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Pioneers of Modern Geography: Translations Pertaining to German Geographers of the Late Nineteenth and Early Twentieth Centuries

Robert C. West

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Translated and Edited by Robert C. West

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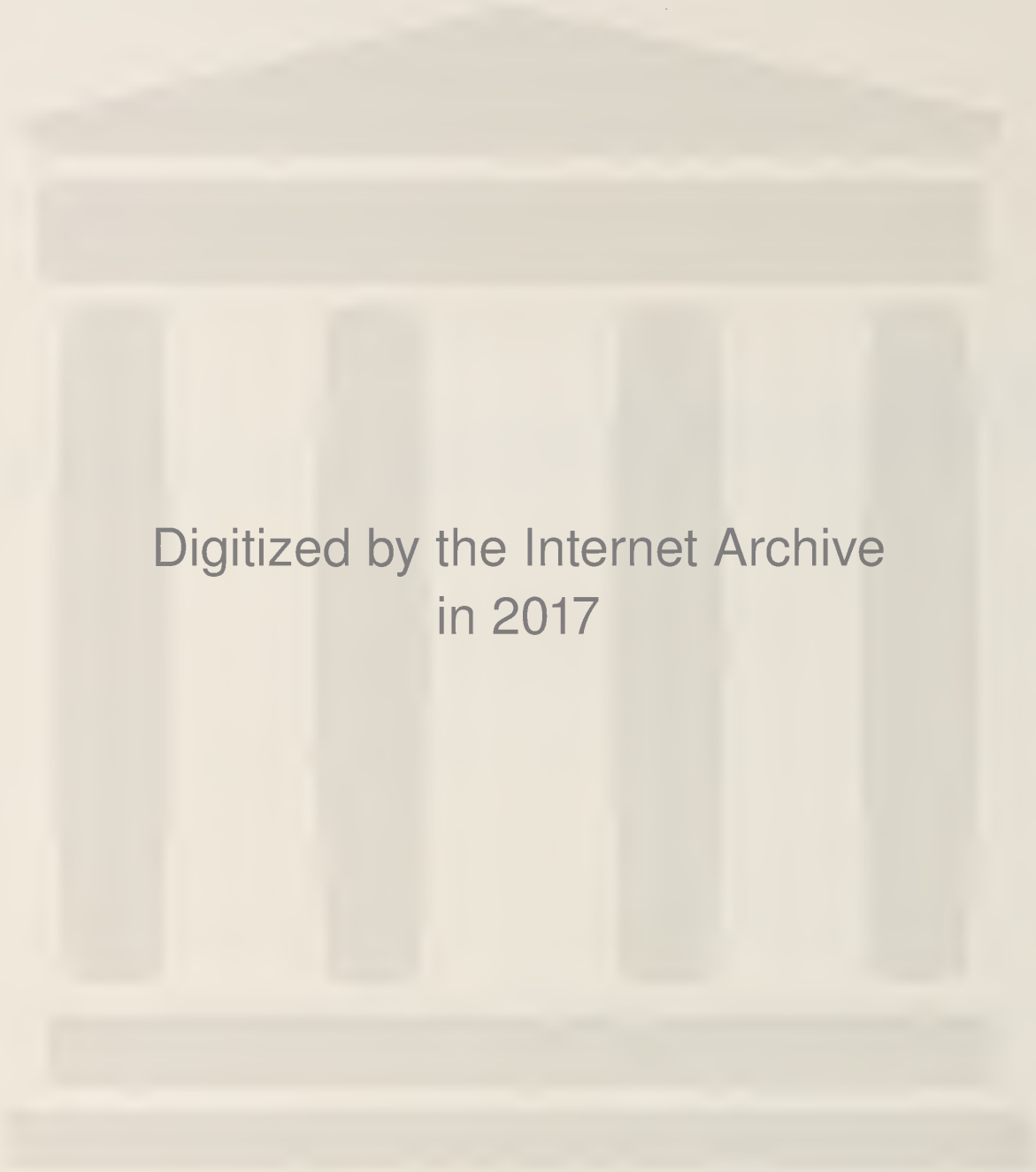

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TRANSLATIONS PERTAINING TO GERMAN GEOGRAPHERS OF THE LATE NINETEENTH AND EARLY TWENTIETH CENTURIES

Translated and Edited by

Robert C. West

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1990

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Preface

These translations were undertaken to aid students in their study of the history of geography. Today, with the general relaxation of foreign language requirements in graduate programs, most students and even instructors of geography lack a reading knowledge of German. During the late nineteenth and early twentieth centuries, important geographical concepts were formulated by German scholars, and their writings are significant for an understanding of the development of the discipline during that period and beyond. The same may be said for the work of French geographers of that time. To be sure, various works in English on German geography by Americans such as Richard Hartshorne, Carl Sauer and Preston James and by British scholars such as Robert Dickinson are valuable sources. Moreover, the series *Geographers: Biobibliographical Studies*, previously edited by T. W. Freeman in England, now edited in the United States by Geoffrey J. Martin, sketches the life and concepts of many world geographers, including Germans. But few English translations of German geographical monographs or key journal articles have been made.

In translating the following works and critiques, an effort was made to stay as close as possible to the authors' thoughts and meanings. For improved clarity, explanatory English words in brackets occasionally were placed within a sentence where deemed necessary. Moreover, the style of the citations and references has been retained as the authors wrote them.

Acknowledgments

The editor gratefully acknowledges the thoughtful critiques made by the following reviewers who read through the initial typescript: Dr. Gary S. Dunbar, professor emeritus of geography, University of California at Los Angeles; Dr. Terry G. Jordan, Webb Professor, Department of Geography, University of Texas at Austin; Dr. Geoffrey J. Martin, professor of geography, Southern Connecticut University, New Haven.

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Introduction

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This collection of English translations samples the writings and/or critiques thereon of six important German geographers of the late nineteenth and early twentieth centuries: those of August Meitzen, Eduard Hahn, Otto Schlüter, Alfred Hettner, Siegfried Passarge, and Karl Sapper. Each of these scholars influenced in various ways the course of modern geographical thinking and instruction in German universities, and their methodologies were also adopted in part by professional geographers in other European countries and in the United States. Four of them—Hahn, Schlüter, Hettner and Passarge—were students of Ferdinand von Richthofen, often considered the "father" of professional geography in Germany. In their writings, most of the men considered herein dealt mainly with the substance and methodology of human geography, but two, Passarge and Sapper, having received formal training in geology, considered problems in physical geography, although both treated various aspects of anthropogeography and ethnography. In the same vein, some of the human geographers of this group, namely Hettner and Schlüter, occasionally wrote on physical geography and emphasized that subject in their teaching. Writings of other leading German geographers of the time period here considered might well have been included; for example Friedrich Ratzel, whose first volume of his *Anthropogeographie* (1882) dealt in part with the influence of nature on mankind, and led directly to the ideas of one of his American students, Ellen Churchill Semple, who was instrumental in establishing the dogma of environmental determinism among geographers in the United States during the early part of this century.[1]

Table 1 summarizes the influence on some American geographers of five of the Germans herein considered.

Of the Germans listed, only August Meitzen received no formal training in geography. Employed as a statistician and investigator of landed estates and land reform by the Prussian Statistical Bureau during the 1860s, he became fascinated with the forms, functions and history of rural settlements, field patterns and farm buildings in Germany and in all of Europe, an interest that culminated in his three-volume work, *Siedelung und Agrarwesen* [Settlement and Agricultural Lifeways], published in 1895. Initially highly praised, Meitzen's opus was later revised by several European scholars. Carl Sauer, University of California at Berkeley, was impressed with Meitzen's work and may have recommended *Siedelung und Agrarwesen* to some of his early students. One of them, Fred Kniffen of Louisiana State University, was attracted to Meitzen's ideas on rural settlement forms and field patterns; during a sabbatical in Germany (1938–39) he was told that he was probably the only one in the country who had studied carefully all three volumes and accompanying atlas of *Siedelung und Agrarwesen.*[2] Later, through his writings and teaching, Kniffen became the leading proponent of house-type geography in the United States. A much later American follower of Meitzen in terms of rural settlement forms and farm buildings is the geographer Terry Jordan of the University of Texas, who has published extensively on rural log and other types of farm structures in the United States and their European origins, and has called for an English translation of Meitzen's *Siedelung und Agrarwesen.*

Unlike his mentor, von Richthofen, Eduard Hahn was in no way a field geographer. He confined his research to the library, working on problems that today are usually classified under "culture history." Among Hahn's interests were such themes as agricultural origins, including plant and animal domestication through time. In the United States, his publications excited the interest of Carl Sauer, who adopted some of Hahn's ideas, especially those pertaining to the role of irrational forces (religion, magic, mythology) in major tech-

Table 1
SOME GERMAN-AMERICAN CONNECTIONS
IN THE TWENTIETH CENTURY

AUGUST MEITZEN	Carl Sauer (U. Cal., Berkeley) Fred Kniffen (LSU) Terry Jordan (U. Texas)	Rural settlement; house types
EDUARD HAHN	Carl Sauer (U. Cal., Berkeley) Fred Simoons (U. Cal., Davis) Erich Isaac (N.Y. City Coll.)	Agri. origins; domestication; culture history
OTTO SCHLÜTER	Carl Sauer (U. Cal., Berkeley)	Historical; cultural-regional geography
ALFRED HETTNER	Nevin Fenneman (U. Cincinnati) Richard Hartshorne (U. Minn.) (U. Wisc.) Carl Sauer (U. Cal., Berkeley)	Regional geog. (chorology)
SIEGFRIED PASSARGE	Carl Sauer (U. Cal., Berkeley) Preston James (U. Michigan) (Syracuse U.)	Landscape; generic regional geography

nological advances in early civilization. Sauer used many of these themes in his renowned *Agricultural Origins and Dispersals* (1952, rev. 1969).[3] He invariably referred to Hahn's works in seminars on various aspects of culture history, often requiring graduate students to read the original German, especially from Hahn's famous work, *Die Haustiere* [Domesticated Animals], published in 1896. One of Sauer's students, Frederick Simoons, followed the pattern of Hahn in his studies on animal domestication, such as his book on the mithan of India (1968).[4] Moreover, Erich Isaac, a naturalized American citizen from Germany, who was introduced to Sauerian philosophy through George Carter at Johns Hopkins University, closely followed Hahn's ideas in his studies on the domestication of cattle and in his book, *Geography of Domestication.*[5] The works of Eduard Hahn also stimulated various American anthropologists, such as Franz Boas and Berthold Laufer in ideas of culture history.

Schlüter, Hettner and Passarge were all proponents of the areal, or regional, concept of geography which they advocated as the core of geographical research. Following their writings (and those of several Frenchmen), Carl Sauer brought the attention of American geographers to the regional concept, mainly through his seminal essays "The Survey Method of Geography and Its Objectives" (1924), "The Morphology of Landscape" (1925), and "Recent Developments in Cultural Geography" (1927).[6] Significantly, as a graduate student at Chicago (1909-1913), Sauer read current German geographical literature and thus must have been aware of the methodological aspects of geography espoused in Europe at that time.[7] In the preface of his doctoral dissertation on the Ozark Highland of Missouri, published in 1920, several years prior to the three positional papers listed above, he stated:

> This volume is a study in regional geography, the most urgent field of geographical inquiry. . . . The preparation of regional monographs, numerously represented in European countries, has hardly commenced in America.[8]

Many of Sauer's ideas expressed in his three positional papers parallel those of Schlüter, who had stated them many years earlier.[9] Such involved (1) the complete rejection of the dogma of environmental determinism, because no science can be based wholly on influences or relationships; (2) the use as objects of geographical study the observable or visible elements in the landscape—their forms, structures and functions in their areal or regional associations; (3) through time and human action the development of the cultural landscape (Kultur-

landschaft) out of the primeval or natural landscape (Urlandschaft or Naturlandschaft). Schlüter's later work emphasized the reconstruction of the geography of past landscapes—historical geography—as did that of Sauer, but eventually Schlüter dropped his earlier insistence on the limitation of geographical study to observable features.

Alfred Hettner was perhaps the foremost advocate of regional geography in Germany during the late nineteenth and early twentieth centuries, emphasizing an orderly presentation of data viewed in relation to a physical framework. One of the first Americans to follow Hettner was Nevin Fenneman, a geomorphologist who suggested areal studies as the main goal of geography in his presidential address before the Association of American Geographers in 1918.[10] However, his suggestion made little impression on the association members, many of whom were still in the throes of environmental determinism. Fenneman's viewpoint on regional geography was demonstrated in his two-volume descriptive work on regional physiography of the United States published in 1931 and 1938.[11] In his "Morphology of Landscape," Sauer cited Hettner as advocating regional studies. But Richard Hartshorne was the American geographer most influenced by Hettner's ideas, focussing much of his renowned *Nature of Geography* on the latter's "methodological discussions [that] have come to be regarded as 'classics' in geography."[12] Although important for its data on the history of geography, Hartshorne's opus is essentially a plea for regional geography.

Although Siegfried Passarge and Karl Sapper received degrees in geology and geography, both can be considered self-trained naturalists and avid field men, Passarge concentrating on Africa, Sapper on Central America and southern Mexico. Both investigated problems in geology, geomorphology, climatology, anthropogeography, economic geography, and ethnography in their field areas. But Passarge dealt much more with geographical methodology than did Sapper and thus may have had more influence on geographers within and outside Germany, including those in the United States. Passarge championed the regional approach, especially studies of natural, or physical, regions which he called Landschaftskunde, and, eventually the interaction of natural and cultural elements within particular local geographical areas (Landeskunde). Carl Sauer was particularly interested in Passarge's system of natural regions, as indicated in "Morphology of Landscape" and in later methodological papers. Preston James was even more taken with Passarge's concept, which he used in his textbook, *Outline of Geography* (1935) presenting world regions based on climatic and related vegetational criteria and their respective human adaptations. James gave credit to the German by stating: "Passarge's *Die Landschaftsgürtel der Erde* gave definite direction to the classification of the world into 'landscape groups'."[13] In the United States, however, this scheme was soon abandoned in geography textbooks in favor of the culture area approach exemplified by Russell and Kniffen, *Culture Worlds* (1951)[14] and James and Davis, *The Wide World* (1959).[15]

Perhaps because of his general disinterest in geographical methodology and his early specialization on Central America, Karl Sapper appears to have had little influence on American geographers. Carl Sauer occasionally quoted Sapper's descriptions of tropical rain forests and savannas in Central America, and scattered references to his writings on climate, Indian cultures, and Spanish colonization in Central America occur in essays and books written by American geographers and historians.[16] However, his geological work (especially on vulcanology) in Central America and elsewhere was basic to later geologists, both American and European.[17] Moreover, several German geographers, especially his closest student, Franz Termer, and much later, Gerhard Sandner, expanded on Sapper's geographical work in the isthmus.[18] Nonetheless, no researcher specializing in that part of the New World, whether geologist, geographer or anthropologist, can afford to ignore the works of Karl Sapper.

NOTES

1. Ratzel's second volume of his *Anthropogeographie* (1891) outlined the role of human migrations and commerce in diffusion of culture traits, which influenced ideas of the American geographer Carl Sauer as well as those of some American anthropologists, such as Robert Lowie and Alfred Kroeber.

2. Fred Kniffen, personal communication, December, 1989.

3. *Agricultural Origins and Dispersals.* New York; American Geographical Society, 1952: *Agricultural Origins and Dispersals*; *The Domestication of Animals and Foodstuffs.* Cambridge: MIT Press, 1969.

4. *A Ceremonial Ox of India: The Mithan in Nature, Culture and History.* Madison: University of Wisconsin Press, 1968. See also Simoons' essay, Contemporary Research Themes in the Cultural Geography of Domesticated Animals, *Geographical Review* 64:556-76.

5. *Geography of Domestication.* Englewood Cliffs: Prentice-Hall, 1970.

6. The Survey Method in Geography and Its Objectives, *Annals of the Association of American Geographers* 14:17-33; The Morphology of Landscape, *University of California Publications in Geography* 2:19-53; Recent Developments in Cultural Geography, in *Recent Developments in the Social Sciences*, ed. E. C. Hayes. Philadelphia, 1927, pp. 154-212.

7. Sauer to William Speth, March 3, 1972: "In the years I worked in the Loop I read German geographers evenings who were doing what I wanted." Quoted in the Preface by Geoffrey J. Martin in: *Carl Sauer, A Tribute*, ed. Martin S. Kenzer. Corvallis: Oregon State University Press, 1988, p. ix.

8. *The Geography of the Ozark Highland of Missouri*, The Geographic Society of Chicago, Bulletin 7, University of Chicago Press, 1920, p. vii. In the preface, Sauer also used the expressions "geographic responses" and "influences of environment" to explain in part his mode of presentation—an indication of the enduring hold of environmental determinism even at that time. In 1927, Sauer (with his student John Leighly) published a second regional monograph, *Geography of the Pennyroyal*, Kentucky Geological Survey, vol. 25, a product of his annual summer field course in Kentucky while still teaching at the University of Michigan.

9. According to Richard Hartshorne, "Insofar as Sauer's methodology is derived from German writers it depends largely on Schlüter." *Nature of Geography*, Association of American Geographers, 1939, p. 101.

10. The Circumference of Geography, *Annals of the Association of American Geographers*, 9:8-11. Also in *Geographical Review* 7:168-75

11. *Physiography of Western United States.* New York: McGraw Hill, 1931; *Physiography of Eastern United States.* New York: McGraw Hill, 1938.

12. *Nature of Geography*, Association of American Geographers, 1939, p. 137.

13. *Outline of Geography*, Boston and New York: Ginn & Co., 1935, p. ix. In their introductory textbook, *Elements of Geography* (1936), V. C. Finch and Glenn Trewartha utilized in part Passarge's scheme of natural regions in the concluding section "Geographic Realms," based on climate, vegetation and soils. However, John Leighly (Carl Ortwin Sauer, 1889-1875. *Annals of the Association of American Geographers* 66:339) avers that Finch and Trewartha used as their model the syllabus by Sauer and Leighly, "An Introduction to Geography," utilized in beginning courses in geography since 1925.

14. R. J. Russell and F. B. Kniffen, *Culture Worlds*, New York: Macmillan, 1951 and subsequent editions. Russell and Kniffen might have derived the idea of the culture area concept from Carl Sauer, who used it in his elementary course in cultural geography regularly taught at the University of California, Berkeley, ca. 1925-1955.

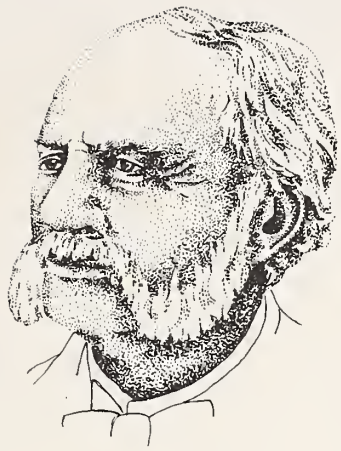
15. Preston James and Nelda Davis, *The Wide World*, New York: Macmillan, 1959. James continued to use the culture area approach in later textbooks: *One World Divided*, New York: Blaisdell, 1965, and others. A current popular textbook following the culture area scheme is Harm J. de Blij, *Geography: Regions and Concepts*, New York: Wiley & Sons, 1971. (5th ed., with Peter O. Muller, 1988).

16. For instance, Glenn T. Trewartha in his *The Earth's Problem Climates*, Madison: University of Wisconsin Press, 1961, pp. 66, 67, 70, cites Sapper's *Klimakunde von Mittelamerika* (Köppen & Geiger, *Handbuch der Klimatologie*, vol. 2, Berlin, 1932). An English translation was made of Sapper's 1936 monograph, *Verapaz im 16. und 17. Jahrhundert; ein Beitrag zur historischen Geographie und Ethnologie des nordöstlichen Guatemala* by Theodore E. Gutman, UCLA Institute of Archaeology, Occasional Paper no. 13, Los Angeles, 1985.

17. Howel Williams, Volcanic History of the Guatemalan Highlands, *University of California Publications in Geological Sciences*, 38(1960,1): 1-86 (See p. 2 for tribute to Sapper). Richard Weyl, *Die Geologie Mittelamerikas*, Berlin: Borntraeger, 1961. (English translation, 1980.)

18. Franz Termer, *Zur Ethnologie und Ethnographie des nordlichen Mittelamerika*, Berlin: F. Durmlers Verlag, 1930; *Zur Geographie der Republik Guatemala*, Hamburg: DeGruyter, 1936. Gerhard Sandner, *Die Hauptstädte Zentralamerikas*, Heidelberg: Quelle und Meyer, 1969; *Zentralamerika und der Ferne Karabische Western*, Stuttgart: Franz Steiner Verlag, 1985.

1. August Meitzen (1822-1910)



Introductory Statement

Robert C. West

Although he was known as Germany's leading agrarian historian and statistician during the late nineteenth century, August Meitzen proved to be an important contributor to European anthropogeography and culture history. He is often cited as being responsible for the development of studies in settlement geography in his country, and some would regard him as the founder of the cultural landscape theme in geography. A native of German Silesia, he was educated in Breslau, his birthplace, but he also attended the universities of Heidelberg and Tübingen where he studied law and economics. Returning to Silesia, in 1846 he took up law, became mayor of the town of Hirschberg (Jelenia Góra), west of Breslau (Wrocław) (1853-56), and later served as registrar of property taxes in Breslau. He thus had opportunity to study first hand farming practices and property holdings in an area of mixed German and Slavic settlement where early village records were extant. His intimate knowledge of village sites, patterns of farmsteads, rural house types and methods of land division led to his first lengthy treatise on settlement geography, *Urkunden schlesischen Dörfer; zur Geschichte der ländlichen Verhältnisse und der Flureintheilung* [Records of Silesian villages; on the history of rural conditions and division of agricultural holdings], published in 1863.[1]

In 1865 Meitzen was commissioned to prepare a comprehensive study of the exploitation of landed property in Prussia and to evaluate the current tax structure. This resulted in a multivolume work on farming conditions in the northern part of Germany. After several years with the Prussian Statistical Bureau, in 1872, with the unification of the German states, he was employed by the Royal Statistical Service of Germany, and was able to travel over the length and breadth of the nation observing rural settlements and gathering village maps and field plans. All this culminated in the publication in 1895 of his famous three-volume work, *Siedelung und Agrarwesen* (cited in full on p. 10, in the partial bibliography of his works), which presented the description and classification of rural settlements in central and western Europe and their historical association with various ethnic groups from Roman times to the end of the Middle Ages, with emphasis on village forms and field patterns.[2] Meitzen's *Siedelung und Agrarwesen* appeared as the first part of a longer study, the second part of which was to trace the history of European settlements after the Middle Ages, but this was never published. More recent studies of field patterns in Germany and France have shown that Meitzen's theories as to their development were not always correct; moreover, his interpretation of historical sources has often been questioned.

In 1881, well after he had become a professor at the University of Berlin, Meitzen presented before the annual German Geographical Congress [Geographentag] a pioneer study on rural house types as criteria of areal differentiation of culture (figs. 1 and 2).[3] A year later there appeared a much longer treatise on German house types by Rudolf Henning, a product of some 20 years of research, entitled "Das Deutsche Haus in seiner historischen Entwickelung" [The German house in its historical development].[4] Both Meitzen and Henning were important instigators of house-type study in many European countries, where traditional rural architecture is prominently displayed in museums and parks and is keenly appreciated by the general public, much more so than in America.[5]

During his tenure as associate professor at the University of Berlin (1875-92) Meitzen encouraged the investigation of rural settlement in Germany and elsewhere. After retirement from teaching he continued his own research and writing as emeritus

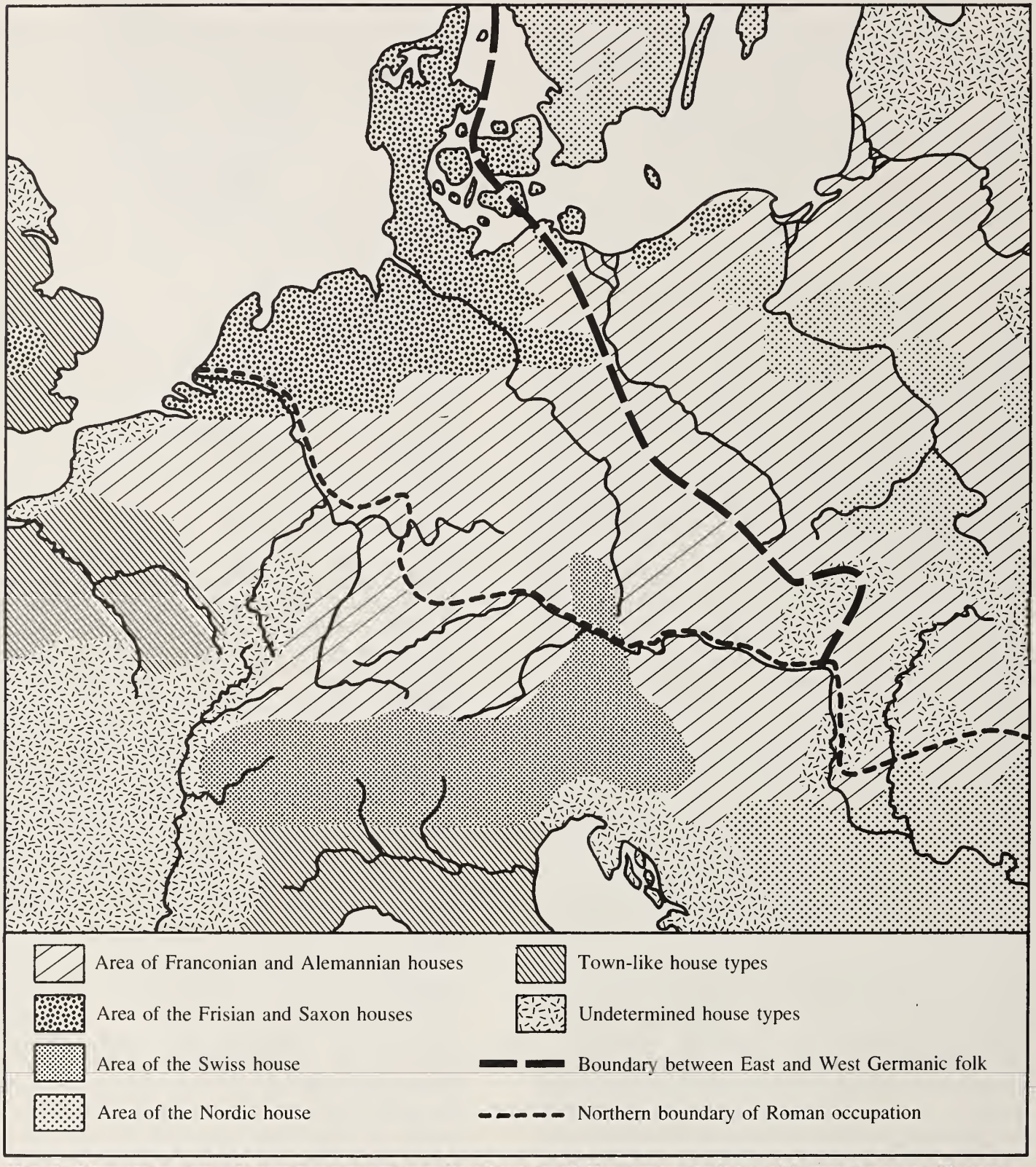


Fig. 1. Meitzen's map showing approximate distribution of Germanic traditional house types in Europe, taken from his 1882 article, "Das deutsche Haus in seinen volksthümlichen Formen," *Verhandlungen des 1. Deutschen Geographentages zu Berlin* (frontispiece of volume).

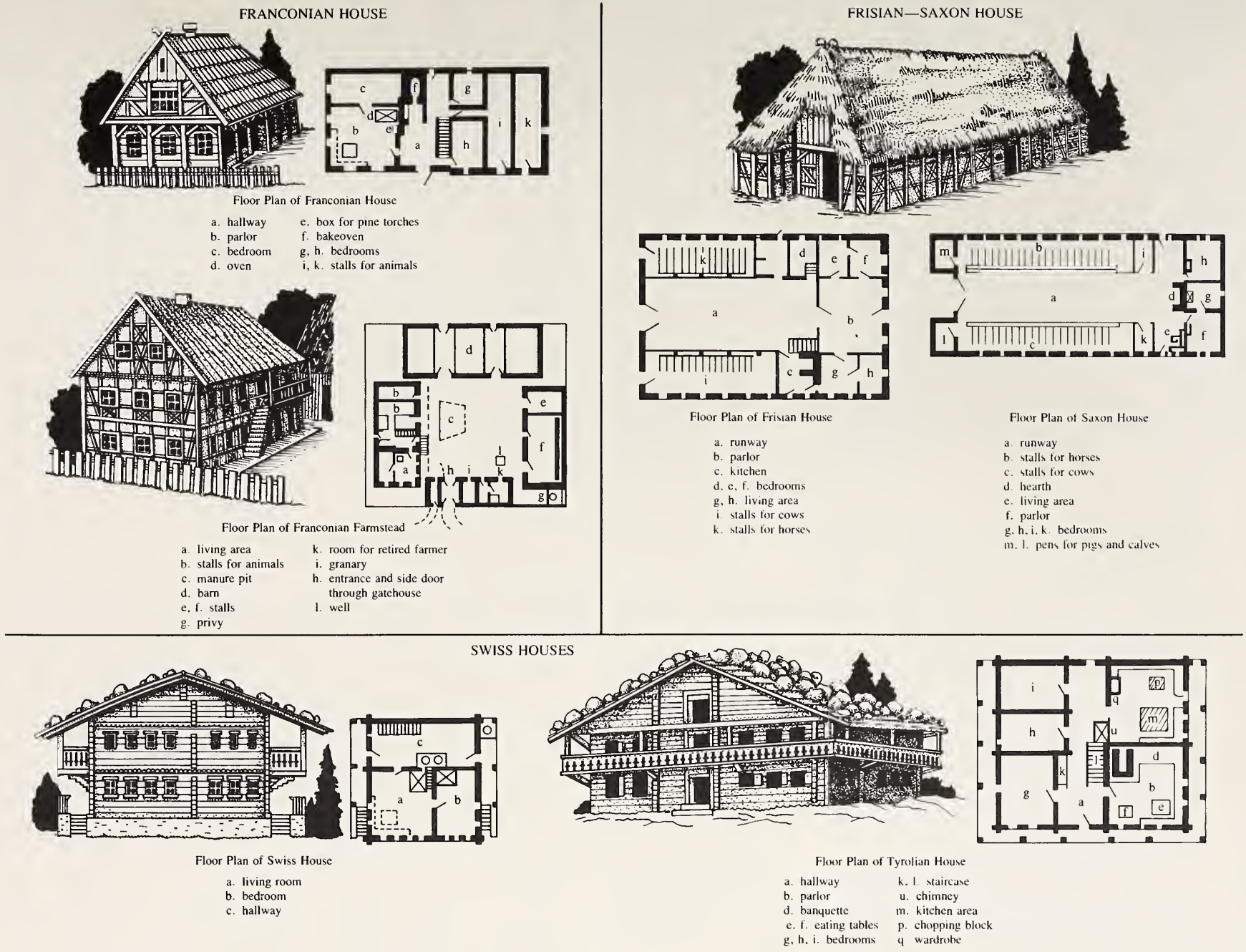


Fig. 2. Examples from Meitzen's 1882 article on Germanic house types.

and honorary professor. In January, 1910 he passed away at the advanced age of 88.

NOTES

1. After short obituaries in *Petermanns Geographische Mitteilungen*, vol. 56 (1910), p. 86, and *Zeitschrift für Ethnologie*, vol. 42 (1910), p. 355.

2. Karl Th. von Inama-Sternegg [Review of Siedelung und Agrarwesen], *Jahrbücher für Nationalökonomie und Statistik*, vol. 67 (1896), pp. 751-60; William J. Ashley, Settlement of the Germans [review of Siedelung und Agrarwesen], *Political Science Quarterly*, vol. 13 (1898), pp. 143-55; August Skalweit, August Meitzen (1822-1910), in *Encyclopaedia of the Social Sciences*, vol. 10 (1937), p. 302.

3. Das deutsche Haus in seinen volksthümlichen Formen [The German house in its traditional forms], *Verh. des 1. Deutschen Geographentages zu Berlin*, Berlin, 1882. A short German review of Meitzen's presentation opined: [in translation] "The essay is an outstanding contribution on national culture history, which might interest not only professionals but also a wider audience." *Jahrbücher für Nationalökonomie und Statistik*, vol. 41 (1883), p. 477.

4. *Quellen und Forschungen zur Sprach- und Kulturgeschichte der germanischen Völker*, vol. 47 (1882), pp. 1-183 [with 64 woodcut prints of traditional house types].

5. The American geographer, Fred Kniffen, avers that his interest in rural houses in the United States did not stem from German examples, but was a personal development through field observation in Louisiana. (Personal communication, December 1989.)

Partial Bibliography of August Meitzen

[Citations taken from Library of Congress, *The National Union Catalogue: Pre-1956 Imprints,* vol. 374:218–19, and other sources]

1861 Kulturzustände der Slaven in Schlesien vor der deutschen Kolonisation [Cultural conditions of the Slavs in Silesia before German colonization] *Abhandelung der Schlesische Gesellschaft für vaterlandische Kultur* (philosophische-historische Abtheilung), Heft 2.

1863 *Urkunden schlesischer Dörfer; zur Geschichte der ländlichen Verhältnisse und der Flureintheilung im besonderen* [Records of Silesian villages, in particular the history of rural conditions and the division of agricultural holdings]. Breslau: J. Max & Co. 391 pp.

1868-94 *Der Boden und die landwirtschaftlichen Verhältnisse des preussischen Staates nach den Gebietsumfange vor 1866* [The soil and the agricultural conditions of the Prussian State according to territorial extent before 1866]. 5 vols. with atlas. Berlin: Wiegandt & Hempel.

1870 *Topographische Erwägungen über den Bau von Canälen in Deutschland* [Topographic considerations on the construction of canals in Germany] Berlin: Wiegandt & Hempel. 66 pp.

1873 Die internationale land- und forstwirthschaftliche Statistik [The international statistics on agriculture and forestry] In: *Denkschrift für den Internationalen Kongress der Land- und Forstwirtschaft zu Wien.* Berlin: Wiegandt, Hempel & Pary. 78 pp.

1874 *Gutachen über die Bearbeitung der Forststatistik der Permanenz-Commission des Internationalen Statistischen Kongress* [Opinions on the treatment of forest statistics of the Permanent Commission of the International Statistical Congress] Berlin. 111 pp.

1875 Zur Statistik der Binnenschiffahrt [On statistics of inland navigation] 35 pp.

1876 *Die Mitantwortlichkeit der Gebildenten und Besitzenden für Wohl der arbeitenden Klassen* [The responsibility of the educated and the landed gentry for the welfare of the working class] Berlin: W. Hertz. 32 pp.

1879 Die Ausbreitung der Deutschen in Deutschland und ihre Besiedelung der Slawengebiete [The spread of Germans in Germany and their settlement in Slavic areas] *Jahrbücher für Nationalökonomie und Statistik*, v. 32, p. 1-59.

1881 Agrarpolitik im engeren Sinne; Landeskultur-Gesetzgebung [Agricultural politics in a narrow sense; legislature on folk-farming] In: *Handbuch der Politische Oekonomie*, 42 pp.

____ Der älteste Anbau der Deutschen. Besprechung von Th. v. Inama-Sterneggs Deutscher Wirtschaftsgeschichte, Band I., bis zum Schluss der Karolingerperiode [The oldest settlement [colony] of the German people. Review of Th. v. Inama-Sternegg's "German Economic History," vol. I, up to the end of the Carolingian period] *Jahrbücher für Nationalökonomie und Statistik*, v. 36, pp. 1-46.

1882 Das deutsche Haus in seinen volksthümlichen Formen [The German house in its traditional forms] *Verhandlungen des 1. Deutschen Geographentages zu Berlin* (Juni 1881). Berlin, 1882, pp. 58-88.

____ Das Nomadentum der Germanen und ihrer Nachbarn in West-Europa [Nomadic life of Germanic peoples and their neighbors in western Europe] *Verhandlungen des 2. Deutschen Geographentages zu Halle* (April 1882). Berlin, 1882, pp. 69-83.

1883 Die Individualwirtschaft der Germanen und die drohende Kapital-Krisis unseres Grundbesitzes [The personal economy of the Germanic people and the threatening financial crisis of our landed property class] *Jahrbücher für Nationalökonomie und Statistik*, v. 40, pp. 1-38.

1886 *Geschichte, Theorie und Technik der Statistik* [History, theory and technique of statistics] Berlin: W. Hertz. 214 pp.; 2nd ed. 1903; English translation, 1891.

1889 *Volkhufe und Königshufe in ihren alten*

Massverhältnissen [The village lands and the royal land grant in relation to their ancient dimensions] Tübingen: H. Laupp. 60 pp.

____ Georg Hanssen als Agrarhistoriker [Georg Hanssen as an agricultural historian] In: *Festgabe für Georg Hanssen*, 47 pp.

____ Beobachtungen über Besiedelung, Hausbau und landwirtschaftliche Kultur [Observations on settlement, house construction and agricultural life] In: Alfred Kirchoff (ed.), *Anleitung zur deutsches Landes- und Volksforschung*. Stuttgart: J. Engelhorn.

1891 Land und Leute der Saalegegenden [Land and people of the Saale [river] regions] *Zeitschrift und Verhandlungen für Volkskunde*, vol. 1, pp. 129-38.

1895 *Wanderungen, Anbau und Agrarecht der Völker Europas nördlich der Alpen. Erste Abtheilung: Siedelung und Agrarwesen der Westgermanen und Ostgermanen, der Kelten, Römer, Finnen und Slawen* [Migrations, colonization, agriculture and agrarian law of the peoples of Europe north of the Alps. First part: Settlement and agricultural lifeways of the West Germans and East Germans, the Celts, Romans, Finns and Slavs] 3 vols., including an atlas. Berlin: W. Hertz.

____ Das nordische und das altgreichische Haus [The Nordic and ancient Grecian house] Berlin: W. Hertz.

1896 Die Flur Thalheim als Beispiel der Ortsanlage und Feldeintheilung im Siebenbürger Sachsenlande [The farmland of Thalheim as an example of the layout and division of fields in Transylvanian Saxony] *Archiv der Verein für Siebenbürgische Landeskunde*, Hermannstadt. n.F. vol. 27, pp. 651-92.

1899 Abbildungen zu den Vorträge: Die verschiedene Weise des Übergänges aus dem Nomadenleben zur festen Siedelung bei den Kelten, Germanen und Slawen [Descriptions of the reports on the different ways of transition from nomadic life to permanent settlement among the Celts, Germanic folk and the Slavs] 7. *Internationalen Geographischen-Kongress*, Berlin, vol. 2, pp. 483-97.

1900 Über die Uhren-Industrie des Scharzwaldes [On the clock industry in the Black Forest] In: *Alemannia*, vol. 28, 78 pp.

1901 *Zur Agrargeschichte Norddeutschlands* [On agrarian history in northern Germany] Berlin: P. Pary. 176 pp.

1906 Allgemeine Landeskunde, politische Geographie und Statistik [General regional geography, political geography, and statistics] In: G. von Neumayer, *Anleitung zu wissenschaftlichen Beobachtungen auf Reisen*. Hannover, vol. 2, pp. 124-53.

Table of Contents of Meitzen's *Siedelung und Agrarwesen*

Overall title: *Wanderungen, Anbau und Agrarrecht der Völker Europas Nördlich der Alpen* [Migrations, Colonization and Agrarian Law of the European Peoples North of the Alps]. Berlin: Wilh. Herz, 1895.

Erste Abtheilung [First Part], 3 volumes including an atlas. *Siedelung und Agrarwesen der Westgermanen und Ostgermanen, der Kelten, Römer, Finnen und Slawen* [Settlement and Agricultural Lifeways of the West Germans and East Germans, the Celts, Romans, Finns and Slavs]

Vol. 1:
- I. Allgemeine Gesichtpunkt der Aufgabe [General Viewpoints of the Problem]
- II. Die nationalen Eigenthümlichkeiten der Siedelung der Germanen [National Characteristics of Settlement Among the Germanic Peoples]
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- VII. Friesin und Sachsen in Deutschland und England [Frisians and Saxons in Germany and England]
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- XI. Wirthschaftliche und ständische Entwickelung in Dänemark, Schweden und Norwegen [The Economic Development and Evolution of Estates in Denmark, Sweden and Norway]
- XII. Wirthschafliche Bedürfnisse, Betriebseinrichtungen und Verwaltung der Grundherrschaften [Economic Requirements, Management Organization, and Administration of the Manors (Seignorial Rights)]
- XIII. Zusammenfassung der Ergebnisse [Summary of Conclusions]

Vol. 3: Der Band III umfasst eine Uebersichkarte und 151 Anlagen, welche Belege zu der zusammenhängenden Darstellung der Siedelung und der Agrarwesens in Band I and II enthalten. [Volume 3 comprises a general map and 151 appendices which contain evidence on the interrelated descriptions of settlement and agricultural lifeways in volumes 1 and 2].

Atlas zu Band III [contains maps, drawings, for each appendix of vol. 3]

Review of Meitzen's *Siedelung und Agrarwesen*

Alfred Kirchhoff (1896)

[Translated from *Geographische Zeitschrift*, v. 2 (1896), pp. 650–51.]

Meitzen, A., Wanderungen, Anbau und Agrarrecht der Völker Europas nördlich der Alpen. 1. Abteilung [First part]: Siedelung und Agrarwesen der Westgermanen und Ostgermanen, der Kelten, Römer, Finnen und Slawen. 3 Bände (nebst einen Begleitband zu Bd. 3 mit 125 Karten und Zeichungen) [3 vols. (including an accompanying volume (an atlas) to vol. 3 with 125 maps and illustrations)]. Berlin, Wilh. Herz, 1895.

This voluminous work by an investigator who, in an unusual way and [with] profound scholarship, joins historical, philological, archaeological, juridical and political-economic subjects with knowledge on farming conditions and management, is presented as the first part [of his study]. To be sure, the study considers settlement not in a geographical, but in an agrarian sense. With a comprehensive style and clever summaries (which always conform to rigorous, original work) [the author] explains the development process of the Germanic method of land division for agricultural production, as well as the establishment of permanent places of settlement in central Europe during the pre-Christian period when Caesar was contacting the semi-nomadic Suevi of Gaul. By necessity, however, the investigation is expanded and lengthened by including all of the principal peoples of Europe, because for southern Europe it was a question not only of investigating the [Roman] conquest but also the colonization and the distribution of land holdings this side of the Alps by the invading Romans on the basis of their particular agricultural methods. The author himself emphasizes that the strong differences among Germans, Celts, Romans, Slavs and Finns indicate the various ways of obtaining land, how the fields at their disposal were distributed or allotted, how dwellings and occupations were inherited; and all such were dependent on acceptable arrangements and legal perceptions. Therefore, a review of this work does not belong in a geographical journal, because in it an abundance of thought and detailed evidence on the migrations of peoples in our part of the world are not established, and because, above all, the formation of the mosaic of folk life of central Europe is not [well] understood through this entirely new approach.

