and Weather Analysis
23. Climates and Their Classification
24. Climates Controlled by Equatorial and Tropical Airmasses
25. Climates Controlled by Both Tropical and Polar Airmasses
26. Climates Controlled by Polar and Arctic Airmasses; Highland Climates

SOILS

27. The Soil
28. The Great Soil Groups

Figure 2 (continued)

Introduction to Physical Geography (1965), Strahler

Chapter

EARTH AS A PLANET

1. The geographic grid and its projections
2. Seasons and time

ATMOSPHERE AND CLIMATE

3. Solar radiation and air temperature
4. Air pressure and winds
5. Moisture, clouds, and precipitation
6. Cyclonic storms, air masses, weather fronts
7. Climate classifications and climatic regimes
8. Soil water and the water balance
9. Equatorial and tropical climates
10. Middle-latitude climates
11. Polar, arctic, and highland climates

SOILS

12. Soils and soil-forming processes
13. The great soil groups

BIOGEOGRAPHY

14. Structure and environment of vegetation
15. Distribution of natural vegetation

LANDFORMS

16. Landforms and earth materials
17. The earth's crust
18. The wasting of slopes
19. Runoff and ground water
20. Landforms made by streams
21. The cycle of landmass denudation
22. Landforms made by glaciers
23. Landforms made by waves and currents
24. Landforms made by wind
25. Coastal plains, horizontal strata, domes
26. Folds, faults, and fault blocks
27. Crystalline masses and volcanic forms

Elements of Geography (1967), Trewartha, et al.

Chapter

EARTH AS A PLANET

1. The Earth: Direction, Distance, and Location
2. Maps and Mapping

ATMOSPHERE AND CLIMATE

3. Solar Energy and Air Temperature
4. Winds and Atmospheric Pressure
5. Atmospheric Moisture and Precipitation
6. Air Masses, Fronts, and Atmospheric Disturbances
7. The Tropical Humid Climates
8. The Dry Climates (Group A)
9. The Subtropical Climates (B)
10. The Temperate Climates (D)
11. The Boreal (E), Polar (F), and Highland Climates

LANDFORMS

12. The Earth's Crust and the Tectonic Processes
13. The Agents and Processes of Gradation
14. The Characteristics and Classes of Surface Form
15. Plains
16. Hill and Mountain Lands
17. Tablelands, and Plains with Hills or Mountains

OCEANS

18. The Continental Margins and the Sea Floor
19. The Seas

BIOGEOGRAPHY

21. Wild Vegetation

SOILS

22. Soils
23. The World Distribution of Soils

OTHER

20. The Waters of the Land
24. Mineral Resources

Figure 2 (continued)

VITA

Michael Steven DeVivo was born in France on 6 June 1957. He attended public schools in Oregon, West Germany, and Connecticut, and graduated from Cheshire High School, Cheshire, Connecticut in 1975.

Following service with the U.S. Marine Corps and Naval Reserve, he pursued post-secondary studies in California and served as Captain on board supply vessels for the mineral and oil industry in the Gulf of Mexico.

DeVivo was awarded a Bachelor of Arts degree in geography from Southern Connecticut State University in 1984. He enrolled in the geography graduate program at the University of Tennessee and was awarded a Master of Science degree in 1988. The writer is currently enrolled in the geography doctoral program.