The worthwhile extensive index that accompanies the third volume, as well as the very desirable and thorough table of contents at the beginning of each of the three volumes, and the atlas, make it easy to find material in question more precisely. Here we should mention briefly the instructive maps of the areal organization of central Europe according to agrarian and settlement characteristics, premised in the companion volume [the atlas] with accurate facsimiles of properly labeled maps, as well as illustrations of dwellings and types of farmsteads. These indicate quite clearly the advantage that we can draw from the suggestive goal of Meitzen's classic work. Above all, the allotment of fields has been maintained so tenaciously for thousands of years that on the basis of this we observe still the clear traits of old Germanic tribal land allotments on our native soil, and likewise we see before us surprisingly sharp turning points in German destiny perpetuated in [present-day] agricultural geography; thus, [to wit] the invasion of the flood of Slavs from the east to beyond the Elbe to the Rednitz [River] in the southeastern Alps, the triumphant penetration of both upper Germanic tribes into the former Roman southern part of central Europe, and that of the Franks across the Rhine into the Roman area of the Celts. More accurately we discern here the true "settlement areas" of the Slavs. The Saale [River] of Thuringia still today limits it on the west (as Einhard declared during the time of Charlemagne, "The Saale separates Germans and the Sorbians [Wends],"); thus, indeed, scattered groups of Wends are found deep within Thuringia. In contrast to the true Thuringian

Forest, the Frankish Forest connects the Saxon settlements of the Slavs with those of the Upper Franks over a wide zone. Surprisingly small is the area of pure German *Gewanndörfer* (compact villages surrounded by mostly rectangular "Gewann," that is, pieces of cultivated fields of the same soil quality that each individual farmer is given a small piece of equal size). [The area] extends from Mainland through Hessen-Nassau and Thuringia to Schleswig-Holstein. To be sure, from there a widespread area of pure German *Gewannfluren* [fields associated with the Gewann system] extends to the south and west, but mixed with "manorial villages, hamlets, and scattered farmsteads." This is the Gallo-Roman area conquered by Germanic people, where still today in the Rhineland and the Danube region the bluish-eyed and blondish Germanic types are more and more supplanting [the people] of dark eyes and hair. However, this is not the case in our northwest, where the Netherlanders and Frisians live as pure-blooded Germanic folk. Even here, however, from the left bank of the Weser to beyond the Westphalian Gate as far as the Schelde River westward we learn from Meitzen's map how far into France and in the Alps genuine Celtic dispersed farmsteads extend. Away from the Weser is a region in which Germanic folk came as foreigners and where the partition of cultivated land and house construction of the early Celtic inhabitants predominate. According to the author, even the original Saxon and Frisian house indicates a profound relationship with the large three-bayed house, like that still found in Ireland and in the excavated remains of the ancient Gallic Bibrakte.

Kirchoff
Hessen-Nassau

The Forms of Rural Settlements (after A. Meitzen)

Otto Schlüter (1900)

[Translated from Die Formen der landlichen Siedelung, *Geographische Zeitschrift*, v. 6 (1900), pp. 248-62]

On a previous occasion[1] I tried to develop the significance of the German city as an example of a settlement form for the study of settlement geography, but I was able to sketch only the manner and method in which such investigations are carried out. A different [approach] lies within [the subject] of rural settlement. For this we are indebted to the decades-long research of August Meitzen—a series of conclusions that now build a wide base for a significant structure for the knowledge of rural settlements. Meitzen's work, earlier published piecemeal as short articles, is now submitted together coherently in the renowned three-volume work "Siedelung und Agrarwesen der Westgermanen und Ostgermanen, der Kelten, Römer, Finnen und Slawen."[2] [Settlement and Agricultural Lifeways of the West Germans and East Germans, of the Celts, Romans, Finns and Slavs]. The work deals with the colonization and agricultural conditions of the people mentioned in the title from [the time of] their origins and their development until the beginning of the great colonization in the German East around the twelfth and thirteenth centuries: the latter [subject] was held in reserve until a later presentation and with it the development of the large landed estates and large-scale farming management in the areas of colonization.[3]

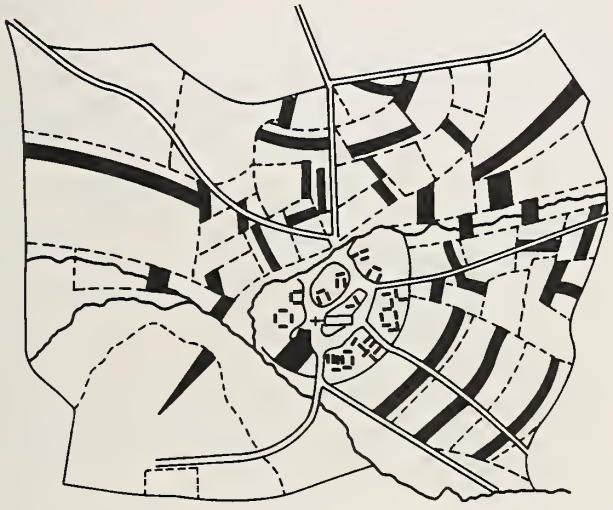
For many years the author was actively engaged as a special commissioner in the consolidation of landed estates and through this occupation conceived the idea of a study of the agricultural conditions in their fullest cultural-historical relationships. Questions of economic history, cultural history, law, agriculture and folklore are handled most thoroughly.

I would like to attempt to summarize briefly and simply the unusually rich and varied content [of this work] which is so important for settlement geography. I have not considered the detailed discussion on house types and thus our presentation has been limited to the forms and geographical distribution of rural settlements north of the Alps.[4]

THE FORMS OF RURAL SETTLEMENT

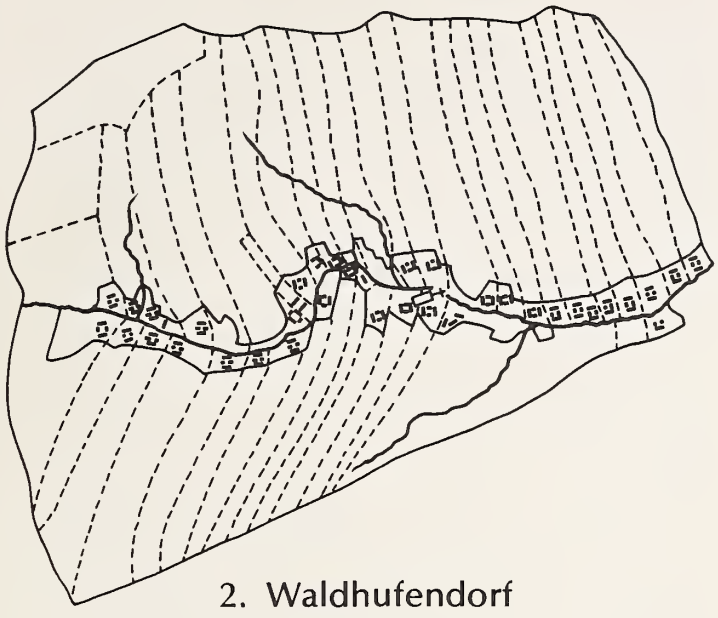
The settlement types that Meitzen differentiates were characterized by their form with which economic considerations were closely associated in the following ways:

The German village [fig. 3(1)] formed an association of several farmers each of whom possessed the value of an equal share of the village land, as well as the use rights to the commons (pastures) and that lying outside the village bounds, or "free area." That share [of village land] of an individual associate was called a *Hufe* [a virgate or hide of about one-quarter acre] the value of which did not involve areal measurement. The difficulty of measuring individual shares of equal value was surmounted through the practice of a complicated procedure that was engendered by the strong sense of justice of the Germanic people. In regard to the differences in soil quality the village lands were divided up in a number of various sized sections, the so-called *Gewanne* [communal village lands of equal soil quality], which in turn were divided into elongated strips of equal size. Such fields determined by form and size were then assigned to the occupiers [village members] by lot. Thusly, the landed property of individuals was scattered [in pieces] throughout the entire village district, the pieces lying in *Gemenge*[5] [a pattern of small scattered fields]. Paths for access to the fields were not considered within the plan of the *Gewann* arrangement; all paths were later established often without consideration for property boundaries. Thus each land owner had to drive his plow through the property of his neighbor. Under these circumstances cultivation without mutual damage was possible only if the village formed an

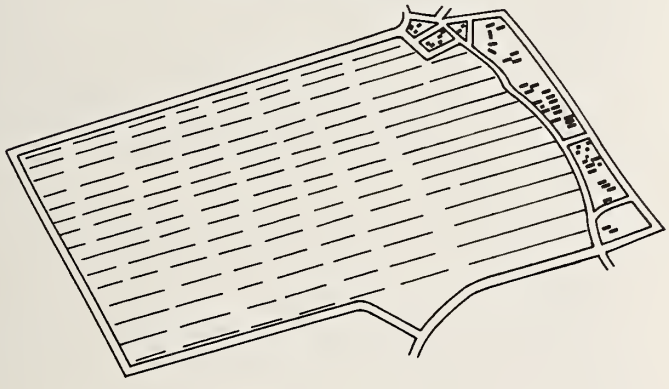


1. Gewanndorf

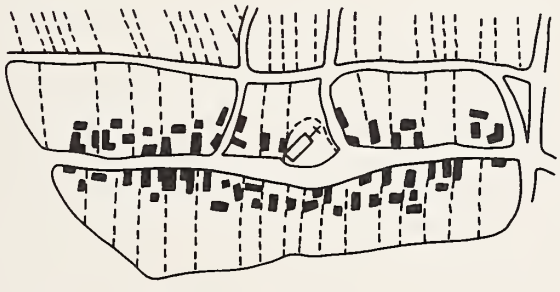
(▬ Fields assigned to a single family)



2. Waldhufendorf



3. Marschhufendorf



5. Slavic Strassendorf

4. Slavic Runddorf

Fig. 3 (1-5). Rural settlement forms around the 12th and 13th centuries, discussed in Schlüter's article (1900) on Meitzen's research.

association in which cultivation was undertaken in common. Singly one could not manage the farming of his plots as he wished, but the entire village association determined which fields would be tilled, which should be left fallow, and decided on the crops to be grown. The scattering of the landed properties and the troublesome but necessary "Flurzwang" [coercion in farm operations] was continued in the *Gewann* field system until its dissolution.

The village itself, located within its fields, as an entity and independent of the various house types, formed an enclosed block surrounded by a hedge. However, the individual farmsteads do not stand wall to wall, but are separated by gardens or vacant lots. In their position one to the other one cannot recognize any kind of plan, rather a completely irregular pattern prevails, which from its beginning, through population growth and retention of the same site, it grew to its present form. A further characteristic of these "Haufendörfer" [villages with irregularly, unplanned clustered houses] is that wherever they occur they show a remarkable conformity as to size, much more so than is the case for the rest of the settlement types.

Another settlement form is that of the "Reihendörfer" [line villages] with fields in forest or in marsh that were formed during colonization [that occurred] in the Middle Ages. In the case of the "Waldhufendörfer" [line villages along a wooded valley] [fig. 3(2)], the farmsteads follow along the valley floor in long rows. The fields are not arranged in small scattered plots, but each farmer has his holding immediately near his house in the form of long strips of equal width that stretch from the valley floor toward the slope or along both sides of the valley to the adjacent summits, commonly to the watershed of the next valley beyond. The properties are distributed in this fashion throughout the entire valley, so that such villages are often several kilometers long.

The *Marschdörfer* [marsh villages] [fig. 3(3)] have basically the same arrangement, except that because of the terrain straight lines prevail. Likewise the farmsteads are arranged in rows, as a rule along a levee built for a road, from which the fields proceed in straight strips separated by ditches toward the edge [of the marsh].

The village settlements of the Slavs[6] appear in two different forms. One is outwardly characteristic of the so-called *Rundlings* [small villages in which farmsteads form a circle around a green] [fig. 3(4)]. The farmsteads are grouped around a round or oval village green, which contains the village pond, so that the houses and farms face in toward these greens. Outside are the gardens, enclosed by hedges and then follow the extensive plowland in a fan-shaped pattern. However, the fields are not directly accessible from the farmsteads, but only through the exit and entrance to the village.

The second form of the Slavic village is the widely spread *Strassendorf* [line village along a road] [fig. 3(5)]. As with the *Reihendorf* the farmsteads form a row along a street. In contrast to the *Reihendorf*, however, the fields of the *Strassendorf* are smaller, more compact, and form a rectangular pattern. As with the *Runddorf*, the plowland is accessible only through the village exits and entrances.

Whereas the *Waldhufendörfer* are frequently much larger than the old *Gewanndörfer*, the Slavic villages are usually much smaller.

In contrast to the village types hereto described are the isolated farms, like those well known in Westphalia. They occur completely dispersed, each of which is surrounded by its own plowland, whereby an independent management of the soil is possible. Only in some places, perhaps near a church, do small accumulations of buildings occur in time.

Since [the time of] Justus Möser [1720-1794] one has been accustomed to see in these farms the original German settlement types, just as [one has seen] the oldest German house types in the lower Saxon farmhouse. Meitzen makes plausible [the idea] that both were formerly derived from farms inhabited by Celts.

Finally he mentions that perhaps the hamlets and dispersed farms may have been derived from [action by] manorial landlords. Also the colonization induced by landlords assumed occasionally the form of true *Gewanndörfer*. As a rule, however, it may have happened in another way, as in the *Reihendörfer* or in dispersed farms and hamlets, of which the latter in part could have developed from isolated farmsteads. Such dispersed farms are different from the Celtic ones in terms of size and form. The characteristic hamlets are small groups of a few farmsteads. Their fields are widely scattered [*im Gemenge*], but the pattern is entirely different from that of the *Gewann*. Of the almost uneasy endeavor toward equal, fully legitimate allotment of property, which is paramount in the old villages, not a trace is recognized in the hamlets, and therein is demonstrated that this [the *Gewann*] did not arise through an agreement among folk

associations, but through the higher will of the landlord.

THE GEOGRAPHICAL DISTRIBUTION OF RURAL SETTLEMENT TYPES

The accompanying map [fig. 4, which is shown in this volume in new black-and-white patterns, rather than the colors and patterns referred to on the original] depicts the geographical distribution of the aforementioned settlement forms in terms of their characteristic features. It is fashioned from a simplified combination of Meitzen's general map and from the map of France and Great Britain given in appendix no. 66a [vol. 3]. In some places Meitzen's remaining appendices [additional notes] are expanded and those of a special purpose are suitably modified. At the same time attempts were made to increase clarity [of the map] through the use of color. In connection therewith I would like to note (in order to avoid misunderstanding) that the colors do not signify the exclusive occurrence of designated settlement forms; they mean only that one or another type prevails; [for example] in the case of *Runddörfer*, that it occurs not predominantly but is generally found within the colored area.

The [ancient Germanic folk] area colored dark red indicates the true folkland of the Germanic people, that is, the region which, according to Meitzen, has never come under foreign influence.

Its boundary begins at the mouth of the Weser and continues westward to the Porta Westfalica ["Westphalian Gate"]. From there it veers in a southwest direction through Westphalia to the Sieg River and then toward the south over the Taunus [Mountains] to the Main River, and along it upstream to join with the Regnitz, and then through the Thuringian Forest to reach the Saale. It then continues along the Saale to its confluence with the Elbe and along the latter to the Ohre. There it curves toward the west, bends back near Laurenberg to the Elbe, and, using the valley of the Delvenau, ends at the Bay of Kiel. Farther north Meitzen includes Denmark and the southern part of Scandinavia with the Germanic folkland. In the entire area the *Gewanndörfer* dominates almost exclusively. To be sure, in Schleswig-Holstein and Denmark its make-up has changed considerably during the last century. Here most of the farm plots—those scattered about the village lands—have disappeared, so that the old village now retains only a small remnant of the remaining fields.

Extensive areas, indicated with a light red color, are attached to the old folkland.

These are the stretches of land over which Germanic settlement spread at the time of the Great Migration [*Völkerwanderung*] through colonization during the early Middle Ages. Involved were Upper Germany with a large part of the Rhine area as well as extensive parts of France and England. In these areas the Germanic *Gewanndörfer* do not occur exclusively. They are mixed with hamlets and farmsteads controlled by landlords.

The regions of Upper Germany that are characterized by hamlets are indicated on the map by vertical line shading.

The dark green color indicates the areas with Celtic farm settlements. The larger part of the British Isles belongs to this area. Ireland, Scotland, Wales, Cornwall, Kent and the Isle of Wight are covered mainly by scattered farmsteads, and also in the remaining parts of England the Germanic *Gewanndörfer* are strongly mixed with the dispersed farmsteads. On the mainland the area of Celtic farms is divided into two parts by a wide zone of Germanic villages: a smaller area in northern France, Belgium, Holland, and northwest Germany, and a larger area to the south that includes two-thirds of France. With these are included predominate dispersed farms in the eastern Alps. Here such settlements are not derived exclusively from the Celts, but from all the numerous folk groups who in the course of time have lived in these mountains and who collectively, through the pressure of geographical conditions, may have been induced [to adopt] this type of rural settlement. These areas with isolated farms of differing origin are indicated in light green on the map. The same color also covers northern Scandinavia. During the Middle Ages this original waste land was colonized slowly and without plan or leadership and was settled with isolated farms, which likewise were distinct from the Celtic ones.

In the east Slavic settlement spread over a vast area. It is indicated in the brown color, with which the distribution of the *Runddörfer* is emphasized by the darker tone. The *Rundlinge* are accordingly limited to the western part of the Slavic region, that is, to the old Sorbenland.

Finally, the distribution of colonies in marsh and forest is represented by diagonal line shading. Since the twelfth century fields for cultivation in marshes have been made in Friesland and

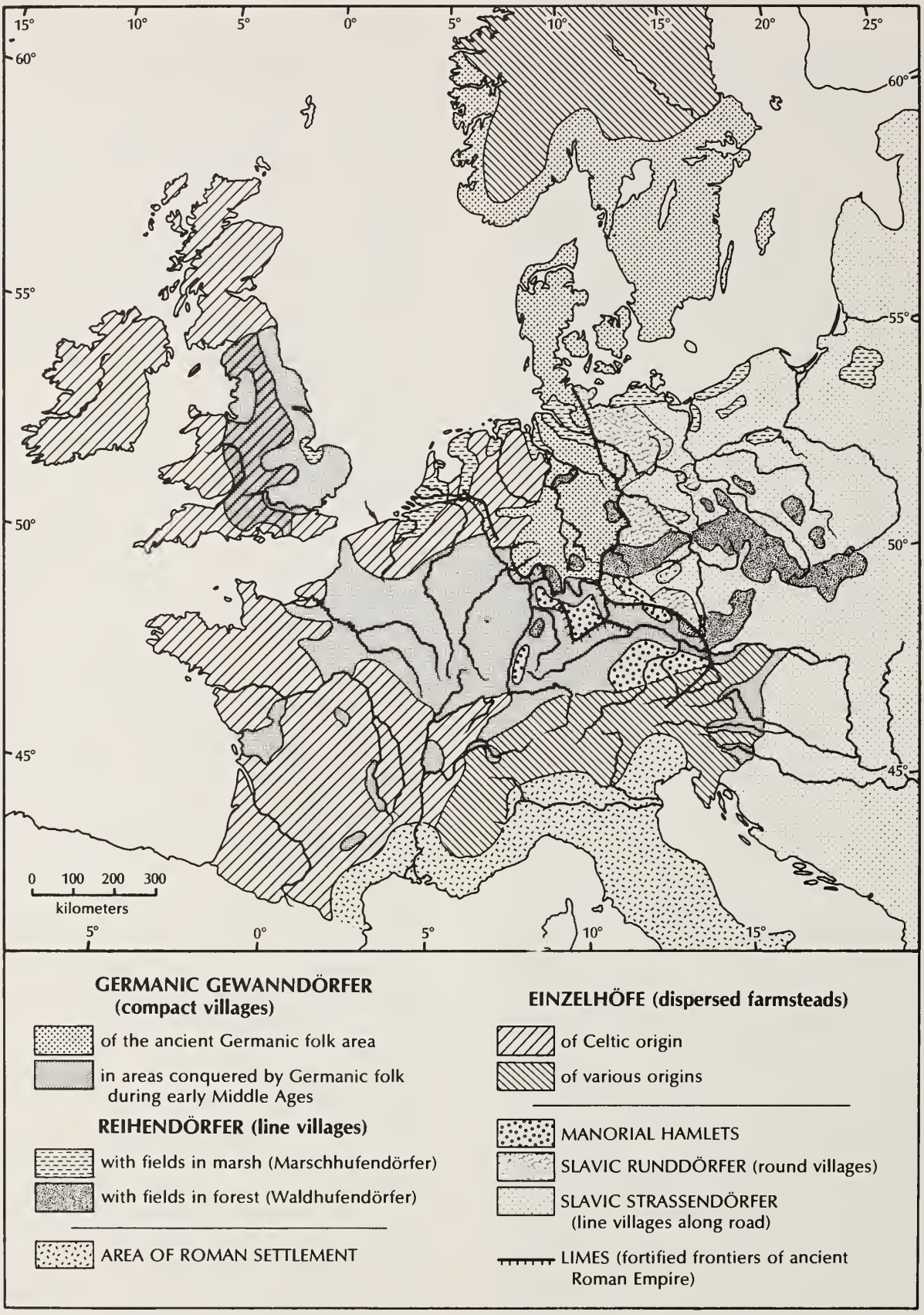


Fig. 4. Distribution of rural settlement types in central and western Europe around the 12th and 13th centuries, according to Meitzen in *Siedelung und Agrarwesen*, 1895.

Holland and within the coastal region of northern Germany, as well as on the numerous former swamps and moorlands of central Germany. The *Waldhufendörfer* are distributed most widely in the forested areas (as well as in mountainous zones) in lands colonized by Germans. In western Germany they occur in detached parts of the Black Forest, Oldenwald, Spessarts and other mountainous areas of central Germany. A remarkable occurrence is found in Hannover, where the long *Reihendörfer* of this type are frequent between the Westphalian Gate and the Aller River.

HISTORICAL INTERPRETATION

To explain the distribution of settlement forms as presented on the map it will be necessary to continue briefly with [an account of] historical events. Beginning with traditional German history, we find that the largest part of the areas under consideration were occupied by Celts. Celts lived in all of Britain, in France, and deep within Germany. It is the previously mentioned western and southern borders of the old Germanic folkland that Meitzen accepted as the limit of Celtic extension into Germany.[7] At the time of [Julius] Caesar [100-44 B.C.] the Celts appear to have firmly settled everywhere on the mainland as well on the southern coast of England. However, not until later did the Celts firmly establish settlement in the larger part of Britain, and in Ireland only around the sixth century, according to Meitzen.

Caesar extended Roman control over the old Celtic lands: in Britain as far as the Pictish wall, in Germany as far as the Danube and the limes [fortification] established by Tiberius. Centuries of Roman control naturally exerted a significant influence on the entire [Celtic] culture and especially on settlement conditions. But, strange to say, the preserved traces of direct [Roman] influence on rural colonization are very few. Traces of Roman land surveys—land division by quadrants or rectangles—with the exception of a few places immediately near a city, are nowhere to be found in Gaul or Britain. The numerous *villae*, which were present in the Rhineland, especially in the area of Trier where Roman culture was widespread in the very remote valleys, were destroyed during the time of the Great Migration; [the latter], after centuries of occupation must have made tracts of land arable once more. Only insignificant remains of such Roman farms have been preserved; in no way do they determine present-day settlement [forms]. However, it is possible that the hamlets and dispersed farms in the northern Alps and the Alpine Foreland have connection with Roman antecedents, in that they use in part the old [Roman] foundations. Also, a Roman influence might be seen in France, where most of the villages are constructed urbanlike, so that houses stand wall to wall.

The relatively few indications of Roman influence on rural settlement is further explained [by the fact] that during the Great Migrations many [Roman traits] were destroyed or became transformed; moreover, as a rule the Romans used foreigners in their colonization projects, especially Germanic peoples, who then retained their local ways of construction as well in foreign areas.

Meitzen assumes—with reason, which may remain debatable — that until Caesar's time the Germanic peoples, divided into East and West Germanic folk, settled in present-day Germany as nomads, or that a few still practiced a certain semi-nomadic life with some extensive agriculture, which is usually customary among nomads. Because of decreasing living space it may have been necessary to change to permanent settlements. According to Meitzen, the first beginnings of this change occurred in Caesar's time and was followed everywhere, as Tacitus writes in his "Germania." The form of settlement that developed therefrom is the *Haufendorf* described previously.

In the course of time the Germanic customs spread further in all directions. Moreover, we can separate the earlier events in the west and south from the later ones in the east and north.

The settlement of the Roman provinces

Well before our chronology Germanic tribes were already settled in the fertile parts of the Rhineland: around 60 B.C. the Nemeter, Triboker and Vangionen on the upper Rhine plain between Strassburg and the Nahe River, 37 B.C. the Ubier between Bonn and Neuss. Two centuries later, as Roman authority began to decline in the northern part of the empire and as the Limes, which were strongly fortified in Hadrian's time, no longer presented an obstruction for the Germanic people, the German conquest of the Roman provinces began. Meitzen separates these events according to three different theaters [of action]: Upper Germany, the Frankish-Vandal region (Gaul), and the Frisian-Saxon region.

The conquest had its most rapid advance in Upper Germany. As stated previously, for a long

time the Triboker, Nemeter and Vangionen had settled on the left bank of the Rhine, while the Romans long held the right bank. Gradually the Alamanni settled in even more, even though they were strongly attacked repeatedly in the upper Rhine area. Farther south were the Juthungen, and east of them, the Bujuvaren, offspring of the old Merkoman, who occupied the alpine foreland; of these three [tribes] the Juthungen built *Gewanndörfer* almost exclusively; these, however, because of later field enclosures, would partly disintegrate into dispersed farmsteads. The Alamanni displayed a certain preference for hamlets; in their place-names the suffix "-weiler" [hamlet] is most frequently encountered. Also in the area of the Bujuvaren many hamlets are found. The manorial hamlets and dispersed farmsteads occupy the lands north of the Danube, especially the high elevations and narrow valleys. Between the Main and the Danube they are found predominantly in the district of the tall coniferous forests that cover this region and also determined the location of the Roman line of fortifications [Limes]. These newly established circumstances[8] contradict Meitzen's hypothesis of the contemporaneousness of hamlet and *Gewanndörfer* and make a more recent origin of the hamlet probable. Another area of hamlets occurs east of the Naab near the Bavarian Forest, first settled in the twelfth century. South of the Danube there is no area of hamlets so pronounced; however it is generally true that the villages lie in the valleys, the predominant hamlets and dispersed farmsteads in the foreland of the Alps. Southward the old Celtic-Roman dispersed farmsteads, whatever may be their origin, gradually appear.

In Gaul, protected by the strong border along the middle Rhine, Roman control persisted much longer than in upper Germany. In the course of five centuries, however, Gaul was convulsed by numerous tribal invasions. Within a few years the eastern Germanic Vandals migrated through the area and continued toward Spain and Africa. In Aquitania the Western Goths founded the Kingdom of Toulouse. The Chatten pressed forward across the middle Rhine. The Alamanni pushed south and north and gradually spread along the entire left bank of the Rhineland as far as the mouth of the Maas. In order to prevent their further advance westward, Aëtius settled the Burgundians west of them [the Alamanni]. But above all in importance were the conquests of the Franks, who around 445 settled between the Schelde and Maas rivers and already by the end of the century had set up under Chlodwig their large empire on the ruins of the disintegrated Roman domain.

Thus all of Gaul was occupied by the Celts, Romans and Germanic peoples, one after the other, each of whom left behind remains of their settlements. Then, however, as previously explained, only a small degree of Roman influence was recognizable so that we are now dealing exclusively with Celts and Germanic peoples. According to Meitzen, the Celts had worked the land with dispersed farmsteads, and the origin of villages is traced back to the Germanic folk. How is it that the latter did not change the settlement forms in their respective ways in all parts of the land, or that, conversely, that not everywhere were the old farmsteads not allowed to persist? Meitzen explains this more or less in the following way: In the south, in the kingdom of the Burgundians and West Goths, settlement was done in this manner: the Germanic folk did not establish new colonies, but the colonists were absorbed by means of establishing *hospites* on the property of the provincial [Celtic] population, who were forced to share their property with the new [Germanic] settlers. Therefore, here the dispersed farmsteads persisted, whereas farther north the much more intensive acquisition of property by the Franks had continued the spread of German settlement.

In the northern area of dispersed farmsteads the conditions were less simple. Meitzen's view follows: In this area farmsteads were also developed by the Celts, who permanently settled there quite early. When they first invaded these lands the Germanic folk were still herdsmen and did not yet know the village form, so common later. Although, to be sure, they expelled the Celts, they retained their farmsteads and houses that were very well suited for herding purposes. These takeovers of the already existing farmsteads facilitated and hastened the transition to permanent settlement. As soon as a similar conversion was carried out in the Germanic folk area—but with the application of the *Gewanndörfer*—the Chattic Marsen pressed forward toward the north, taking over the "Hellweg" between Paderborn and Dortmund and there constructed villages in the midst of farmsteads that otherwise covered the land. Thus, Meitzen believes, the dispersed farmsteads and the lower Saxon house are of Celtic origin. The latter [the Saxon house] was not only retained by the Germanic folk, who settled permanently in the Celtic area, but also, because of its usefulness, spread

east of the Weser and there it was constructed in established villages.

Whatever Meitzen adduced for the motivation of his views is more or less the following: We know that the Germanic folk lived everywhere in villages; only in defined areas of northwestern Germany do we find them on farmsteads. This difference is not explained by tribal diversity within the German folk nation, for the same tribes west of the Weser lived in dispersed farmsteads, those east of the river, in villages. Nor is such explained by geographic conditions; no differences are exhibited to the right or left of the Weser. After all, it is not to be assumed that a further transformation occurred from village to farmstead, just as, conversely, the origin of the *Gewanndörfer* out of the old dispersed farmstead is out of the question. On the other hand, it could be that the hypothesis of the Celtic origin of the Westphalian dispersed farms brings into complete harmony the historical and geographical facts, and that Caesar's reported example of Usipiter and Tenkterer, whom the Celtic Menapier expelled from their house and in which he himself settled,[9] proves that such occupation of foreign farmsteads in fact occurred.

With the preceding [material] a model for a third of the area conquered by West Germanic folk—the Frisian-Saxon region—has already been presented, and there remains to be considered the type of settlement in Frisia [modern Netherlands] and Britain in a few words.

The land of the Frisians is sharply divided geographically into marsh and higher areas of dry sandy ground [*Geest*], and within the latter the moors present an even more peculiar soil. Of these three land types the *Geest* was the first settled. On it there were only small villages, to which almost always a market place or a church were associated. In addition, here dispersed farms also occurred. From the *Geest* the Frisians advanced into the moors and marsh to reclaim land for cultivation and in doing so originated the pattern of the marsh colony. Colonies in the moors were similar. A difference consisted only [of the fact] that in the moors no property boundaries were permanently established, but the colonists were allowed a specific width [of land] that extended into the moors as far as they could or wished to go.

The migration of Germanic folk into Britain began in a small way perhaps under King Probus (A.D. 276-282). But the decisive event was the invasion of the Angles and Saxons in the mid-fifth century. Subsequent historical development is generally known and does not need to be repeated here. From the kingdom established by the Angles and Saxons settlement resulted in the usual form of the Germanic *Gewanndörfer*. However, the boundary between the area of village and that of single farmstead was not sharply defined; in England the transition was brought about through a wide zone in which Celtic and Germanic settlement habits were mixed. The old dispersed farmsteads of the Celts remain in Ireland, Scotland, Wales and Cornwall.

Besides the Angles and the Saxons, Beda mentions still a third folk, who, together with others came across from the mainland. This tribe, the Juti, settled in Kent, the Isle of Wight and along the adjacent stretches of coast. Deviating from the Angle-Saxon area the dispersed farmsteads prevail in the landscape of southern England. It has now been established that the Juti were not Jutes, for whom they were long taken, but they belonged to the Chauken [tribes]. However, the Chauken lived along the Weser River and thus the Juti could have been familiar with living in dispersed farms characteristic of their homeland.

The characteristics of rural settlement in England were directly determined by centuries of widespread migrations. Enclosures, the early prevalence of large landed estates, the widespread substitution of farming for profitable grazing economy and cattle breeding—all these have gradually but strongly obliterated the ancient scene.

Settlement of the Slavic lands from the 9th to the 11th centuries

Let us turn from the West to the East. In the time of Tacitus the Slavs had their western border along the middle Vistula. Then they advanced into land abandoned by the East Germanic people and in the sixth century reached the Elbe and Saale rivers. In order to keep the peace Karl the Great [Charlemagne] established the *Limes Sorabicus* [line of fortifications]. This was no real strategic boundary and as such may have become quite unsuitable. On the contrary, Karl considered himself completely the master of the Slavs. He forbade the Slavs to move west of the Limes and to engage in commerce with the Germans at determined points. The Limes (see map) began in the south near the region of the Taurus Mountains, went to the Enns River and proceeded in a northwest direction over the wilderness of the Bavarian Forest toward the

region of Nuremburg; it then followed the course of the Tegnitz and the Itz, penetrated the Thuringian Forest and reached the Saale. From there on it coincided with the eastern border of the old folkland of the Germanic people, mentioned above.

Generally speaking, if not in all details this line coincided with the cultural boundary between Germans and Slavs, as it stood at that time. Later it was the main task of the Germans to shift the Slavic boundary farther east, a task, which was dissolved at its height during the Stauferzeit. Meitzen did not treat the great Germanizing of the East; only a small preliminary inquiry received consideration in his work.

During the time from around 800–1000 the Germans had reconquered only a small part of Slavic lands. The events can be followed in four separate regions; in Austria-Carinthia, Upper Franconia, Upper Saxony and the Altmark.

Austria-Carinthia. After the establishment of the Ostmark [Austria] by Karl the Great [Charlemagne], at once there set in here and in Carinthia a rather lively colonization and it made good progress until, under Ludwig the Child and by means of the Battle near Pressburg, all advantages were lost once again. Only after the victory of Otto I at Lechfelde (955) could colonization be resumed, carried on under the Badenbergs in the middle of the eleventh century (1043) as far as the present-day border with Hungary.

So much for history. With regard to settlement, one can differentiate three components in Carinthia and in the Ostmark. In the mountains and narrow valleys and everywhere in the Alps we find the old dispersed farmsteads, which existed before the period of German influence. Although here there were establishments that stemmed from German conquest, because of geographical conditions settlement forms were retained as farmsteads and hamlets. On the other hand, the wide valleys of the Danube, Drau, Mar and Save rivers are covered with pure German *Gewanndörfer*. Finally, in the plains of Moravia and Lower Austria we find extra-ordinarily large villages with quite normal scattered fields [*Gewannfluren*]. However, these are establishments of a somewhat later time.

Upper Franconia became a transit zone for many folk groups. The Markoman, who infiltrated into the area between the Fichtel Mountains and the Bohemian Forest found the land a wilderness, and also the Slavs seemed to have found little resistance because of the conquest of the sixth century. They settled permanently at the foot of the mountains and spread farther westward, but without reaching all points along the later line of fortifications [Limes]. In these areas are found many traces of Slavic settlement. Also, west of the Limes occur many Slavic place-names, especially near Ansbach. The number of existing *Runddörfer* is quite small. In the remaining Franconian sections, especially in the southwest, typical *Gewanndörfer* are found everywhere in the valleys, whereas the high areas are occupied by hamlets.

Conquest and settlement in Saxony, between the Saale and Elbe rivers, lasted longer than in Upper Franconia, which already in 805 was finally taken into the [Holy Roman] Empire. Not until the establishment of bishoprics at Merseburg and Zeitz by Otto I could German control be considered moderately secure [in Saxony]: the area since that time has remained quiet politically. However, actual occupation lasted a long time. One can differentiate two periods: since 1100 settlement chiefly had the goal to establish control and was limited to the flatter sections of the land; thereafter a more extensive development began—the possession of the forested areas and the reclamation of the swamps. Accordingly the mountains of Upper Saxony were invariably settled with colonies of line villages [*Waldhufendörfer*] at a later time. The foothills were originally covered with many villages, which, to be sure, followed the practice of alloting land parcels [*Gewanneinteilung*], but because of their limited size reveal their Slavic origin. Among these settlements a remarkable difference subsequently developed. In the Elbe Valley between Pirna and Meissen and from there on in a wide stretch westward to the Saalfelder area the small Slavic villages have been retained.[10] North thereof, in an extensive river basin in the thirteenth century the villages were collected into a few large areas. These areas were swampy and little cultivated by the Slavs. For that reason, since an extensive land reclamation was undertaken, a completely new type of settlement was formed. Moreover, the Church appeared, which was associated almost exclusively with these tracts and which took the opportunity to spread Christianity among the very reluctant Slavs.

Colonization by the Germans on the right bank of the Saale utilized the Slavic villages, but they enlarged them for their purposes by prolonging the *Strassendörfer* and by adding new line settlements to the round villages [*Runddörfer*]. The form of the *Strassendörfer* appeared to them so suitable that they laid out completely new settlements in that fashion, without, however, neglecting to include the

marked-off fields [associated with] the accustomed allotment of property [*Gewanneinteilung*].

Finally, the Altmark experienced the longest resistance to Germanization. It is divided in three sections, mutually differentiated according to the manner of colonization and the form of the settlements. In the east lies the extensive lowland of the Elbe, the so-called Weische, which in the twelfth century was made economically useful by forming marsh colonies. The remaining area is divided in two halves by a southwest-northeast line, from the Gardelegen region to Arend Lake. The eastern half exhibits the Slavic village converted to German style, similar to those of Saxony. The western half, the so-called Wend region, still remains fully Slavic, as it has for centuries; here the pure *Rundling* village is found almost everywhere.

The North and Colonization of the Interior

The little on the colonization of the Scandinavian North that has a place here has already been mentioned. It concerns a gradual penetration, unhindered by other folk, into an unpopulated wilderness, carried out by individual family colonists without any determined plan, and for that reason gave rise to farmstead settlement.

Besides the spread of German culture across the borders of the ancient folkland [or culture hearth], in time it [Germanism] developed importantly with colonization within the interior of Germany. Forests and swamps became the major hindrance for settlement and only reclamation or clearing could extend it. Forests, which at one time had covered almost all of Germania, were only little used for ancient settlement. Probably, within a particular tribal area there were openings [natural clearings] in the forest, but these were separated one from the other by extensive wooded areas and were utilized by the inhabitants only to a limited extent at their margins; otherwise, they remained completely deserted. Later district boundaries[11] were developed, which still today can be recognized in many places within the remains of ancient forest cover. Legally unoccupied forests belonged to the king, and that was of great importance in the future, for thereby the king possessed means to reward his faithful servants. In the times of a purely barter economy, by leasing pieces of landed property, just one forested area was taken to be [a source] of seemingly immense wealth. Thus, directly from this developed extensive landed properties of secular and clerical landlords. At the same time [the practice of] leasing pursued the distinct goal of making uncultivated land arable, of increasing the yield from the soil, and of providing the essential conditions of life for a large number of people. The landlord had the forest cleared and established colonies which spread the extensive utilization of the soil; thereby the management of the large manorial estates occurred on a small scale. For such colonies the *Reihendörfer* (line villages] proved to be more and more the most suitable settlement form. They were already well known in the time of Karl the Great, but found their most widespread use in the twelfth and thirteenth centuries. Especially the forested mountains of the Slavic area—Erzgebirge, Sudeten, and the mountains of Austria, until then completely untouched, were developed with the long *Waldhufendorf*. West of the Slavic boundary their number is unevenly smaller because of the lack of mountainous terrain. In southern Germany perhaps the ancient manorial hamlet and dispersed farms play their role.

The vigorous reclamation of swamps began in the thirteenth century. From it the Cistercian [Order] and the Netherlanders gained the greatest profit. The former permitted, among others, the Helmen lowlands to be drained by Flemmings and thus created from a swampy valley a "Golden Fleece." Netherlander colonists were first induced to settle the marshes along the Weser River by the Bishop of Bremen (1106 and 1143). Thereafter they assisted almost everywhere in Germany to cultivate swampy areas, and when they themselves did not participate, [reclamation] enterprises and the form of the marsh farming colonies were done by [using] their traditional ways.

CONCLUDING REMARKS

So much for the goals of the essential results of Meitzen's investigation presented above. Meitzen's work in many respects is without doubt of fundamental significance, since for the first time it attempts a coherent representation of rural settlement characteristics supported by extensive data. However, it is with the use of the literature that some caution seems advisable. Because of the great size of the task that the author has undertaken, a uniform control of the material is, in all its parts, out of the question, and so probably the picture that Meitzen sketched has experienced many changes with the course of time. Especially this is true of the many hypotheses and assumptions with which the author frequently takes recourse, often when-

ever desirable. Hitherto I have gone as far as possible to be fair, so I would like now, however, to consider one of these hypotheses in order to show that an absolute trust in Meitzen's presentation is not always in place.

According to Meitzen's assumption, the Germanic people, coming from Asia and southern Russia, were drawn to Germany as far as the area of Magdeburg, going between the Carpathians and the Pripet marshes. They stopped at Magdeburg, where they found salt familiar to them from their Asiatic homeland. From the Elbe district they then spread out in various directions: the Angles and the Wari wandered northward, the Frisians to Friesland, the Hesse to the west. As evidence for this radiation outward from the middle Elbe Meitzen advances the Thuringian district names Engelin and Friesenfeld. Indeed that may be true. To be sure the Engelin district takes its name from the Angles, that of Friesenfeld from the Frisians. Moreover, undoubtedly the Angles and the Wari settled in Thuringia, but it is not certain that it was the earlier or northern, but just the later residence of both tribes. Rather, as far as I know, the opposite [view] was commonly accepted. The same is true of the Frisians. As far as we can go back in German history the Frisians have lived in their present-day area; Friesenfeld, however, first received its name at the end of the sixth century when the Saxons acquired the area north of Unstrut through the overthrow of the Thuringian Kingdom (531) and again retreated (568), and new settlers, Frisians among them, settled here. Likewise Meitzen wanted to use the district of Hasse for [as derived from] Hessen, although in this case the determination was not completely explicit. However, this [district] name likewise appears for the first time with that of Friesenfeld; originally it was called Hosgau and probably had nothing to do with Hessen.

However, we disregard the imperfections that accompany Meitzen's presentation. We must discover if the book is a work qualified to exert a strong, helpful influence on settlement geography, methodologically and materially. [From it] We learn many things that were totally or only imperfectly known to us and we see other things in a new light. And this increase in our stock of knowledge is based on subjects information on which appertain to important stipulations for the development of geographical theory on settlement, on form and place. It extends far into the economic conditions and perceptions of the past, which fulfill for us a valuable service through the attempt made to present a historical-genetic consideration of settlement characteristics. And therein lies the methodological significance of Meitzen's work. In order to attain a model for a presentation of the study of settlement, it may be necessary to know the land as well as the people and their culture, and, to be sure, to survey both the time of the founding of inhabited places and the relationship between man and the land, not just their status at a given moment but in their change and growth during the course of history. The promotion that the human part of these exercises underwent through Meitzen did not go unused [was not neglected], and Meitzen's work, perhaps more than seen hitherto, leads us beyond the rationalism of settlement geography, by which he attempted to explain settlement conditions more with the help of general reflections than with the help of exhaustive observation of the past.

However, the intention of Meitzen's investigation is not wholly identical with the requirements of settlement geography. His research is directed more toward native origins; it attempts to understand settlement forms in their most possible pristine condition and fails to consider later change. Indeed, this might become a special stimulus for the settlement geographer. I believe that for me an extraordinarily profitable task would be to pursue changes that original village forms have undergone with time within a given area, how here the original types of rural villages are still preserved, how there houses show variations in form and construction, which the town styles approximate, and, finally how these [phenomena] in many places must have totally disappeared.

NOTES

1. See *Geographische Zeitschrift*, 1899, p. 65 [see p. 64].

2. Three volumes plus atlas, Berlin, Wilhelm Herz, 1895.

3. The [present] work appeared as the first section of a still larger [publication] entitled "Wanderungen, Anbau und Agrarrecht der Völker Europas nordliche der Alpen." [Migration, colonization, and agrarian rights of European peoples north of the Alps].

4. I did not consider the settlement practices of the Finns.

5. The shaded area in fig. 1 [3(1)] indicates the land owned by one village member.

6. In Little Russia are found villages as well

as dispersed farmsteads, and it is not unlikely that these represent the original methods of settlement of the Slavs.

7. Meitzen does not state for which time these boundaries apply. The German "folkland" appears to be defined only according to historical reports; in prehistoric times Celts might also have settled here.

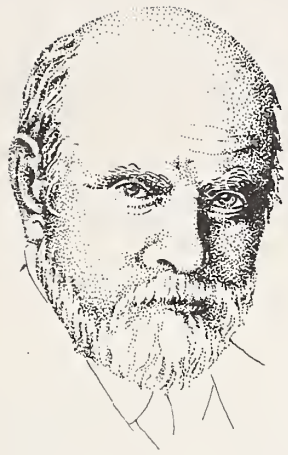
8. Cf. Gradmann, Der obergermanisch-rätische Limes und das fränkische Nadelholzgebiet. [The Upper Germanic-Rhaetian Limes and the Frankish area of Coniferous Forest]. *Petermanns Mitteilungen*, 1899, pp. 57-67.

9. De bello Gallico [on the Gallic Wars] IV, p. 4.

10. Buschik's map of the Saxon Kingdom (Wissenschaftlichen Veröffentlichungen des Vereins für Erdkunde zu Leipzig, 1895), as a population density map hardly successful, illustrates very well the contrast between the small Slavic villages and the *Reihendörfer* [line village] of the Erzgebirg.

11. Tribal and district boundaries in the early Middle Ages were not lines, but wide uninhabited strips. (Cf. Hans F. Helmolt in *Historische Jahrbuch der Görres-Gesellschaft*, v. 17, 1896, and Ratzel, *Politische Geographie*, the chapter on boundaries.)

2. *Eduard Hahn (1856-1928)*



Introductory Statement

Robert C. West

Most of Eduard Hahn's work lay in the fields of cultural and economic history with emphasis on the development of agriculture in antiquity. Perhaps for that reason his ideas were appreciated more by sociologists, land economists, historians and anthropologists than by geographers in late nineteenth century Germany. One of his most important contributions to culture history was a new classification of economic development which overturned the old "three-stage" theory, in vogue since antiquity, that postulated the passing of mankind from the first stage of primitive hunting and gathering into nomadic pastoralism and thence to agriculture. On the basis of historical and ethnological materials Hahn suggested that hunters and gatherers, through domestication of plants and animals, became farmers and that nomadic herders, or pastoralists, were but an offshoot from agriculturalists.[1] Hahn also ascribed the origin of agriculture to women, who were the gatherers of wild plants and the keepers of the hearth in primitive society. His most controversial ideas on animal domestication and agricultural history stressed the role of religion and magic in the development of farming techniques. For example, he attributed the invention of the plow to mythical beliefs in Mesopotamia, where oxen (castrated bulls) were used as sacred animals to pull religious carts or wagons; oxen were also employed to pull the plow, a sacred implement used to turn and fertilize the soil, represented by the great goddess "Mother Earth." Plowed earth represented the womb of "Mother Earth;" the plowshare was the symbol of the phallus which opened up the womb and thus compels fertilization.[2] Such theories were viewed askance by most economic historians of the time, but were later espoused by some cultural geographers such as the American Carl Sauer and a few of his students.

Among Hahn's best known works is his book on domesticated animals, their distributions and role in human culture (*Die Haustiere und ihre Beziehungen zur Wirtschaft des Menschen*), published in 1896. From this book the chapter on the horse as well as Alfred Hettner's comments on the volume accompany the following translations pertaining to Hahn.

Several accounts of Hahn's life and appraisals of his work have appeared in print, some of which are listed below.[3]

NOTES

1. Fritz Kramer, Eduard Hahn and the end of the "three stages of man," *Geographical Review*, vol. 57 (1967), pp. 73-89. As late as the early 1900s the old "three-stage" theory was followed in some American sociology and economic textbooks.

2. Some of these ideas are expressed in his small book *Demeter und Baubo; Versuch eine Theorie der Entstehung unseres Ackerbaus* [Demeter and Baubo; an attempt at a theory of the origin of our field agriculture]. See for example pp. 48-49.

3. Honigsheim, Paul, Eduard Hahn und seine Stellung in der Geschichte des Ethnologie und Soziologie, *Anthropos*, vol. 24 (1929), pp. 587-612; Vierkandt, A., Zum Andenken Eduard Hahn, *Archiv für Geschichte der Mathematik, der Naturwissenschaften und der Technik*, vol. 11 (1928-29), pp. 225-39; Lowie, Robert H., *History of Ethnological Theory*, New York, 1937, pp. 112-19; Plewe, Ernst, Eduard Hahn, 1856-1928, *Geographisches Taschenbuch*, 1975/76, pp. 239-46; and Plewe, Ernst, Eduard Hahn, Studien und Fragen, zu Personlichkeit, Werk und Wirkung, *Beihefte zur Geographischen Zeitschrift, Erdkundliche Wissen*, vol. 41 (1975), pp. 120-40; reprinted in vol. 85 (1986).

Bibliography of Eduard Hahn, 1887-1934

[Revised from Hahn's bibliography contained in *Festschrift Eduard Hahn zum LX Geburtstag dargebracht von Freunden und Schülern* (Studien und Forschungen zur Menschen- und Völkerkunde, Band XIV), Stuttgart, 1917. (Reviews not listed)]

1887 Die geographische Verbreitung der *Coprophagen Lamelicornier* [The Geographical Distribution of *Coprophagen Lamelicornier*]. Ph.D. Dissertation. Lübeck. 87 pages, 1 map.

1891 Waren die Menschen der Urzeit zwischen der Jagerstufe und der Stufe des Ackerbaus Nomaden? [Were men of primitive times nomads, who were between the stages of hunting and farming?]. *Das Ausland*, vol. 64, pp. 481-87.

1892 Karte der Wirtschaftsformen der Erde [Map of the Economic forms of the Earth]. *Verhandlungen der Gesellschaft der Naturforscher und Ärzte*, Halle, 1891, p. 559.

____ Die Wirtschaftsformen der Erde [The economic forms of the Earth]. *Petermanns Mitteilungen*, vol. 38, pp. 8-12.

____ Sir Francis Drake auf den Isthmus von Panama. *Das Ausland*, vol. 65, pp. 228-29.

____ Der Schelch des Nibelungenliedes [The *Schelch* (Tragelaphus?) of the Nibelungenlied]. *Verhandlungen der Berliner Anthropologischen Gesellschaft*, 1892, pp. 121-25.

1893 Die wirtschaftliche Stellung des Negers [The economic position of the Negroes]. *Festschrift für Ferdinand v. Richthofen*. Berlin, pp. 371-83.

1894 Die Hirse, seine geographische Verbreitung und seine Bedeutung für die alteste Kultur [Millet, its geographical distribution and its significance for earliest culture]. *Zeitschrift für Ethnologie*, vol. 26, pp. 603-08.

____ Die kultivierten Knollenpflanzen in Peru und die dort üblichen Konservierungsmethoden [The cultivated tuber plants in Peru and the customary methods of preservation]. *Zeitschrift für Spiritusindustrie* [vol. no. and pagination unobtainable.] 4 pages.

1895 Die Stellungs Africas in der Geschichte des Welthandels [The place of Africa in the history of world commerce]. *Verhandlungen des 11. Deutschen Geographentages zu Bremen*, Bremen, pp. 166-90.

____ Heilige Wagen [Sacred Carts]. *Verhandlungen der Berliner Anthropologischen Gesellschaft*, 1895, pp. 342-47.

1896 *Die Haustiere und ihre Beziehungen zur Wirtschaft des Menschen* [Domesticated Animals and Their Relation to Human Economy]. Leipzig. 581 pages.

____ *Demeter und Baubo. Versuch einer Theorie der Entstehung unseres Ackerbaus* [Demeter and Baubo. An Attempt at a Theory of the Origin of Field Agriculture]. Lübeck. 77 pp.

1897 Zur Zucht des afrikanischen Tigerpferdes und des Maultieres in unseren Kolonien [On the breeding of African zebras and mules in our colonies]. *Mitteilungen der Deutschen Kolonialgesellschaft*. No. 8, Berlin.

____ Die Transporttiere in ihrer Verbreitung und in ihrer Abhängigkeit von geographischen Bedingungen [Transport animals–their distribution and their dependence on geographical conditions]. *Verhandlungen des 12. Deutschen Geographentages zu Jena*, pp. 181-96.

____ Siedelungskolonien, Plantagenkolonien, Faktoreikolonien [Settlement colonies, plantation colonies, colonies for trading houses]. *Aus allen Weltteilen*, vol. 28, pp. 211–28.

____ Wie setzt sich der Bestand unserer Kulturpflanzen zusammen? [What does the stability of our domesticated plants consist of?] *Korrespondenzblatt der Deutschen Gesellschaft für Anthropologie*, vol. 28, pp. 158-64.

1898 Urgeschichte des Bieres [Early history of beer]. *Wochenschrift für Brauerei*, vol. 15, pp. 433-35.

1899 Die Kartoffel und ihre Kultur in ihrem Vaterlande [The potato and its cultivation in its homeland]. *Blätter für Gerstein- Hopfen- und Kartoffelbau*, vol. 1, no. 6, pp. 182–88.

____ Die Entstehung des Ackerbaus [The origin of field agriculture]. *Globus*, vol. 75, pp. 281-87.

1900 *Die Wirtschaft der Welt am Ausgange des 19.*

Jahrhunderts [The economy of the world at the close of the 19th century]. Heidelberg. 320 pages.

1901 Ursprung und Entstehungsweise des Ackerbaus [Source and origin of field agriculture]. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, vol. 36, pp. 230-54.

1902 Die Überschätzung der Anbaufläche Babyloniens [The overestimation of the area under cultivation of the Babylonians]. *Deutsche Kolonialzeitung*, vol. 19, no. 27, p. 262.

____ Das Vaterland der Kartoffelkultur [The homeland of potato cultivation]. *Naturwissenschaftliche Wochenschrift*, n.F., vol. 2, no. 27, pp. 1-3.

1903 Die Entstehung des Rades und des Wagens [The origin of wheels and carts]. *Internationales Zentralblatt für Anthropologie*, vol. 8, pp. 1-3.

____ Knochenfunde an der belgischen Küste [Discovery of bones on the Belgian coast]. *Zeitschrift für Ethnologie*, vol. 35, pp. 965-66.

____ Die Einführung neuer Kartoffelsorten aus Peru und ihre Bedeutung für die deutsche Landwirthschaft [The importation of new varieties of potatoes from Peru and their significance for German agricultural economy]. *Jahresbericht der Spiritusfabrikanten*, vol. 3, pp. 260-70.

____ Der Sonnenschirm als Königssymbol, und der Rosenkranz [The parasol as a royal symbol and the rosary]. *Internationales Archiv für Ethnologie*, vol. 16, p. 10.

____ Entstehung des Getreidebaus [The origin of the cultivation of the cereals]. *Zeitschrift für Ethnologie*, vol. 35, pp. 1007-08.

____ Die Weltstellung Yemens [The world position of Yemen]. *Geographische Zeitschrift*, vol. 9, pp. 657-66.

1904 Bogenschiessen [Archery]. *Akademische Turnbundblätter*, vol. 17, pp. 213-15.

____ *Das Alter der wirtschaftlichen Kultur der Menschheit* [The antiquity of the economic culture of mankind]. Heidelberg. 256 pages.

____ Der Sperling nicht bloss im Rosengarten [The sparrow (is) not only in the rose garden]. *Gartenflora*, vol. 54, pp. 103-04.

1906 Die primitive Landwirtschaft [Primitive agriculture]. *Zeitschrift für Sozialwissenschaft*, vol. 9, pp. 73-88; 172–188; 241-251; 309-324.

____ Über Künstliche Bewasserung, besonders der Ackerbau mit künstlicher Bewasserung nach der Theorie Ferdinand von Richthofens [On irrigation, especially field agriculture with irrigation, after the theory of Ferdinand von Richthofen]. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, vol. 41, pp. 640-85.

1907 Die Entstehung und Bau der ältesten Seeschiffe [The origin and construction of the oldest sea-going vessels]. *Zeitschrift für Ethnologie*, vol. 39, pp. 42-56.

____ Streitfragen aus der ältern Wirtschaft [Contentions over the earliest economy]. *Korrespondenzblatt der Deutschen Gesellschaft für Anthropologie*, vol. 38, pp. 161-62.

1908 *Die Entstehung der wirtschaftlichen Arbeit [The Origin of Economic Labor]*. Heidelberg. 109 pages.

1909 *Die Entstehung der Pflugkultur [The Origin of Plow Agriculture]*. Heidelberg. 192 pages.

____ Die Gestirn des Wagens [The constellation of the cart]. *Zeitschrift für Ethnologie*, vol. 41, p. 42.

____ Die Obstzucht bein den frankischen Königen [Fruit breeding by the Frankish kings]. *Gartenflora*, vol. 58, pp. 59-62.

____ Baumrinde—Auerochs [Tree bark–ure-ox]. *Korrespondenzblatt der Deutschen Gesellschaft für Anthropologie*, vol. 40, pp. 89-90.

1910 Hackbau oder niederer Ackerbau? [Hoe farming or primitive field agriculture?] *Globus*, vol. 97, pp. 202-04.

____ Hackbau und Pflugkultur [Hoe farming and plow cultivation]. *Geographischer Anzeiger*, vol. 11, pp. 127-29.

____ Die Rolle des Gartenbaus in der Geschichte der Menschheit [The role of garden farming in the history of mankind]. *Gartenflora*, vol. 59, pp. 346-53.

____ Die Entstehung und geschichtliche Bedeutung der Wanderhirten [The origin and historical significance of the pastoral nomads]. *Zeitschrift für Sozialwissenschaft*, n.F., vol. 1, pp. 419-33; 500-514.

____ Die Brandwirthschaft in der Bodenkultur [Fire economy in cultivation of the soil]. *Nachrichten des Klubs der Landwirte zu Berlin*, 1910, pp. 552-56.

1911 Die Entstehung der Bodenwirthschaft [The origin of the cultivation of the soil]. *Scientia. Rivista di Scienza*, vol. 9, pp. 139-53.

____ Die Entstehung des Getreidefeldes [The origin of the grain fields]. *Internationale Wochenschrift*, 1911, pp. 1-18.

____ Schwierige Nahrungsmethoden der Ernährung bei den Naturvölkern [Difficult methods of livelihood for sustenance among primitives]. *Naturwissenschaftliche Wochenschrift*, n.F., vol. 10, pp. 545-48.

____ Die Erkenntnis des heutigen Volkslebens als Aufgabe der Volkskunde [The knowledge of present-day folkways as a problem in folklore]. *Zeitschrift des Vereins für Volkskunde*, vol. 21, pp. 225-33.

____ Zur Rolle Babyloniens für Kultur und Astronomie [On the role of the Babylonians in culture and astronomy]. *Deutsche Literaturzeitung*, 1911, pp. 2629-33.

____ Die Entwicklung des Schiffes und der Seeschiffahrt [The development of ships and seafaring]. *Zeitschrift des Verbandes der Diplomingenieure*, vol. 2, pp. 617-24.

____ Wirtschaftliche zur Prähistorie [Economy in prehistory]. *Zeitschrift für Ethnologie*, vol. 43, pp. 821-40.

____ Der Klabautermann [The Bogyman]. *Zeitschrift des Vereins für Volkskunde*, vol. 21, p. 178.

____ Richard Andree. Nachruf [in memorium]. *Zeitschrift des Vereins für Volkskunde*, vol. 21, p. 271.

1911-19 In Johannes Hoops: *Reallexikon der indogermanischen Altertumskunde*, vol. I-IV, Strassburg.
Bienenzuch [Beekeeping], vol. I, pp. 277-79
Ente [The Duck], p. 613
Esel [The Ass], p. 632
Fasan [The Pheasant], vol. II, p. 13
Gans [The Goose], pp. 111-13
Hackbau [Hoe farming], p. 347
Hammel [Mutton], p. 372
Herde [Fireplaces], p. 508
Hermelin [Ermine], p. 509
Hirtentum [Pastoralism], p. 534
Honig [Honey], p. 560
Hufeisen [Horseshoe], p. 565
Huhn [The Chicken], pp. 568-69
Hund [The Dog], pp. 570-71
Katze [The Cat], vol. III, pp. 18-19
Kleinviehzucht [Small Cattle], p. 64
Milch [Milk], pp. 223-24
Pferd [The Horse], pp. 408-410
Rind [Cattle], pp. 503-04
Schaf [Sheep], Vol. IV, pp.88-90
Schelch [Giant Deer, or Tragelaphus?], p.91
Schwein [Swine], pp. 149-50
Taube [The Dove], p. 307
Viehzucht [Livestock], pp. 419-20
Ziege [The Goat], pp. 589-90

1913 Zur Einführung der Milch in die menschliche Nahrung [On the introduction of milk in human food]. *Zeitschrift für Agrarpolitik*, vol. 11, pp. 421-24.

____ Ein babylonischer Pflug [A Babylonian plow]. *Zeitschrift für Ethnologie*, vol. 44, pp. 638-39.

____ Die Hirtenvölker in Asien und in Afrika [Herding peoples in Asia and Africa]. *Geographische Zeitschrift*, vol. 19, pp. 305-319; 371-382.

____ Himmelsanschauungen und Himmelseinteilung [Concepts of heaven and classifications of heaven]. *Korrespondenzblatt der Deutschen Gesellschaft für Anthropologie*, vol. 44, pp. 71-77.

1914 Zwei Erntegeräte aus Tirol [Two harvest tools from Tyrol]. *Zeitschrift für Ethnologie*, vol. 45, pp. 672-73.

____ *Von der Hacke zum Pflug* [From the Hoe to the Plow]. Leipzig. 114 pages. Second ed., Leipzig, 1919. 121 pp.

1915 Wirtschaftskunde und Landwirtschaft [Economics and Agriculture]. *Zeitschrift für Agrarpolitik*, vol. 13, pp. 225-29.

____ Wirtschaftsforschung [Research in economics]. *Zeitschrift für Agrarpolitik*, vol. 13, pp. 367-73.

____ Der Gottesfriede [The truce of God]. *Zeitschrift für Volkskunde*, vol. 25, pp. 89-95.

____ Menschenrassen und Haustiereigenschaften [Human races and characteristics of domesticated animals]. *Zeitschrift für Ethnologie*, vol. 46, pp. 248-57.

____ Pflugwirtschaft als Zeitbestimmung [Plow economy as chronology]. *Zeitschrift für Ethnologie*, vol. 46, pp. 258–68.

1924-32 In Max Ebert (ed.): *Reallexikon der Vorgeschichte* Vol. I-XV, Berlin, [139 short articles on domesticated plants and animals, foods, agricultural practices, etc. (Indexed alphabetically in vol. XV, *Register*, under Hahn, E.)].

1927 Die Anfänge einer Bodenwirtschaft und das Aschensalz [The beginning of soil management and (with the use of) alkali]. *Landwirtschaftliches Jahrbuch*, v. 65, pp. 451-59.

1928 Zur Wirtschaftsgeschichte von Africa [On the economic history of Africa]. *Koloniale Studien* (1928), pp. 97-108.

Eduard Hahn

[An Obituary]

Th. H. Engelbrecht (1928)

[Translated from "Eduard Hahn." *Geographische Zeitschrift*, vol. 34 (1928), 257-59.]

On February 24 (1928), after a short illness, Dr. Eduard Hahn, Professor at the Agricultural College [*Hochschule*] and at the University of Berlin, died in his 72nd year. [He was] a scientist of distinct individuality of an unusual independence, often contesting the prevailing opinions of the time.

[We shall make] only a few observations on his development during his early years. Because of his frequent illnesses caused by an accident in his early youth, he was not able to finish the *Gymnasium* [high school] in his home city of Lübeck until relatively late. He studied medicine and natural science at Jena, Greifswald, and Leipzig. His doctoral dissertation of 1886, prepared under the direction of Marshall, had a zoogeographic theme as a subject. Only after that did he begin his study of geography under the great geographer and scientific traveller, Ferd. v. Richthofen, with whom he soon became quite close. In the autumn of 1886 he followed him to Berlin.

After a lecture on the origin of domesticated animals in 1887, Richthofen suggested to him that he work on the same theme as a *habilitation* [validating] paper, to be done in two years, because "no great question could emerge in this field." However, the young zoologist, who was thus introduced into a new field of research under the direction of the old master of geography, saw the material growing under his hands, and he was able to finish his work only after many years. At the same time his studies led him toward the most difficult problems of the origins of agriculture. These were subjects of his first publications, even before he terminated his investigation on the origin and history of domesticated animals. By 1891 he was able to present in Halle at a meeting of the society of natural scientists and physicians a map of economic forms of the earth which was based entirely upon the new results of his research; at the beginning of the following year it was published in *Petermanns Mitteilungen*. In the autumn of 1895, the map was published as an appendix in his book *The Domesticated Animals and their Relations to Economy and Man [Die Haustiere und ihre Beziehungen zur Wirtschaft und zum Menschen]*. This was the basic work of Hahn, the starting point for nearly all of his later studies.

Of course, earlier, doubts had arisen occasionally as to whether the generally accepted three stages of culture of hunter, herdsman, and farmer were really appropriate. Especially Alexander v. Humboldt had contested this theory in its general aspects on the ground of his accurate knowledge of South America. However, he was not able to establish his viewpoint, especially because the whole concept of historical and cultural evolution was based upon this [the three-stage] theory. Now, suddenly, an entirely new viewpoint was presented, which was strongly opposed to the traditional one; moreover, [it was] a viewpoint proved by many facts and presented clearly on a world map.

It may be assumed that the [Hahn's] theory as such is well known. But still we may be allowed to touch upon it briefly. The lowest level of the gatherers, existing at present only among a few inhabitants in remote regions, is followed by hoe agriculture, which may be found still today widespread among the native cultures of America, the Negroes of Africa, and among the tribes of the South Seas. The dibble and the hoe are the tools of these planting cultures. The women work the soil; on her shoulders rests [the responsibility for] the provision of mainly vegetable foods for the tribe, whereas the product of the hunt [obtained by] the man, is unstable and uncertain. In strong contrast to hoe agriculture stands plow culture which makes use of animal power to cultivate the fields. The draft animal is the ox; the man drives the plow team; small-grain cereals are cultivated. In addition to the ox as a work animal, the cow is used as a producer of milk. These details, different in origin in space and time, seem to have been fused into plow culture within the oldest cultural center, the Near East. It is one of the most characteristic forms of agriculture. Even in prehistoric times

this kind of agriculture, a combination of cattle, the plow, and small grains, spread widely from [the Near East]—westward across North Africa and Europe, eastward into India and across the chain of oases to North China. In the course of this spread, however, certain elements were lost from plow culture in the remote areas. Thus, the use of milk has not penetrated into China, and the plow has not penetrated into tropical Africa, though cattle have. Cattle are kept in large herds in eastern and southern Africa, and, for many tribes, milk from the herds affords the main element of food, together with the products of hoe agriculture.

It has been the great merit of Hahn to give us this broad outline which, at the same time, presents a deep insight into the development of prehistoric agriculture.

Next came his extensive studies of pastoral peoples and their dependence on neighboring food areas; of hoe agriculture of the Negroes, its characteristics and development as a folk economy; of the original hearths and the spread of domesticated plants; of the history of human foods, to introduce just a few examples. All this [work] is based upon data that pertain to the field of economic geography.

Beyond this systematic structure extends the theory by which the origin of plow agriculture is traced back to religious viewpoints and ritual acts. Naturally, this theory is foreign to modern sentiment. However, it is remarkable that such a prominent researcher as Wilhelm Wundt, in his *Psychology of Peoples* [Völkerpsychologie], has accepted Hahn's concept in all its main points.

In numerous papers and in several larger publications over the course of years Ed. Hahn has progressively extended the total geographic picture [of economy types], which previously he had outlined only in its larger aspects; he has further elaborated it in many details until, gradually, the old three-stage theory has been supplanted. His concept of hoe agriculture and of the distribution of plow culture, based upon facts of economic geography, has imperceptibly become common scientific property; for a younger generation it naturally seems so valid that one almost forgets the founder of the theory. Actually, [this fact represents] the greatest success imaginable. Whenever a poem becomes a folk song, the name of the author is invariably lost.

Just a short time before the War [World War I] Ed. Hahn summarized very clearly in popular scientific form his complete theory of the beginnings of agriculture, of plow culture, and of herding. [This appears] in a small monograph, *From the Hoe to the Plow* [Von der Hacke zum Pfluge], dedicated to the philosopher Wilhelm Wundt. The complete list of all his works up to the year 1915 has been included in the paper commemorating his 60th birthday (August 7, 1916). His 70th birthday was another occasion of many honors, and gave evidence of the large number of friends that had gathered around him.

Similar scientific interest, perhaps strengthened still more by parallel scientific development, connects Ed. Hahn with Georg Schweinfurth, the *Nestor* of explorers of Africa. [Schweinfurth] with an admirable versatility, has extended his field of work from botany to geographic research, and thence to the study of the antiquity of the Egyptian pyramids. Most important, he belongs among those few botanists who have considered it worthy of effort to deal also with domesticated plants and their history. Consequently [his interest in so many related fields] has pointed to various interrelationships that have led to stimulating ideas. Highly instructive and stimulating for Hahn was his field study in Egypt where he was accompanied by Schweinfurth. Hahn was particularly interested in the Germans settled within the boundary zones of the southern and southeastern parts of Germany. During his trips, which were regularly repeated for a number of years on a Danube paddle-wheeler [*Hausschiff*] from Ulm downstream to Vienna, he brought together his enthusiastic friends to whom he disclosed, in this way, the subtle beauties of the Danube. His favorite object of travel was Styria, whose ancient Alpine economy continually attracted him.

For many decades his faithful collaborator was his sister, Fräulein Ida Hahn. She has fully penetrated into the world of ideas of her brother and gradually took over more and more work from him. She participated in many ways in his publications, and smaller articles and studies were also published under her name. Her own special field of study was the history of food which she has fully elaborated. Whenever the situation required it, she was able to find in a few minutes the necessary information from her brother's numerous boxes that were full of many thousands of reference notes on bibliography concerning different scientific fields. Indeed, very seldom has such a rich scientific heritage been shared by such a well-informed person or cared for with such devotion. This justified the hope that this heritage will be fully preserved for further scientific research.

Eduard Hahn

[An Obituary]

Walther Vogel (1928)

[Translated from the original text of Walther Vogel, "Eduard Hahn," *Petermanns Mitteilungen*, vol. 74 (1928), 174-175.]

Eduard Hahn, who died on February 24 of this year [1928] in his 72nd year, was a non-conformist all his life. He was not an odd man, for his sphere of activity and circle of friends were large; but his whole appearance, which was quite peculiar, and his scientific doctrine, like his personality, stood in opposition to the dominating trends of his time. His doctrine, because it was opposed to the rationalism that pervaded economic geography and economic science; his personality, because he was not a positivist character in spite of his thorough, minutely detailed research; on the contrary, for his personality, supported by his admirable book-learning, was indeed universal. Only the last fifteen years, in which those predominating trends in science were losing their vitality, were in principle more favorable to his character. However, he never attained much proficiency in any outstanding academic activity, for which he had little inclination. Thus his life, which in other respects proceeded within the quiet and modest frame of a private scholar's existence, was not without a tragic feature.

Born in a manufacturer's home at Lübeck, which was dominated by the spirit of a strong Protestant solidity, he studied the natural sciences at Griefswald, Leipzig (with Lückardt), and Jena, and graduated under Haeckel. Of decisive importance for his life was his acquaintance with Ferdinand v. Richthofen with whom he was tied by a close friendship until the former's death. Following a somewhat incidental suggestion of v. Richthofen, he turned towards the study of domesticated animals, especially the time and place of their origin; this research led him to entirely new and surprising viewpoints. He recognized that the traditional Three Stage Theory of the economic evolution of man was erroneous in principle; that the herdsman has never originated from the hunter, that the former was a relatively late secondary form which was already conditioned by the cultivation of plants. He discovered further important correlations of the origin of plow culture with certain religious and cultural viewpoints, and he rejected decidedly any rational attempt at explanation. He finally suggested a new system of the forms of subsistence economy in which hoe agriculture [*Hackbau*] took an important place as a hitherto unrecognized form. He first presented to the scientific world the results of his investigation in the form of an explanatory map in *Petermanns Mitteilungen* (1892). His research on domesticated animals has been published in his book, *The Domesticated Animals and Their Relation to the Economy of Man [Die Haustiere und ihre Beziehungen zur Wirtschaft des Menschen]*, which is, no doubt, considered as a work of basic and lasting importance. Hahn has further elaborated his viewpoints in his numerous articles and subsequent books, above all in his original pamphlet, *Demeter and Baubo*, 1896; *The Antiquity of Economic Culture [Die Alter der wirtschaftlichen Kultur]*, 1905; *The Origin of Economic Labor [Die Entstehung der wirtschaftlichen Arbeit]*, 1908; *The Origin of Plow Culture [Die Entstehung der Pflugkultur]*, 1909. Especially he has explained more precisely the important position of woman in the economy, and that of man in politico-social life, in the beginnings of culture, in which he often touched upon the viewpoints of Ratzel, Schurtz, Bucher, and others. Although he was thoroughly a scholar, he was not opposed to [considering the] problems of the present. His social thinking was oriented not toward a biased sense in regard to industrial labor, as it is common today, but toward a more liberal viewpoint. He exerted his criticism of man, conservative in the biological sense, against the age of technology which so often boasted, with proud righteousness, of its progress. He pointed especially to the widely extended plundering in agriculture, and his almost

forgotten book on the economy of the world at the end of the nineteenth century should be worthy of study even at the present time. His sincere interests in the problems of the younger generation [*Jungsmannschaft*] also belong here; suddenly he was surprisingly up-to-date in the last few years, and made contact with the youth movements.

His friends were hoping that he would, above all, finish his far-reaching studies on domesticated plants, which he perhaps carried out by too indirect means, as is seen in a stimulating booklet, *From the Hoe to the Plow [Von der Hacke zum Pflug*], 1914 (second edition in preparation). Unfortunately, no more was written after this final work. However, there is such a rich documentation [his preparatory notes] available that one may hope that his devoted sister and collaborator will put it in such a form so as to make its publication possible.

The investigations of Eduard Hahn will become more important the more geography learns how to appreciate man as a constructing agent of the earth's surface, and, conversely the better it arrives at an understanding of the profound roots of human existence in its relation to geographic conditions. Hahn has been recognized even by many of the most illustrious people of his time—let us mention, in addition to the names quoted above, at least W. Wundt, Schmoller, Ed. Meyer, Schweinfurth, Engelbrecht; but still his complaints that especially pre-history and ethnology have too often neglected to formulate complete conclusions from their investigations were not unjustified. Moreover, it has been his destiny that many of his concepts and notions (e.g., hoe agriculture) have been accepted as common scientific property, whereas their author has often been overlooked.

A large group of friends and students mourn at the grave of this uncommonly original and stimulating man; a delicate and noble man, in spite of many peculiarities and even idiosyncrasies. It is my conviction that at a later time the genial acuteness of this scholar will still be better appreciated.

Vogel
Berlin

The Economic Forms of the Earth

Eduard Hahn (1892)

[Translated from the original text "Die Wirtschaftsformen der Erde," *Petermanns Mitteilungen*, vol. 38 (1892), 8-12.]

In attempting to present a map of the economic forms of the earth (fig. 5) to the scientific world, I do not wish to neglect saying in advance that no one, myself included, can be more convinced that with the existing material such an attempt must necessarily prove deficient and faulty. Nevertheless, I have drawn and published the map—drawn, because I considered it highly desirable to test my viewpoints obtained at the conference table on the reality of a cartographic presentation and published, despite all objections, because it seems to me necessary to overthrow some old, inherited, but incorrect viewpoints. In no case do I want to assert that I represent the only correct and the only justified viewpoint; on the contrary, I hope that a discussion will make this concept more clear, and I would value it greatly if I could open such a discussion. I have expressed elsewhere (*Ausland*, 1891, no. 25, pp. 481-87) my reasons for relinquishing the old stage sequence: (1) Hunter, (2) Herdsman, (3) Farmer; and therefore I can now review them only briefly. Further, I wish to observe that I have already had the honor of presenting this map at the meeting of naturalists and physicians at Halle an der Saale in the autumn of 1891, in the geographical section under the chairmanship of Professor Kirchhoff.

Instead of the usual term "cultural stage" [*Kulturstufe*], or a similar term that always includes a sort of judgment on the level and time sequence of the evolution of an economic form, I have selected the term "form" which avoids such a judgment. I differentiate six such economic forms for the earth: (1) Hunting and Fishing, (2) Hoe Farming, (3) Plantation Farming, (4) our European-Western Asiatic Agriculture, (5) Livestock Economy, and (6) Gardening. The reason for which I am going to discuss these points once again was the circumstances that on investigating the distribution of domesticated animals (which has been my concern for several years) I found that the conventional viewpoint of the transition of the oldest cultures from hunter to herdsman and from herdsman to farmer involved a fundamental error; secondly, it has been proved as urgently necessary to oppose the directly dangerous viewpoint that our agriculture (which is based on the use of economic animals in the cultivation of soils and which points to a western Asiatic origin) represented the only standard form of the use of soils. Concerning the map I wish to observe also that I just wanted to present very general relationships, and that I express by intermingled dots the fact that two economic forms overlap.

About the first form, *hunting and fishing*, I need add little. I only observe that I have given to this form a more important extent in northeastern Asia and in Europe than to any other. I wanted also to indicate partly by mixing the colors, as in the case of Kola and the Tungus, that the herdsmen possess, in many cases, an insufficient number of animals to live directly from their products. Those stock raisers live from hunting and fishing, but when they have to change their residence their animals are important to them because they carry nets, traps, tent poles, covers, etc., or they pull those objects on sledges. In this capacity the reindeer corresponds directly to dogs which in many ways are important as animals of transport for the northern hunter of both hemispheres.

The next stage I have defined as the most original form of the cultivation of the soil, *hoe agriculture*. It seems that the hunter has often arrived independently, certainly at least once in each hemisphere, to this form of land use, which makes use solely of human energy and of very primitive instruments of wood, horn, and stone. Hoe agriculture plays still today a great role in the wet areas of the tropics, and will do so for a long time, because the profusion of the

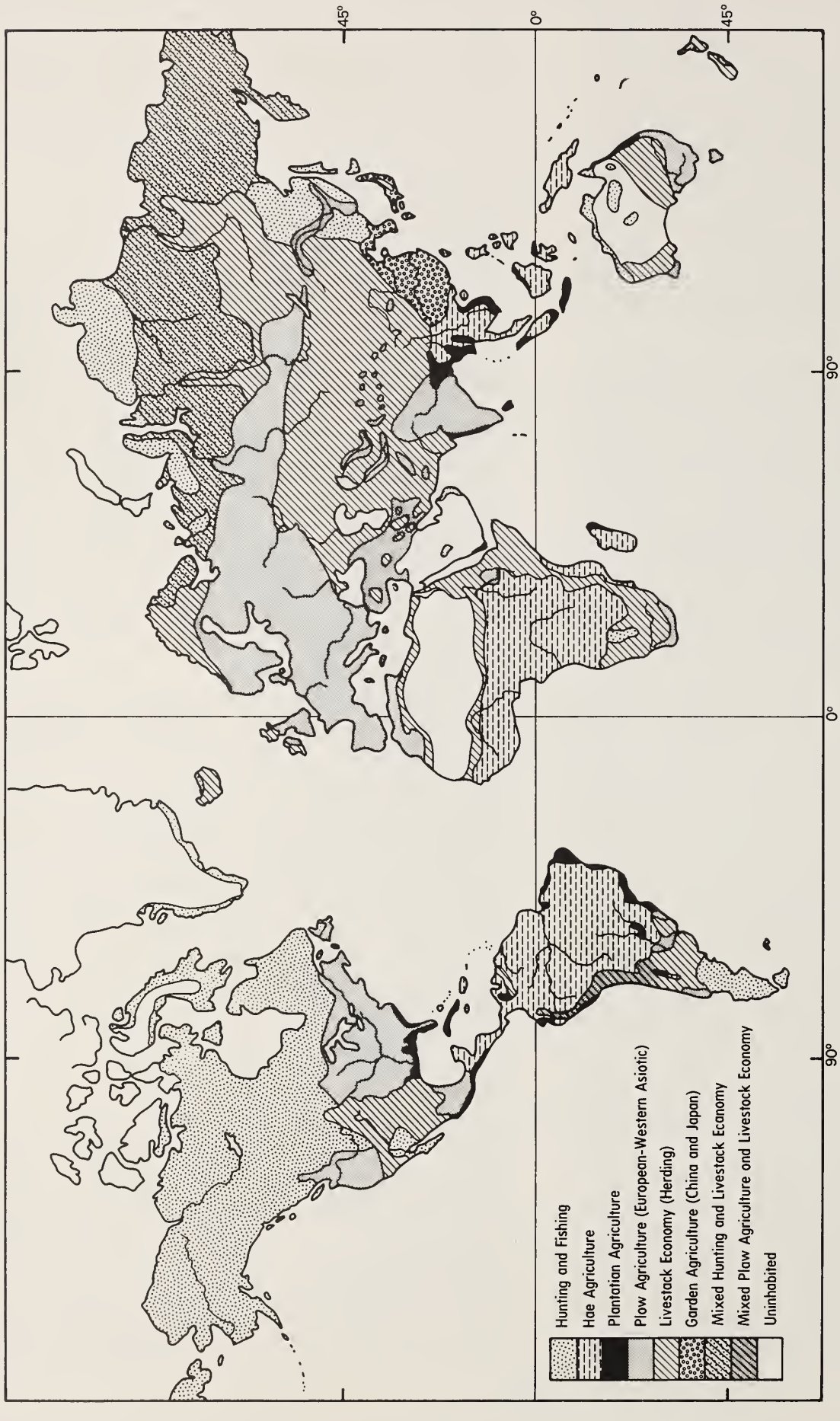


Fig. 5. Hahn's economic forms of the earth, 1892.

vegetation is so great there that only a very restricted population is able to rise to higher stages. Especially characteristic for present-day agriculture in the tropics is the domination of the tubers—yam, manioc, taro, and others. Next to these, to be sure, fruits, all sorts of vegetables, and legumes play a large role. Our cereal crops are entirely lacking. Representing the grains are species related but different from our own, especially maize, which in preColumbian times (and still today) was the main product in the western hemisphere, and sorghum with several affiliated kinds in the eastern hemisphere.

This form [hoe agriculture] has become important, on the other hand, also as a preparative stage for several higher forms. With the hoe have been cultivated small field surfaces where our wheat and barley were first developed into cereals, producing bread which has supported our entire civilization since ancient Babylonian times. Just as our household animals, our cultural plants, too, must be domesticated.

I have given the name of *hoe agriculture* to this important form; that is, [it is named] after the hoe, in order to differentiate it from our field agriculture, which is worked with the plow. I would have gladly selected some other and better term, because I must admit myself that even the highest form of agriculture, such as that in China and in Japan, also makes use of the hoe. But nothing better occurred to me; perhaps a more convenient term will be suggested from some other source. Hoe agriculture is characterized by the primitive manner of cultivation and the small extent of cultivated surface; the rapid exhaustion of the badly treated soil often compels the frequent shifting of the agricultural plots. Of course, the enormous area occupied on the map by hoe agriculture shows a series of gradations and transitions. If people of a higher development improve their hoe agriculture through the use of manure and irrigation, then this primitive form may pass directly into the highest one, gardening.

The third form, *plantation agriculture*, is, properly speaking, only a special form of hoe agriculture; however, because of its outstanding importance for the history of transportation and of trade, especially in the past century, I have defined it as a special form. Plantations are maintained by hoe cultivation, just as any field of the Indians or Negroes, but the decisive European influence gives plantation agriculture its special character. The European offers his energy and capital for disposal, and brings together a number of laborers under his direction for his own purpose. Another characteristic is that plantation agriculture raises only so-called colonial products, that is, coffee, sugar, and spices. But no one is able to live by that alone. Moreover, the manager of a plantation is interested in getting as much profit as possible from his capital. Because it is cheaper and more convenient for him to import food for his people rather than use his own expensive labor for the cultivation of food crops, a peculiar system of maintenance of the plantations has been developed; this system has contributed especially to the rapidly growing prosperity of youthful North America. North America soon found a paying market area for its product (pork meat and wheat flour, maize, and cut planks) in the West Indies and Brazil; the latter, however, was supplied with dried meat from Argentina. As it was often the case, unfortunately, in the last century, when the relations of the plantation colonies (with their market areas in Europe and their supply areas in the New World) were troubled by war, the economic life of plantation areas must have been damaged most severely. The person who had to pay for all these difficulties was, of course, the most passive part, that is, the slave. Thus the European plantation economy assumed that brutal form [slavery] which justified the general indignation in Europe over such conditions and resulted finally in the abolition of the whole system. It will be the task of the present plantation economy (which has accepted substantially a more considerate form [of labor]) never to forget that an excessive intensity, that is, a limitation of production only to marketable and valuable products, brings great disadvantages despite high returns. The economy that is based on the importation of food from entirely different countries will tend toward great fluctuations in times of crisis. It is peculiar that modern times have seen the Dutch introduce a rational plantation economy in Java, when a kind of plantation economy with many drawbacks was able to develop in our own areas. Whereas Java, under the intelligent management of the Dutch and their cultural system was able to supply its rapidly rising population with its own products, and at the same time furnish significant profits to the Dutch state, in our country [Germany] the best soil is condemned to compete with tropical sugar in a way that is untenable in the long run. At the same time the cultivation of beet [sugar] requires more and more labor from other areas for a type of work very similar to plantation agriculture; and it

attempts with success to transplant our inextricable manufacturing conditions into the countryside. It is very questionable whether the economic history of the next centuries will see in our [beet] sugar agriculture an essentially beneficial factor of our development, as magnificent and impressive the effects of technical chemistry on this business may seem to our descendants.

Our *European-western Asiatic agriculture* also has developed from the lower stage of hoe agriculture. The oldest pioneers of our culture domesticated wheat and barley in the small fields associated with hoe economy, and thus won them for [the later development of] field agriculture. From this has developed the peculiar triad that consists of the plow, the ox, and the cultivation of small grains, which has impressed its stamp upon our entire culture. One cannot say much about when and where this triple alliance originated; however, I believe to be justified in locating it with some probability in Babylonia and in placing that epoch far, far before the beginning of all this that we call history. From there field agriculture [*Ackerbau*], as I wish to call our West Asiatic-European form, has proceeded eastwards and westwards, and finally, in fact, Europeans have carried it in an essentially unchanged form into the other continents. Of course, field agriculture shows us all possible differentiation in the immense area of its distribution. But its characteristics remain everywhere the same; that is, it brings as a main product our small grains and makes use of the plow to work the soil, whereby the plow is pulled in the old fashioned way by the ox and only to a small extent by the horse. Despite all the different forms to be found in the immense area from China to North America and from India to northern Russia, the characteristic association of ox, plow, and small grains exists everywhere.

The next form, *livestock economy [Viehwirtschaft]* to my mind should also be placed on an entirely new basis. Formerly only *one* circumstance was considered in that nomadic wandering was accepted as the most important characteristic of the herd owner. In so doing, naturally, almost everything was neglected that was concerned with cattle, which in general have such requirements as to refuse to live too far into the steppes proper. On the other hand, it goes without saying that in such regions (as for example the African grasslands and the South American pampas which support mainly cattle) a perpetual state of wandering is constantly necessary or at least is useful in times of stress. For all these reasons, and to separate ourselves from this viewpoint, I have selected the neutral term "*Viehwirtschaft*" [livestock economy]. I must discuss this new term and its application in different areas in somewhat more detail. I can pass over Australia and South Africa (the latter in so far as it is settled by European stockmen), because they do not present any especially prominent traits. America, however, is another thing. Here, herds of cattle and sheep in the Pampas have taken on a different importance than formerly. In North America, too, the area is much more extensive; it is the area in which the Germanic cowboys continue today the business of earlier Spanish-Indian vaqueros. I still have not been able to clarify how far I should extend stock raising economy to the old Indian [inhabitants]. The latter became partly accustomed to using horses with surprising rapidity; but if the Comanches, Apaches, and others also satisfy their need for saddle animals by the use of herds of wild horses, it is, then, still not possible for me to include them with the people of livestock economy. Regarding the Patagonians, the information in this respect, too, is uncertain, at least inasmuch as it was accessible to me, so that I have classified these people as hunters.

However, to show how an economy elsewhere can develop differently from all our European conditions, I wish to call attention to a long and narrow zone extending from the sources of the Nile as far as South Africa. The cattle herders of this zone make almost no use at all of their large flocks, so that, in fact, one cannot speak of an economy. The use of milk and butter is insignificant and in parts of Africa is lacking entirely. Under normal circumstances only the meat of animals that have died a natural death is consumed; they are killed only at large feasts and funerals. Thus, cattle form only a unit of measuring values and an objective value, like a woman; for according to his number of cattle and women one recognizes the social position of a man.

In order to consider the nomads proper of North Africa, western and central Asia, I must touch upon still another important factor in the life of the livestock breeder, a factor that has been formerly incorrectly understood, not because it was overlooked, but because one supposed its existence at places where it did not occur. I am thinking of milking. For us it seems natural to drink the milk of our flocks, at least of cows and goats, and under some circumstances also sheep, horse and camel milk. This, however, has remained entirely

foreign to other people. Chinese and Japanese have never turned to milk drinking, although the Chinese are still close neighbors of Mongols and Tibetans who live on it [milk] almost exclusively. Also, in the entire western hemisphere no one people has accepted milk drinking without European influence. Milk and wool, however, are the only products that the herdsman may take from the animal without killing it. Thus, in fact, the herding economy of the Incas was established upon an entirely peculiar basis. Since milk was not used, it was only necessary to keep a few transport animals in the direct proximity of man. Once a year the wild flocks were brought together, wool was sheared from all the animals, superfluous males and old females were killed, satisfying in this way, to a considerable extent, the need for meat of the country. This wild-herd economy was probably not so much a product of a far-reaching statesman-like intelligence as that of a bitter necessity, for I am firmly convinced that a herd owner who is dependent upon the meat resources of his own flocks will soon consume all of his livestock. And so, perhaps the Incas, too, may have been led to the state organization of hunting because of a serious depletion of guanacos.

In the steppes and desert areas of the highlands of Asia only such people who made use of milk as food were able to maintain themselves continuously. Now, with some reason, one may deduce from culture history—and many others have done it before me—that the horse and camel are only quite late phenomena. The horse and camel, however, give the nomads mobility, which is inevitably necessary to control the great deserts and steppes, the present area of the nomads. Before introducing these animals the herdsman was obliged to limit himself to a life with his goats and sheep in the steppes and desert oases, located as far as possible from settled areas; only in such a way did he find the necessary contact with his neighbors, who already at that time were hoe or plow agriculturists and who supplied him with food. If we do not consider some unimportant exceptions, the typical nomad lives from the output of his flocks, but not from these alone, i.e., not only from milk and meat. Even the nomads who dominate our imagination, the patriarchs of ancient biblical times, as well as the Bedouins of the Arabian desert, nourish themselves with barley, dates, and partly also with rice and other crops. If they produce these fruits in their own gardens and fields, they are half nomads, as Herr v. Richthofen aptly calls them; if they do not have such fields, they must look for their supply of vegetables by way of exchange, that is, they must trade just as the Mongols do to get their tea.

I must admit that this concept of a direct necessity of the connection of trade in reference to nomads and its great importance in cultural history has cleared up for me a whole series of questionable points. Thus the sudden warlike invasions of the whole nomadic mass of central Asia towards the west, as well as their relations with China, who has often found a reason to close effectively her western boundary, has been clarified. I do not wish therefore to underestimate the importance of nomads in any way, but I do not wish, on the other hand, to deny that they have the right to be called representatives of a special economic form; on my map, however, I have recorded mainly only the livestock economy which without any doubt may be practiced by the nomads in the larger areas.

Finally to come to the last and highest form of human economy, I have assumed *gardening* only for China and Japan. In Mexico and Peru it has been, in fact, destroyed by the Spanish conquest. Europe, and consequently Italy, Spain, France, Holland, due to the small scale of the map, could be considered only schematically in regard to the complex and sporadic distribution. Chinese gardening is in no way different from that of the Mediterranean countries and from ours it is differentiated only by artificial irrigation. Also in China and Japan the soil is worked upon in substance by human labor and manured with human excrement. As evidence I may cite the example in the excellent book, *Beiträge zur Kenntnis der japanischen Landwirthschaft* [Contributions to the Knowledge of Japanese Agriculture] by Fesca [who avers] animals as manure-producing factors have been entirely overlooked, for they have no importance for Japan. On the other hand, compost is used as an important source of manure and, peculiarly enough, certain very modern tendencies of our farmers here are similar to the practices in China and Japan, just as in the case of agriculture using no livestock. In Japan the extensive interior roads, now abandoned, are exploited for the purpose of getting compost. For a long time it has been known and often jokingly mentioned how careful is the Chinaman in utilizing any waste of economic value. In any case, China has been able to maintain its enormous population for many centuries only by the most careful treatment of the soil. Even with such care, it would not have been possible to maintain the yield capacity of the soil, if the

Chinese, with his long experience and virtuosity, had not made use of artificial irrigation. Among us, one cannot speak at all of a real water economy, even in the remotest terms. Our gardening makes very little use of artificial irrigation and properly speaking only for extravagance. There are very few exceptions [to this statement], among which I do not wish to omit mention of the truck gardens of Berlin around the small town of Werder on the Havel River. Of course, also in this direction, there are trends in Germany that condemn the neglect of any organized economy and that insist on a remedy. Another circumstance is connected with the development of Chinese agriculture. Of course, consumption of milk is unknown in China, thus the cow and ox are almost absent there, whereas the buffalo, in some places, pulls a light harrow on the soft soil of a rice field. Meat is supplied almost exclusively by the pig and chicken, which are fed the refuse from kitchen gardens and granaries. The duck also [is present] which is easily understandable because of the countless irrigation canals, standing water in rice fields, and extensive water collecting basins. However, in China, and especially too in Japan, fish from rivers that are not polluted by any urban refuse and waste from manufacturing plants, as well as fish from the adjacent seas are used to replace meat on a scale unknown in our country. Strong spice and fish seem to be almost necessities to digest rice foods, especially fish in a macerated condition, which is for us inedible.

If I denote gardening as the highest form [of agriculture], then I know quite well that I expose myself to cheap reproach, as if I were praising Chinese conditions in general. But it is impossible for me to overlook the fact that China and Japan were able to maintain their population for centuries without any importation of foodstuffs from abroad. [This is] a fact about which my highly respected teacher, v. Richthofen spoke in great detail in his lectures on the geography of settlements and transportation in the summer of 1891. At present in our country there are different trends in agriculture showing that at some places our [farming] conditions cannot be considered as entirely excellent and incapable of improvement. Now, if the ideal of an agricultural system is to be seen in its capacity to support in a given area the greatest possible population, then our agriculture certainly does not correspond to this, for it has always attempted to replace labor more and more with machines. On the other hand, if it is desirable that the proletariat of overly large industrial cities be balanced by a healthy and not too penurious rural population, then this aim certainly cannot be reached by continuing the present system of agriculture which necessarily treats with more favor the large land owner than the small one. In order to introduce another system, it is necessary not to proceed to a partition of large holdings but to change directly to gardening without livestock and without machines around the large cities. [Cities] as producers of manure only have never been a blessing for us but rather a burden. In opposition to the self-sufficiency of Chinese and Japanese agriculture I cannot see the highest national economic form in our own agriculture which is, indeed, also uncommonly highly developed and which, scientifically, within the last few decades has become incomparably so. In the course of a few decades the guano islands of Peru (where once the Inca used to correlate consumption and [rate of] accumulation with intelligent precaution) have been plundered, and the stream of gold that poured forth into Peru and into the pockets of the heirs of the conquerors has melted away entirely without profit. At present our economy plunders the nitrate deposits of Chile and anxiously is on the watch for new resources of nitrogen and phosphorus, and at the same time it is exhausting with increasing speed the subsurface treasures of our country's soil!

The End.

Annex: A map, "Die Kulturformen der Erde von Dr. Eduard Hahn," in the same volume (1892), *in fine*.

Selections from *Domesticated Animals and Their Relation to Human Economy*

Eduard Hahn (1896)

1. TABLE OF CONTENTS

2. PREFACE TO HAHN'S *DIE HAUSTIERE*

Now that I submit the product of my years-long labor to the general public, no one can understand and feel as fully as I, how incomplete the results of it have been. I worked long and earnestly, but naturally I realize that such an enormous subject as that which embraces domestic animals and their spread through time and over all areas of the earth, exceeds the productive power of many human lives. Nonetheless, following counsel from my

any longer, because however incomplete it may be the work has to be concluded. To me it seems fitting that the results obtained are now submitted, because they vary substantially from the ideas heretofore considered to be valid. My views are perhaps too far-reaching, but if I prove only a small part of them to be correct, we should see the original conditions of our culture world in an entirely new light . . . By no means did I wish to replace completely Victor Hehn's excellent work, *Kulturpflanzen und Haustiere in ihren Übergang aus Asien nach Griechenland und Italien sowie in des übrige Europa. Historisch-linguistische Skizzen* [Domesticated plants and animals in their movement from Asia to Greece and Italy as well as the rest of Europe. An historical-linguistic sketch], Berlin, 1870.[1] I can mention only briefly author Hehn, whom we thank for so many full descriptions and ingenious depictions. Unfortunately I was never allowed the opportunity to personally communicate with him, which I had wanted so much to do. The great researcher died almost unknown and unappreciated on 21 March 1890 in Berlin.

For the scholar of linguistics perhaps [in my study] I have contributed one or another point, indeed a small "building block" for the structure [of that subject]. Unfortunately I have not been capable of solving numerous questions that domesticated animals pose for the zoologists. Nevertheless, I have endeavored to compile, chiefly from the old literature, cases that could interest the zoologists. To me that does not seem superfluous, because even many of the interesting aberrations do not very frequently occur in nature. In this regard I have in no way the ambition to surpass or to reform such outstanding research as that of Nathusius-Hundisburg or even Charles Darwin's *The Variation of Plants and Animals under Domestication*;[2] on the contrary I rely mainly on these great scholars . . . and others like them.

Since I hardly had a notion of the extent of the work, originally my entire book was to serve as a study of the knowledge of the geographical distribution of animals. To be sure, I chanced more and more toward economic geography and thus got into one of the richest and most important areas of geography, but unfortunately into one of the least developed and cultivated. . . . During [the course] of the study naturally many of my views that were formed initially in part had to be changed later; and because not in all cases could the entire literature be worked through again, it happened that I may have overlooked outstanding evidence which now I would probably want to appraise.

In order to emphasize especially the geographical aspect of my work, I have treated the individual countries in the second section according to their economic characteristics; for this [purpose] I took the opportunity—chiefly in the tropics—to present them in a new light. Of course the domesticated animals represent not only important factors in economic activity: the existence of animal domesticates of every country—if the history of each of the animals could be pursued—gave us welcome information on the economic conditions of the areas in question. To be sure, in order to solve completely this aspect of my work, I first should have been a farmer, and that I am not; further, I should have made extensive travels—and I scarcely have been outside Germany. Thus I bring along to my work essentially not much more than goodwill and the ability to work over a considerable quantity of literature. Through the rich holdings of the Royal Library of Berlin, which for me as with others was most liberally at my disposal, my work was made possible, the results of which in certain cases and even many times were questionable, but at least they gave certain value to one side [of the issue]. I have examined on the spot all materials cited that are not accompanied by a cross sign. So far as mistakes and typographical errors do not interfere, one can depend that the citation can be found at the actual place indicated. To be sure, my information, especially for countries outside Europe, often shows large gaps; as an excuse I blame that perhaps on the extremely sparse sources of literature that are still especially difficult to find. Scientific studies on flora and fauna and fewer scientific travel accounts, with equal indifference customarily omit [information on] both domesticated animals and plants.[3] Are these connections actually so unimportant that a mention or notation, ([observation for] which on the spot surely would not be difficult and in any case easier than in the library) would form only ballast?

I cannot conclude without here thanking the kindness of my highly respected teacher, privy councilor baron Ferdinand v. Richthofen, full professor of geography at the University of Berlin. Without his frequent, friendly stimulation and encouragement perhaps I could not have carried the difficult work out to the end. I must not omit at this point to render him my warmest and humble thanks. Likewise I here offer my heartfelt thanks to

all of my scientific friends who so often supported me with the publication and research. Naturally in the course of time my material has grown and it continues to grow; I fear, however, that once the theme is grasped I cannot get free from it again and for that reason in conclusion I would like to ask all of my critics and censors as far as they have new, positive material to add, that they make it accessible to me as much as possible.

NOTES

1. Citations from Hehn will follow his fifth edition, 1887. I can no longer agree with the sixth edition, in which the text of the latter edition is unchanged with new remarks by Prof. Schrader and Prof. Engler, Berlin 1893-94.

2. First edition, London 1868, second (stereotype) edition, 1875; I cite Darwin's second edition.

3. *De Candolle*, Ursprung der Kulturpflanzen. Leipzig, 1884.

3. CHAPTER ON "DAS PFERD" [THE HORSE]

[Translated from Hahn's original text in *Die Haustiere und ihre Beziehungen zur Wirtschaft des Menschen*, 1896, pp. 186-206.]

Without doubt the [domesticated] horse is related to the wild species, which in part until historical times inhabited Spain, France, the German forests, the Alps and the entire area of the East. I shall return later to the fact that only in part can one consider the individual wild herds, which now still exist in the Russian steppes and Inner Asia, as the pure descendants of the original wild horse.[1] At any rate, as many have thought, it is not so extraordinary that the wild horse in eastern Europe and Asia was a steppe animal, and in western Europe, an animal of forest and bush; [the latter situation] is basically related to need for protection. I need only recall that the bison was almost wholly limited to the prairie and did not enter the forest, whereas in contrast, the wisent is a pronounced forest animal. I ascribe the domestication of horses to a Turanian people of central Asia, who became horsemen and, as so many like them, suddenly pushed out of their region like a swarm of locusts, overthrew the civilization at that time and, like the Huns, withdrew leaving no horses behind.

No doubt the domestication of horses followed that of the ass. However, it is not certain whether this [sequence] furnished directly the pattern for riding, or whether the camel preceded the horse as a riding animal. Perhaps this illustrates the transition from pack and draft animals [cared for by] women and children to the riding animal of the men; and perhaps one was not [wholly] dependent on the horse as a riding animal. For the priority of the camel one might say that in southern Mesopotamia it surpassed the horse (see below) but, in contrast, in the north it lagged far behind.[2] However, as a riding animal the horse first came in contact with new people who slowly arrived at the idea that the dangerous "companion in arms" of their enemies [i.e. the horse] might be exactly the same animal that they knew so well as their spoils of the hunt. Also without practice and understanding the riders could hardly be imitated, and because of the wild nature of horses the attempt [at riding] them was surely not immediately or always successful. Therefore I believe that the oldest idea of the use of horses and therewith the oldest breed of horses came to us slowly from the East. I also consider that the oldest breed occurred where wild horses originated, as did the idea of the utilization of horses. To be sure, as one first became more acquainted with the horse the wild ones were used in large numbers; also there occurred a definite admixture of tame with wild blood, partly intentional, partly accidental, through the abduction [of tame mares by wild stallions] and the return [of domestic animals] to a wild state. Naturally the result was practical in that eventually the domesticated horses absorbed more valuable blood from the native wild species, because such mixing could not be avoided. However, I cannot assume that where this occurred horses were independently tamed, so that new centers of horse breeding were independently developed. Such appears to me to be ethnologically impossible, for mankind does not display so much energy and persistence. This is the case still today; where wild horses are regularly utilized—in America for example—, a breed usually unthought of: there, new horses are caught whenever needed. Also reports agree in describing the intractability of wild horses as being very great. [In this regard] J. P. Falk[3] says directly that one should not think about domestication of [wild] horses, for they starve in captivity or escape as soon as possible, as did a stallion as reported by Pallas:[4] the following spring it ran away taking with it a pair of tame mares. It is even reported that the small wild horses of Sardinia may be completely untamable.[5]

Also leucism [white color] and melanism [black color] appear to be of value among horses; here the correlation is the same. [The coats of] white or gray horses often are sprinkled with black or, less frequently, with red hairs, have black eyes, hoofs and mucous membranes. A variety of the white horse is covered with dark hair during youth, whereas with advanced albinism the animal is born white; also these may have red eyes and white hoofs. Moreover, there are reddish varieties; [such as] the "Isabellen" [light-bay horses], etc. An accidental and for long a valuable variety was the so-called "golden horse" which unlike the Isabelle or cream-colored, was pure yellow. For me there is a widespread and somewhat problematical phenomenon with the horse—the dapple appearance. On a lighter or darker background [of the hide] are seen other tinted circles or spots. Often the "designs" appear to be based only on differences in hair texture within these "dappels," so that they appear to be caused by angle of light. No wild horse has ever exhibited such markings, so that a comparison could be made.

It is well known that among domesticated horses there occur carefully bred giant types; moreover, there are widespread occurrences of dwarf varieties; partly these result from poor sustenance; however that is not generally certain. They are commonly found on islands, where comically small, diminutive types occur. Those of Ireland and Iceland are renowned; still much smaller are those on the Isle of Man, and in the Hebrides, Orkneys and Shetland islands. Only a few of the latter, which are surpassed only by those of Sardinia and Greece, are left on the Faroes.[6] On Öland off the east coast of Sweden small horses were present in the time of Olaus Magnus [1490-1557],[7] but now they have disappeared.[8] Also on the island of Ezel [Saarenaa] off the west coast of Esthonia the horses are small.[9] Dwarf horses are again encountered on Corsica and Sardinia.[10] According to Maltzan [11]they are "like a large hound" and according to Cetti, three feet high. Small horses are found on the island of Veglia in Quarnero [Velika Kvarner, off coast of Yugoslavia].[12] On Skyros there are horses 1.18 - 1.20 meters high.[13] Helreich[14] mentions them on Samothrace and in 1657 J. J. Strauss knew them from Metelin (Mytilene).[15] Again, they take up a large area in Indonesia,[16] and even on Santo Domingo there were small horses in 1711.[17] I think that here should be presented a prevailing phenomenon, which must be attributed to the nature of islands as habitats. Here breeding alone does not play an exclusive role in causing stuntedness or dwarfism; I believe, rather, that this is a prevailing phenomenon that is also observed among other mammals.

I would like to bring up two of the various characteristics of the skeleton. One is the short or pug face, which although not a racial characteristic, occurs occasionally.[18] Marco Polo[19] mentions that among the horses of India some are born with short, crooked legs. This "breed" probably has almost disappeared. Occasionally among our horses a throwback related to long-dead ancestors occurs;[20] for example, the toes originally characteristic of the genus *Hippus*, but have long disappeared, may often reappear in our present horses. More frequently they are found only on the forefeet and then usually on the outer sides.[21] Such an animal once played a role in world history. As people in the know were no longer confused as to what Caesar intended, a horse with this deformity was born on one of his estates. A soothsayer was kind enough to explain that it [the birth] meant that the owner [would be] master of the world. As a favor Caesar might have extolled the pet animal to the superstitious folk; in any case so much value was placed on it[22] that a statue was made and a coin was struck of it. In order to indicate better what he intended the artist stuck a staff of Mercury behind the toe. In contrast, on a Gordian coin,[23] which depicts a similar horse, the stamp-cutter, who perhaps hardly understood what he should show, put a human hand on the right side of the animal's fetlock and a human foot on the left side.

The intensity of the hair cover varies strongly among horses. We not only have the very thick pelt as a breed characteristic, but also even individual cases of especially strong curliness—that is, wooly horses.[24] Such an animal came to Colmar in 1282[25] and in 1805 one came to Paris after the first occupation of Vienna by the French.[26] As a pathological characteristic (but not a mark of breeding) there occur isolated cases of hairless horses that carry no trace of hair either on the body or on the tail or mane.[27] A special variation , a unique alteration of hair formation under changing ecological conditions, is the mole-like hide of the horse used in mining.[28]As a special hair formation a mane grows along the entire back of the horse,[29]and a mustache[30] that one can even twist.[31] I cannot comment on the report of the horse with two camel

humps that was presented to Lady Stanhope.[32] Hanging ears often occur,[33] but they are hardly the slack ears like those of many hunting dogs and of goats; few are the times that I have seen such develop. Also the complete lack of tails may occur as a characteristic of breed.[34]

A special development are horns on horses. Here it is a question of a purely pathological development, similar to the horns that occur with humans. But like the human horns, these have [been given] exaggerated attention. Such horns often develop out of the ear muscles[35] and may grow and be shed annually.[36] Azara once said[37] that they occurred so often in Argentina that one could say that a horned breed had developed. Such a horse was shown on many coins of Seleuceus Nicator;[38] on the adverse side are shown horns as a symbol of godly skill and might, on the reverse, a horned horse. If it is a question here of only a protuberance of the skin in the ear muscle, it is strongly emphasized.

A kind of psychic hereditary transmission is shown, whether in Peru or elsewhere, where through training a horse is converted into a so-called "ambling nag," from which occasionally "nags" are born.[39]

Wild horses, which were mentioned from earliest times, as, for example, from Alsace, England, Sweden,[40] etc., are only in a certain sense perceived as wild; for the question here is with horses that, if they were wild, were still well defined property of certain owners.[41] Moreover, wherever reference to a cultivated area was acknowledged, a special situation was made in consideration for horses. Even large herds of horses are composed of polygamous families. A stallion follows a small group of mares, which he builds as his jealously guarded harem. Like other polygamists, he is always ready to enlarge his harem; if he is given the opportunity to encounter a tame mare, he will use all in his power of seduction to take her with him. Today, in areas where wild and domesticated horses congregate we must figure that the so-called wild stock have drawn part of their blood from the domesticates. Also we hardly know if there is any area in which only wild horses occur in a primeval condition and are not associated at the same time with domestic stock. However, based on good observation, the so-called wild horses of the eastern steppes are also regarded as only partly wild. Despite this we hear that they are untamable and at least in part rage themselves to death in captivity.[42]

The wild horse was initially widespread in Europe; in the course of time it disappeared in many places and the herds that still exist became isolated [as groups of] wild studs. The last of this kind within fully civilized Europe were the horses of the Camargue at the mouth of the Rhone River and those of the Seine. I shall speak of the latter in the appendix. In Hungary and southern Russia until recently there were half-wild herds, an inconspicuous breed and not easily handled, but were valued despite their resistance. In Austria such a horse is called *Wildfang*[43] ["madcap"; feral?] and thus this term was carried over into our speech. It is not entirely impossible that the wild horses of the large wooded district of New Forest are not derived from original wild breeds, but resulted from horses that became feral in the confusion of war. I shall not go into the breeds like those in Sardinia, Corsica and the Shetlands. To prepare a list of the [areas of] wild horses is an altogether painstaking exercise, because so many of the even highly valued animals have not been reported. There must be wild horses on Cyprus; Mungo Park mentions wild horses, all of the same color, in Nigeria;[44] for a short period there were wild horses in the Congo, despite such an unfavorable climate; these, of course, soon perished.[45] They arose from a gift sent by the king of England; also in the Cape [of Africa] wild horses occurred, which Kolbe distinguished from zebras.[46]

It has often been remarked that the horses of Baraba [SW Siberia] are probably feral.[47] Pallas presents it differently: that the so-called wild horses of these steppes are mixed with tame blood. Naturally there would be such a mixing with tame blood through destructive military operations, which the owners favored putting an end to; thus the feral horses in Gansu in China may have originated during the Dungan uprising.[48]

According to a vague report there are probably wild horses in the Celebes and the Philippines.[49] Also in the so-called Australian Alps there are wild horses; according to Linderfeld they are small, dark brown or black and have been hunted, but little valued.[50]

As is well known, within a century the Spanish economy plundered, devastated, and made a desert of the islands of the Antilles; like the wild cattle, the wild horses survived.[51] According to Labat they are captured with nooses [lariats] and that they often thrash themselves to death.[52] In 1658 in the settlement of Jamaica, they [wild horses] must have been plentiful, for one of the English generals

contemptuously considered them as vermin,[53] as an Englishman will often do. According to a report, they had a very smooth hide, thus presumably little hair.[54] The great wild herds of the Pampas have become well known;[55] the report of Azara deals with them.[56] Also, on the Galapagos horses have become wild.[57] Finally, in the prairies of Texas large herds occur, about which Catlin[58]says that they are of all the colors that can be found in a pack of English hounds; as a whole and individually they are highly colored, whereas the wild horses of South America, are colored only brown and dark brown, according to Azara.[59] Also, on one of the barrier islands (Chincoteague) off the coast of Maryland there were once (around 1879) wild ponies.[60] On his trip in Tibet, Prshewalssky in 1879 encountered a wild horse which on essential points he differentiated from our horse, in that it had a tail that was covered with hair only in the lower part.[61] I fear that here we are dealing in no way with a new independent wild horse. If such an animal so outstandingly fleet as a wild horse was limited to such a small area and if it occurred in so small numbers, it might seem quite strange that we are just now hearing of it, while we still have a great number of reports of the wild camel, many of them from Chinese sources. I am thinking of the quite renowned perversity of the wild ass, if I here assume, rather, a kind of wild mule stock, that is, an inflow of blood from feral mare asses into a wild breed of horses. Even in every remote area all wild species are quickly melting away before the hunter with powder and shot. After all, the Sardinian horse has a tail with a wide lower part, like that of *Equus Prshewalsski*.[62]

In some areas the horse is used not only for riding, draft, etc, but also for its milk and meat. It is striking that the latter uses do not occur throughout, all the more so when the horse is not considered somewhat unclean as is the swine. However, such assumptions do occur here and there, but they are slightly motivated. Horse milk is used abundantly only in the east by Turkish nomads and Mongolian tribes; but not everywhere in that area, for example, not by the Turkomen. The earliest report on kumiss came from Rubruk;[63] Pallas gave the best report.[64]To be sure we find milk horses mentioned for the Scythians from Homer to Sidonius Apollinaris,[65] but always described unclearly and by hearsay. It is significant that neither the Spaniards in South America nor the Indians, despite the large herds of horses, ever stooped to [using] horse milk. Exceptions should be taken into account, such as the use of milk in case of illness, but that will be taken up elsewhere.[66]

Horse flesh is forbidden to Jews without indicating a reason, and likewise horse meat was not eaten in the ancient world, but not because the horse was disdained. According to Hieronymus,[67] the Quads, Vandals and Sarmati ate wild horse meat, but later the Germanic peoples must have given up its use. In that case the Church carried out the prohibition; [the eating of] common hares, which was forbidden as well, could be quietly permitted. To be sure, it was a long time before the ban could be enforced.

Generally horse meat is not eaten in Islamic lands; but in the nearest neighboring areas to the original Islamic states the Assyrian Arabs, who had nominally taken over the highest degree of the new belief, ate horse meat.[68] Burckhardt mentions also[69] that a sheik, who had nothing for his guests, wanted to slaughter his own mare; thus he could not have considered it to be a forbidden and unclean food. If in 1686 the Tartars who had settled in Poland ate horse meat,[70] this did not have much significance for their fellow believers who considered them to be separate and degenerate people; but the Tartars on the Volga in 1715 ate it also,[71] and it is still, or was, eaten there.[72] It was also consumed in China and wild mares were actually valued [for this].[73] Finally, it is well known as the main and most esteemed food among the Pampean Indians[74] [of Argentina].

Just as in the case of a great desire for benevolence, mankind has also given the horse great care. That is evident in the number and kinds of operations performed on the horse. Even operations on dogs are not as common as those on horses performed by the English in earlier times. Previously I have mentioned briefly the practice of castration (on animals); I now add that for long, spaying of mares in France appears to have been frequent; it was forbidden at least by 1717.[75] Similarly, just as we prefer to eat oxen, the Patagonians castrated horses, their most important food.[76] In 1590 among the English, as with us, it was the fashion to cut off the tails of horses,[77] and according to a reference by Bullock,[78] around 1820 at least part of the horse's ears were clipped. Thus in 1787 the council of Calchutense spoke with indignation against the "disfigurations" that were permitted on horses.[79] Until the time of Maximilian I horses were sheared and their tails were supported upward.[80] A "worthy" operation was to slit the nostrils wider to

make breathing easier;[81] this was practiced also in Peru.[82] A unique custom is reported by Nachtigal:[83] the Sonrai in Bagirmi [Chad, Africa] have no saddle, but by inflicting repeatedly wounds [to form] scarred tissue on the horse's back they made a place to ride!

I have previously indicated in [the section on] the mule that I have been inclined to ascribe the domestication of horses to a Turanian people who rode the animal. It [that opinion], however, is entirely theoretical. Nonetheless it can be supported by what we know about riding. It is highly astonishing and inconceivable! In the ancient classical world the horse was first used as a draft animal, not for riding. In Babylonia, Assyria, Egypt and in all of Western Asia we always hear of warring with [horse-drawn] chariots, not with cavalry. The war chariot was used from England to India. Is not this rather unsure restriction of prevalent use—one still rode the ass—connected with the recollection of the invasions of dreaded horsemen?[84] And do we not have in the mythical form of the centaurs a result of this recollection, as was long supposed? For people who were unskilled as riders and who were unfamiliar with horses, an invasion of mounted people must have been twofold in nature. It [the invasion] disappeared as quickly as it came, so it was quite possible that only a weak recollection was retained in the form of such mythical beings. These assaults must have stormed over within a short space of time, otherwise the surprised victims themselves might have learned to be horsemen; on the other hand it has been long confirmed that in Western Asia as in Greece during the heroic age horses were not ridden but instead battles were fought with chariots.

It is obvious, indeed, that the mythical form of horse-like humans—the centaurs—were connected with the invading horsemen, although in Greek mythology they were not always considered as completely wild; later this nice connection was lost in oblivion, for the word "centaur" is again found in the Gandharva mythology of India. As long as Sanskrit is considered the older, the fact was determined that in this case the Gandharvas were not horselike but of human form and drove chariots; this fact is encountered as well in the Vedas, as in Homer.[85] Now, however, the matter has been changed; the nimbus of Indian antiquity had burst. The conjuncture is again admissable and I assume it again. Is not this example a good proof of the care and skill of the critic of ancient Indian philology? The Gandharvas should belong to the apex of antiquity; at the height of antiquity those who knew the "Recensent" well did not ride [horses], thus they must have driven them.

This imperfect understanding regarding riding and the custom that the horse was long utilized only for chariots existed not only among Asiatic Indians and the Greeks; we find it again in Assyria and Babylonia, where representations of horsemen rarely occur, where only war chariots but no riders appear, exactly as [mentioned] in the Bible and in Egypt. Herodotus even knew a Scythian tribe, the Sigynni, who fought with chariots.

That is after all a highly remarkable phenomenon! The ass was known, but was serviceable and valued only in a modest way—especially as a pack animal. And now one might think that from a pack animal to a riding animal was but a small step and actually a smooth transition. It is quite striking that throughout antiquity nowhere do we learn anything of a people who employed the ass in warfare with the exception of a fleeting suggestion by Herodotus and a short notice at a much later time that such was limited to India, that is, to a quite distant area. It appears that there was never a cavalry of asses, as such, evolved by any classical people, although that is not certain since this use of the ass may have been impossible. However, the ass was so indispensable and important for the carrying on of warfare, as it was always used as a pack and transport animal. We learn little from history and almost nothing from myths about the domestication of horses. I cannot help but think that the Mexicans [Aztecs and others], when they first saw the [Spanish] horsemen, blended animal and man into a centaur; thus I see again in this mixed form an indication of the oldest horsemen, although it is not unknown to me that a greater part of Greek cultural elements are recognized more and more as having been borrowed; however the tendency toward the mixed form of man and animal is very strong in Babylonian mythology and culture, and despite the fact that an equivalent [representation of] the horseman is still lacking, perhaps it is possible that archaeologists may soon produce more clarity [on the problem], as well as on the chariot and on horsemen among the family of gods.

It was no surprise that the horse subsequently would soon become sacred within the same circles; thus there were sacred horses of the sun (2nd Kings 23, v. 11) in the temple of Jerusalem, despite the fact that the horse was generally forbidden (but with little success) by the Second Law in the

minds of the priests (5 Moses, 17, 16). However, horsemen appear in representation very late and only sparingly; thus Izdubar rode a lion,[86] and Assurbanipel was represented on a horse.[87] According to Hommel,[88] the horse came to Babylonia from Elam (thus from the East) around 2300 B.C.; the Hyksos brought it with them to Egypt between 2000 and 1750 B.C.[89] According to Presse d'Avennes it likewise came there with the Hyksos; however the practice of riding remained unknown to the Egyptians.[90]

I shall say nothing further about horses in Western Asia and Europe. Here [the story of] the horse cannot be pursued through history because it, like cattle, was preceded by agriculture, etc. On the other hand I shall now turn to the error that the home of the horse was Arabia from which it spread outward; there are many disputes over this idea, an idea that is fundamentally wrong. Based not on the assessment by Arabs, who are as unreliable as our farmers, but on reality, the camel is still today the most important animal for the Arabs; they have ridden it since early antiquity, as Assyrian monuments show us. In the battle of Bedr the small army of Mohammed had 310 men, 70 camels and 2 horses.[91] Mohammed did not even tax the horse and the Omahaden obtained their horses from Persia, not from Arabia.[92] At present, says Burkhardt,[93] the Kurds and Arabs of Mesopotamia have more horses than all the tribes of Arabia combined. Even the northernmost tribe of the Syrian Desert, the Aeneze, have the most: about 10,000 horses and ca. 100,000 camels, but a "wealthy" Arab in Tadmor had, for example, 400 sheep, 2 mares and one stallion.[94] In Hauran there are rich tribes with huge herds of goats, besides sheep and cattle, but "perhaps 20" and "each [tribe] has a dozen horses;"[95] in Mecca there were about 60 and in Medina, none.[96] It does not matter that the horse is the Arab's pet animal, that he protects it, cares for it, that he feeds it and gives it camel's milk to drink, and that he turns his entire endeavors toward it.[97]

Arabia cannot be said to be the original homeland of the horse; indeed, the land is in no way suited for horses. In Oman they are so scarce that Wellsted, because he was riding, was nearly killed as an enemy, that is, a "Wahabitan" from central Arabia[98] and the horses of Oman and the Hadramaut are said to be in poor condition. Among the Egyptians the horse played an important role even in ancient times, especially as a war- and parade-piece, less so as a useful animal. Just as the [mention of] the camel is not found in Egyptian sacred writings and art, so there are hardly any representations of horsemen even in later times. Priestly decrees appear to have prevented this. In any case the Egyptians thought of the horse as having no [areal] limits, as they had with the camel. First it spread westward; at the time of Greek colonization the coins of Cyrene depicted not the camel but the horse and the chariot.[99] Moreover, already during antiquity the horse may have spread southward. We know nothing about where the spread stopped at that time. In any case the drawings of horses appear very late in Meroitic antiquities. Perhaps the Arabic invasions had first given impetus [to the introduction of horses southward]. Now the horse has spread south of the Sudan throughout the grasslands, and there was established a series of types and breeds, of which those of Dongolu, now extinct, were especially prized. Abyssinia, which had ancient relations with Arabia, received the horse soon after the time of Christ, if not before. However, properly speaking, it did not spread from there much farther south or west. It is interesting that the Galla, during their dreadful incursion into Abyssinia around 1570, first learned about the horse (and the mule), as related in the important chronicle that A. W. Schleicher edited. . . . [100] To be sure, now the Somali and the southern Galla have horses; however, on the one hand the horse has not entered the forests along the Nile, but on the other, the entire interior of Zanzibar and Mozambique as well as the steppes of the inland highlands appear to be poorly suited [for horses]. The entire west coast [of Africa], from Gambia southward, is likewise ill suited; whereas the Hausa in the interior do have horses, they do not prosper on the coast, indeed they can hardly live [there].[101] On the other hand Ca da Mosto found a few horses among the Negroes in Gambia[102] and around 1500 the Joloff in Senegambia were skilled horsemen.[103]

In Angola and Portuguese Africa the horse must not have prospered; besides, the haughty Portuguese did not come to introduce a riding animal. In the Cape area, after several difficulties, the horse was well established, at first with Persian stock,[104] later improved with English thoroughbreds. From there on, breeding was further advanced in the highlands toward the north, and even the Kaffirs have adopted the horse here and there after initial opposition.[105] The horse is connected with the dreadful disruptions of the Zulu war, in that

Dingiswayo, the teacher of Tshakas, the first Zulu king, as heir apparent rode the first horse into his homeland around 1800.[106] But even in the highland of Transvaal from time to time the horse herds were more than decimated by devastating diseases. Whereas the horse maintained itself in the dry Northwest of India in the same relationship as in Western Asia, in the hot humid South it did not prosper at all, and thus horses became an important trade article from Persia and Arabia into southern India by the time of Marco Polo. Because the horse maintained itself so poorly and common oxen are too slow and clumsy for carrying people, a rare trotting variety of dwarf cattle was developed as a substitute for the horse. In southern India even Englishmen travel with them. . . . In places within northern Asia the horse is the most important animal of the nomads, (for example, the Kirghiz), and, of course, the use of horse milk, as it usually occurs nowhere else. Towards the north where cold increases the horse appears stunted in size; however it remains a strong and lively animal. Recently in the forested area of northern Siberia the horse seems to be gaining more headway. Since the Tungus people descend to the Amur River where their reindeer herds suffer losses from severe diseases, they perforce prefer the horse. Thus the horse-Tungus have become a special division of a widespread people. In China the horse is small in size and from our viewpoint is not highly regarded. Nevertheless, the Chinese associate it with luxury and especially in the sense of a wicked ruler concerned with horses and dogs instead of the welfare of the people. It might be that mandarins [public officials] successfully called attention to the Chinese public mind that the horse might really be a foreign animal related to enemy barbarians.[107] I would place little or no importance on this. A fable of apparent Chinese origin of a breed of white horses that under exertion perspired blood was lately understood by a very natural but improbable explanation. It was a question of a parasitic worm that penetrated the small outer veins of the horse's hide.[108] It can be imagined that the same occurred for every white horse. . . . Conditions [caused by] overexertion can give rise to high blood pressure. Japan, as well as the Liukiu [Ryukyu] Islands possesses a breed of ponies, all strong animals. In Indochina the horse has often declined in importance; however, here there are small but strong horses that are used either as pack or riding animals. On the islands [of southeastern Asia] horses are likewise small but useful animals; they prefer the eastern or drier parts, Java for example, and extend as far as Timor. An attempt should be made to introduce these animals that are accustomed to a tropical climate into East Africa. Spaniards encountered no horses on the Philippines; they were later introduced into China and Mexico.[109]

Horses arrived in Australia soon after European settlement. Because Bombay was the colony that lay nearer [to Australia] than the motherland [England], Persian stallions were introduced from there. The Australian horse has acquired a certain elegance. As in Australia, the horse arrived in New Zealand soon after its settlement. It was introduced at various times into several Pacific oceanic islands[110] and because of the want of European influence in Melanesia it naturally failed there. On none of the islands did it play a significant role with the exception of Hawaii. Only there has the pony breed developed; there it is intimately associated with the life of the natives. For them riding is the only way of movement on land and unfortunately often the only occupation.

The [occurrence of native] American horses has often been disputed, especially in France.[111] The question is: did the horse exist there or not when the European discoverers arrived? The question for America is peculiar in that it is entirely obvious—paleontologically speaking—that horses did exist here a short time ago. Teeth and skulls of such horses have been found in the Pampas [of Argentina]. Now the question remains: were these animals entirely extinct when the Spaniards later discovered America? For me there is no doubt that this is true; perhaps humans contributed to their demise. Thus the idea of using horses is not so obvious, for every group of people must find that independently.

Unfortunate attempts at colonization and the careless economies of the Spaniards immediately gave horses the opportunity to go wild and thereby encounter a characteristic place in relation to the original inhabitants. This happened first, and quite early, in the Pampas of Argentina, and a second time in North America. Herds of feral horses pushed slowly out of Mexico towards the north and east into nearby Texas, and thus as [Indian] hunters made contact with them, they changed to a riding [mounted] people. It is doubtful that any of the nomadic Indians of North America adopted a herding economy. They were and remained hunters and practiced in various degrees some agriculture. But in hunting and in warfare they

made use of the widespread abundance of horses, and to this end captured wild [or feral] horses from the herds. I do not believe that the Indians bred horses in any part of North America; perhaps that was better developed in South America. The Pampean Indians appear to have developed a kind of domestication which was transmitted [to others]. [The development of] an actual breed, however, is indeed something else. Around 1800 even the Spaniards hardly practiced any breeding, but mostly caught wild animals. They utilized the herds only to this end and sometimes for their hides. Often they shot them for fuel![112] Indians also used horse meat. Furthermore I do not believe that anywhere did any folk groups invent riding independently. "Barbarous" Europeans or descendants of Europeans, who seldom fail to be in outer areas, probably became the teachers of this skill and perforce gave rise to riding in one tribe after the other.

Europeans brought the first horses to Santo Domingo on Columbus' second voyage.[113] Apparently the animals reproduced without difficulty and in significant numbers, so that needs were soon satisfied. Horses were taken on many unfortunate expeditions on which apparently many were lost; thus in 1538 De Soto took along 218 horses to Florida, [114] [all being lost]. The great influence of horses on the Spanish Conquest is well known. Therefore I shall now consider first the subject of Mexico and Peru. But because the Spaniards through experience knew so well the influence of horses on the original inhabitants, horse breeding and the care for horses was treated with distinction; that is something which one must admire the Spaniards for. Díaz de Castillo, for example, furnished 17 horses which Cortés took with him to Mexico, all with names and personal descriptions.[115] Usually greater care and treatment was given horses than all the men taken together; that is indeed quite clear. But Cortés found himself in a well cultivated, rich and open land. Other expeditions traversed dense, almost uninhabited virgin forests. For example, how did Philipp von Hutten on his expeditions against the Omaguas bring his horses over the frightful road from Venezuela almost to the Amazon and back to the sea? One cannot think of the suffering of the adventurers without revulsion and understand that whenever maize was found, they preferred to feed the horses rather than themselves. Naturally such occurred only in the first period [of discovery]; as soon as the horses began to reproduce, these [difficulties] ceased; indeed, the waste and raw exploitation became as bad as always. Now, the horse plays a large role in all of Spanish America, in Mexico as in Peru, in Chile as in Argentina, but perhaps it is more the animal of luxury than actually a factor in the economy.

Southerly[116] remarks that horses in Brazil came from the Cape Verde Islands. In 1534 Mendoza brought horses to the La Plata area. As is well known the expedition failed and the survivors pushed on into the interior to Paraguay. Even at that time feral horses from other failed expeditions came together to form enormous herds that filled the entire area of the open Pampas. There, the Indians very quickly learned to ride. Already in 1585, 44 years after the conquest of Chile, we encounter Araucanians with horses.[117] In 1641 the Abipon were riding horses, the first to do so among the natives of Paraguay.[118] In 1740 Byron[119] found Patagonians on the Strait of Magellan mounted in part, but the Yaghans were still pedestrians,[120] and by the beginning of the nineteenth century they were learning to ride. In a relative sense, as one becomes more European, it [the horse] is usually considered a useful animal, as we do; perhaps, of course, [it may be considered] only a luxury animal, whereas the characteristic work animal is very often the mule. In contrast, in Portuguese America the social position of the horse does not appear to be so high; there the mule serves for both work and luxury. In Anglo-America the horse has the very same position as in Europe, but in early Spanish America perhaps the Iberian extensive economy still prevails. In part wild horses still appear to thrive in the prairies. At first the French had trouble in introducing the horse in Canada, where extreme winter cold could not be endured. Later they succeeded. Apparently the horse did not extend far into the lake country of the North, so that here in summer water transport on the large lakes and river courses and in winter travel by human power and dog sleds must occur. However, Franklin encountered horses at 52° 30' N. lat. in the Hudson Bay area.[121] In 1848 the horse was still new on Lake Athabasca.[122] The attempt once made in Greenland in 1728 to penetrate the inland icecap with horses is something of a curiosity; naturally, it was a case again of a failed expedition that was seeking the Eldorado of Greenland, the Osterbygd.[123]

NOTES

1. On Equus Prshewalsski, which I mentioned further along in the section on feral horses at the conclusion.

2. Ed. note: For a more modern treatment of the camel in the Near East see M. W. Mikesell, Notes on the Dispersal of the Dromedary, *Southwestern Journal of Anthropology*, vol. 11 (1955), pp. 231-45. Mikesell suggests southern Arabia as the likely place of domestication of the one-humped camel and that it was used initially as a pack animal, later for riding.

3. Beyträge zur Kenntnis des russischen Reichs, St. Petersburg, 1786, II, 290.

4. Reisen in verschiedenen Teilen des russischen Reichs, St. Petersburg, 1771, I, 272.

5. von Maltzan, Reisen auf der Insel Sardinien, Leipzig, 1869, 524.

6. Dr. Schunke, Globus LIV, 1888, 86.

7. De gentibus septentrionalibus Romae, 1555, fol. lib. II c. 23, p. 84.

8. L. Akerblom, Insel Oeland, Lubeck 1889, Festschrift der Geographische Gesellschaft zu Lubeck, p. 8.

9. Pallas, Zoographia Rosso-asiatien, St. Petersburg, 1811 I, 257.

10. Cetti, Naturgeschichte, I, 41.

11. Reise auf der Insel Sardinien, Leipzig, 1869, 524.

12. Topographia veneta, Venice, 1787, I. According to Joh. Beckmann, Physikal-okonomiche Bibliotek, Gottingen, 1788, XV, 303.

13. C. Freytak, Haustierrassen, Halle, a/s, 1874/77, 51.

14. Faune de la Grece, Athens, 1878, 16.

15. Denkwurdige Reisen, Amsterdam, 1678, fol. 62 u.s.w.

16. Z. B. E. v. Martens, Zoolog. Garten, III, 1862, 10.

17. Labat, Nouveaux voyages aux îles français de l'Amérique, La Haye, 1724, II, 245.

18. Schäff, Sitzungsberichte d. Ges. naturforsch. Freunde, Berlin, 1890, 167. The colt with a human-like face was such that it was mentioned by Lycosthenes, Chronicon prodigiosum, Basel, 1557, fol. 437. The farmer to whom it was born immediately beat it to death.

19. In der Ausgabe von Yule, London, 1875, II, 326. "Non nascitur nisi roncinus parvus cum pedibus et cruribus tortis."

20. C. von Siebold, Hipparion auf den Jahrmarkten, Arch. für Anthropologie, XIII, 1881, 427.

21. Cases with two toes on the hind foot: M. Martin, Description of the Western Islands, London, 1703, 40. Bellonius, Observationes lat per Clusium, Antwerp, 1589, lib. I, cap. 53, p. 127; a case of only one foot with an extra toe supplied by Isbrandi de Diemerbrock, Opera omnia anatom. et medica, Ultrajecti, 1685, fol. I, 171; after B.v.H. (Joh. Beckmann), Vorrat kleiner Anmerkungen, Göttingen, 1795, 123. See also Struthers, Edinburgh New Philosophical Journal, n.s. XVII, 1863, 279.

22. Plinius [Pliny], Hist. nat. VIII, 42 (64). Solinus, Collectaea rer. memorabil, c. 45, 10. Antigonus Carystius, Historia mirabilium, c. 72, ed. Beckmann, Leipzig, 1791, 121. Sueton, I, c. 61. Spanheim, De praestantin numismat, diss. 3, Amstelod, 1671, 246-249.

23. Sueton ed. Burmann, Amstelod., 1776, II, notae 172, tab. IV, no. 3.

24. According to Azara, Essais sur l'histoire naturelle des quadrupèdes de la province de Paraguay, Paris, IX, 1801, II, 333, all these curly horses had small hoofs, like those of mules.

25. Colmarer Chronik, Mm. Gg. Script, t. XVII, 208

26. Fred. Cuvier, His. naturelle des massifère.

27. Fitzinger wished to make a separate breed of these. Sitzungsberichte Akad. Wien, math. naturw. Kl. 1858, XXXI, 138. Otherwise, Praetorius, Zool. Gart. XXII, 1874, 86; those with black hide from Turkestan: Zool. Gart. XXII, 1881, 28. Leipziger Illustr. Ztg., 5 Marz 1892, 256 (a wooly horse, ibid., 28 Jan.); in 1798 a hairless horse in the veterinary school in Berlin; J. G. Naumann, Pferdewissenschaft, Berlin, 1800, 23, 24.

28. S. S. Godron.

29. Pallas, Zoographia Rosso-asiatien, St. Petersburg, 1811, I, 258; such animals were especially valued in Russia.

30. Pallas, Reisen in verschieden Teilen des russischen Reichs, St. Petersburg, 1773, II, 130.

31. Such an animal was in Berlin in 1857. A. von Schlieben, Pferde des Altertums, Neuwied, 1867, 78.

32. Arundell, Discoveries in Asia Minor, London, 1834, II, 121.

33. Daubenton, with Buffon, Histoire naturelle générale, Paris, 1753, IV, 281.

34. A. Waterton, Essays on Natural History, 2 ser., 161, based on Darwin I, 56.

35. (Ol. Wormius) Museum Wormianum, Lugd. Bat. 1655 fol., 341.

36. I have recently seen here a biased case.

37. Voyages dan l'Amérique méridionale, Paris, 1809, I, 379.

38. Otto Müller, De antiquit. Antiochenis, Göttingen, 1838/39, Tab. II.

39. Von Tschudi, Peru, St. Gallen, 1846, I, 201.

40. Karte des Elsäss von Dav. Speckle, 1576, nach Grad. Bulletin de la Société d'Histoire Naturelle de Colmar, 12 und 13 année, 1872, 224. Helisaeus Roesslin, Des Elsäss Gelegenheit, Strassburg, 1593, 21. Marryat, The Children of the New Forest, in Linnaeus, Fauna suecia, Holmiae, 1746, 12.

41. See appendix no. 9.

42. J. P. Falck, Beyträge zur Kenntnis des Russischen Reich, St. Petersburg, 1786, II, 290.

43. Hohberg, Georgica curiosa aueta, Nürmberg, 1695, fol. II, 135.

44. Travels in interior of Africa, 2nd. ed., London, 1799, 104.

45. Proyart, Geschichte vom Loanga, Leipzig, 1777, 31.

46. Beschryving van de Caap de goede hoop, Amsterdam, 1727, fol. I, 193.

47. Bell of Antermony, Travels, Glasgow, 1763, I, 212. Pallas, Reisen in verschiedenen Teilen d. russischen Reichs, St. Petersburg, 1771, 1773, 1776, I, 210; II, 642; III, 511. Pallas, Zoographia Rosso-Asiatien, St. Petersburg, 1811, I, 260.

48. Prshewalssky, Reise in der Mongolei, Jena, 1877, 280.

49. Mallat, Les Philippines, Paris, 1846, II, 153.

50. Zoologischer Garten, XXX, 1889, 113; XIII, 1872, 319.

51. Garcilasso, Hakluyt Society, London, 1871, II, 467.

52. Nouveaux voyages aux Iles d'Amérique, La Haye, 1724, II, 245.

53. "Vermin" Sedgewicke in Bridges, Annals of Jamaica, London, 1701, fol. I, LVIII.

54. Hans Sloane, Voyage and Natural History of Jamaica, London, 1701.

55. Falkner, Beschreibung von Patagonia, Gotha, 1775, 57.

56. Voyages dans l'Amérique méridionale, Paris, 1809, I, 374. Essai sur l'Histoire Naturelle, des quadrupèdes du Paraguay, IX, Paris, 1801, II, 298.

57. Wolff, 60.

58. Letters and notes on the North American Indians, London, 1841, II, 57.

59. Of 100 there are about 80 bay-colored and chestnut brown with reddish tint, 20 dark brown and about one in 2000 jet black or coal black. Azara, Essais, II, 306.

60. Scharf, History of Maryland, Baltimore, 1879, II, 7.

61. Reisen in Tibet, Jena, 1884, 25.

62. Maltzan, Reise auf Sardinien, Leipzig, 1869, 521.

63. In Recueils et mémoirs publiés pour la Société de Géographie, IV, 1839, 369. Zeitschrift der Gesellschaft für Erdkunde zu Berlin, XX, 1885, 228.

64. Reisen, see page 178, I, and 315ff.

65. Ilias, XIII, lib. IV, epist. I.

66. Mallat, Les Philippnes, Paris, 1846, I, 153.

67. Advers, Jovinian, II, c. 7.

68. Burckhardt, Beduinen und Wahaby, Weimar, 1831, 196.

69. p. 277.

70. Sam. Kiechel, Reisen, Stuttgart litt. Cerein, v. 86, 1866, 103.

71. Bell of Antermony, Travels, Glasgow, 1765, I, 15.

72. Raffles, History of Java, London, 1811, I, 97.

73. Du Halde, Beschreibung des chinesischen Reichs, I, 14.

74. de Moussy, Description de la confédérat argentine, Paris, 1864, II, 68.

75. Gregoire, on Oliver de Serres, Théatre d'agriculture, Paris, 1903, I, 158.

76. Guinnard, Trois ans d'esclavage chez les patagons, 2nd. ed., Paris, 1864, 165.

77. Michel Montaigne, Journal du voyage, Rome, 1775, III, 242.

78. Six months in Mexico, 2nd. ed. London, 1825, I, 239.

79. Du Cange, s.v. equi derumenti, "equos vestros turpi consuetudine detrucatis, mares fumlitis, aures capulatis, verum etiam et surdos redditis (by cutting, off the ear!) caudas amputatis et quia illos illaesos habere potestis, hoe nolentes cunetis odibiles redditis."

80. Camerarins, Horae subeisivae, Francof, 1602, I, 167.

81. Ol. de Serre, p. 551 (vol. I).

82. von Tschudi, Peru, St. Gallen, 1846, II, 32.

83. Sahara und Sudan, Berlin, 1881, II, 584.

84. According to Strabo, 1, XV, c. I, #6, Müller, p. 585, Megasthenes contended that the

Scythians had overrun all of Asia and were first stopped by the Egyptians.

85. Zimmer, Altindisches Leben, Berlin, 1879, 294.

86. Joachim Menant, Glyptique oriental, Paris, 1882, I, 79, Fig. 38.

87. In the British Museum; de Mortillet, Origines de la chasse, peche et l'agriculture, Paris, 1890, 394.

88. Babylonien und Assyrien in Oneken, Allgemeine Geschichte in Einzeldarstellungen, I, 2, Berlin, 1885, 195.

89. Brugsch, Geschichte von Ägypten, Leipzig, 1877, 273.

90. Histoire de l'art égyptienne, Paris, 1879, 403.

91. Springer, Leben des Mohammed, Berlin, 1862, III, 111.

92. A. v. Kremer, Kulturgeschichte des Orients unter Chalifen, Wien, 1875/77, I, 54, 56.

93. Beduinen und Wahaby, Weimar, 1831, 345.

94. *Ibid.* 7 und 56.

95. Burckhardt, Reisen in Syrien, 1823, I, 198.

96. Burckhardt, Reisen in Arabien, Weimar, 1830, 327-28, 587.

97. Burckhardt, Beduinen, 152.

98. Wellsted, Travels in Arabia, London, 1838, I, 303.

99. Rawlinson, on Herodotus IV, 159 in his edition, London 1862, III, 112.

100. Geschichte der Galla, Berlin, 1893, 20.

101. Transactions of the Entomological Soc. of London, 2nd. ser., vol. V, 1858-61. Proceedings, p. 119 a table thereon is made accountable.

102. Helps, Conquest of America, London, 1855, I, 53.

103. Maffei, Histor. indicarum, libri XVI, lib. I, Viennae Austraiae, 1751, fol. 15.

104. Theat, Hist. of South Africa (I), 1486-1691, London, 1888, 539.

105. Gardiner, Narrative of a journey to the Zoolu country, London, 1836, 246.

106. Theat, Hist. of South Africa (III) 1796-1854, London, 1891, 294. [The horse] first came to Damaraland in 1830s with Captain Alexander. Buttner, Hinterland von Walfischbai, in Sammlung von Vortragen von Frommel u. Pfaff, XII, Heidelberg, 1884, 238.

107. Pauthier, China, prèmiere partie: histoire, Paris, 1837, 84; in *L'Universe*: Asie, I.

108. Piètremont, Chevaux, Paris, 1883, 29.

109. Antonio de Morga, History of the Philippines, Hakluyt Soc., London, 1858, 276.

110. In 1673 on the Marianas, De Gobien, Hist. des îles marianes, Paris, 1700, 202.

111. Piètremont, Les chevaux dans les temps prehistoriques et historiques, Paris, 1883.

112. Azara, Essais sur l'histoire naturelle el des quadrupèdes de Paraguay, Paris, IX, 1801, II, 300. That is, they cook with the bones and use the tallow as their hearths, as Herodotus related about the Scythians.

113. Navarrete, Relation de quatre voyages de Colomb, Paris, 1828, II, 480.

114. Conquest of Florida, Hakluyt Society, London, 1851, 25.

115. Díaz de Castillo, Geschichte der Entdeckung von Neu-Spanien, Bonn, 1838, I, 69-70.

116. History of Brazil, London, 1810, I, 318.

117. Fonck, Zeitschrift für Ethnologie, 1870, II, 285.

118. Dobrizhoffer, Geschichte der Abiponer, Wien, 1783, III, 11.

119. Voyage around the World, London, 1767, 47.

120. Falkner, Beschreibung von Patagonia, Gotha, 1775, 138.

121. Narrative of (I) Journey to the Polar Sea, London, 1823, for example see pp. 113-115.

122. Richardson, Arctic Searching Expedition, London, 1851, II, 30.

123. Nordenskjold, Gronland, Leipzig, 1966, 114.

Animal Domesticates and the Forms of Human Economy (After Eduard Hahn)[1]

Alfred Hettner (1897)

[Translated from a critique of Hahn's *Die Haustiere* written by Alfred Hettner in *Geographische Zeitschrift*, vol. 3 (1897), 160-166.]

The geographical distribution of domesticated animals is a theme of great geographical interest, for in many parts of the world animal domesticates have almost wholly supplanted wild mammals and make up an important element of the landscape. The manner of their occurrence or absence is of the greatest significance for economic life and human nourishment, as well as for the condition of commerce. Moreover, they are by no means evenly distributed over the earth. Today, to be sure, the variations in their distribution are less than those of general culture manifestations, although the camel and the reindeer have a peculiarly limited distribution. However, this cosmopolitanism of most animal domesticates was first brought about during the period of the Great Discoveries through the spread of Europeans over the earth. Prior to this time, areas of the world had exhibited great differences in their endowment of domesticated animals;[2] this is partially associated with their diversity of cultural development. The natural scientists—the top men like Nathusius and Darwin—have been much concerned with the origin of races of animal domesticates. Culture historians (I recall here only [Victor] Hehn's fine book on domesticated plants and animals in their spread from Asia to Europe) have investigated the origin of domesticated animals and their spread within the culture realm of Asiatic-European peoples, through the aids of linguistic and historical research. Nor have geographers neglected the domesticated animals; however, a comprehensive geographical treatment has been lacking up to this time, and consequently we should welcome with joy the present book, so rich in facts and ideas. It is, of course, not a book whose results science can consider lightly; on the contrary! In spite of the extraordinarily copious data, which are compiled from old and most ancient sources (more than from more recent ones), there are few books that are so subjectively written. Simple "enthusiastic" propositions are much advocated in place of demonstrated expositions. Also all of the ideas are not as new as the author makes out, in his enthusiasm of discovery. However, the book contains a number of very noteworthy ideas which I would like to report to the readers of the *Geographische Zeitschrift* in more detail than was possible in the short review. [This review was published in *Geographische Zeitschrift*, vol. 2 (1896), pp. 540-541.]

An important contribution of Hahn's book seems to me to lie in the vivid clarification of some difficult problems which presents in a comprehensible manner the process of animal breeding [domestication]. One has generally regarded the occurrence of the animals in question only in their wild state (which still is but a condition of breeding), and has accepted the process of domestication itself very much as somewhat self-evident; whereas great difficulties lie in exactly this [problem]. One must distinguish between captured or tamed animals and those that are bred or truly domesticated, which reproduce in captivity and thereby in the course of generations acquire new characteristics; which phenomenon rests on the effect of captivity and breeding by man and which one can therefore designate as a characteristic of domesticated animals. Captured and tamed animals are found among many peoples, and even more so among the lowest of primitives. For the most part such animals afford no economic use,[3] but are only pets used to give vent to both affection and cruelty. The number of true animal domesticates is very small; it is a definitely small animal association, which has remained almost the same since ancient times, and has maintained only slight growth. This condition rests really on the difficulty of breeding. In the lower culture stages, mainly within nomadic life, as led by most hunting and fishing folk, it is

often extremely hard to obtain sufficient food for sustenance, and naturally still more difficult to care for captured animals in the presence of continual hunger and other dangers. Thus tamed animals are easily lost. Furthermore, captured animals, for reasons unknown, reproduce with great difficulty in captivity. Even in our zoological gardens it is difficult to get animals to reproduce, and it must be much more difficult for primitives. (With Nathusius and Darwin, Hahn holds as probable, and refers to it repeatedly, that reproduction may have taken place originally through hybridization, that is, through crossbreeding of two related species). But reproduction in captivity must first precede the origin of true domesticated animals with acquired characteristics. The motive for breeding [domestication] presents a third problem. Today we keep most of our animal domesticates because of their economic utility. According to Hahn, however, this economic utility was for the most part entirely absent originally, since utility is based not on any original characteristics of wild animals, but on acquired characteristics of domestication. Chiefly that is true of milk from cattle and other milk-producing animals. (A cow that is not bred for milk will not permit herself to be milked and even has scarcely enough milk for her calf). It is also true of wool from sheep, which first gradually took the place of ordinary hair. Therefore animals could not have been domesticated chiefly for economic reasons; economic utility came about only later. The original motive for true animal breeding has been, rather, according to Hahn, a religious one; the breeding of animal domesticates, as we shall see later on, grows out of a definite religious concept, and therefore is limited to a definite area of culture. Herein lies, as it appears to me, the significant geographical result of Hahn's exposition. For the development of animal domesticates the presence of any given animals in the wild state matters little, for domestication by no means takes place in their entire area of distribution; and many animals, which might have been bred just as well as the domesticated ones, remain wild. Breeding is, rather, closely associated with a definite relationship to cultural development; it takes place independently only in a few places and from these it has spread gradually throughout the world. The distribution of animal breeding, therefore, may serve as new evidence especially for Ratzel's interwoven theory that most culture traits may have been acquired, not many times, but only once and from one place, and from there, through human migrations and trade, may have a spread into their present areas.

In any case the oldest animal domesticate is the dog. Originally it was only a parasitic companion of the campsite and of the women; attracted by the camp fires, the dog voluntarily associated itself with man. Gradually it became a camp and hunting companion of the men, a watchdog for the campsite and in some places of individual hearths, a transport animal, and here and there an animal used for food. Already in ancient times it had spread with man over the earth, for we find it outside the Old World, not only in America but also in Australia, where it is lacking in the wild form.[4]

If one disregards their spread since the Age of Discoveries, all other animal domesticates have a limited distribution; thus they are a recent possession [of man], first acquired after the dispersal of mankind over the earth. The mainland of Australia did not have any animal domesticate other than the dog. America had only a few domesticated animals, which are quite distinct from those of the Old World. Also the border [coastal] areas of the Old World are poor in animal domesticates; the greater number of them decidedly belong, rather, to the Asiatic-European culture belt that passes through the center of the Old World; and these [animals] have spread partially into the northern and southern border areas. Disregarding the dog, no doubt we have to consider cattle as the oldest animal domesticates. Starting from Bastian's ideas, Hahn believes that the first domestication and breeding of cattle can be explained only through religious concepts, and advances the frequent connection of cattle with mythological concepts. The similarity of [the shape of] their horns with the crescent moon has made them [cattle] a sacrificial animal for the moon, the goddess of fertility. Since the wrath of the goddess was often manifested in the sudden occurrence of lunar eclipses, one always must have on hand these sacrificial animals; for that reason one keeps them captive and thus gradually they become accustomed to captivity and there begin to reproduce. Slowly man may have become attracted by the milk, which first served only as an offering, but afterwards it may have become utilized economically in ordinary life. Then the sacred animals were hitched to holy carts which carried the image of the goddess; for carts also may have been used not until later as an implement of everyday life; they were first used to transport royalty and as war chariots, only later as vehicles for travel and carrying freight.[5]

Finally plows were also utilized for religious ceremonies (for the plow, developed from the hoe, represented the phallus, which tears open the womb of the Mother Earth in order to bring about fertility), and field agriculture may have proceeded from this ceremony. With these religious beginnings of field [plow] agriculture is connected the customary castration of bulls harnessed in front of the plow. Thus, according to Hahn, the economic utilization of cattle developed gradually from their use as sacrificial animals. He believes that this whole process took place in Mesopotamia, and for that very reason it may be the oldest culture area. From there cattle as domesticates gradually spread over the entire area of Asiatic-European culture and beyond to neighboring primitives. Many uses [of cattle], however, may have been left behind, for on the one hand the use of milk is lacking in East Asia and India, and on the other hand the use of the plow is unknown in Africa south of the Sahara (with the exception of Abyssinia, the culture of which was received from Arabia). After cattle breeding, once the value of animal domesticates was learned and an understanding of their breeding had been gained, man took to breeding other animals. The breeding of most animal domesticates, chiefly sheep, the goat, swine, the donkey, and the camel, as well as a number of fowl may have taken place approximately in the same area [as cattle]. The domestication of other animals like the horse by neighboring people of the Turanian steppe or the reindeer by northern nomads, at least appears to lead back to this area [Mesopotamia] from which stimulation took place; and properly speaking, only the domestication of the llama and alpaca and a few other animals might be wholly independent of it.

With these varying concepts of the origin of animal domesticates is closely connected the commonly divergent notions of human forms of economy.[6] According to the common notion, the stage of nomadic livestock herders follows that of the hunter and fisher, and then after these that of the farmer. This concept, however, thereby implies that our agriculture (especially through sedentary settlement, which it [such agriculture] imposes upon the farmer), is a higher economic form than the nomadic herding of steppe people of Inner Asia, and that its penetration into the latter signifies cultural progress. However, it overlooks entirely the difficulties which are associated with original animal breeding, and which, as we have seen, are so serious that wandering hunting peoples have found it impossible to overcome them. It overlooks also that apart from the dog, cattle are the oldest of domesticated animals, that we find among nomadic herders not cattle but sheep and goats, besides the horse and camel. And it also overemphasizes the economic independence of the herder, who, with few exceptions, does not live exclusively from the products of his flocks, but either cultivates some crops or obtains plant foods from neighboring farmers, like the Mongols [who get] tea bricks and millet from the Chinese. Thus cattle breeding cannot be older, but must be younger than planting. Only after the cultivator of plants had learned to breed animals could herding people, who live entirely from livestock breeding, develop.

However, the origin of field agriculture is more complicated than we commonly think. In our ordinary farming there are three different associated elements: the sowing of small grains, the use of the plow, and the employment of the ox as a draft animal. These three elements cannot have fallen down together from Heaven, but could only be acquired one after the other and slowly fused. It is now evident that a widespread planting culture which without the help of oxen or draft animals generally was carried on with the hoe instead of a plow. It is a planting culture with an entirely different position which therefore must be carefully distinguished from true field agriculture. Hahn suggests the name *Hackbau* [hoe culture] for its primitive lower form; when it is carried on intensively with the help of artificial irrigation and fertilization, the name *Gartenbau* [garden agriculture]; when pursued under European management and capital with world trade as an aim, the name *Plantagenbau* [plantation agriculture].

The picture of the economic development of mankind therefore assumes form in the following manner. In primitive times we must imagine men as simple gatherers, chiefly of seeds and fruits, for hunting and fishing already assumes a certain development—the preparation of tools, etc. Hence there develops accordingly hunting, fishing, or a primitive type of planting culture (Hackbau); by way of casual observation it was easily shown that buried tubers afforded a new plant. Only a few peoples totally lacked planting. The main root plants cultivated by hoe farming, such as manioc, yam, sweet potato, taro, etc., but also individual grains such as maize, rice, durra, millet, and others, play a part in such cultivation, and counter to our schematic concept, we find in it also the banana and other fruit trees. Domesticated animals do

not form an essential part of this economy and are not utilized in the working of the soil; but quite frequently the pig, the goat, chicken and the duck, and others are included in it. Today hoe cultivation occurs especially in the tropics, but formerly it had a wide distribution in the northern temperate zone. In Europe and in northern and central Asia millet appears to have formed the main crop in this hoe cultivation; for O. Heer found millet in pile dwellings in which the plow and ox are still lacking. The disjunct distribution of present-day millet cultivation, which we find only in economically backward areas and only in small plots, can be explained only through a recessive [relict] condition; and it is also significant that the Mongols even traded millet from the Chinese.

If we disregard plantation agriculture, which economically is but a subtype of hoe culture, two distinct economic forms derive from hoe cultivation: garden agriculture and field [plow] agriculture. Garden agriculture derives from hoe culture through the increased intensity of cultivation with growing density of population, so that quite gradual transitions unite the former with the latter.

The two forms coincide in that in both work is not performed by animals, but by men; however, the two are distinguished in that garden agriculture is characterized by careful cultivation of the soil, through the application of fertilizer, especially human manure, and through artificial irrigation, which makes it independent of the vissicitudes of the weather and thereby marks it as the highest form of economy. The number of cultivated plants is very large; however there is only one grain closely connected with garden cultivation—rice. Among animal domesticates chiefly the pig, chicken, and duck are associated. We find garden agriculture of rather minor importance among us, where the hoe has recently been replaced by the spade; it is the predominant economic form in a few districts of the Mediterranean area, as the vegas of Spain and the garden landscape of Italy, but it takes on its full importance principally in southern China and in Japan. Before the Spanish conquest it was also predominant in the areas of ancient civilization in America.

Field agriculture has developed in an entirely different direction; it is characterized mainly by the predominant cultivation of the small grains, the substitution for the hoe of the plow, and, related to this, the use of work animals. The origin of field agriculture, as we have learned, is closely connected with the breeding of cattle, and includes thereby also a religious motive. Also it apparently took place in the lowland plains of Babylonia. From here, as Hahn believes, plow agriculture, at a very early period in a powerful religious revolution, spread triumphantly over the entire world that was known before the Age of Discovery, pushing hoe-culture before it. The oldest grain of plow agriculture apparently was barley, having displaced millet and other plants characteristic of hoe culture; soon wheat, rye, and oats followed. Apparently the oldest field agriculture, within its place of origin [Mesopotamia] was displaced by artificial irrigation; this latter technique was given up as man passed into wetter areas. We find field agriculture still in northern China, where, however, the use of milk is lacking, and in northern India; in contrast, it has not penetrated into southern China and Japan and into the tropical area of India. Cattle are present in tropical and southern Africa, but plow farming did not reach this area, for here cattle are considered only as property, not as an element in the economy; for, according to Hahn, field agriculture, contrary to what we proudly believe, is not the highest form of land economy, but stands below Chinese and Japanese garden culture, which is independent of the weather and is able to support a denser population.

Animal breeding carried on by nomads and pastoralism apparently proceeds from plow agriculture. The possession of animals, which furnish food and material for clothing and habitations and likewise afford means of transport, makes it possible to penetrate into the steppe, which was inaccessible to the planting people. Consequently, there developed a new form of economy, which relies entirely on wandering herds and is little concerned with plant materials. But the herdsmen have never given up such materials [plants] entirely, for they have always developed trade with agricultural areas; their interest in agricultural products has become a motive of conquest which has had such a great historical significance. True pastoral life is limited to areas of Asia, North Africa, and Europe, which lie next to the region of old field agriculture. Yet in tropical and southern Africa it [pastoralism] takes on a somewhat different character. It has been transplanted to America in an essentially different form. And the intensive livestock economy of our marshes and of the lower Alps is again quite distinct.

It will be the task of further research to prove these conclusions and to pursue in detail the origin of the distribution of the different forms of econ-

omy. For example, Hahn suggests repeatedly that he does not agree with the tropical nature of plow agriculture (in the narrow sense of the word) and that hence this form could not displace hoe culture and garden cultivation in the tropics; however, he provides no thorough examination of this question, which is apparently decisive for the present distribution of the economic forms mentioned. And similar is the case with many other questions, especially problems of a special geographical nature, which concern the dependence of economic forms in other circumstances. To be sure, Hahn in the end gives economic-geographic characteristics to individual areas of the earth; but unfortunately in this case he loses sight of his true theme. Partly we get here what we expect, that is, observations on the origin of domesticated animals and their use in the economy; but frequently general politico-economic discussions take their place. Such discussion, however, might better be considered in discussion groups; moreover, [Hahn's] superficial knowledge of areas under consideration is very marked. Hahn considers the stupidity and baseness of man in the South American republics as well as in the modern development of European economic relations. I fear that his scolding of man does not make him smarter or better; however, such an attitude may cause many readers to lose confidence in the truly scientific merits of the book. And that would be a pity, for to me great books are those that stimulate, not those that give sure and final results.

NOTES

1. *Die Haustiere und ihre Beziehungen zur Wirtschaft des Menschen, Eine Geographische Studie*, 581 p., with map, Leipzig, Duncker and Humblot, 1896. (Compare the review in *Geographische Zeitschrift* vol. 2, p. 540.) The author has assembled the most important economic results in: *Demeter und Baubo, Versuch einer Theorie der Entstehung unseres Ackerbaus*, 77 p., Lübeck, privately printed (commission by Max Schmidt).

2. The present distribution of domesticated mammals is represented on a very few small general maps in *Berghaus' Physikalischer Handatlas*, Plate 60. Such a distribution for the year 1500 would offer great interest. It is much to be regretted that the author of the book under consideration did not utilize his rich collection of data to draw such a map.

3. This viewpoint, that economic utility may not be the original motive for domestication, has been emphasized also by Ratzel (*Völkerkunde*, first ed., vol. I, p. 57).

4. The dingo must be distinguished from wild forms of the domesticated dog.

5. Hahn developed his ideas on the origin of the cart earlier in *Demeter und Baubo*, pp. 30 ff.

6. A few years ago Hahn presented his new classification of economic forms including a map showing their geographical distribution in *Petermanns Mitteilungen* (1892, p. 8 ff. and plate 2). The map accompanying the present book is simply a reproduction of the earlier one; unfortunately Hahn has not executed this superficial sketch with sufficient accuracy.

3. *Otto Schlüter (1872-1959)*

Introductory Statement

Robert C. West

Otto Schlüter established the methodology of settlement geography in Germany and, like many of his contemporaries, advocated the idea that the region or area is a fundamental object of study, especially for anthropogeography. He based much of his early thinking regarding the study of settlement on August Meitzen's previous work, but in geographical methodology was also stimulated by his teacher, Ferdinand von Richthofen. Schlüter first expressed his concepts on region and settlement in his methodological essay "Bemerkungen zur Siedlungsgeographie" [Remarks on settlement geography], published in 1899 in the *Geographische Zeitschrift*. Rejecting environmentalism as the main focus of cultural geography, he limited the material significant to geographical study to observable objects in the landscape, as indicated in the following translation (pp. 66-67):

> A science cannot be based on a concept of influences . . . [rather] like physical geography, anthropogeography must proceed from the consideration of concrete phenomena and [one] must try to understand [explain] these phenomena from all points of view. Not what is "limited" by nature, but what belongs to the landscape falls within the area of geographical investigations. . . . What the study of geography strives for is the knowledge of form and arrangement of phenomena on the earth's surface, as far as they are perceived spatially through vision and touch. All kinds of explanation must be used for understanding these forms and arrangements of phenomena.

As both Manfred Schick and Hermann Lautensach have indicated,[1] Schlüter was not "servilely bound to the fixation on visible objects" as the only landscape phenomena worthy of geographical study, and later he dropped his insistence on the "doctrine of observable things."

Schlüter, however, insisted on a genetic or historical approach to areal and settlement study, as did Meitzen. Thus he distinguished two kinds of landscape: the *Naturlandschaft* or *Urlandschaft*, undisturbed or unaltered by mankind, and the *Kulturlandschaft*, which through human action "develops out of the natural landscape." Perhaps his best example of historical settlement geography was his last and most extensive work in two parts: *Die Siedlungsräume Mitteleuropas in frühgeschichtlicher Zeit* [Areas of settlement in Central Europe during early historical times], published 1952-58 (see accompanying bibliography). A product of years of research, Schlüter considered this treatise the culmination of his professional career.

Much of Schlüter's work in historical settlement geography was in the form of maps that he devised for atlases. With meaningful symbols and color he was able to depict various periods of settlement on a single map without compromising readability or esthetic quality. One of his students has written on his master's cartographic skill.[2]

NOTES

1. Schick, M., Otto Schlüter, 1872-1959. *Geographers: Biobibliographical Studies* (ed. T. W. Freeman), v. 6 (1982), pp. 115-122; Lautensach, H., Otto Schlüters Bedeutung für die methodische Entwicklung der Geographie [Otto Schlüter's significance for the methodological development of geography]. *Petermanns Mitteilungen*, vol. 96 (1952), pp. 219-31.

2. Otto August, Otto Schlüter, *Kartographische Nachrichten*, vol. 10, Heft 3 (1960), pp. 65-74.

Works of Otto Schlüter

[List of Schlüter's works published as of summer 1952 was taken from Arbeiten Otto Schlüters (bis Sommer 1952), *Petermanns Mitteilungen*, vol. 96 (1952), pp. 290–92. Titles of his later writings were compiled from various sources.]

1896 Siedelungskunde des Thales der Unstrut von der Sachsenburger Pforte bis zur Mündung [Study of settlement of the Unstrut valley from the Sachsenburg gate to its mouth]. Ph.D. dissertation, Univ. Halle. 64 pp.

1898 Die Grundgedanken zur Friedrich Ratzel's "Politischer Geographie" [The fundamental ideas from Friedrich Ratzel's "Political Geography"]. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, vol. 33, pp. 126-40.

____ Die Entdeckungen der Portugiesen im 15. Jahrhundert und die Auffindung des Seeweges nach Ostindien durch Vasco da Gama [Portuguese discoveries in the 15th century and the disclosure of sea routes to the East Indies by Vasco da Gama]. *Himmel und Erde*, vol. 10, pp. 512-21.

1899 Klondike im Jahre 1898 [The Klondike (Canada) in the year 1898]. *Globus*, vol. 75, pp. 59-63.

____ Bemerkungen zur Siedelungsgeographie [Remarks on settlement geography]. *Geographische Zeitschrift*, vol. 5, pp. 65-84.

____ Über den Grundriss der Städte [On the ground plan of towns]. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, vol. 34, pp. 446-62.

1900 Die Formen der ländlichen Siedelungen (nach A. Meitzen) [Forms of rural settlement (according to A. Meitzen]. *Geographische Zeitschrift*, vol. 6, pp. 248-62.

1901 Die erloschenen Vulkane und die Karstlandschaften im Innern Frankreichs [Extinct volcanoes and the karst landscape of central France]. *Himmel und Erde*, vol. 14, pp. 26-36, 122-33, 178-87.

1902 Über die Aussprache des Namens Kerguelen [On the pronunciation of the name Kerguelen]. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, vol. (1902), pp. 64-65.

____ Die Siedelungen im nordöstlichen Thüringen. Ein Beispiel für die Behandlung siedelungsgeographischer Fragen (Vortrag) [Settlement in northeastern Thuringia. An example for the treatment of questions on settlement geography. (Lecture)]. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, v. (1902), pp. 850-74.

1903 *Die Siedelungen im nordöstlichen Thüringen. Ein Beispiel für die Behandlung siedelungsgeographischer Fragen* [Settlement in northeastern Thuringia. An example for the treatment of questions on settlement geography]. Berlin: H. Costenoble, 453 pp.

1905 Das österreichisch-ungarische Okkupationsgebiet und sein Küstenland. Eine geographische Skizze [Austria-Hungary's zone of occupation and its coastland. A geographical sketch]. *Geographische Zeitschrift*, vol. 11, pp. 18-38, 99-114, 193-217.

____ Plan zur Gründung einer anthropogeographischen Zeitschrift unter dem Titel "Archiv für die Geographie des Menschen." Als Manuskript gedruckt [Plan for the establishment of an anthropogeographical journal with the title "Archive for Human Geography." Typescript]. Berlin. 27 pp.

1906 Die Siedelungsgeographie als Arbeitsfeld der germanistisch-historisch vorgebildeten Erdkundelehrer [Settlement geography as a field of study for geography teachers trained in German history]. *Geographischer Anzeiger*, vol. 7, pp. 49-52, 73-78, 97-101, 125-32.

____ Über Nation und Nationalität. (Kritik der Schrift von A. Kirchhoff, "Zur Verständigung über die Begriffe Nation und Nationalität"), Halle, 1905 [On nation and nationality. (Critique of the writing by A. Kirchhoff, "On the understanding of the concepts nation and nationality"), Halle, 1905]. *Geographische Zeitschrift*, vol. 12, pp. 528-29.

____ Deutsches Reich. (Bericht über die landeskundliche Literatur der Jahre 1903-05.) [The German Empire. (Report on regional geographical literature for the years 1903-05)]. *Geographisches Jahrbuch*, vol. 29, pp. 113-

40.

____ Die leitenden Gesichtspunkte der Anthropogeographie, insbesondere der Lehre Friedrich Ratzels [The leading viewpoints of anthropogeography, especially the theories of Friedrich Ratzel]. *Archiv für Sozialwissenschaft und Sozialpolitik*, vol. 22, pp. 581-630.

____ *Die Ziele der Geographie des Menschen [The goals of human geography]*. Munich & Berlin: R. Oldenbourg. 63 pp.

1907 Über das Verhältnis von Natur und Mensch in der Anthropogeographie [On the relationship of nature and man in anthropogeography]. *Verhandlungen des 16. Deutschen Geographentages zu Nürnberg im Jahre 1907*, pp. 304-18; also in *Geographische Zeitschrift*, vol. 13, pp. 505-17.

1908 *Ferdinand v. Richthofen's Vorlesungen über Allgemeine Siedlungs- und Verkehrsgeographie*, bearb, u. hrg. v. Otto Schlüter [Ferdinand von Richthofen's lectures on general settlement and transportation geography, compiled and edited by Otto Schlüter]. Berlin: Dietrich Reimer, 353 pp.

1909 Deutsches Reich. (Bericht über die landeskundliche Literatur der Jahre 1906–09) [The German Empire. (Report on regional geographical literature for the years 1906-09)]. *Geographisches Jahrbuch*, vol. 32, pp. 69-99.

____ Beiträge zur Landeskunde Bosniens und Herzegowins. Nach dem gleichnamigen nachgelassenen Werk von Ed. Richter [Contributions to the regional geography of Bosnia and Herzegovina. After the similarly titled and posthumous work of Ed. Richter]. *Geographische Zeitschrift*, vol. 15, pp. 642-50.

1910 Beiträge zur Bevölkerungs- und Siedelungsgeographie Deutschlands [Contributions on the populaton and settlement geography of Germany]. *Petermanns Mitteilungen*, vol. 56, pp. 7-10, 64-67.

____ Über einige neuere Werke zur französischen Landeskunde [On some new works on French regional geography]. *Geographische Zeitschrift*, vol. 16, pp. 605-18, 665-89.

____ Die französischen Landesaufnahmen im linksrheinisches Gebeit, 1801-14 [On French topographic mapping in the region west of the Rhine, 1801-14]. *Westdeutsche Zeitschrift für Geschichte und Kunst*, vol. 29, pp. 182-93.

1911 Die Erde als Wohnraum des Menschen. In: K. C. Rothe und E. Weyrich: *Der Moderne Erdkundeunterricht* [The earth as the home of mankind. In K. C. Rothe and E. Weyrich: The Modern Instruction in Geography]. Leipzig & Vienna: F. Deuticke, pp. 379-429.

1912 Zur Geschichte der deutschen Landschaft (vorläufige Mitteilung). Mit einer Kartenskizze (1:5,000,000) [On the history of German landscape (provisional report). With a sketch map, 1:5,000,000)]. *Mitteilungen des Naturforschenden Gesellschaft zu Halle a. S.*, Heft 6, 10 pp.

____ Deutsches Siedelungswesen. In: *Reallexikon der Germanischen Altertumskunde*, hrg. v. Johannes Hoops [The nature of German settlement. In: Encyclopedia for the Study of German Antiquity, ed. by Johannes Hoops]. Strassburg (1912-1918): Trübner. vol. 1, pp. 402-39. (Karte, Die Besiedlungsfläche in Deutschland um 500 n. Chr. 1:5,000,000 [Map, The settled area of Germany, A.D. 500]. In same work: Dorf [village], vol. 1, p. 482; Einzelhof [isolated farm (dispersed settlement)], vol. 1, p. 543-44; Haufendorf [village, houses irregularly clustered], vol. 2, p. 453; Reihendorf [shoestring or line village], vol. 3, p. 487; Runddorf [circular village around a central green, vol. 4, p. 5; Stadt [town or city], vol. 4, pp. 240-44; Strassendorf [linear roadside village]. vol. 4, p. 294; Weiler [hamlet], vol. 4, p. 504.

____ Deutsches Reich (Bericht über die landeskundliche Literatur der Jahre 1908-12) [The German Empire (report on the regional geographical literature for the years 1908-12)]. *Geographisches Jahrbuch*. vol. 35, pp. 422-55.

____ Die Generalisierung von Gemeindekartogrammen zu Volksdichtekarten. Bemerkungen zu dem Aufsatz von K. Closterhalfen [The generalization of community (parish) cartograms as population density maps. Remarks on the treatise by K. Closterhalfen]. *Petermanns Mitteilungen*, vol. 58, pt. 2, pp. 259-60.

____ Christian Sandler [obituary]. *Mitteilungen der Geographische Gesellschaft in München*, vol. 7, pp. 282-85.

____ Ferdinand von Richthofen: Chinas Binnenverkehr in seinen Beziehungen zur Natur des

Landes [Ferdinand von Richthofen: China's inland commerce in its relation to the nature of the land]. Address given at XIII Deutschen Geographentage am 29. Mai 1901 zu Breslau. Nach dem Tode F. v. R.s hrg. von O. Schlüter [After the death of F. v. Richthofen (the above material) edited by O. Schlüter (and published) in] *Mitteilungen des Ferdinand von Richthofen-Tages*, Berlin, pp. 1-18.

1913 Nutzbarmachung statistischen materials für länderkundliche Darstellungen (Nach Greim: *Beiträge zur Anthropogeographie des Grossherzogtum Hessen*, Stuttgart, 1912) [Useful statistical materials for regional geographical representations (According to Greim: Contributions to the Anthropogeography of the principality of Hesse)]. *Petermanns Mitteilungen*, vol. 59, pp. 68-69.

____ Anthropogeographie. In: *Das Jahr 1913, ein Gesamtbild der Kulturentwicklung* [Anthropogeography. In: The year 1913, a general picture of cultural developments]. Leipzig & Berlin: B. G. Teubner, pp. 401-06.

____ Die Erdkunde in ihrem Verhältnis zu den Natur- und Geisteswissenschaften. In: *Die Geisteswissenschaften* [Geography in its relationship to natural science and the humanities. In: The Humanities]. Leipzig, vol. 1, pp. 283-89, 310-15; also *Geographischer Anzeiger*, vol. 21, pp. 145-52, 213-18.

1914 Die geopsychischen Erscheinungen. (Nach W. Hellpach) [Geopsychical phenomena. After W. Hellpach]. *Geographischer Anzeiger*, vol. 15, pp. 1-3.

1917 Der Rosegglетscher. Ein besonderer Fall der Vereinigung zweier Gletscher [The Roseg glacier. A special case of the union of two glaciers]. *Geographischer Anzeiger*, vol. 18, pp. 124-25.

1918 Paul Vidal de la Blache [Obituary]. *Petermanns Mitteilungen*, vol. 64, p. 178.

1919 Die Stellung der Geographie des Menschen in der erdkundlichen Wissenschaft [The place of human geography in geographical science]. *Geographische Abende im Zentralinstitut für Erziehung und Unterricht*, Heft 5. 34 pp.

1920 Über Inhalt und Aufgaben der Geographie [On content and problems in geography]. *Erziehung und Bildung*, pp. 73-77.

____ Eine neue Volksdichtekarte der Rheinprovinz [A new populaton density map of the Rhineland]. *Petermanns Mitteilungen*, vol. 66, pp. 128-29.

____ Wald, Sumpf und Siedelungsland in Altpreussen vor der Ordenszeit [Forest, swamp and land for settlement in Old Prussia before the time of the Germanic Order]. *Geographischer Anzeiger*, vol. 21, pp. 245-49.

1921 *Wald, Sumpf und Siedelungsland* . . . [as above, published as book]. Halle a.S.: Max Niemeyer, 96 pp.

1923 Eine Entgegnung. (Betr. H. Mortensens Kritik an der Arbeit "Wald, Sumpf und Siedelungsland in Altpreussen") [A reply. (concerning H. Mortensen's critique of the work "Wald, Sumpf und Siedlungsland . . .)]. *Sitzungsberichte d. Altertums*, pp. 173–85.

1924 Ein Beitrag zur Klassifikation der Küstentypen [A contribution to the classification of coastal types]. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, 1924, pp. 288-317.

____ Staat, Wirtschaft, Volk, Religion in ihrem Verhältnis zur Erdoberfläche [State, economy, people, religion in their relationship to the earth's surface]. *Zeitschrift für Geopolitik*, vol. 1, pp. 378-85, 432-43.

1926 Aufbau, Gliederung und Lage des Rheingebietes. In: *Der Deutsche und das Rheingebiet*, Halle: Waisenhauses [Structure, organization, and location of the Rhineland. In: Germans and the Rhineland] [Also map included, Der landschaftsliche Zustand des Rheingebietes in frühgeschichtlicher Zeit [The landscape status of the Rhineland in early historical times].

____ Karte: Die frühgeschichtliche Waldbedeckung der Rheinlande (etwa 500 n. Chr.) 1:1,000,000. In: *Geschichtlicher Handatlas der Rheinprovinz*, hrg. v. Hermann Aubin und Josef Niessen [Map: The forest cover of the Rhineland in early history (about A.D. 500) 1:1,000,000. In: Historical Atlas of the Rhineland, ed. Hermann Aubin & Josef Niessen]. Köln u. Bonn: J. P. Bachem.

____ Die Urlandschaft. In: *Der ostdeutsche Volksboden.* Aufsätze zu den Fragen des Ostens, Erw., Ausg., hrg. v. W. Volz [The primaeval landscape. In: The east German human habitat. Essays on the question of the East (Germany), revised, edited by W. Volz]. Breslau: F. Hirt, pp. 52-66.

____ Über ein neues System der politischen Geographie (Kritik des Werkes von O. Maull

"Politische Geographie," Berlin) [On a new system of political geography (Critique on the work by O. Maull "Political Geography")]. *Geographischer Anzeiger*, vol. 27, pp. 62-66.

____ Deutsches Reich. (Bericht über die landeskundliche Literatur der Jahre 1912-26.) [The German State. (Report on the regional geographical literature for the years 1912-26)]. *Geographisches Jahrbuch*, vol. 41, pp. 212-52.

1927 Mitteldeutschland als geographischer Raum. In: *Mitteldeutschland auf dem Wege zur Einheit.* Denkschrift . . . , Hrg. von Landeshauptmann der Provinz Sachsen, Merseburg [Central Germany as a geographical area. In: Central Germany approaching unity. A memorial. . . . , ed. governor of Saxony, Merseburg], part II, pp. 17-34.

1928 Die natürlichen Grundlagen der Besiedelung Deutschlands. In: *Deutschland, die näturlichen Grundlagen seiner Kultur*, hrg. v. d. Kaiserl. Leop. Deutschen Akademie der Naturforscher zu Halle [The natural bases of settlement in Germany. In: Germany, the natural foundation of her culture]. Leipzig: Quelle & Meyer, pp. 286-301.

____ Die analytische Geographie der Kulturlandschaft, erläutert am Beispiel der Brücken [The analytical geography of the cultural landscape, illustrated by the example of bridges]. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin, Sonderband zur Hundertjahrfeier der Gesellschaft*, pp. 388-411.

____ Einheitsbestrebungen in Mitteldeutschland [Endeavors for unity in central Germany]. *Geographischer Anzeiger*, vol. 29, pp. 379-83.

1929 *Beiträge zur Landeskunde Mitteldeutschlands.* In: Festschrift, dem 23. Deutschen Geographentages zu Magdeburg dargeboten vom Ortsausschluss, hrg. [ed. by] von Otto Schlüter und Ernst Blume [Contributions on regional geography of central Germany]. Braunschweig, Berlin & Hamburg: G. Westermann. 326 pp. Articles written by Schlüter therein: Der Begriff "Mitteldeutschland." [The concept "central Germany," pp. 713, and Die frühgeschichtlichen Siedelungsflächen Mitteldeutschlands [The area of settlement of central Germany in early historical times]. pp. 138-54 and map.

____ Halle an der Saale und seine Umgebung [Halle on the Saale (river) and its environment]. *Geographische Zeitschrift*, vol. 35, pp. 210-18.

1930 Das Rheingebiet und seine geograpische Stellung. In: *Probleme des Westens.* Eine Aufsatzfolge im Auftr. d. Verb. Dt. Geschichtlehrer hgr. v. Fr. Metz [The Rhineland and its geographical setting. In: *Problems of the West.* A series of essays of the Commission for the Betterment of Historical Teaching, ed. by Fritz Metz]. Berlin: Reimer Hobbing, pp. 30-46.

____ Über die Aufgaben der Verkehrsgeographie im Rahmen der "reinen" Geographie [On the problem of commercial geography within the framework of "pure" geography]. In: Hermann Wagner-Gedächtnisschrift, Ergänzungsheft 209, *Petermanns Mitteilungen*, pp. 298-309.

____ Die Siedlungsräume des deutschen Altertums und ihre Bedeutung für die Landeskunde [The area of settlement in German antiquity and its significance for regional geography]. *Verhandl. der 23. Deutschen Geographentages zu Magdeburg* 1929, pp. 187-90.

1931 Karte: Wald, Sumpf und Siedelungsland in Elsass-Lothringen um 500 n. Chr., 1:500,000 [Map: Forest, swamp and land for settlement in Alsace-Lorraine around A.D. 500, 1:500,000]. In: *Elsass-Lothringenatlas*, ed. Georg Wolfram & Werner Gley. Erläuterungsband [Illustrated ed.], pp. 26-30 and map 7.

1932 Karte: Wald, Sumpf und Siedelungsland im früheren Mittelalter, 1:750,000 [Map: Forest, swamp and land for settlement in the early Middle Ages, 1:750,000]. In: *Atlas der Sudetenländer*, ed. Geographischer Inst. der Deutschen Univ. in Prag.

____ Karte: Die Waldverbreitung Mitteldeutschlands in Gegenwart und Vergangenheit, 1:1,000,000 [The distribution of forest in central Germany at present and in the past, 1:1,000,000]. In: *Landesplanung im engeren mitteldeutschen Industriebezirk*, Merseburg. Map volume, sheet 7.

____ Über ein neues Kartenwerk zur Kulturgeographie [On a new kind of map on cultural geography]. *Geographischer Anzeiger*, vol. 33, pp. 340-45.

____ Alfred Kirchhoff [obituary] d. 8 February 1907. In: *Saale-Zeitung*, Halle 15 Feb.

1932.
1933 Joseph Fischers Ptolemaeus-Werk [Joseph Fischer's work on Ptolemy]. *Geographiche Wochenschrift*, vol. 1, pp. 394-97.
1934 Hans Spethmanns Werk über das Ruhrgebeit [Hans Spethmann's work on the Ruhr area]. *Geographiche Wochenschrift*, vol. 2, pp. 438-41.
____ Aus der Geschichte der Kartographie [On the history of cartography]. *Nova Acta Leopoldina*, new ser. vol. 1, pp. 624–25.
1935 Die sächsisch-thüringischen Lande; Mitteldeutschland [The Saxony-Thuringian area, central Germany]. In: *Das Buch vom deutschen Volkstum; Wesen - Lebensraum - Schicksal*, ed. Paul Gauss. Leipzig: F. A. Brockhaus, pp. 232-41.
____ Die Montblancgruppe nach einem Aquarell vom Carl Ritter aus dem Sommer 1812 veröff. b. d. Übernahme d. neuen Räume d. Geogr. Sem. d. Martin-Luthern-Univ. [The mountain cluster of Mont Blanc after a water color by Carl Ritter, summer of 1812, published under auspices of Geogr. Seminar of Martin Luther Univ.]. Plate & 1 page text.
____ Karte: Entwicklung des Siedelungsräumes der Pfalz und heutiger Waldbestand, 1:300,000. [Map: Development of settlement areas of the Palatinate and the present-day forest cover, 1:300,000]. In: *Pfälzischer Geschichtsaltas* [Historical Atlas of the Palatinate], ed. W. Winkler. Plate 1 with text.
____ Karte: Die frühgeschichtlichen Wohnflächen, 1:1,000,000 [Map: The early historical living area, 1:1,000,000]. In: *Mitteldeutscher Heimatatlas*, Magdeburg. Plate 3.
____ Der Mitteldeutsche Heimatatlas [The local atlas of central Germany]. *Thüringer Fähnlein*, vol. 4, pp. 356-62.
1936 Der Mitteldeutsche Heimatatlas. (Sachsen und Anhalt) [The Local Atlas of Central Germany. (Saxony and Anhalt)]. *Jahrbuch d. Landesgeschichtliche Forschungsstelle für das Prov. Sachsen u. für Anhalt*, vol. 12, pp. 252-56.
____ Der Mitteldeutsche Heimatatlas [The Local Atlas of Central Germany]. *Mitt. d. Sächsen-Thüringischen Vereins für Erdkunde zu Halle a.s.*, (1935-36), pp. 1-3.
____ Adolf Schenck [obituary]. *Petermanns Mitteilungen*, vol. 82, p. 350.
1938 Die vor- und frühgeschichtlichen Siedlungsräume in Mitteleuropa [The pre- and early historical settlement areas in Central Europe.] *Comptes Rendus du Congr. Intern. de Géographie*, Varsovie [Warsaw], 1934. (Warsaw, 1938), pp. 15-18.
____ Die frühgeschichtliche Verbreitung von Wald und Siedlungsland in Böhmen und Mähren [The early historical distribution of forest and settlement in Bohemia and Moravia]. *Sudeta, Zeitschrift f. Vor- u. Frühgeschichte*, vol. 14, pp. 89-116.
____ Der Mitteldeutsche Heimatatlas. (Die Provinz Sachsen) [The local atlas of central Germany. (Province of Saxony)]. *Mitteilungsblatt*, vol. 7, pp. 12-14.
1940 Der Mitteldeutscher Heimatatlas. Eine neue Lieferung [The local atlas of central Germany, A new edition]. Die Prov. Sachsen, Amtsblatt d. Oberpräs., vol. 10, pp. 27-28.
1952 *Lebenslauf des ordentlichen Professors der Geographie: Otto Schlüter [Life history of a full professor of geography: Otto Schlüter (an autobiography)]. *Petermanns Mitteilungen*, vol. 96, pp. 289-90.
____ Die Siedlungsräume Mitteleuropas in frühgeschichtlicher Zeit. Erster Teil: Einführung in der Methodik der Altlandschaftsforschung [Areas of Central Europe settled in early historical times Part 1: Introduction to the method of investigation of the ancient landscape]. *Forschungen zur deutschen Landeskunde*, vol. 63, 47 pp.
____ Abderhalden und die "Leopoldina." [Abderhalden and the "Leopoldina" (Deutsche Acadeamie der Naturforscher Leopoldina)]. *Nova Acta Leopoldina*, n.s., vol. 14, pp. 147-54.
____ *Die Errichtung des Lehrstuhls für Geographie an der Universität Halle und dessen erster Inhaber Alfred Kirchhoff [The establishment of the chair of geography at the University of Halle and its first occupant, Alfred Kirchhoff]. In *450 Jahre Martin-Luther Universität Halle-Wittenberg*, vol. 2, pp. 465-73.
1953 *Die Siedlungsräume Mitteleuropas in frühgeschlichtlicher Zeit. Zweiter Teil: Erklärung und Begründung der Darstellung, I: Das südliche und nordwestliche Mitteleuropas [Areas of Central European settlement in early historical times, part 2: Interpretation and substantiation of the presentation I: Southern and northwestern

Central Europe]. *Forschungen zur deutschen Landeskunde*, vol. 74, 240 pp.

1958 *Ibid., part 2, II: Das mittlere und nordöstliche Mitteleuropas [Central and northeastern Central Europe]. *Forschungen zur deutschen Landeskunde*, vol. 110, 123 pp.

1959-61 [posthumous] **Atlas des Saale- und mittleren Elbegebietes*, 2. völlig neuarbeite Auflage des Werkes Mitteldeutscher Heimatlas [Atlas of the Salle and central Elbe area, 2nd ed., completely reorganized edition of the work Mitteldeutscher Heimatlas]. ed. by Oscar August. Leipzig: Verlag Enzyklopädie. 3 vols., 61 maps.

* Items added to Schlüter's bibliography published in *Petermann's Mitteilungen*, vol. 96 (1952), pp. 290-92.

Life History of Otto Schlüter, Full Professor of Geography

[An Autobiography]

Otto Schlüter (1952)

[Translated from an autobiographical sketch in *Petermanns Mitteilungen*, vol. 96 (1952), pp. 289-90.]

I was born 12 November 1872 in Witten-an-der-Ruhr. My father, Reinhard, who was a lawyer and notary there, came from Cleve on the lower Rhine. In the eighteenth century his forebears were authenticated forest rangers in the old border country of Altmark. My mother Berta, née Keller, was born in Hamm in Westphalia. She came from a family of eminent lawyers who became highly respected. When I was barely six years old we moved to Essen, where my father died in 1890, whereas my seriously ill mother lived in Hannover until 1899.

I received my first schooling through a private tutor. In the autumn of 1881 I transferred to the humanist high school [Gymnasium] in Essen, which I attended until [passing] the final examination, Easter, 1891. Of greater significance for my wider development was the benefit of very stimulating instruction in geography at the high school. The teacher avoided the usual dry description of the land, but acquainted us with problems in scientific geography—the genetic conceptions of landforms, as well as the relationships to people, their culture and history within their milieu. Thus already as a pupil I was fairly acquainted with the views of Carl Ritter and learned well the works of Oskar Peschel, first the "Neue Probleme der Vergleichenden Erdkunde," [New Problems of Comparative Geography], in which the essays on fiorded coasts and delta formation especially captivated me; and later his "Völkerkunde" [Ethnology] and the "Geschichte des Zeitalters der Entdeckungen" [History of the Age of Discoveries]. Although my geographical concepts at that time had already been conceived in a sure sense, it was not my intention to make geography my main line of study. I entered the University of Freiburg in order to study history, German philology and the history of literature. Not until I transferred to Halle and came under the influence of the extraordinarily stimulating and clearly presented lectures of Alfred Kirchhoff, did geography for me finally become more and more to the fore. Consequently, I gave up philology and instead undertook geography and, in part, mineralogy and petrography. Besides, the lectures of the philosopher Benno Erdman gave me deep understanding of the way of life. Since then I have occupied myself with philosophy, especially that of Immanuel Kant, which, I think, was advantageous for my writings on geographical methodology.

At the beginning of 1896 I earned the degree of doctor of philosophy, based on a dissertation "Siedelungskunde des Thales der Unstrut von der Sachsenburger Pforte bis zur Mündung." Previously, soon after [completing] my oral examinations in November 1895, I had turned toward Berlin, in order to further my professional education under Ferdinand von Richthofen. His personality as a researcher and person, a great and honorable man, became a determining influence on my mental development. But under Ferdinand von Richthofen his students generally had freedom to develop especially their own talents and inclinations; thus, in Berlin I continued along the same lines as [expressed] in my dissertation. For a year I improved on the subject begun in the "Siedelungskunde des Unstruttales" [Study of Settlement of the Unstrut Valley] in a book provided with many maps that appeared in 1903 entitled "Die Siedelungen in nordöstlichen Thüringen" [Settlements of northeastern Thuringia]. The subtitle "Ein Beispiel für die Behandlung siedelungsgeographischer Fragen" [An Example for the Treatment of Inquiries into Settlement Geography] expresses for me, besides the description of a given area, [the necessity] to present also especially a general goal for the methodological advancement of settlement geography, at that time still in its infancy. Besides this work I concerned myself with general questions

of anthropogeography, in part stimulated through the writings of Friedrich Ratzel, but without adopting his special method of treatment. During these years, aside from necessary excursions in northeastern Thuringia, I undertook numerous short and long study trips through regions of central Europe, including the Alps. Incidentally, during the International Geological Congress in Paris in 1900, I participated in an excursion to Brittany and Auvergne in addition to Valay and Causses; in 1903, through the Geological Congress in Vienna, [I made] an excursion in Bosnia and Dalmatia, which for me was an inducement to describe this area in a large regional treatise. Unfortunately, I have never had the opportunity to make extensive research trips abroad.

After I had become an active assistant with the Berlin Geographical Society (1898-1900) and as such had taken part in the organization of the Seventh International Geographical Congress (Berlin 1899), I habilitated [acquired right to teach in university] in the spring of 1906 as lecturer [Privatdozent] at the University of Berlin. Soon thereafter I received a part-time lectureship in the newly established Commercial College [Handelhochschule]. Certain tasks that I undertook for the Rheinischen Geschichtaltlas [Historical Atlas for the Rhineland] caused me to apply for a lectureship at Bonn. That action was not concluded, because already in the spring of 1911 I was called to Halle as the successor to Alfred Philippson. In the meantime I had wed (December 1907) Margret, née Heyer. She died 9 July 1947. Of our three sons, born 1910, 1911 and 1913, the two younger ones were killed in 1941 on the battlefield.

I was full professor at Halle from 1911 until my retirement in 1938. Because of the absence or death of my successors I was obliged to undertake the post, now for the fourth time, as a substitute. Through my teaching activity I endeavored to do justice as much as possible to all aspects of geography. Above all I have the preference as much in general lectures as in descriptions of given areas and in teaching excursions [or field trips] to handle geomorphological phenomena and problems, because they are best suited for the student to observe and to be instructed in geographical reflections or thought. On the other hand, in my own work I have preferably limited myself to the human aspects of geography and have sought definite directions to understand the development of these important branches. In contrast to the widely-held notion that the task of geography consisted of establishing the influence of nature on man, the [study of] the phenomena of folk and cultural life, whatever they may be, to explain the geographical scene, shaped for me the persuasion that above all it was necessary in geography to find a clearly determined area of research within its human aspects. This I perceived [to be] in the visible cultural landscape [Kulturlandschaft], just as the natural landscape [gives us] the object of study for physical geography. However, the explanation should not be considered only within geographical circumstances, but also within [the nature] of the people themselves and their history. For herein lies the causative force that creates the cultural landscape. From the following list of my publications can be seen how my intentions in fact have changed through the methods and areas I have experimented with. Because of time constraints it was not possible for me to create a comprehensive presentation of the geography of the cultural landscape. [My writings] remain in fragments and suggestions. Hitherto my only comprehensive study, which I have worked on since 1911 and is now nearly concluded, is the demonstration of the distribution of forest, swamps, and settled areas in Germany and adjacent areas during historical antiquity. With it the groundwork should be created for settlement geography and especially the geography of the cultural landscape can be synthesized.

Halle/Saale, 1947.

Otto Schlüter's Significance for Geographical Science

Rudolf Käubler (1964)

[Translation of Otto Schlüters Bedeutung für die geographische Wissenschaft, *Die Erde*, vol. 95 (1964), pp. 5-15.]

Dr. Otto Schlüter, professor emeritus, for many years director of the Geographical Institute, University of Halle, died in 1959. Since he was a recipient of the Carl Ritter gold medal [awarded by] the Geographical Society of Berlin and because his scientific work represents a landmark in the development of geography, it was deemed appropriate to estimate his significance for geography in this journal. Schlüter's importance in a way can be shown by depicting his life history and occasionally attempting to characterize his scientific work.

Otto Schlüter was born 12 November 1872 in Witten on the Ruhr, son of an attorney and notary public. He was a Westphalian by birth only, as his forebears on his father's side came from the Altmark. When he was in his fourth semester of his student training at Freiburg University he transferred to Halle. His talent for the German language and its study during the first semesters manifests itself in all of his later writings through a precise style that has made his works so effective and understandable. His early study of Germanism and history later influenced Schlüter as a geographer in the choice of chiefly German areas for his investigations and also his turn toward historical geography.

The attraction of the inspiring lectures of the geographer Kirchhoff, the first occupant of the chair of geography at Halle, led Schlüter to change his studies to geography. As Schlüter has informed us, already during his [earlier] schooling at the high school [Gymnasium] at Essen, how an inspiring instruction in geography greatly influenced him and how his thinking [on geography] had been adjusted, because the teacher eschewed the dry description of areas but made his mature students familiar with a genetic conception of landforms and likewise the relation of people, their history and their culture, to their homeland. If Kirchhoff produced few scientific writings, he was, however, a successful synthesizer of other available material, an enthusiastic academic teacher for students, foreign specialists, and faculty; indeed older professors willingly attended his profitable lectures as permanent auditors. I can appreciate Kirchhoff's influence on the student Schlüter, because such must be important psychologically for every university teacher.

On the other hand, in Kirchhoff's individuality described above it becomes evident that the dissertation with which Schlüter concluded his studies at Halle can be characterized as a purely school exercise constructed wholly according to an organization usual at that time. The work, publicly defended in 1896, although entitled "Study of Settlement of the Unstrut Valley from the Saxonburg Gate to its Mouth," dealt only with the history of the settlement sequence and the circumstances (including the site conditions) for it and not the settlement [type] itself. The regional motif is more important than it sounds: the presentation of a small portion of Central Germany. And incidentally the observation may be permitted that here for the first time the completely excellent German [language] becomes evident, [an element] that henceforth would be characteristic of all of Schlüter's works. Seven years later Schlüter wrote in his qualifying dissertation [Habilitationsschrift] that because of unclear understanding and unobserved historical points, it [the initial dissertation] might not have been satisfactory.

Nonetheless, the Unstrut Valley motif contained two themes that influenced Schlüter throughout his entire scientific career. One of these, [patterned] after the model of W. Arnold of the year 1875, was the use of sets of place-names which, with the lack of historical information should help to [determine] a temporal classification; and there is the battle of Unstrut of the year 531, when the large Thuringian state was broken up by the Franks and the Saxons, an occurrence that Schlüter could

utilize not only for political but also for settlement history to establish two separate periods. Thus in many of his later historical-geographical works he referred to this time around [A.D.] 500 which he finally named the "early historical" [period]; on this he based the cross-section of his historical-geographical maps.

During the time he was completing his doctoral examinations [at Halle] Schlüter in 1895 went to Berlin in order to improve his methodological development under Ferdinand von Richthofen, "as a researcher and person equally great and worthy of honors." Schlüter wrote in his autobiography that for his mental development that personality became a stimulating influence.

Here Schlüter became acquainted with the methodological position of geography. In the nineteenth century that position was fed by two currents [of thought]: one stemmed from the olympian spirit of Alexander von Humboldt, a cosmic way of thinking about nature, in which the phenomena of the heavens and of terrestrial life were examined through experience and observation. At that time it was still possible to find [practiced] such a universal natural science in the spirit of Alexander von Humboldt and in the thought of Goethe. The other current, suggested by Herder, pedogogically practiced by Pestolozzi and used by Carl Ritter, implied how one can easily infer the central idea of the earth as the educational home [training place] for mankind. This philosophical idea is also applicable for modern people, however only in their general, typical, ordinary form; thus for Carl Ritter and his students in the second half of the nineteenth century this idea was made concrete at least in geographical descriptions, as for example the period of high culture of classical Greece having been determined by the confinement of the land, the many bays of its irregular coastline, and the climate. With the insufficient content of nineteenth century maps of foreign lands such unscientific determinism led to erroneous conclusions and false connections.

Through the personality of Richthofen—under the restriction of geographical considerations to the earth's surface—the physical nature of the land was defined as the subject matter of geography; the anthropogeographical part existed in von Richthofen's definition only in relationships, in influence, in the causal relation between the physical and man and his culture, from which one can trace a Ritterian inheritance. The anthropogeographical part thus lacked concrete subject matter; it consisted in principle of only relationships, which one can only perceive as real and cannot rationally conceive. Richthofen's personal interest in physical considerations was also grounded in that fact; thus his definition of geography worked out to be very detrimental for all work that had an anthropogeographical aim. Also we see the entire scope of Friedrich Ratzel's anthropogeography, whose brilliance among the young scientific stars began to glow at Leipzig. Here human geography consisted of fewer subjects, for example those subscribing to the relationship between nature and man and his works. Schlüter himself expressed that Richthofen was not a "definer," however, and by the separate treatment of the uniform character of geography had in mind independent anthropogeographical data. Also already in 1895 and 1897 Alfred Hettner claimed in his newly established *Geographische Zeitschrift* that human geography should be grounded on its own data and not on relationships; later, however, he did not remain consistent regarding that suggestion.

In 1899 Schlüter in his "Bemerkungen zur Siedelungsgeographie" [Comments on Settlement Geography] had discussed clearly the data base for settlement geography and claimed [to be] unprejudiced in his interpretation; that is, not only the investigation of the geographical circumstances among which at that time one understood only the physical-geographical ones (and, unfortunately, many still do today), but also even the examination of operative and scientifically important causal factors that should be taken into consideration, such as trade and [nature of] society.

Before he expanded on this methodological theme of human geography he first wrote in 1903 his qualifying dissertation, "Die Siedelungen im nordöstlichen Thüringen" [Settlement of northeastern Thuringia], essentially his best established work, in which he attained a methodological improvement on the expanded spatial field of study of old central Germany. His years in Berlin produced the laying of the foundation for human geography; for in that time appear the short but seminal works "Die Ziele der Geographie des Menschen (1906) [The Goals of Human Geography] and "Über das Verhältnis von Mensch und Natur in de Anthropogeographie" (1907) [On the relationship between Mankind and Nature in Anthropogeography].

The publications on the nature of geography [that appeared] in the years after 1920, especially those on human geography (for example, "Die

Erdkunde in ihrem Verhältnis zu dem Natur- und Geisteswissenschaften," 1913 [Geography in its relationships to the natural sciences and the humanities]) are properly only expansions of [but] to be sure, consistent with, the methodological accomplishments made earlier in Berlin. The Berlin years from 1895 to 1910 with his teaching duties [Dozentur] there, including the residence at Bonn (with the delayed dissertation because of acceptance of the work on the Historical Atlas of the Rhineland) marked the first period of the Schlüter productions. [This period] produced especially a confirmed methodological foundation for settlement geography based on regional examples and a methodological improvement in human geography.

Next, speaking temporally, for the past 60 years every physical-geographical determination of cultural phenomena, especially those of economic character, has been systematically rejected in every scientific concept of geography because of Schlüter's views. What was new at that time was the fact that Schlüter [considered] that consistent treatment of the landscape required less [emphasis] on the effect of the land, but [more] on what belonged within the landscape. In the case of the infinite number of these [landscape elements] that the geography of man and his culture had to deal with, he required a restriction to those that were perceptible in the landscape through the sense of vision. For the explanation of this limited number of data that he wanted to see presented in a morphology of the cultural landscape, he required the employment of a genetic method, an explainable morphology of the cultural landscape. Since the subject of human culture in part extends from the past to the present, he came to demand a historical geography, which at first was characterized by past cross-sections, but also had to investigate the areal extent of present-day practice of historical traits. To be really understandable, that extent is a matter of quantitative representation. Hence it follows that he has seen people and human societies especially in relation to population distribution for the comprehension of which he fruitfully employed a methodological method today widely practiced through the research of H. Louis. Of course to explain the cultural landscape Schlüter made reference to human society, but did not see [the latter] as proper subject matter for geography. This leads along a direct road to the most recent branch of geography that for three decades has developed into social geography.[1] As H. Lautensach has so appropriately expressed in his paper on Schlüter's methodological work, the latter should not be held accountable for such a development.[2] Therewith, however, Lautensach would have only the earlier work of Schlüter to be worthy [of consideration].

In 1911, Schlüter was called to Halle to fill the chair of geography as successor to Alfred Philippson. Halle, or Halla Saxonum, as he wrote when a student in an autobiography composed in Latin, a part of central Germany on which he had already published two large regional works, was for him a home base which he never left. The development of the Geographical Institute at Halle, in terms of its content and extent, as well as its relocation to a new place on Gustav Nachtigal street (#26) was essentially the work of Otto Schlüter. At that time the department was still called the "Geographical Seminar" which he presided over not only until his retirement in 1938, but also often served temporarily thereafter, as the faithful "Ekkehard" of geography at Halle. Schlüter's first successor, Adolf Welte, was killed in 1940 during the last war; Karl Dietzel then served briefly as a substitute, and was followed by Oskar Schmieder who occupied the professorship in geography for the short interval from 1944 to the conclusion of the war. Thus the teaching responsibilities again came under Otto Schlüter's prudent directorship after the war, a post that he held until 1951 when Ernst Neef was provisionally entrusted with the direction of the Institute until 1952. At that time Schlüter once more undertook the management. Thus, including the so-called interruptions, Schlüter carried on the directorship of the Geographical Institute for 40 years.

During these long decades Schlüter's management of the Institute comprised the pressing load of academic activity of a director of a scientific institution that included the proposal and direction of 58 dissertations. He also served from 1915 to 1945 as chairman of the Sächsisch-Thüringische Geographical Society, popularizing scientific results, as testified by the many lecture sessions with foreign speakers as guests and even more so by the several splendid and high quality volumes of the *Mitteilungen* [Communications].

The volumes of the Mitteilungen [edited by] Schlüter, as well as the "Beihefte" [Supplements], contained the best dissertations authored under his direction, which in large part dealt with regions of Central Germany; they also contained complete compilations of geographical and related scientific literature on Central Germany—and comprehensive reviews, of which those referring to Schlüter's ideas

made up the larger part. In addition, Schlüter wrote in various journals over 30,000 lines of reviews, which through appropriate references indicated the essentials and significance of the critique. These numerous activities should illustrate Schlüter's workmanship. He left for us Schiller's motto (adopted by the University of Jena): "Only the earnestness of purpose that is not afraid of toil smokes out the truth from deeply hidden sources."

The annual enrollment of Schuler's students over many years testifies even more: that in his teaching he endeavored successfully to do justice to all aspects of geography and in his clearly presented lectures to transmit a geographic view of the world, even if emphasis lay somewhat in geomorphology. That emphasis undoubtedly stemmed from specific studies that strongly leaned in the direction of geology and mineralogy and from his own outspoken belief, "because they [geomorphic phenomena] are best suited for the student to observe and to be instructed in geographical thought."

Moreover, with increasing teaching experience we may be permitted to consider as a task for geography a full effort [to recruit] superior students to teach in higher education, just as this was the leading activity as an organizing task in the central committee for scientific regional geography.

Schlüter limited his own scientific works (some 90 in number) almost exclusively to human geography. And just as he dealt with systematic principles of geography during his time in Berlin, during his second period (by which we understand his many years as professor at Halle) he produced specific works on settlement geography in which he employed those principles. In an extensive study of maps he was able to obtain the types of settlement that occurred in Germany—in contrast to the romanticized preliminary work of Meitzen—which he attempted to explain in a scholarly, unprejudiced manner. Thus, from 1912 to 1918, he published in Hoops Reallexikon der Germanischen Altertumskunde [Hoop's Encyclopedia of German Antiquity] the sections on "Dorf" [village], "Runddorf" [circular village], "Stadt" [city], "Strassendorf" [roadside line village], "Weiler" [hamlet], for which he rendered the contemporary understanding [of the terms] with Schlüterian brevity; in many cases these [definitions] have not been improved upon even today.

In a similar way Schlüter was able to realize an endeavor to present an expanded geography of nature and mankind by means of a cooperative publication that appeared in sections from 1935 on, entitled Mitteldeutschen Heimatatlas [Local Atlas of Central Germany], the organization of which he prepared and expedited by supplying various contributions. Even these atlas maps permit a broader recognition of Schlüter's type of work, which complement his grammatical clarity; he strove toward beauty of presentation as well as factual correctness. These efforts are apparent in the selection of map data, and overcrowding is avoided by the choice of symbols, color, and type of lettering.

However, his firmly fixed perception of the foundation of human geography that the explanation of the present cultural landscape must consider not only the physical conditions but also the human and historical factors, led him, as a geographer to investigate the subject of settlement and to consider this in a historical context. And so he employed the concept of the time around A.D. 500 as the most important period that produced a differentiation of the cultural landscape, chiefly for central Germany, but also for other regions [of central Europe]. He described the "early historical landscape" by maps and accompanying explanations that included areas from Alsace to Prussia, from the Rhineland to Moravia, and [were based] on repeated and expanded research with refined and corrected treatment of [the material] in central Germany and for many regions of Central Europe. From his work it is apparent how Schlüter relied for research aids especially on place-names, prehistorical finds, and the historical reports of either Strabo or Tacitus. He also drew on scientific literature and evaluated the nature of the land, questioning what it might be able to affirm for the early historical period of the region concerned with. Since these data come in part from the time before the selected time division [A.D. 500] and in part from a more recent time, the concept of the early historical area is linked with the thesis of a continuity of settlement. As early as 1922 H. Mortensen critically reviewed the thesis of "natural openness" [open areas naturally free of tree growth], which was formerly expressed in R. Gradmann's Steppenheide theory. Mortensen thought that the thesis should undergo regional checking, modification or further study, as revealed by more recent elaboration of specific areas or by the germane comments of Tackenberg in the festschrift for Rudolf Koetzschke in 1937. That is true also for the age stratification of specific groups of place-names. And the early land clearing described by Schlüter permits the cartographic representation of present-day forests as reforested areas, such as we

[the author] have carried out in the Geographical Institute at Halle, chiefly for the large area of the Altmark.[3] Thereby the results of our more recent investigations and field work can be traced back [to the time] when Schlüter was composing his writings and especially his cartographic work, and he knew Germany accurately through his many trips and excursions.

It is now [time to] speak of the third period of Schlüter's work, the period of his retirement which actually began with his 80th birthday and continued from 1951 to October 1959; during this period of successful work he was still a "youthful" old man. By 1940 he had completed a map that drew together all of his earlier individual works on historical geography; he then published in 1952, 1953 and 1958 the three volumes of his "Siedlungsräume Mitteleuropas in frühgeschichtlicher Zeit" [Areas of Central Europe Settled in Early Historical Times].

As a nucleus the map depicts the areas left unsettled in the early historical period. [Ed. note: the map was published in the 1952 volume mentioned above.] By considering these [areas] and by modifying the outdated motives expressed in his doctoral dissertation and his qualifying thesis [Habilitationschrift], Schlüter now understood the century after Roman domination and before the occurrence of major forest clearing during the Middle Ages. He was aware of the methodological difficulty of representing the compression of various time periods on the two-dimensional cross-section of a map. The use of color served as a framework to represent the settled areas of that time; thus, green tones represented forest clearing through historical times including the most recent [late nineteenth century] forest cover. Here he succeeded in combining [cartographic] practicality and aesthetics. The map offers an abundance of information to whomever concerns himself with the history and regional geography of Germany. At the same time one does not see in the finished map which conceptual thought or which single work comes from the many different sources for the [cartographic] representation. The first explanatory volume presents the methodological explanation for what [is] impartially provable in the complicated map for the early time period, which can be traced back "step by step to scientifically bound fantasy," as Schlüter writes. The two larger volumes present the material depicted on the map in regional detail and characterize the status of investigation for the individual landscapes and depicts the early historical conditions [for each].

At the annual meeting of the Geographische Gesellschaft in der DDR [Geographical Society in the Deutsche Demokratische Republik (East Germany)] in Potsdam, 1959, it was ascertained [by a Soviet geographer, Professor Dr. Shirmunskij of Moscow] that economic conditions frequently can be explained only through history. From this we are pleased that Schlüter's methodological concepts are becoming [accepted] in the modern period. Schlüter had recognized and formulated this [historical] idea for 60 years and many German geographers have long conducted research in that sense. Also, in the field of settlement geography, in addition to many geographers of the Schlüterian school and historians of the Koetzschkean school, we might mention Mager and Mortensen, and in the field of economic geography, Waibel and his methodological reflections.

Today we know that Schlüter's forceful temporal cross-section [time division] has no substantive significance for the present-day cultural landscape, because more recent incisive developments have interposed. We also know today that Schlüter's principal research material (place-names) especially in the eastern half of his study area, are not sufficiently assertive for the long historical period, because the [Old High] Germanic place-names in large part have disappeared, the Old Slavic names to a large extent are still not distinguishable from the mass of mostly more recent Slavic ones, and the German names, however, are too recent.

On the other hand, the study of place-names—difficult from a philological viewpoint—led Schlüter to a systematic investigation of rules of phonetic changes in place-names, through which he arrived at datable offshoots that reached back into the early historical period.[4]

This was found to be the case, in places, for example in the basin of the middle Eger River near Karlsbad (Karlovy Vary) which Schlüter used on his small-scale map in his research. The case of very small tribal settlements with Slavic names that existed crowded together in large numbers had to be discarded; such settlements represented a relatively older occupied area than neighboring areas. After all, as Schlüter demonstrated, if one wished to distinguish an old settled area, he would have to go farther east in that basin, namely around the center of the old county of Zettlitz, north of Karlsbad.[5] Also, the studies of place-names and especially the forms of field patterns, have been advanced so importantly through the work of the Koetzschke school and by the geograph-

ical work such as that of Mortensen, Scharlau, Müller-Wille, Niemeier, and Krenzlin, that today Schlüter could no longer utilize only a few sets of these sources of information.[6] Although in view of these statements Schlüter's historical-geographical work was, in part, critically examined, and in part, its continuation was dependent on others, everything was done in a spirit of sincerity, which characterized Otto Schlüter's oral and written discussions with the author. However, he remained opposed to any departures from his geographical scientific views until the last days of his life.[7] Seen on the whole, however, his "Siedlungsräume Mitteleuropas in frühgeschichlicher Zeit" became an important and firm foundation for a difficult synthesis of a complex historical geography, mainly because of his many mature opinions on the outdated regional literature. It also gave us a basis for a fruitful discussion on systematic principles. In his autobiography Otto Schlüter indicated, when reviewing his work[8] with much modesty, that all [his written] fragments and suggestions thereon should be preserved,[9] for on these must be based settlement geography and especially the cultural landscape. In Otto Schlüter we see a great objective and we also know that he had given us an expanded base and many separate supports, through his early methodological works, and, of course, through his more recent investigations, especially for the field of social geography. [He also gave us] the outline and partial completion of some superior atlases during his long professorship at Halle, and even in his retirement [he produced] the great example of an historical geography [his Siedlungsräume Mitteleuropas. . . .]. All this would prepare for us all the [necessary] steps, without which we might not go far and with which we must continue.

The clarity of his concepts, his thoughtful expressions, the discipline of his speech, and his calm, diligent scholarship were all joined with such perseverance in pursuit of his goals, that these characteristics remained with him until the last week of his life, for he retained physical vigor even in his old age.

He, the "oak" of Westphalia, who had put down his roots in the center of Germany, retained his intellectual attitude without interruption, despite being hit by the most grievous misfortunes. For example, in the two world wars many of his students and friends fell on the battlefield and others died or became demoralized; and in 1941 two of his three sons were killed one shortly after the other; in 1947 his wife, happily united with him in marriage, died. That [attitude] was perhaps a manifestation of his "religion" or "steadfastness" in terms of the wholeness and the feeling of responsibility of a person for a profession, a scientific field that was assigned to him.

His entire scientific deportment and output found appreciation. In 1952 he was named president of the Deutschen Akademie der Naturforscher Leopoldina [German Academy of Naturalists Leopoldina]—this free republic of scholars—on the occasion of its 300th anniversary. In 1959 the same academy honored Schlüter in a memorial colloquium dedicated to him, carried out by the then president, Prof. Dr. K. Mothes with appropriate words of appreciation. The University of Leipzig invested Otto Schlüter with an honorary doctorate; the University of Halle made him one of its honorary senators. The most prestigious medal that is offered by the German geographical societies was bestowed upon him, and he was also made honorary member of several geographical societies.

From him, his exact but appropriate expressions were also always humane in regard and trust. For us younger ones in the geographical world he set an example in attitude, performance, and fulfillment of duty.

We geographers can be proud of Otto Schlüter. He has elevated the name of German geography through his output on human geography, settlement geography, and historical geography.

NOTES

1. Compare the last critical discussion by H. Bobek: Kann die Sozialgeographie in der Wirtschaftsgeographie aufgehen? [Can social geography be absorbed by economic geography?] *Erdkunde* vol. 16 (1962), pp. 119-126.

2. Lautensach, H.: Otto Schlüters Bedeutung für die methodische Entwicklung der Geographie. [The significance of Otto Schlüter for the methodological development of geography] *Petermanns Geographische Mitteilungen* vol. 96 (1952), pp. 219-231.

3. Käubler, R. (1962): Über Hochäker zwischen Erzgebirge, Thüringer Wald und Ostsee [On fields (cultivated land) at high altitudes between the Erzgebirge, Thuringian forest and the Baltic Sea], *Berichte zur deutschen Landeskunde*, vol. 28, (1961), pp. 7073. However, there may be some high forest in "old settled areas" still referred to in recent historical times. Compare R. Käubler, Beiträge zur Altlandschaftsforschung

in Ost-Mitteldeutschland [Investigation of ancient landscapes in eastern central Germany], *Petermanns Geographische Mitteilungen* vol. 96 (1952), pp. 245-49.

4. Käubler, R.: Das Alter der deutsche Besiedlung des Egerlandes [The antiquity of German settlement of the Eger area] *Göttinger Geographisches Abhandlungen*, vol. 20, Göttingen 1958.

5. Käubler, R.: Die erzgebirgischen Waldhufendörfer zur Zeit ihrer Entstehung. [The line villages along wooded river banks of the Erzgebirge at the time of their origin]. *Wissenschaftiche Zeitschrift der Martin-Luther Universität*, Math.-nat., 1963, vol. 7.

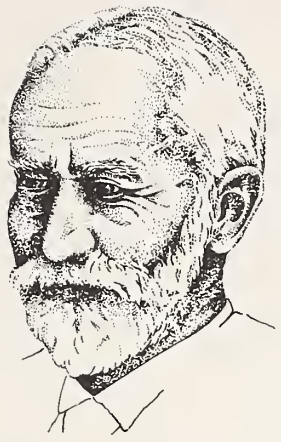
6. Schlüter, O.: Die Siedlungsräume Mitteleuropas in frühgeschichtlicher Zeit, vol. I, pp. 34-35. *Forschungen zur deutschen Landeskunde*, vol. 63, 1952, pp. 34-35.

7. Käubler, R.: In memoriam Otto Schlüter, *Petermanns Geog. Mitt.*, vol. 103 (1959), pp. 241-42.

8. A complete listing of his work until 1952 in *Petermanns Geog. Mitt.*, vol. 96, pp. 290-92. Selections and supplements of his work until 1958, *ibid.*, vol. 103, (1959), p. 243.

9. While these lines were in press, there appeared a superior and current discussion that agreed with the author on almost all points of argument and which could be expanded for central Germany (Jäger, H.: Zur Geschichte der Deutschen Kulturlandschaften. *Geographische Zeitschrift*, vol. 51 (1963), pp. 90-143.)

4. *Alfred Hettner (1859-1941)*



Introductory Statement

Robert C. West

Alfred Hettner may well have been the most influential scholar in the development of geography in Germany during the early part of this century. He was widely recognized as geography's leading methodologist of that period. Basically he considered geography to be a chorological or regional science. Partly to present his views, in 1895 he established the *Geographische Zeitschrift*, which became a sounding board for methodological discussions and one of Germany's outstanding geographical journals, edited by Hettner for 40 years. His early interest and training in philosophy gave him a background for logical presentation of his views and probably considerable advantage over many of his contemporaries on methodological questions. Out of his numerous essays on geographical methodology that appeared in the *Geographische Zeitschrift* grew his famous book *Die Geographie; ihre Geschichte, ihr Wesen und ihre Methoden* [Geography; its history, nature and methods], published in 1927.

Moreover, again perhaps more than his contemporaries, Hettner was the "compleat" geographer, having investigated and published on most branches of the subject during his lifetime. As a student he undertook arduous field work mainly in South America where he spent his "Wanderjahr" (in his case two years, 1888-90) in the Andean countries, Argentina and southern Brazil investigating both physical and cultural phenomena.[1] While in South America he suffered the beginnings of an affliction that ultimately caused atrophy of his leg muscles, limiting his ability to travel by foot. Nonetheless, he later pursued occasional field excursions in western and eastern Europe, North Africa and Asia until the outbreak of World War I.

Hettner's early interests were in climatology and geomorphology on which he published frequently throughout his academic career. Of the approximate 170 publications listed in his bibliography, many (37) dealt with physical geography. In 1972 an English translation was made of his best known general work on geomorphology, *Die Oberflächenformen des Festlands* [The surface features of the continents], first published in 1921.[2]

During his long tenure as professor at the University of Heidelberg (1898-1928) his concern with human and regional geography increased. One of his most interesting books dealt with culture history: *Der Gang der Kultur über die Erde* [The spread of culture over the earth] (1923) in which he followed some of the ideas of Eduard Hahn on forms of economic activity and the origin of agriculture. Hettner was one of the few geographers of his time who appreciated Hahn's work. During and after World War I Hettner wrote many articles and books on political geography, which he held as an important branch of the discipline, disagreeing with Schlüter's "doctrine of observable things." Many of Hettner's articles revealed his concern with the methods of teaching geography in primary and secondary schools as well as at the university level. Perhaps his best work in regional geography is found in his *Grundzüge der Länderkunde* [Basic elements of regional geography]; the first volume on Europe appeared in 1907, the second, on non-European areas, in 1924. Finally, his three-volume work on general human geography was published posthumously (1947-57), edited by two of his students, H. Schmitthenner and Ernst Plewe.

The best survey of Hettner's life and works is by H. Schmitthenner, a translation of which accompanies this section. Shorter notes on Hettner include:

Uhlig, C., Alfred Hettner. *Geographischer Anzeiger*, vol. 20 (1919), pp. 129-33.

Schwalm, H., Alfred Hettners Reisen in Peru und Bolivien, *Geographischer Anzeiger*, vol. 30

(1929), pp. 267-69.

Hartshorne, R., *The Nature of Geography* (1939), pp. 137-44.

Pfeifer, G., Alfred Hettner zum 100. Geburtstages. *Kosmos*, vol. 55 (1959), pp. 351-53.

Notes by various authors in Alfred Hettner: Gedenkschrift zum 100. Geburtstag. *Heidelberger Geographische Arbeiten*, Heft 6 (1960).

Dickinson, R., *Makers of Geography* (1969), pp. 112-25.

Plewe, E., Alfred Hettner (1859-1941). *Geographers. Biobibliographical Studies* (ed. T.W. Freeman), vol. 6 (1982), pp. 55-63.

NOTES

1. For Hettner's South American experience see Ernst Plewe and Ute Wardenga, Der Junge Alfred Hettner (*Geographische Zeitschrift, Beihefte, Erdkundlisches Wissen*), 1985. 30 pp.

2. The English translation of the second edition entitled *The Surface Features of the Land. Problems and Methods of Geomorphology* (New York: Hafner, 1972) was done by Philip Tilley, whose preface reviews Hettner's interest and debates concerning the subject.

Bibliography of Alfred Hettner

[Based chiefly on bibliography contained in "Alfred Hettner," 6.8.1859. Gedenkschrift zum 100 Geburtstag *Heidelberger Geographische Arbeiten* no. 6 (1960), pp. 81-88.]

1881 *Das Klima von Chile und Westpatagonien. Erster Teil: Luftdruck und Winde. Meeresströmungen.* [The climate of Chile and western Patagonia. First part: Pressure and Winds. Ocean Currents]. Bonn, Universitätsbuchdruckerei von C. Georgi. 55 pp. [Dissertation for Ph.D. degree at Strassburg].

1884 Reisen in Kolumbien [Travels in Colombia]. *Mitteilungen des Verein für Erdkunde zu Leipzig*, pp. 34-39. [Summary of address given before the Society.]

1885 Die Sierra Nevada von Santa Marta [The Sierra Nevada of Santa Marta]. *Petermanns Mitteilungen* vol. 31, pp. 92-97.

____ Reiseskizzen aus Columbien [Travel sketches from Colombia]. *Globus*, vol. 48, pp. 88-89; 103-106; 119-121; 135-136; 150-152; 166-170.

1886 Die Bogotaner [The people of Bogotá]. *Globus*, vol. 50, pp. 69-71; 86-89; 105-107; 118-120.

____ Die wirtschaftlichen Verhältnisse der Vereinigten Staaten von Kolumbien [The economic conditions of the United States of Colombia]. *Deutsche Kolonialzeitung*, vol. 3, pp. 723-729.

____ Reisen in Kolumbien [Travels in Colombia]. *Mitteilungen des Verein für Erdkunde zu Leipzig*, pp. xii-xiii [Summary of address given before the Society].

1887 Gebirgsbau und Oberflächengestaltung der sächsischen Schweiz [Mountain structure and surface configuration of Saxon Switzerland]. *Forschungen zur deutschen Landes- und Volkskunde*, vol. 2, Heft 4, pp. 245-355. Stuttgart. Engelhorn. [Habilitationsschrift, University of Leipzig].

1888 Mitteilungen über seine Reise nach dem peruanischen Hochland (Briefe an F. von Richthofen über seine zweite südamerikanische Reise) [Reports on his (Hettner's) trip to the Peruvian Highlands (Letters to F. von Richthofen on his second South American trip)]. *Verhandlungen der Gesellschaft für Erdkunde zu Berlin*, vol. 15, pp. 402-406.

____ *Reisen in den Columbianischen Anden* [Travels in the Colombian Andes]. Leipzig, Dunckert and Humblot. 389 pp.

____ Kartographische Ergebnisse einer Reise in dem columbianischen Anden [Cartographic results of a trip in the Colombian Andes]. *Petermanns Mitteilungen*, vol. 34, pp. 104-112.

____ (with G. Linck) Beiträge zur Geologie und Petrographie der columbianische Anden [Contributions to the geology and petrography of the Colombian Andes]. *Zeitschrift der Deutschen Geologischen Gesellschaft*, vol. 40, pp. 205-230.

1889 Die Llanos von Columbia [The llanos of Colombia]. *Das Ausland*, vol. 62, pp. 614-617; 634-637.

____ Zweiter Bericht von Herrn Dr. Alfred Hettner über seine Reise in Peru und Bolivia [Second report of Dr. Alfred Hettner on his travels in Peru and Bolivia]. *Verhandlungen der Gesellschaft für Erdkunde zu Berlin*, vol. 16, pp. 154-160.

____ Dritter Bericht von Herrn Dr. Alfred Hettner über seine Reise in Peru und Bolivia [Third report of Dr. Alfred Hettner on his travels in Peru and Bolivia]. *Verhandlungen der Gesellschaft für Erdkunde zu Berlin*, vol. 18, pp. 269-276.

____ Vierten Bericht von Dr. A. Hettner über seine Reisen in Peru und Bolivien [Fourth report of Dr. Alfred Hettner on his travels in Peru and Bolivia]. *Verhandlunden der Gesellschaft für Erdkunde zu Berlin*, vol. 16, pp. 387-394.

1890 Fünfter Bericht von Dr. A. Hettner über seine Reisen in Peru und Bolivien [Fifth

report of Dr. Alfred Hettner on his travels in Peru and Bolivia]. *Verhandlungen der Gesellschaft für Erdkunde zu Berlin*, vol. 17, pp. 103-108.

____ Sechster und siebenter Berichte von Dr. A. Hettner über seine Reisen in Südamerika [Sixth and seventh reports of Dr. A. Hettner on his travels in South America]. *Verhandlungen der Gesellschaft für Erdkunde zu Berlin*, vol. 17, pp. 232-237.

1890 Achter Bericht von Dr. A. Hettner über seine Reisen in Südamerika [Eighth report of Dr. A. Hettner on his travels in South America]. *Verhandlungen der Gesellschaft für Erdkunde zu Berlin*, vol. 17, pp. 398-401.

____ Reisen in den Anden von Peru und Bolivien [Travels in the Andes of Peru and Bolivia]. *Verhandlungen der Gesellschaft für Erdkunde zu Berlin*, pp. 512-525. [Address before the Society, June 12, 1890.]

1891 Die Typen der Lande- und Meeresräume [Types of land and sea areas]. *Das Ausland*, vol. 64, pp. 444-448; 470-474.

____ Ratzels Anthropogeographie, II Teil [Ratzel's Anthropogeographie, part II]. *Das Ausland*, vol. 64, pp. 661-666; 689-694.

____ Das südlichste Brasilien. Rio Grande do Sul [Southernmost Brazil. Rio Grande do Sul]. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, vol. 25, pp. 85-144.

____ Bilder aus Südbrasilien [Pictures of Southern Brazil]. *Über Land und Meer*, vol. 71, pp. 193-202; 253-261.

____ Die Städte des südlichen Brasiliens [The cities of southern Brazil]. *Unsere Zeit*, vol. 27, pp. 352-381.

____ Die deutsche Colonie San Laurenzo in Südbrasilien [The German colony of San Laurenzo in Southern Brazil]. *Leipziger Zeitung*, no. 135, 15 June, pp. 2229-2230.

____ Eine Kutchenfahrt durch Uruguay [A trip by carriage through Uruguay]. *Leipziger Zeitung*, 18 May, pp. 1813-1814.

1892 *Die Kordillere von Bogotá [The Cordillera of Bogotá]. Petermanns Mitteilungen*, Ergänzungsheft no. 104, 131 pp.

____ Die kolumbianische Ostkordillere oder Kordillere von Bogotá [The eastern cordillera of Colombia, or the Cordillera of Bogotá]. *Mitteilungen der Verein der Erdkunde zu Leipzig* [Summary of lecture delivered before the Society, 29 January, 1892], pp. xv-xvii.

____ Reisen in den Anden des südlichen Perus und des nördlichen Boliviens [Travels in the Andes of southern Peru and northern Bolivia]. *Mitteilungen der Geographische Gesellschaft in Hamburg*, Jhg. 1891-92, pp. 333-335. [Summary of lecture given before the Society, 7 January 1892].

____ Reiseskizzen aus Südbrasilien. Ein Besuch in den deutschen und italienischen Kolonien bei Porto Alegre in Südbrasilien [Travel sketches from southern Brazil. A visit to the German and Italien colonies near Porto Alegre in southern Brazil]. *Deutsche Rundschau für Geographie und Statistik*, vol. 14, pp. 193-202.

____ Reiseskizzen aus Südbrasilien. Ein Besuch der Kohlenmine von Arroyo dos Ratos und der Kolonien Estrella und Santa Cruz [Travel sketches from southern Brazil. A visit to the coal mine of Arroyo dos Ratos and the colonies Estrella and Santa Cruz]. *Deutsche Rundschau für Geographie und Statistik*, vol. 14, pp. 253-261.

1893 Tiahuanaco. *Leipziger Zeitung*, p. 497.

____ Die Anden des westlichen Kolumbiens; eine orographische Skizze [The Andes of western Colombia; an orographic sketch]. *Petermanns Mitteilungen*, vol. 39, pp. 129-136.

____ Regenverteilung, Pflanzendecke und Besiedlungen der tropischen Anden [Distribution of rainfall, plant cover and settlement in the tropical Andes]. *Festschrift Ferdinand freiherrn von Richthofen zum sechzigsten Geburtstag am 5 March 1893*, Berlin, D. Reimer, pp. 197-233.

____ Über den Begriff der Erdteile und seine geographische Bedeutung [On the concept of the continents and their geographical significance]. *Verhandlungen des 10. Deutschen Geographentages zu Stuttgart*, 1893, pp. 198-199.

1894 Die geographische Verbreitung der Transportmittel des Landverkehrs [The geographical distribution of means of transport in traffic on land]. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, vol. 29, pp. 271-289.

1895 Geographische Forschung und Bildung [Geographical research and training]., *Geographische Zeitschrift*, vol. 1, pp. 1-19.

____ Der XI deutsche Geographentag in Bremen, I Teil: die Sitzungen [The 11th meeting of the German Geographical Association in Bremen, Part I: the Sessions]. *Geographische Zeitschrift*, vol. 1, pp. 51-54.

____ Zur Benennung geographischer Bildungen und Vorgänge [On naming of geographical forms and practices]. *Geographische Zeitschrift*, vol. 1, pp. 127-128.

____ Die Lage der Menschlichen Ansiedlungen. Ein Vortrag [The status of human settlement. An exposition]. *Geographische Zeitschrift*, vol. 1, pp. 361-375.

____ Bemerkung zu A. von Tillots Vorschlag über die Notwendigkeit einer internationalen kartographischen Vereinigung [Remarks on A. von Tillot's proposal on the need of an international cartographic association]. *Geographische Zeitschrift*, vol. 1, p. 237.

1896 *Spamers Grosser Hand-Atlas* (Text, geographische, ethnographische, und statistiche Beschreibung aller Länder der Erde, von A. Hettner) [(Text, geographical, ethnographical, and statistical description of all countries of the earth, by A. Hettner)]. 132 pp. Leipzig.

1897 Die Haustiere und die menschlichen Wirtschaftsformen. Nach Eduard Hahn [Domesticated animals and forms of human economy. After Eduard Hahn]. *Geographische Zeitschrift*, vol. 3, pp. 160-166.

____ Die Oberflächenformen Norwegens. Nach Eduard Richter [Surface forms of Norway. After Eduard Richter]. *Geographische Zeitschrift*, vol. 3, pp. 45-50.

____ Venezuela. Nach den Forschungen von W. Sievers [Venezuela. After the investigations of W. Sievers]. *Geographische Zeitschrift*, vol. 3, pp. 401-408.

____ Die gegenwärtige Stand der Verkehrsgeographie [The present status of the geography of transportation]. *Geographische Zeitschrift*, vol. 3, pp. 624-634; 694-704.

1898 Die Entwicklung der Geographie im 19. Jahrhundert. Antrittsrede [The development of geography in the 19th century. Inaugural address]. *Geographische Zeitschrift*, vol. 4, pp. 305-320.

1900 Neue Äusserungen über Wesen und Aufgaben der Geographie [New assertions on the nature and problems of geography]. *Geographische Zeitschrift*, vol. 6, pp. 574-577.

____ Über bevölkerungsstatistische Grundkarten [On base maps for population statistics]. *Geographische Zeitschrift*, vol. 6, pp. 185-192; 522.

____ Erwiderung [Reply to query on population maps]. *Geographische Zeitschrift*, vol. 6, p. 522.

1901 Über bevölkerungsstatische Grundkarten [On base maps for population statistics]. *Verhandlungen des 7. Internationalen Geographen-Kongress, Berlin, 1899*, Berlin, 1901, Theil II, p. 502-510.

____ Die Landbauzonen der äussertropischen Länder. Nach den Untersuchung Th. H. Engelbrecht's [On agricultural zones of extra-tropical regions. After investigation of Th. H. Engelbrecht]. *Geographische Zeitschrift*, vol. 7, pp. 271-281; 333-342.

____ Über die Untersuchung und Darstellung der Bevölkerungsdichte [On investigation and representation of population densities]. *Geographische Zeitschrift*, vol. 7, pp. 498-514; 573-582.

____ Über die Oberflächenformen der Hochalpen. Nach den Untersuchungen Eduard Richter's [On surface features of the high Alps. After investigations of Ed. Richter]. *Geographische Zeitschrift*, vol. 7, pp. 447-459.

1902 Die wirtschaftlichen Typen der Ansiedlungen [Economic types of settlements]. *Geographische Zeitschrift*, vol. 8, pp. 92-100.

____ Das Deutschtum in Südbrasilien [The German element in southern Brazil]. *Geographische Zeitschrift*, vol. 8, pp. 609-626.

____ Die Deutschen in Süd-Chile [Germans in southern Chile]. *Geographische Zeitschrift*, vol. 8, pp. 686-692.

____ Zur Ausbildung der Geographielehrer [On educating the geography teacher]. *Geographische Zeitschrift*, 601, 8, pp. 100-102.

1903 Grundbegriffe und Grundsätze der physischen Geographie [Fundamental principles and axioms of physical geography]. *Geographische Zeitschrift*, vol. 9, pp. 21-40; 121-139; 193-213.

____ Die Felsbildunge der sächischen Schweiz [Rock forms in Saxon Switzerland]. *Geographische Zeitschrift*, vol. 9, pp. 608-626.

____ *Das Deutschtum in Südbrasilien und Südchile*. [The German element in southern Brazil and southern Chile.] Teubner, Leipzig.

1904 Die deutschen Mittelgebirge. Versuch einer vergleichenden Charakteristik [The German Mittelgebirge. An attempt at a comparative method]. *Geographische Zeitschrift*, vol. 10, pp. 13-25; 86-95; 134-143.

____ Das Klima Europas [The Climate of Europe]. *Geographische Zeitschrift*, vol. 10, pp. 371-390.

____ Das europäische Russland. Eine anthropogeographische Studie [European Russia. An anthropogeographical study]. *Geographische Zeitschrift*, vol. 10, pp. 481-506; 537-569; 600-626; 666-691.

1905 Das Wesen und die Methoden der Geographie [The Nature and Methods of Geography]. *Geographische Zeitschrift*, vol. 11, pp. 545-564; 615-629; 671-686.

____ *Russland, Eine geographische Betrachtung von Volk, Staat, und Kultur.* [Russia, a geographical consideration of folk, state, and culture]. Leipzig, B. G. Teubner [2nd and 3rd ed., 1916, 356 pp.; 4th ed., 1921.]

____ Das System der Wissenschaft [The system of science]. *Preussische Jahrbücher*, vol. 122, pp. 251-277.

1906 Ferdinand von Richthofens Bedeutung für die Geographie [Ferdinand von Richthofen's significance for Geography]. *Geographische Zeitschrift*, vol. 12, pp. 1-11.

1907 Methodologische Streifzüge. I. Der Gegenstand der Geographie; II. Geographie und Erdwissenschaft [Methodological excursions. I. The subject matter of geography: II. Geography and earth science]. *Geographische Zeitschrift*, vol. 13, pp. 627-632; 694-699.

____ Die Geographie des Menschen [Human geography]. *Verhandlungen des 6. Deutschen Geographentages zu Nürnberg*, 1907, pp. 273-303. [Republished in *Geographische Zeitschrift*, vol. 13, pp. 401-425.]

____ Über das Verhältniss von Natur und Mensch. Randbemerkungen zu Schlüters Vortrag [On the relationship between man and nature. Side remarks on Schlüter's presentation]. *Geographische Zeitschrift*, vol. 13, pp. 580-583.

____ Die Zukunft der deutschen Geographentage [The future of the German geographical conventions]. *Geographische Zeitschrift* vol. 13, pp. 45-50.

____ Zur Geologie der columbianischen Zentralkordillere [On the geology of the central Cordillera of Colombia]. *Zentralblatt für Mineralogie, Geologie, und Paläontologie*, Jhg. 1907, pp. 545-547.

____ *Grundzüge der Länderkunde. [Characteristics of regional geography].* vol. I, Europa. Leipzig, O. Spamer. [2nd ed., 1923; 3rd ed., 1925; 4th ed., 1927; 5th ed., 1932.]

____ Der Wert unserer Kolonien [The value of our colonies]. *Nation und Welt*, Berlin, June 2, 1907. [Newspaper article.]

1908 Methodologische Streifzüge. III. Beobachtung, Forschung, Darstellung [Methodological 'excursions.' III. Observation, research, presentation]. *Geographische Zeitschrift*, vol. 14, pp. 561-568.

____ Die geographische Einteilung der Erdoberfläche [The geographical division of the earth's surface]. *Geographische Zeitschrift*, vol. 14, pp. 1-13; 94-110; 137-150.

____ Zur Geologie der columbianischen Zentral-Kordillere. Nebst Erwiderung von E. Geinitz [On the geology of the Central Cordillera of Colombia. With a reply by E. Geinitz]. *Zentralblatt für Mineralogie, Geologie, und Paläontologie*, Jhg. 1908, pp. 185-197.

1909 Zur geographischen Einteilung der Erdoberfläche [Erwiderung] [On the geographical division of the earth's surface (Reply)]. *Zeitschrift für Schulgeographie*, vol. 30, pp. 109-110.

1910 Die Eigenschaften und Methoden der kartographischen Darstellung [The characteristics and methods of cartographical representation]. *Geographische Zeitschrift*, vol. 16, pp. 12-28; 73-82.

____ Die Arbiet des fliessenden Wassers [The work of flowing water]. *Geographische Zeitschrift*, vol. 16, pp. 365-384.

____ Wüstenformen in Deutschland? [Desert forms in Germany?] *Geographische Zeitschrift*, vol. 16, pp. 690-694.

____ Die Klimatischen Regionen der Wasserführung. Nach Penck [Climatic regions of river discharge. After Penck]. *Geographische Zeitschrift*, vol. 166, pp. 654-658.

1911 Die Terminologie der Oberflächenformen [Terminology of landforms]. *Geographische Zeitschrift*, vol. 17, pp. 135-144.

____ Die Klimate der Erde [Climates of the earth]. *Geographische Zeitschrift* vol. 17, pp. 425-435; 482-502; 545-564; 618-633; 675-685.

____ Anmerkungen zu E. Obsts Bemerkungen [zu A. Hettners Wüstenformen in Deutschland]. [Observations on E. Obst's remarks (on A. Hettner's desert forms in Germany)]. *Geographische Zeitschrift*, vol. 17, pp. 341-342.

____ Herman Kroeck [obituary] *Geographische Zeitschrift*, vol. 17, p. 481.

____ Der Geographielehrer [The geography teacher]. *Südwestdeutsche Schulblätter*, vol. 28, pp. 53-59.

____ Die Geographie in der Schule [Geography in the school]. *Südwestdeutsche Schulblätter*, Vol. 28, pp. 1-7.

1912 Alter und Form der Täler [Age and form of valleys]. *Geographische Zeitschrift*, vol. 18, pp. 665-682.

____ Aus dem Schweizer Jura. Eine morphologische Skizze [From the Swiss Jura. A morphological sketch]. *Geographische Zeitschrift*, vol. 18, pp. 515-521.

1913 Geographische Anschauung [Geographical viewpoint]. *Geographische Zeitschrift*, vol. 19, pp. 35-39.

____ Die Entstehung des Talnetzes [The origin of valley patterns]. *Geographische Zeitschrift*, vol. 19, pp. 153-161.

____ Rumpfflächen und Pseudorumpfflächen [Peneplains and pseudopeneplains]. *Geographische Zeitschrift*, vol. 19, pp. 185-202.

____ Die Abhängigkeit der Form der Landoberfläche von innern Bau [The dependence of surface forms on underlying structures]. *Geographische Zeitschrift*, vol. 19, pp. 435-445.

1914 Die Entwicklung der Landoberfläche [The development of surface forms]. *Geographische Zeitschrift*, vol. 20, pp. 129-145.

____ Die Vorgänge der Umlagerung an der Erdoberfläche und die morphologische Korrelation [The occurrence of deposition on the earth's surface and morphological correlation]. *Geographische Zeitschrift*, vol. 20, pp. 185-197.

____ Unsere Aufgabe im Kriege [Our task in the war]. *Geographische Zeitschrift*, vol. 20, pp. 601-603.

1914-16 (ed.) *Die Kriegsschauplätze*. [Theaters of War]. Heft 1-6. Leipzig.

1915 Italiens Eintritt in dem Krieg [Italy's entrance into the war]. *Geographische Zeitschrift*, vol. 21, pp. 425-443.

____ Russland und die Meerengen . . . [Russia and the straits . . .]. *Geographische Zeitschrift*, vol. 21, pp. 148-153.

____ Die Ziele unserer Weltpolitik [The goals of our world politics]. *Der Deutsche Krieg*, Heft 64, Stuttgart and Berlin, 30 pp.

____ *Englands Weltherrschaft und der Krieg*. [England's world domination and the war.] Leipzig, B. G. Teubner. 244 pp. [2nd ed. 1916; 3rd ed. 1917; 4th ed. (Englands Weltherrschaft, 1928)].

____ Die geographischen Bedingungen der menschlichen Wirtschaft [The geographical conditions of human economy]. *Grundriss der Sozialökonomik*, Abteilung II/I, Tübingen. pp. 1-31. [2nd ed. 1925, 56 pp.].

1916 Das britische und das russische Reich [The British and the Russian Empire]. *Geographische Zeitschrift*, vol. 22, pp. 353-371.

____ Deutsche Eigenwirtschaft oder Weltwirtschaft? [German local economy or world economy]? *Europäische Staats- und Wirtschaftszeitung*, vol. I, pp. 1058-1064.

____ Volk, Nation, Sprache [People, nation, language]. *Zeitschrift der allgemeine deutschen Sprachvereins*, vol. 31, pp. 118-122.

____ Die Dardanellen und Russlands Zukunft [The Dardanelles and Russia's future]. *Europäische Staats und Wirtschaftszeitung*, Munich, pp. 479-481.

____ Weltpolitik und Weltverkehr [World politics and world commerce]. In *Deutschlands Weltpolitik*, Bielfeld, pp. 81-91.

____ Deutschlands Weltstellung [Germany's place in the world]. *Neujahrsgabe der Universität Heidelberg für ihre im Felde stehenden Soldaten*. Heidelberg. pp. 47-56.

1917 Das Königreich Polen [The Kingdom of Poland]. *Geographische Zeitschrift*, vol. 23, pp. 40-43.

____ Die Geographie auf der Schule [Geography in the school]. *Geographische Zeitschrift*, vol. 23, pp. 315-321.

____ Englands Seeherrschaft und unser Kampf um die Freiheit der Meere [England's domination of the sea and the struggle for freedom of the sea]. *Geographische Zeitschrift*, vol. 23, pp. 393-409.

____ *Der Friede und die deutsche Zukunft [The peace and the future of Germany]*. Stuttgart and Berlin, Deutsche Verlags Anstalt, 244 pp.

____ Die geographischen Grundlangen der Politik [Geographical bases of politics]. *Deutsche Politik*, vol. 2, Heft 18, pp. 562-573.

____ Deutschlands Weltstellung [Germany's place in the world]. *Staatsburgerkunde*, ed. by Rhein-Mainischen Verband für Volksbildung, Berlin, pp. 185-202.

____ Deutschlands Lage im Herzen Europas [Germany's position in the heart of Europe]. *Deutsche Kriegswochenschau*, no. 27 (10 June).

____ Zum Frieden mit Russland [On peace with Russia]. *Europäische Staats- und Wirtschaft-*

szeitung, Munich, pp. 560-565.

1918 Die allgemeine Geographie und ihre Stellung im Unterricht [Systematic geography and its place in teaching]. *Geographische Zeitschrift*, vol. 24, pp. 172-178.

____ Selbstgenügsamkeit oder Weltbetätigung? [Self sufficiency or international cooperation (trade)?] *Das Echo*, vol. 37, pp. 46 ff.

____ Die wirtschaftsgeographischen Lehren des Weltkrieges [The economic-geographical precepts of the World War]. *Norddeutsche allgemeine Zeitung* (20 Jan. 1918); [also appeared in *Zeitschrift für Polizei- und Verwaltungsbeamte*, p. 133].

____ Warum brauchen wir Kolonien? [Why do we need colonies?] *Wochenschau für die Hochseestreitkräfte und die Marinestation der Nordsee*, vol. 2, 14 April 1918.

1919 Deutschlands territoriale Neugestaltung [Germany's territorial reorganization]. *Geographische Zeitschrift*, vol. 25, pp. 57-72.

____ Der Friede und die politische Geographie [The peace and political geography]. *Geographische Zeitschrift*, vol. 25, pp. 233-235.

____ Die Morphologische Forschung [Morphological investigation]. *Geographische Zeitschrift*, vol. 25, pp. 341-352.

____ Die Einheit der Geographie in Wissenschaft und Unterricht [The unity of geography in science and teaching]. *Geographische Abende im Zentralinstitut für Erziehung und Unterricht*, Heft 1, Berlin. pp. 1-32.

1920 Fünfundzwanzig Jahre 'Geographische Zeitschrift.' Ein Rückblick und ein Ausblick [Twenty-five years of the Geographische Zeitschrift. Retrospect and prospect]. *Geographische Zeitschrift*, vol. 26, pp. 1-8.

____ Die morphologische Darstellung [Morphological representation]. *Geographische Zeitschrift*, vol. 26, pp. 131-136.

____ Tagung des Arbietsausschusses des deutschen Geographentages zu Gotha Pfingsten, 1920 [Meeting of the program committee of the German Geographical Convention at Gotha Pfingsten]. *Geographisches Zeitschrift*, vol. 26, pp. 244-246.

1921 Die Davissche Lehre in der Morphologie des Festlands [The Davisian theory on morphology of continents]. *Geographischer Anzeiger*, vol. 22, pp. 1-6.

____ *Die Oberflächenformen des Festlands. Ihre Untersuchung und Darstellung* [Surface forms of the continents. Their investigation and presentation.] Leipzig and Berlin, B. G. Teubner, 250 pp. [2nd ed., 1928, 178 pp.].

1922 Zur Stellung der historischen Geographie [On the place of historical geography]. *Geographischer Anzeiger*, vol. 23, pp. 93-94.

1923 Methodische Zeit- und Streitfragen [Methodological topics and controversies]. *Geographische Zeitschrift*, vol. 29, pp. 37-59.

____ Die Bedeutung der Geographie für die Deutschkunde [The significance of geography for study of Germany]. *Deutsche Bildung*, Mitteilungen der Gesellschaft für deutsche Bildung, vol. 4, pp. 17-22.

____ Die Geographie in Wissenschaft und Schule [Geography in science and school]. *Erziehung und Bildung*, Wissenschaftliche Beilage zur preussischen Lehrerzeitung, vol. 4, March, 1923, pp. 17-19.

____ Leitlinien geographischer Auffassung des Auslanddeutschtums [Main trends in geographical comprehension of overseas German culture]. *Der Auslanddeutsche*, vol. 6, pp. 474-475.

____ *Der Gang der Kultur über der Erde.* [The Spread of Culture over the Earth.] Leipzig and Berlin, B.G. Teubner, 164 pp. [2nd ed. 1929.]

1924 Methodische Zeit- und Streitfragen [Methodological topics and controversies]. *Geographische Zeitschrift*, vol. 30, pp. 117-120.

____ Noch einmal die leidigen Fastebenen [Once again the poor peneplain]. *Geographische Zeitschrift*, vol. 30, pp. 286-290.

____ *Grundzüge der Länderkunde* [Characteristics of regional geography.] vol. 2, *Die äussereuropäischen Erdteile.* [The areas outside Europe]. Leipzig, B. G. Teubner. [2nd ed., 1924; 3rd ed. 1926; 4th ed. 1928.]

1925 Methodische Zeit- und Streitfragen [Methodological topics and controversies]. *Geographische Zeitschrift*, vol. 31, pp. 162-164.

____ Das Verhältnis der Geographie zu den Natur- und Geisteswissenschaften [Relation of geography to the natural sciences and the humanities]. *Geographischer Anzeiger*, vol. 266, pp. 209-216.

____ Geographie auf der Schule [Geography in the school]. *Pädagogische Warte*, vol. 32, pp. 539-546.

____ Die geographischen Grundlagen der französischen Kultur und Politik [Geographical bases of French culture and politics].

Westdeutscher Kulturboden, Aufsatze zu den Fragen des Westens, ed. by W. Volz, Breslau. pp. 7-23.

1926 Die japanische Landschaft [The Japanese landscape]. *Pädagogische Warte*, vol. 33, pp. 54-58.

____ Verzeichnis der in der Kriegs- und Nachkriegzeit ungedruckt gebliebenen geographischen Doktordissertationen der deutschen Hochschulen [List of unpublished geographical doctoral dissertations completed in German universities during and after the war]. *Geographische Zeitschrift*, vol. 32, pp. 101–111.

1927 Vorwort [to series of articles on Baden]. *Geographisches Zeitschrift*, vol. 33, pp. 169-172.

____ *Die Geographie; ihre Geschichte, ihr Wesen, und ihre Methoden.* [Geography; its history, nature, and methods.] Breslau, F. Hirt. 463 pp.

____ Zusatz zu: Eichelberger, R: Der Stand des erdkundlichen Unterrichts an den hoheren Schulen Badens [Addition to: Eichelberger, R.: Status of geographical instruction in universities and colleges of Baden]. *Geographische Zeitschrift*, vol. 33, pp. 281.

1928 Neue Wege in der Länderkunde [New trends in regional geography]. *Zeitschrift für Geopolitik*, vol. 5, pp. 273-275.

1929 Methodische Zeit- und Streitfragen, neue Folge [Methodological questions and controversies, new series]. *Geographische Zeitschrift*, vol. 35, pp. 264-286; 332-345.

____ Unsere Auffassung von der Geographie [Our comprehension of geography]. *Geographische Zeitschrift*, vol. 35, pp. 486-491.

____ Geopolitik und politische Geographie [Geopolitics and political geography]. in *Zur Stellung und Methode der Wirtschaftsgeographie*, pp. 332-345.

1930 *Die Klimate der Erde [Climates of the Earth].* Geographische Schriften, Heft 5, Leipzig and Berlin, B. G. Teubner, 115 pp.

____ Zur Stellungnahme von Seiten der Schulgeographie [On Points of view on behalf of school geography]. *Geographischer Anzeiger*, vol. 31, pp. 353-357.

1931 Der Orient und die Orientalische Kultur [The Orient and Oriental culture]. *Geographische Zeitschrift*, vol. 37, pp. 193-210; 269-279; 341-350; 401-414.

____ Die Geographie als Wissenschaft und als Lehrfach [Geography as a science and as a teaching subject]. *Geographischer Anzeiger*, vol. 32, pp. 107-117.

1932 Das Länderkundliche Schema [Regional geographical models]. *Geographischer Anzeiger*, vol. 33, pp. 1-6.

1933 Zur Ästhetischen Landschaftskunde [On esthetic geography]. *Geographische Zeitschrift*, vol. 39, pp. 93-98.

1933-35 *Vergleichende Länderkunde [Comparative Regional Geography].* 4 vols. Leipzig and Berlin. B. G. Teubner.

1934 Der Begriff der Ganzheit in der Geographie [The concept of totality in geography]. *Geographische Zeitschrift*, vol. 40, pp. 141-144.

____ Daniel Häberle [Obituary]. *Geographische Zeitschrift*, vol. 40, pp. 241-242.

____ Neue Angriffe gegen die heutigen Geographie [New attacks against present-day geography]. *Geographische Zeitschrift*, vol. 40, pp. 341-343.

1935 Gesetzmässigkeit und Zufall in der Geographie [Rule and accident in geography]. *Geographische Zeitschrift*, vol. 41, pp. 2-15.

____ Vergleichende Länderkunde [Comparative Regional Geography]. *Forschungen und Fortschritte*, vol. 11, pp. 351-352.

1941 Über die Bedeutung der Klimatologie [On the significance of climatology]. *Geographische Zeitschrift*, vol. 47, pp. 221-225.

POSTHUMOUS PUBLICATIONS

1947-5 *Allgemeine Geographie des Menschen* [General Anthropogeography]. 3 vols. Stuttgart, W. Kohlhammer, Verlag.

Vol. I (1947) Die Menschheit. Grundlegung der Geographie des Menschen [Mankind. Basis of Human Geography]. Ed. by H. Schmitthenner.

Vol. II (1952) Verkehrsgeographie [Transportation geography]. Ed. by H. Schmitthenner.

Vol. III (1957) Wirtschaftsgeographie [Economic geography]. Arranged by E. Plewe.

1960 Drei Autobiographische Skizzen [Three autobiographical sketches]. In Alfred Hettner 6.8.1859. Gedenkschrift zum 100. Geburtstag. *Heidelberger Geographische Arbeiten*, Heft. 6, pp. 43-76.

Foreword and Table of Contents to *Geography: Its History, Nature and Methods*

Alfred Hettner (1927)

[Translated from *Geographie, ihre Geschichte, ihr Wesen und Ihre Methoden*, 1927.]

FOREWORD

The present book is in many ways my life's work. I have not simply gathered together the larger part of its contents, but I have experienced them. Its beginning reaches back to my student days. Since I was perhaps the first to enter the university with the strong intention to study geography, I was confronted with something different than I had thought—a great deal of natural science; and I was confronted by my university instructors, each in a different way: A. Kirchhoff, Theobold Fischer, G. Gerland, F. v. Richthofen, for all of whom I hold the deepest gratitude. It lay in my intellectual aptitude to look for theoretical aspects to explain these various concepts, and thus from the outset I have frequently dealt with methodological deliberations; such have accompanied me on both of my South American trips. But then many years later and on many occasions, with the founding of the Geographische Zeitschrift and with the position of a newly established professorship in Tübingen, I often expressed myself on these questions, and then still later my methodological contributions accumulated. I have always believed that the methodology of a science must grow from a double basis, chiefly from individual research and presentation in different parts of the science as well as from detailed occupation with the general scientific instruction in theory, and I must add that the experience of the last years, in which methodology has again become fashionable, has confirmed this conviction. So far as possible this book is based on scientific objectivity, [but also] is subjective in a personal and certain sense. I attempt to explain all primary trends of geography and to anticipate these with an outline of the history of geography; however, I forego mention of every individual methodological opinion and will deal with such provided only details are expressed. The classification of methodological opinions, like those recently created, gives a false picture of disagreement, as they no longer exist in reality. Much more important as determinants of the problems of science are inquiries into its methodology, and, to be sure, not only of teaching but also of research and presentation. A glance of the table of contents will show that herein lies the weight of my book.

I believe it may be permitted to exclude an alphabetical index; such is necessary in books in which facts are important, but is of little use in books in which the expression of ideas form the main theme. If one is interested in particular questions, these can be easily found with the help of the table of contents.

Again, my dear wife Marie née Mall and Miss Dr. Erika Schmitthenner helped with the manuscript and corrections of the book; for that I sincerely thank both. Also I am thankful for the amiable cooperation of the publisher, who kindly presented me with the festschrift that my students [prepared for me] on my 60th birthday.

Heidelberg, 21 March 1927
Alfred Hettner

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Alfred Hettner

[A Biography]

H. Schmitthenner (1941)

[Translated from the original German in *Geographische Zeitschrift*, vol. 47 (1941), pp. 441-468.]

With Alfred Hettner's death, one of the last witnesses and scholars of the great era of German geography passed away. Only a suggestion of the academic evaluation of this man can be made in this short essay. To deal with this task properly, a biographer would have to consider Hettner's life and work in relation to their historical background, and would have to write, therefore, a complete history of geography of the last 80 years.

Alfred Hettner's date of birth, the sixth of August, 1859, lies between the time of the deaths of Alexander von Humboldt (May 6, 1859) and of Carl Ritter (September 28, 1859). When Hettner began his studies Peschel had died and Richthofen had not yet begun his lecturing. At that time there were only three chairs for geography in Germany. Thus Hettner, as a student and from the time he began his independent scientific research, consciously witnessed the entire development of German academic geography. Later as a professor of geography he worked closely with his former teachers, Alfred Kirchhoff, Georg Gerland, Ferdinand von Richthofen, and Theodor Fischer; and joined with his colleagues Hermann Wagner, Friedrich Ratzel, Joseph Partsch, Alexander Supan, Albrecht Penck, Erich von Drygalski, Karl Sapper, Siegfried Passarge, Robert Gradmann, Eduard Brückner, Otto Schlüter, Wilhelm Volt, and a number of others to form the leading group within a generation of geographers. Many academic teachers of today are his students. But above all his research and thinking have influenced geography most strongly, and he has left us an imposing number of contributions to geographical literature.

Among his unpublished writings a stenographic manuscript was found: "From my Life,"[1] which he had written at the age of 77. By reading this it became even more clear to me how Hettner was able to regulate his life with such clarity and consistency in spite of all handicaps and how a scientific work of art could be formed only with the "ethos" of a great and just soul always conscious of its mission.

As a son of the widely known literary historian and director of the Royal Collection of Antiquities in Dresden, Hermann Hettner, he spent a happy and spiritually inspired childhood and youth, living with his numerous brothers and sisters under comfortable circumstances. His penchant for geography did not have its origin in the family circle, which was more interested in the fields of history and art. It is curious that the artistic influences of his childhood gave him only relatively little understanding of the arts. He was never interested in music, and works of poetry and fiction meant nothing essential to him. But he had an innate sense and memory for forms, and until the end of his life he enjoyed the fine arts. This feeling for the architectonic beauty of a clear and plain style is certainly a paternal heritage.

His interest in geography was first awakened when a nephew of Heinrich Barth, Rudolf von Schubert,[2] became his classmate and friend in the Obertertia ["upper third," or grades corresponding to the American junior college] of the Vitzthum Gymnasium. However, the concern of scientific geography at that time was not travel and descriptions of travel, but the problems of human geography. When Hettner left school during Eastertide in 1877 he was probably the first to do so with the marked intention to study geography. It was only through the wish of his father that there was an addition in his class schedule in the gymnasium: "and history."

The choice of a university for a future geographer was not an easy one at that time. In Leipzig [the chair of geography] was left vacant by Peschel's death, for Georg Schweinfurth had rejected this professorship offered to him. Hermann Wagner was teaching in Königsberg, Alfred Kirchhoff in Halle, and Georg Gerland in Strass-

burg. The historians Carl Neumann in Breslau and Heinrich Kiepert in Berlin and the statistician Johann Eduard Wappaus in Göttingen, it is true, took care of geography as a subsidiary subject. During the summer semester of 1877 and the winter semester of 1877/78 Kirchhoff was Hettner's first teacher in geography. Kirchhoff was an inspiring teacher, especially for the younger students. From him Alfred Hettner received lasting and always gratefully-felt inspiration for his methods in regional geography. But the beginning courses disappointed him because he had imagined geography as Ritter taught it. Now he had to experience the fact that as the basis for modern geography of that time studies of the natural sciences, especially of geology, were necessary subjects, with which he was not yet familiar. Although Halle offered much inspiration, Hettner could not feel at home in this university where learning was highly esteemed and rather narrow-minded students focused their attention only on passing the state examination. Kirchhoff's lectures were entirely adjusted to this tendency and therefore were placed on a broad level. In spite of his great merits concerning the methods of geography, Kirchhoff was more a popular teacher than a deep scholar. His lectures could not lastingly satisfy a young critical student, who was certain that he would never become a school teacher.

Hettner went to Bonn University mainly for personal reasons. He knew that he would be received there by an inspiring community of young scholars, the so-called "Bonn circle." In Bonn he made friends with men who later became important figures in Germany's universities and in public life. At that time Theobald Fischer was assistant professor in geography at Bonn. The lectures of this ingenious man, still in the beginning of his career at that time, did not impress Hettner very much. But Fischer gave him the opportunity to work according to his interests. In Halle Hettner had already begun to deal with climatological problems, inspired by Woeikof's book on atmospheric circulation (1874).[3] In Bonn, induced by Theobald Fischer, he turned to an investigation of rainfall in South America, then gradually passed to the study of climate in Chile. Besides this he took courses in geology and in the basic subjects of the natural sciences: physics, chemistry, mineralogy; but also in history and especially political science. It was precisely the latter subject he pursued constantly because of his interest in cultural geography. In Bonn at that time it was not yet possible to take the doctor's degree in geography. Thus Hettner had to change universities. The splendor of the new and growing university of Strassburg attracted him, and many of his friends, joined by new ones, were in Strassburg.

It is important, but mostly due to the situation of scientific geography at that time, that Hettner graduated under Gerland. Gerland was originally a classical scholar; later as a disciple of the philosopher Theodor Waitz, author of the *Anthropology of Primitive Peoples [Anthropologie des Naturvölker]*, he turned towards ethnology and edited the 5th and 6th volumes of this great work after Waitz's death. Gerland was no geographer when he was offered and accepted the chair of geography in 1875, though he failed to change it into a chair of ethnology. With great diligence he acquainted himself with the field of geography, methodologically still obscure, though it had been rather far from his original interests. Since he was already a man of middle age he only partially succeeded. Because Waitz regarded psychology as a basis of philosophy and tried to base psychology on natural science, Gerland was already oriented toward the natural sciences. Through Peschel's last activities general physical geography or rather systematic geography had gained superiority, and Gerland went over entirely to that side. Regional geography, which he called descriptive geography, was only of minor importance to him. It is well known that he rejected human geography because of theoretical reasons. He regarded his teaching of ethnology as a personal union with geography, and he seldom gave ethnographic lectures in addition to the long ones in geography. It is characteristic that today Gerland's name mainly lives on in geophysics, as well as in seismology, and through "Gerlands Beiträge zur Geophysik," a journal which was founded by him. But Hettner's period of instruction with Gerland, whose house the graduate student often visited, and with whom he had often discussed human geography, was not fruitless. Gerland's great thoroughness, scientific accuracy, and his broad knowledge of the field of history did not fail to be effective. His courses and seminars were inspiring, and they drew Hettner's attention again to South America when studying the travels of Humboldt and Darwin. Moreover, Gerland was probably the first geographer to make field trips at that time, though they were eclectic and not entirely satisfactory in terms of the methods applied, according to Hettner's manuscript ["From my Life"], mentioned above. Above all,

however, Gerland organized in Strassburg the first geographical seminar around which an independent scientific center for all students interested in this subject was established. Hettner often had thought about going to another university; but it seemed to him to be unwise to change so shortly before his graduation; all the more so since he was very contented with the scientific institutions and social life in Strassburg. Though his scientific aim was geography, Hettner thought it necessary to begin his first independent research with problems in physiography. His dissertation was to deal with an investigation of the climate in Chile, already started in Bonn. But the work he presented comprised only the first part on pressure, winds, and the Humboldt Current.[4] The continuation of this study had become impossible because of the war between Chile and Peru, for the published meteorological material concerning temperature and precipitation was not sufficient for computing usable mean data, and the publication of meteorological observations was discontinued due to the war. Hettner's work on this subject was never to be resumed. Unfortunately his dissertation is only slightly known and is unobtainable even in second-hand bookshops. Hettner writes about this work: "I may claim the honor to have been the first to try to deal with climate in a psychological manner. I had already proceeded well into my work when Supan's 'Statistik der unteren Luftströmungen' (1881) appeared which was characterized by similar ideas." Hettner often emphasized the point of how important it was for his scientific development to have begun with climatological research. To Hettner, morphology, which had begun to develop at that time, seemed to be the second basis for the scientific pursuit of the subject he had chosen. He started field work, especially in order to train his ability to observe. He chose the so-called "Saxon Switzerland" in his native neighborhood and presented a lecture on rock formations in the Elbsandstein mountains in Gerland's seminar. Later his inaugural dissertation resulted from his occupation with these problems.

In Strassburg the young geographer was fascinated by his experience with philosophy, not so much by lectures as by conversations and discussions with his friends and by reading Lange's history of materialism. After Hettner's death the author found this book still open at his resting place. Hettner chose philosophy as his second subsidiary subject for the doctoral examination, and at times his philosophical interests were so great that he thought of going into that discipline. His friendship with the philosopher Kulpe and even closer relations with Heinrich Meier still deepened this interest later on. Looking back, Hettner writes: "It is good that I did not go into philosophy for many parts of that subject are alien to my intellectual individuality, and probably I would not have seen my way in modern philosophy. But the study of philosophy has been useful to me in so far as it gave my methodological endeavors a deeper foundation. I felt grateful for having been awarded an honorary membership by the 'Verein für Erdkunde in Dresden' as the philosopher among the geographers."

At the beginning of the winter term of 1881-82 the young doctor moved to Bonn immediately after his graduation in order to enter the circle around Ferdinand von Richthofen, who had begun his lectures in the meantime. Originally he had intended to stay there only for one semester and to fulfill his military obligations afterwards. Because he was rejected [by the military], he went back to Bonn again the following semester. Richthofen's imposing personality deeply impressed him as it did all other students. He heard him lecture and took part in the famous colloquium established by Richthofen in Bonn and continued by him in Leipzig and then in Berlin until his death. Hettner writes about Richthofen nearly fifty-five years later: "His speech was a little stagnant, but through its keen, ingenious contents [it was] very imposing. From Gerland's systematic geography I came again in contact with real geography, though probably a little one-sidedly oriented toward morphology; [it was] particularly in this morphological section that Richthofen's geography yielded entirely new viewpoints." But the young doctor inwardly criticized the way in which the colloquium was held. The entirely free choice of topics, at that time mainly reports on newly published books and treatises, of which several quite different ones were given in one evening, could be doubtlessly instructive for advanced students, but not for the younger ones and for those who were studying geography more as a subsidiary subject. Hettner was cordially received by Richthofen, who believed, however, he would find in this young man (who had just dealt in his dissertation with the Humboldt Current) an assistant whom he could induce to work in oceanography, a field which at that time was little explored. But Hettner had gone to Bonn in order to study morphology from Richthofen; thus, he "had to resist him a little." Nevertheless his studies with Richthofen were of lasting value for him as

he has always acknowledged. Strictly speaking, however, he never thought himself a disciple of Richthofen. When he came to Richthofen, Hettner had already developed his academic personality; he had acquired a certain view of his life's work as a scientist; and he regarded his studies at Bonn more as a preparation for his future field work. He was absolutely aware of the fact that he had to make exploring expeditions in foreign countries to gain his aims.

He did that sooner than he expected. His father had been ill for several years, and the family had to consider the fact that he would not recover his health. Nevertheless death came rather unexpectedly on May 29 in the Whitsun-week of 1882. Hettner had no idea that his fate should be determined by this event. Among the letters of condolence was a note written by the well-known politician Georg von Bunsen, who happened to know that a son of the deceased had graduated in geography. Bunsen was seeking a private tutor for his English friend, J. P. Harries-Gastrell, the newly appointed ambassador to Colombia, a tutor who would be able to prepare his son for the diplomatic examination. Because he was convinced that with this position he would do a geographer a greater favor than a philosopher, he inquired whether this son of Hermann Hettner would be willing to accept the tutorship in Bogotá. Though it was hard for Hettner to leave his family at that time, he decided to go to London a few weeks after he had settled his military status, for the Gastrells planned to move very soon. Thus it had become certain that Hettner would go into the Andean countries as a pioneer of German geography.

He had to begin his stay in Colombia without any special scientific preparation for that area. In fact, the departure was delayed; but nevertheless his studies in the British Museum, which had become possible at that time, could only be cursory. But Hettner's scientific training had been thorough, and his intellectual maturity was such to make his stay in Colombia a fine scientific success. Other circumstances were very favorable. Because the British ambassador was not pleased with conditions in Bogotá, he soon returned with his family to London in March, 1883, but paid his son's tutor for the whole stipulated time. Freed from his duties, Hettner remained in South America with the intention of traveling over the country and investigating it as far as possible.

He has summarized his stay in Colombia in a series of essays published in "Ausland" (1885 and 1886) and has described it in a book with the title *Reisen in den Columbianischen Anden* [Travels in the Colombian Andes (1888)]. Even today it still belongs to the books of travel most worth reading, especially for the geographically interested reader, because it summarizes the material by aspects of the geographically typical, at the same time giving details. Hettner had already done some traveling [in Colombia] during the time he was a tutor and could therefore now turn from short excursions to longer trips. But his plan to reach Ecuador and Venezuela had to be given up, and he restricted his research mainly to the Cordillera of Bogotá. Only one longer trip led him beyond the Magdalena River across the Central Cordillera to southern Antioquia, and a short trip then took him to the eastern edge of the cordillera and into the border region of the Llanos. In August, 1884, he had to discontinue his investigations in Cúcuta, because the political situation had changed for the worse and at the same time news from home seemed to make a return necessary. He reached New York by ship via Maracaibo and Curaçao. The short time in the United States, which was just long enough for him to see Boston, the Niagara Falls, Philadelphia, Baltimore, and Washington, besides New York, was to be Hettner's only stay in North America. On September 28, 1884, he was again on German soil. On the whole Hettner had performed the task that he had set for himself. Geographical knowledge of Colombia was still quite meager at that time, and the existing maps were insufficient. Everywhere he had to map his own routes[5] and also obtain the geological background for his studies himself. The first geological division, still generally accepted by the Colombian Geological Survey, is based on Hettner's investigations. These Sievers could use even in manuscript form on his travels in Venezuela; [Sievers] then published them earlier than Hettner. In 1935 Hettner wrote about his Colombian results: "Of course I started from the prevailing geological ideas of that time, which were mainly concerned with the processes of folding. Stille's later assumption of a dominating fault structure proved to be incorrect, but overthrusting may be an important factor, of which nobody thought at that time. I also believe that I was right in explaining morphological and anthropogeographical conditions. But on some points [misinterpretations] were asserted due to lack of sufficient observations and experience, as, for example, that concerning the problem of a former glaciation of the mountains. . . . I thought it proper to consider carefully arguments and counter-

arguments and to leave the question open. . . . The original forest covering, or lack of it, in the inner parts of the Cordillera seemed to be an important question to me: but I did not succeed in forming a definite opinion." It was not until 1888[6], 1892[7] and 1893[8] that the scientific results were published. Several causes delayed publication. First of all Hettner had to familiarize himself once more with home conditions and become accustomed again to study in the library. But most of all he had to overcome the aftermath of a case of dyspepsia and dysentery from which he had suffered very much.

From the fall of 1884 until Easter of 1888 Hettner lived at times in his parental home at Dresden-Loschwitz, but mostly in Leipzig where Richthofen had been appointed professor of geography. He took part again in his lectures and seminars, renewed his investigations in the "Saxon Switzerland," and in addition began to work up the material of his Colombian travels. His work in Saxony with which he had become familiar in all its details, served as a tonic to regain a feeling for home. The completion of the treatise on his travel results, however, was handicapped by this work. With his famous [habilitation] dissertation on the mountain structure and landforms of the Saxon Switzerland[9], which had progressed more [quickly] than his essay on the Cordillera of Bogotá, he graduated under Friedrich Ratzel, who in the meantime had become the successor of Richthofen in Leipzig (June 29, 1887). In order to accede to Hermann Credner's criticism Hettner agreed to add a chapter on the landscape around Dresden, which he very carefully elaborated; Hettner always regretted that this chapter was never published.

In the "Saxon Switzerland" Hettner has developed his morphological concepts. A geological survey had not yet been made; consequently Hettner also had to map the area geologically. The results of his work were surprising in many respects, though less so in the discovery of the relations between individual forms and rock type. Above all, he was the first to turn against the theory of Eduard Suess, prevailing at that time, that all fault forms were connected with depressions. From the morphological point of view he had obtained the almost revolutionary idea that the Elbe Valley for the most part did not originate before Pleistocene times and that this could be explained only by uplift. Possibly more significant, however, was his idea that the plains areas, which often corresponded to high valley floors, were developed by continental denudation [mass wasting]. But this interesting theory was not seriously considered at that time. Indifference to this idea was also due to the fact that the printer's devil made "mass deposition" out of mass wasting at a very important juncture of the paper. Thus almost at the same time as the American geologist Davis (but quite independent of him and without acquaintance with his works), Hettner developed a theory which was generally accepted later on in geomorphology, but only at a time when Hettner himself had already recognized that the concept could not be maintained in its generalized form.

In the winter of 1887, his teaching career began with a lecture on South America. But this was the only lecture he gave for some time, for already early in the summer of 1888, Hettner set out on his second and greatest South American trip. In Cuzco Adolf Bastian had purchased a valuable collection of Peruvian antiquities for the Berlin Museum of Ethnology. Hettner, who knew South American conditions, was to receive the materials and send them to Germany. He agreed to this proposal provided he would be given means to travel in the country. All preparations for leaving were completed, tickets were already booked for transport, when a German business concern in Arequipa and Cuzco agreed to ship the material. Bastian accepted the offer, but he generously did not renounce the contract with Hettner; rather he directed Hettner to collect as many Incan antiquities as possible for the Berlin Museum.[10] Besides this, he was to be entirely independent. Thus the generosity of the ethnologist, Bastian, made it possible for a geographer (who only with great difficulty could get public financial support for research outside of Africa at that time) to carry out his research plans independently. It was Hettner's plan to travel (by-passing the railroad) on horseback and on foot from Mollendo into the uplands of Bolivia and Peru, investigating first the upland of Lake Titicaca and environs in the west, but particularly in the southeast and northeast. He then intended to advance into the high mountains of the eastern cordillera and into the Yungas of the eastern slope; then to travel through the valleys of the Peruvian Sierra to Cuzco; and after that to investigate the country between Cuzco and the coast, crossing the western cordillera on the way back to Cuzco; thence to Lima and the coast at Callao. Before the start of this exploring expedition he made a short trip from Callao and Lima via the Oroya railway to visit German friends in the mining district of Yuli. On this trip, the beginning

of his undertaking, Hettner became acquainted with the "soroche" or mountain sickness, due to the rapid ascent into high altitudes. Fortunately, three quarters of his travel program would be carried out, but the attempt to reach Lima by crossing the high mountains failed, due to bad weather and a series of small mishaps. A fall from a mule finally forced him to return to Cuzco. Now he decided to go to the basin of Lake Titicaca, crossing the basin from Puno to pass over the Chilean border to Moquegua and Tacna, after traversing the mountainous Puna of the western cordillera, and to reach the coast at Arica. About one year after he entered South America, he arrived in Tacna, where his exploring expeditions ended. Then he was informed that new financial support would be available from the Berlin Geographical Society [Gesellschaft für Erdkunde zu Berlin] and that it would be possible for him to widen his knowledge of South America considerably and to return via Chile, Argentina, Uruguay and Southern Brazil. It was too late in the year, however, to journey through Chile and especially its southern areas. There were less than two months for travelling at his disposal, for the trip across the Chilean-Argentinian cordillera had to be made before the beginning of the first snows. He became acquainted with Iquique and the nitrate area, continued by steamer to Valparaiso and after a short stay at Lota and Corral, to Valdivia. From there he travelled by land via Osorno, Lake Rupaico and Lake Llanquihue to Puerto Montt, where he visited the outstanding authority on Chile, Dr. Martin. He also became acquainted with the German settlements in the South Chilean forest region. The attempt to journey along the coast farther south failed because of an influenza epidemic, reducing the steamboat traffic. Therefore he returned to Talcahuano, the port of Concepción and on by train to Santiago, where he was cordially received by German professors of the university. From there he went by rail to Santa Rosa and on horseback to Mendoza. The fact that this trip across the high mountain range did not impress Hettner in the same way as [it had] many others before him finds its explanation by considering that this landscape is inferior to the grandeur of the Peruvian ranges. Now he went by train across the Pampa to Buenos Aires and La Plata. The passage to Montevideo followed and then the trip, partly by stagecoach, through Uruguay to Bage near the Brazilian border; thence by train to Rio Grande do Sul and by steamship across the Lagoa dos Patos to Pôrto Alegre. The next weeks were spent visiting the German settlers in southern Brazil. Without making the trip to the uplands of So Paulo, Hettner traveled from Pôrto Alegre directly to Rio de Janeiro. There he enjoyed the wonderful landscape before departing from South America.

Hettner could look back on his travel with pride. He had investigated the elements of landscape of a vast area as far as that was possible for a single person at that time. He had held to his purpose to avoid the railways and steamboat routes of Lake Titicaca within the main area of his explorations. He had lived on horseback, and even decades later the author of this short biography could see him speaking to his riding animals in Spanish or Aymará in quite different regions of the world. His stays at great altitudes, the almost continuous living in the open air under weather conditions that varied from the lowland tropics up to the páramo, the constant attentiveness of his mind, the burden of mapping his route everywhere—all demanded the greatest physical efforts. But the scientific results seemed to have justified the effort. However, all this would cost him dearly. During a trip made from Santiago, he suddenly felt "as if the weight of a leaden ball were hanging from his legs;" he was really unable to move. The beginning of a muscular atrophy was recognized already by the first medical examination. Until now it could be noticed only in certain weakness of his legs and a susceptibility to ankle sprains, which did not hinder him while making both of his long trips through the Andes. But now this disease was worsening due to past hardships; the long and hard exercise of the upper thigh may have prevented the atrophy to advance beyond his knees later on. Hettner was always hampered in walking since that unfortunate event. After his return [to Germany] the disease became worse; but improvement set in after a period of near paralysis, and Hettner was able to regain a considerable amount of mobility by using an apparatus of Hessing. He rode a bicycle and during his later travels was able to visit all places that could be reached by riding a horse or a mule. The free movement of his limbs, however, was lost. This fact made intensive field work difficult for him, and later on made it even impossible. In the summer of 1914, he was involved in an automobile accident on a field trip in the Palatinate and broke the thigh bone of his right leg. The long period of lying in bed while the bone healed caused him to lose much of his former mobility, and henceforth had to lean upon someone when

walking. It is obvious that this disease influenced his character. He had to compensate for everything usually done by the work of the muscles through the exact arrangement of his activities; he had to have in his mind what he otherwise would have done with his legs. But with an admirable attitude, he bore and practically overcame the disease.

The scientific results of his long travels have become known only slightly, mainly through the publication of the letters written during his field work. In these, Hettner reported his findings to Ferdinand von Richthofen, who published them in the Transactions of the Berlin Geographical Society [Verhandlungen der Gesellschaft für Erdkunde zu Berlin].[11] Hettner has published a longer essay on Germanism in South Brazil and South Chile in the "Geographische Zeitschrift" in 1903. The combination of his own observations with the existing literature in one long manuscript was delayed by other works and was finally dropped. But later on he often placed his diaries and works at the disposal of his students and younger colleagues working in South America.[12] Much that he had investigated and put down in writing has been independently recovered and then published by other authors. In spite of this, the field work [in South America] was of utmost importance for Hettner's development. Through research and observations, directed towards all geographical features, he had gained the basis of his method of geographical description and had become a successful explorer. In short, he had become a geographer thoroughly trained in field work and a geographer with a strong personality.

In the winter of 1890-91, after an interruption of five semesters, he resumed his lecturing in Leipzig. He always liked to remember Leipzig. His relations with Ratzel were friendly but cool. The personalities of these two great geographers were entirely different. It was not until his last days in Leipzig that Hettner was genuinely friendly with him. Fifty years later Hettner writes about Ratzel: "My way of thinking was not very deeply influenced by him. In fact, I tended to anthropogeography from the beginning, and my method of handling the subject was different from his. I was less occupied with outlines but cared much more for an intensive study of physical geography, chiefly of the morphological basis." His relations with his younger colleagues, such as Hassert and Schurtz, became very friendly, and these also inspired contact with other colleagues in the university. In the midst of his work on the Andean countries Hettner took over a literary task which gradually distracted him from the elaboration of the results of his field work. At the request of Albrecht Penck, the publisher Spamer had asked him to prepare a German edition of the French atlas of Schrader and to write a German text corresponding to the French edition, to be printed on the back of the atlas pages. The remuneration was attractive, but in the main Hettner wanted to get away from his Latin American specialism and to orient himself within the whole field of geography by working on this task. In order to achieve as much as possible within the available space, the writing of the text required a troublesome selection of material and an extensive factual knowledge. Hettner had no scientific success with this work, but it became the basis for the characteristics of his regional geography.

Even before finishing the atlas text Hettner founded a new geographical journal. He got the idea to do so because the old, famous journal *Das Ausland*, edited by Peschel and Ratzel, had suspended publication, and because for some years a journal of general scientific geography had ceased to appear. Another factor was that *Petermanns Mitteilungen* overstressed special problems, especially when Alexander Supan was editing the journal; Supan refused to publish essays on general geographic themes, as Hettner personally discovered. This new periodical should present general ideas and scientific results to a wider audience interested in geography, as was done formerly by *Das Ausland.* While still thinking over his plans (also sometimes talking about them with Ratzel) he was contacted by the publishing house, B. G. Teubner, to which the suggestion to found a new geographical journal had been made by other persons. Ratzel referred the publishing house to Hettner. Thus in 1895, the first number of this journal [*Geographische Zeitschrift*] was published by B. G. Teubner. Even with its first volume it already had become a leading representative of German geography and has upheld its present character from the beginning. Perhaps it leaned a bit more to the scientific side than Hettner had originally intended. Through four decades, until he reached the age of 76, the *Geographische Zeitschrift* was the means by which Hettner exerted a far-reaching scientific influence on geography. A large number of his own essays appeared in it, and one can say that his activity with this journal gave him a central position in German geography; for him this activity was always a great scientific and ethical obligation. The principles of his editorial policy are laid down by him in the introductory

essay to the 25th volume.

On May 30, 1894, nearly a year before the first appearance of his journal, Hettner had become an assistant professor. It was not until 1897 that he got an independent professorship in Tübingen. There he was cordially received in an intellectually stimulating circle. The geologist, E. von Koken; the zoologist, R. Hesse; and the philosopher, Heinrich Meier, soon became his friends. Lecturing, however, was not really possible until the second semester. As an assistant professor Hettner did not yet have a seat and a vote in the faculty [council] and accordingly could not look after the interests of his subject there. The request for the establishment of a geographical institute was granted, but concerning the question whether such a geographical institute should have an annual budget of 600 or only 400 Reichmarks, the senate and the faculty of the university each reported differently to the [government] ministry! This dispute finally led to Hettner's acceptance of a chair in Würzburg during the following summer, where also a new geographical professorship was established. But there, too, difficulties arose. Here the fight was for the necessary rooms for the institute. Only later did Hettner's successor, Fritz Regel, succeed in conquering an old "Karzer" [At that time a lock-up or prison for students who had violated university rules] as a home for the geographical institute. Hettner himself was not given any time to begin his professorship at Würzburg, for a few weeks later he got the chair in Heidelberg, which would become his future home. In spite of its shortness Hettner's stay in Tübingen was very important for his scientific development. There he thought out plans for his lectures, and began to test them; by means of many bicycle trips he became familiar with the beautiful landscape of the environs, and obtained new ideas for his morphological studies. When Hettner came to Heidelberg in 1899 the university was at one of its peaks. Important scholars of all faculties gave it a particular splendor. The city with its romantic enchantment had something of an elegant and dreamful quality, and was not yet overrun by the crowds of the motor age. In the house, Ziegelhauser Landstrasse 19, opposite the Castle, Hettner found a nice apartment. Until his death he lived in this house, and his colleagues and students were frequent visitors there. One usually came in the afternoon when coffee was served, sat in his study room or on the balcony, and — during the conversation — viewed the castle, the green bays of the Königsstuhl, or the roaring Hackteufel, and later after the construction of the dam, the smooth surface of the river. How often these objects would serve as examples in scientific or philosophical discussions!

Hettner experienced joys and sorrows in Heidelberg. Soon after the beginning of his activities in Heidelberg great and deeply felt happiness came when he married Berta Rohde, the daughter of the famous philologist Erwin Rohde. But this would last only for a short time. His wife died after a serious pulmonary disease scarcely three years after the marriage. Until his death a vivid memory of the deceased remained with him always. She gave him both the greatest happiness and the deepest pain. Not until twenty-three years later did he marry for the second time — with Marie Mall, his faithful assistant for many years, who ran his home and had become his indispensible secretary and his most faithful friend. She kept his hospitable house entirely according to his wishes, and has become familiar and dear to many of Hettner's students. Without her untiring help at the writing desk, in the household, and at the steering wheel, Hettner's indefatigable activity and constant energy, lasting until the end of his life, would have been impossible.

What he found in Heidelberg corresponded with his character, and thus he quickly became attached to the circle of his colleagues in Heidelberg. Many groups of friendly acquaintances linked him with colleagues in allied sciences as well as with members of other faculties. The closest relations existed with the church historian Hans von Schubert, an early friend and fellow-student. For some time during Hettner's later activity both the city and the University of Heidelberg were rather distinctly the center of a certain scientific and esthetic intellectualism. Hettner, however, was far from this tendency, though he stood firmly within the circle of his colleagues and students. He felt deeply attached to the county of Baden and especially to the landscape around Heidelberg; and since his lecturing developed according to his concepts, he refused every appointment that he was offered later on.

His vacations were spent mainly by taking trips, which he prepared exactly and in every detail. Thus he acquired a far-reaching knowledge of the European countries. The Balkan Peninsula and Greece were the only countries he did not visit. He usually travelled with a relative or a close friend.

After the Seventh International Geological

Congress in 1897 in St. Petersburg he visited European Russia and the Caucasus. In 1908 he was in Egypt with his brother, the painter Otto Hettner. The author had the chance to accompany Alfred Hettner on two trips, in 1911 to Tunisia and Algeria and in 1913/1914 on a thoroughly planned round trip to Asia, through Siberia, to Tsingtau, Peiping, and into the loess areas; then across to Japan; again to central China via Hong Kong, and Canton, and up the Sinkiang; then via Singapore to Java as far as the Tenger Mountains; to the Malay Peninsula; to Burma, up the Irrawaddy River to Mandalay and into the Shan States; to India, making several trips from there into the Himalaya Mountains, into the Aravalli Range, into the Western Ghats, and into the Nilgiri Mountains; and finally into Ceylon. In spite of his handicapped leg, Hettner did not experience any difficulties on this trip, which was rather hard at times, whereas I fell ill in Java and had to return home early. Hettner made the trips through Burma, India, and Ceylon alone. At the end of April, 1914, he returned home safely and full of new impressions, which made all the more tragic his leg fracture suffered in an accident in the Palatinate in May of the same year. When the war broke out he still had to stay in bed, where he gave his lectures and courses. Only by the greatest effort was it possible for him to go on long field trips, but nevertheless he climbed many a mountain in central Germany after the war. During the war and in the post-war period he made only short trips to adjacent countries, in the Alps and in Italy. He also attended meetings and scientific congresses, of which the last one he visited was in Magdeburg in 1929. In order to be more mobile he bought a car in 1930, which was driven by his wife. The very next summer he went by car to Rome and into the Abruzzia Mountains; in the following years to southern Tirol, to northern and central Germany, to the Rhine, and often to the Black Forest. During the last period of his life the Kandel, the magnificent corner pillars of the high Black Forest to the north of the Freiburg Bay, practically became his summer home. Even in that year the car and gasoline for the trip (to the Kandel) were granted by the authorities: even a few days before his death he had stayed there, and had often looked up from his reading to view the wide, beautiful landscape extending into Alsace, where his eyes sought the spire of the cathedral of Strassburg through the haze—Strassburg which had once more become German and which he had longed to visit again.

The World War [I] began just a few months after Hettner's return from his trip through Asia, just as he was in the midst of writing up his experiences and ideas. His life was less influenced by the war than by his scientific activities. The latter were always adjusted to the situation of the time. It was a matter of course to him that science was pursued not for its own sake but for serving mankind. Therefore all his abilities in practical geographical work were given to his fatherland. Up to the end of the war he believed in Germany's victory or at least that the Reich would emerge from the war intact. He always considered the period after the breakdown as transitional and refused to acknowledge the new political and economic structures as permanent and open to scientific investigation. The world, affected by the shocks of war, was ill. To work for Germany and to maintain the honor and reputation of German scholarship in spite of all hardships seemed to be possible to him only in the field of purely scientific activities. Therefore he resumed his scientific work at a point where he had interrupted it at the beginning of the war. Thus Hettner's life work is divided into three periods by the World War.

At the time of Germany's greatest humiliation he celebrated his 60th birthday within the small circle of his most intimate students. The publication, "Twelve Studies in Regional Geography" (Zwölf Länderkundliche Studien), dedicated to him in honor of his birthday, could not appear until later due to the circumstances of the time. Years passed in tireless work. His retirement (in the spring of 1928) was not as easy for him as one might expect for a man physically impaired; but in the end he was happy to be rid of his official duties and to have the chance to devote himself entirely to his writing; [he was] all the more [at ease] as the problem of his successor had been satisfactorily solved, and at the same time the way was clear for a new era of geography in Heidelberg through my transfer to Leipzig.

His relations with his successor, J. Sölch, became very friendly. Hettner welcomed the grant of a new institute for the new professor: this had been necessary for some time, and was quickly completed, though Hettner never entered its new rooms. Later, when Sölch had moved to Vienna, the relations between Hettner and Wolfgang Panzer, who was chosen as Sölch's successor, were good. During the last years of his life he developed a particularly close friendship with Ernst Plewe, with whom he was connected by philosophical and methodological interests. His 70th, 75th, and 80th

birthdays were landmarks in the last period of his life. On his 75th birthday his students and friends gathered around him, and on his 80th, which he celebrated on the Kandel, immediately before the beginning of the war [WW II], again a great number of his students, besides his closest relatives, came to visit him. But for him life was an obligation [to finish] his great task, until a final short illness and death prevented him from working on. In the early morning of August 31, 1941, Alfred Hettner passed away. His death was really, as a colleague wrote to me, "a physical and spiritual ending in the harvest of the last seed, nurtured in his own thoughts and works as in those of his students; he consciously lived a rich life until its very end."

In order, however, to understand Hettner's work and his importance for geography, we must consider his teaching and his written works.

The academic profession always meant a great obligation to Hettner, and he fulfilled it most conscientiously for more than 40 years. He passed on his scientific ethos to his assistants[13] who worked together harmoniously with him since 1905. There were close, even friendly, relations between Hettner and them.

The core of his teaching work was the main lecture of four hours a week. Hettner did not impress [his audience] by ornamental speech, for he did not aim at flowery or witty diction, but at distinctiveness and clear demonstration, sometimes spiced with humor or sarcasm. Particularly characteristic was his starting with facts and his rigorous holding to reality which gave his thoughts fixed points and made impossible any rambling speculations and asides. His speech, strangely changing between two pitches, was fluent and convincingly impressive. Because it was necessary for him to lecture at the same time to beginning and advanced students, to students familiar with localities and those newly matriculated, to those majoring in geography and others who were taking geography only as an elective, he thought it impractical to give a course running over several semesters; he covered all or at least the most important facts of geography within a semester period. From his point of view the academic lecture did not have to strive for completeness: "By reading students can fill gaps themselves, during their studies or later. The lecture should give the student what he cannot find in books." Most of all he was interested in providing his audience with a whole methodical concept, enabling his students to extract geographically essential things, even from non-geographical readings. Because there were a number of good textbooks in general physical geography at the turn of the century, but nothing of this kind in anthropogeography and regional geography, Hettner gave lectures mainly on regional geography during his first 15 years at Heidelberg.

Moreover, there were lectures on anthropogeography given at greater intervals, dealing with a general survey or with greater parts of this subject, such as the popular lectures on the geography of colonization, of world trade, and of world politics. After his "Characteristics of the Regional Geography of Europe" had been published he treated mainly the non-European countries; when the characteristics of regional geography were completed this aspect became more or less secondary in his lectures, and he began to emphasize physical geography. Beside the main lectures there were minor courses prepared for a larger audience; these dealt with the Alps, Germany, the German colonies and the development of culture. Later on, when Fritz Jaeger and I were university lecturers in Heidelberg for a short time, Hettner gave up the minor lectures, and he generously permitted the younger assistant professors to lecture even on some themes that he still dealt with himself. In the beginning of his academic career he gave a lecture which he entitled "Introduction to Geography." This course was to make his audience familiar with the basic facts and elements of geography. He started with methodological development, similar to the methods used in grade-school teaching; next he proceeded to the environs of the University, then extended the discussion to neighboring areas, and finally to more distant regions. In later years he no longer gave this lecture, for he had transferred this introduction to the Unterseminar [seminar for beginning students]. He put such value on this Unterseminar that he taught it himself. It was organized in such a way that changing themes served as an introduction to geography and was conducted in grade-school fashion with questions and answers. These exercises were probably his greatest success and besides the beginning students, even candidates for the master's and doctor's degrees took part. In contrast to the famous Richthofen colloquium, his Oberseminar [seminar for advanced students], was always held on a general theme from the field of regional geography, physical geography, or anthropogeography, subdivided into single subjects for students' reports. Courses in cartography, summer field work, and map drafting were given by

his assistant. Stress was laid not upon the technique of drawing, but on the contents of the map.

During his early studies under Gerland, Hettner already realized the importance of field trips. When occupied with methodological problems he often thought about the manner of carrying them out. In reality, however, the execution of these problems was hindered by his leg injury. Therefore small field trips were left to his assistants and younger lecturers. But until the World War he conducted the long field excursions himself: he was able to support students financially through grants from the Arnold Hirt Foundation, and later, after the ruin of this foundation during the inflation, through government funds. Of course, it was impossible for him to walk about with his students; but he would go on bicycle, on horse-back, by coach, or later by car to the important lookout points, arriving there before the hikers. [On such trips] he never made long lectures; he was convinced that more was to be gained in terms of interpretation and explanation if students' questions based on their observations were answered and expanded upon. He led several excursions into the Swiss Alps and the Swiss Jura, one from Dresden into the Sudeten Mountains and Bohemia, and a large number of others to the neighboring Central Mountains [Mittelgebirge] in Germany. One field trip, planned from the Splugen Pass to the Dinaric Alps, had to be cancelled prematurely because the bus was involved in an accident between Bagni di Lucca and Lucca. Most of the students were slightly hurt; Hettner himself broke several ribs. It was on a field trip to the Palatinate that the accident, reported above, occurred. From then on the long excursions were led by his assistants and lecturers.

Concerning the themes of dissertations Hettner most always tried to suit the individuality of the candidate. But he refused to accept studies in regional geography as dissertations. He was convinced that a student would derive more benefit from a sharply defined theme in his first research work. Two groups of themes are outstanding among the dissertations written by his students: The investigation of the interrelationships of climate, vegetation, and settlement in certain foreign countries and some studies on food and beverages in different regions. By starting such investigations he intended to establish the basis of a geography of consumption, [a study] neglected up to this time. Unfortunately all these studies were written in the post-war period and therefore could not be published. Only 30 doctor's degrees were conferred by Hettner during his long period of teaching in Heidelberg; only eleven of this small group of students chose an academic career, nine as geographers and two in other subjects. These numbers are characteristic; they illustrate the conscientiousness with which Hettner supervised every graduation and the effectiveness of his teaching methods. In the academic field Hettner never tried to attract attention. Thus many students passed him up in Heidelberg without having any idea of the importance of this great scholar and personality. But all those who were attracted to him almost always remained connected with him. His strong influence on his students resulted as much from his scientific abilities as from his outstanding, strong-willed and kind personality. He knew how to evoke the enthusiasm of his young students for science and how to influence them beyond the academic-scientific within the moral core of their being, in spite of the objective simplicity and stringency of his thoughts. Everyone who was closely connected with him received lasting impressions which were only deepened within the course of time. They were fascinated by this great personality and by Hettner's kindness and faithfulness, manifest in his natural and selfless way to help others. In Hettner we saw a heroic will, directed toward the high goals of the spirit and reaching them in spite of all physical disabilities and unfavorable circumstances in a life full of work and strife. He never showed superiority in his relations with students or younger colleagues. His behavior was as simple and natural as possible, and the guest had the happy feeling of being free of all vanity and pathos, having the deep experience of absolute sincerity. Alfred Hettner particularly liked the company of his students. He felt that we were attached to him and that he, who had no children of his own, would live on in the spirit of his students. He also believed that among the younger generation of scholars he would be alive within the circle of those who understood his thoughts and his striving for the scientific aims that he set for himself. Because he did not restrict anyone in his free development, it is correct to say that Hettner did not leave a school [of geographic thought] in the true sense of the word; for we all, basing [our work] on his thoughts, have developed freely and quite differently. But we all, regardless of what we achieve scientifically today, are able to meet and understand each other on a scientific and human basis that was established by him in Heidelberg. His feeling of justice and his conscientiousness protected him

from nepotism; only four of his students have habilitated under him. Hettner's scientific writing could not be freely developed before his stay in Heidelberg—not until the long work on the atlas text had been completed, until the *Geographische Zeitschrift* had been established, and until he was financially more independent, so that he could obtain more scientific assistants to work on his journal.[14] His years in Heidelberg until the World War saw a constant rise in his productivity; this had its origin not in outward activity but resulted, logically, from work done in former years. In one letter, addressed to Joseph Partsch on February 7, 1903, he writes, "You will be frightened at the bulk of my writings; sometimes I am myself; for it is not at all my intention to rival others. To do this I lack the ability to read extensively and to commit to memory what I have read. I aim at intellectual penetration; I try to give the discipline of geography a firmer basis than it had formerly." According to the intellectual traits of his character, aiming at a deep penetration of problems, Hettner had been occupied with the method of geography since he began his studies, at a time when the views of geography were widely divergent. During his travels in South America he had made many notes [on methodology] but nothing had been published, for he was convinced that methodological discussions could be worthwhile only [if they were] based on long scientific experience. It was not until his professorship in Tübingen that he presented publicly his first methodological essay, given at his inaugural address at Tübingen. This address dealt with nature and methods of geography. His philosophical concept of geography as a chorological science has been widely accepted. With this concept he bridged the dualism between nature and man (for both form the character of a landscape) and found the selective principle of facts to be interpreted and to be dealt with geographically. He regarded regional geography as the essential part of geography. Basing his ideas on his own experiences in research and teaching and on his work in the field of general scientific methodology,[15] he discussed all of the main problems and trends of geography in numerous articles published in the *Geographische Zeitschrift* over a long period of time. Later he collected these methodological essays in a book. He thought it necessary to preface the methodological discussion with a short survey of the history of geography. Thus the book is entitled: *Geography; its History, Nature, and Methods* [Die Geographie; ihre Geschichte, ihr Wesen und ihre Methoden].[16] He originally regarded his methodological works as auxiliary constructions. Tirelessly and critically, he reconsidered the system of geography and investigated every one of its elements according to its tenability. Thus a critical and philosophical investigation of the whole of geographical science and a well-founded methodologic system developed from his work. Many generations can base their scientific work on his outline and structure of this pure science. Hettner's methodology is the most important product of his intellectual work; he himself thought this. Since his methodological essays had already been published and were well known and had been well received by German scientific geography, this book had a stronger influence outside geography and a greater effect in foreign countries than in Germany. This effect becomes evident in Hartshorne's work, "The Nature of Geography: A Critical Survey of Current Thought in the Light of the Past," published in two volumes by the Association of American Geographers in December, 1939. [This work] coincides with Hettner's methodology in nearly all respects, or is even wholly based upon it. Hettner's work, "Geography; its History, Nature, and Methods," will always remain a landmark in the development of geography. Hettner also defended and explained his point of view in methodological treatises that appeared later. Thus even his last long essay on "Rule and Accident in Geography" [Gesetzmässigkeit und Zufall in der Geographie], published in 1935, deals with a methodological philosophical theme.

Hettner regarded regional geography as the most important subject of geography. It is certainly due to him that this [viewpoint] has become the general opinion today. Since his work on the text of Spamer's atlas, regional geography dominated his writings. The first volume of his "Characteristics of Regional Geography" [Grundzüge der Länderkunde], dealing with Europe, was published by Spamer's in 1907. It was well received. Nevertheless the author and publisher realized that the text was too long to serve as a textbook, and on the other hand was too concise to serve as a reference book not only for scientists but also for the interested public. Therefore Hettner decided to divide the material and to try to write a short text, giving an outline of regional geography, and then to write a more detailed and extensive description in several volumes, offering—if possible through the cooperation of other authors—an interesting description of all countries, presenting a detailed

characterization of the landscape. His travels in Egypt, Algeria, and Tunisia and the trip through Asia served [as partial background] for this planned work on regional geography. Many parts had been finished when the war broke out; Spamer cancelled the contract and Hettner himself put aside his work in regional geography because of other tasks during the war. "Characteristics of Regional Geography," dealing with Asia, did not appear until 1923/24, published by B. G. Teubner. It was reprinted several times. The Athenaion Publishing House was interested in a more detailed edition and planned a "Handbook of Geography" [Handbuch der Geographischen Wissenschaften]. But the contract was made under difficult circumstances and disputes on the interpretation and observance of the terms of the contract followed. Finally the project came to naught though many parts of the text, written by Hettner, had been already set up in type. The Handbook of Geography was then edited by Klute [Handbuch der Geographischen Wissenschaften] and a number of contributors, originally chosen by Hettner, have worked at this large publication, which is nearly finished today. [The *Handbuch der Geographischen Wissenschaften*, composed of eleven volumes, was completed in 1940.] I need not enter here into the particulars of the importance attributed to the "Characteristics of Regional Geography": this publication is well known to every geographer and is considered as the most characteristic work of its author. It was Hettner's objective to give a detailed survey of all elements forming a landscape, regarding small geographic units as parts of a greater single landscape. With [that organization] he wanted not only to serve geographical teaching but also [wished to contribute to] the method of regional geography. But only the second, more detailed, and comprehensive version of "Regional Geography" should have become his main work. It is to be regretted that this text was not published; the comparison of the completed chapters of this work (present in the manuscript or the galley proofs) with corresponding sections of the "Characteristics of Regional Geography" reveals how the text is much more comprehensive in the presentation of the material, in its regional organization, and its tendency towards distinctness and clarity. Only here would Hettner's scientific individuality in regional geography have been really valid.

Hettner thought it absurd to regard general earth science as a part of geography. However, to him general [systematic] geography was always a necessary element of the science. But he devoted only the last decade of his life to a comprehensive study of that subject. In former years there were single problems with which he dealt in essays and articles.

For many years morphology particularly attracted him. As mentioned above in connection with his habilitation thesis, Hettner independently developed the theory of mass wasting with respect to valley floors, and to explain this theory used the plains on both sides of the Elbe River, within the Elbsandstein Mountains. But when he wanted to transpose his concept, which was developed in Saxony, to the Swabian Alps, he failed because of the facts. He recognized that besides or even before the formation of the valley floors, there were other mass-wasting processes dependent on the differential resistance of the rock material. During a new investigation in the Saxon Switzerland in 1902 he used his experiences gained in South Germany and discovered that there the plains were again not old valley floors but were due to differential erosion of the rocks. This essay, however, did not appear until 1911. In the meantime, through the influence of W. M. Davis, during his exchange professorship in Berlin, Hettner's concept, which he had dropped, triumphed in its theoretical and deductive variations in Germany and France. Hettner was not only dubious about the correctness of the theory, but also questioned the deductive method which was the basis of Davis' concepts. Referring to Richthofen's "Guide for Explorers" (Führer für Forschungsreisende), in a series of essays he tried to base morphology again on the inductive method and to deal with this subject in a physiological way, taking into consideration all of the active processes. His aims were the same as those of Alexander Supan and Siegfried Passarge, who also criticized Davis' theory. He writes that in 1935: "Together with Supan and Passarge I have the satisfaction of having broken the curse of schematism and to have opened up new ways for unprejudiced research." The morphological essays were published later in book form.[17] With them Hettner finished his own work on morphology.

Hettner's [doctoral] dissertation dealt with a climatological theme. During his entire life he considered climatology to be one of the most important bases of geographical work. He took up this subject again more intensively when he first came to Heidelberg, being obliged to do so through his work in regional geography. The usual statistical treatment seemed to be unsatisfactory to

him, since, by giving only minor importance to atmospheric circulation, the causal factors were insufficiently explained. Hettner interpreted climate genetically and physiologically, first in an essay on the "Climate of Europe,"[18] then in a longer series of essays on the "Climates of the Earth,"[19] which was later revised and published as a book,[20] presenting one of the clearest and best surveys of this field. Even his last essay in the present volume of the *Zeitschrift* enters into the discussion of modern climatological questions.

During his stay in Leipzig Hettner had already approached a problem in the field of plant geography and zoogeography, an investigation dealing with the dependence of the distribution of forest and savanna in the tropics on the length of the rainy and dry seasons; he also dealt with the dependence of settlement and cultivation on the vegetation cover. He began to consider these questions during his travels in South America, and in the publication in honor of Richthofen's 80th birthday he discussed these problems in an important essay.[21] In connection with this essay the series of [his students'] dissertations, mentioned above, was started. In Hettner's essay for the first time a geographer raised the question of the original landscape. Here is the beginning of the investigations of the cultural landscape that have become a very important object of research in modern geography, especially by the independent and various works of Schlüter, Gradmann, and Krebs. Hettner's scientific work did not enter into other problems of plant and animal geography. But he tried to develop methodologically the geographical treatment of vegetation and animal life in its difference from the botanical and zoological one, that is, in its difference from geobotany and geozoology. It is significant that R. Hesse dedicated his "Zoogeography on an Ecological Basis" to Hettner.[22]

But after all Hettner was mainly interested in anthropogeography. A series of essays dealt with the methodological theory of this important branch of geography. His paper on the problems of anthropogeography, read at the geographical meeting at Nuremberg [Nürnberger Geographentag] in 1907, was a more general approach to this subject. The following essays were on major groups of problems: "The Location of Settlements" [Die Lage der menschlichen Ansiedlungen] in 1895; "The Economic-Geographical Types of Settlements" [Die wirtschafts-geographischen Typen der menschlichen Ansiedlungen] in 1902; "The Present Position of Transportation Geography" [Die gegenwärtige Stand der Verkehrsgeographie] in 1897; "Investigation and Description of the Density of Population and Demographic Maps" [Untersuchung und Darstellung der Bevölkerungsdichte und bevölkerungstatistische Grundkarten] in 1900; "Geographical Elements of Politics" [Die geographischen Grundlagen der Politik] in 1917. From the beginning of his time in Heidelberg he was especially occupied with methods and descriptions of population density. In contrast to the generally used relative presentation Ratzel had recognized the value of the absolute presentation, but had confused this concept with the patterns of settlement. Now Hettner tried to construct more exact basic principles, and, according to Hettner's suggestion, C. Uhlig designed a map of the distribution of population in northern Baden. His paper, however, did not receive full approval at the international meeting of geographers in Berlin. Particularly Meitzen opposed it. But today Hettner's principal idea has been entirely accepted, though not under his name, but under the name of the Swede, Sten de Geer, whose independently developed method [dot map] is really only a cartographic variation of Hettner's proposal.

In 1905 Hettner's widely-read book on European Russia appeared [Das europäische Russland]. It refers to a series of essays, published on the occasion of the first Russian revolution and the Russian-Japanese War in the *Geographische Zeitschrift*. Hettner did not regard this work as a regional geography but as an example of dealing with anthropogeographical and political-geographical problems in a major part of the earth—as an attempt to understand the Russian world from a geographical point of view. During the World War (1916) this book was reprinted. But now a second part on the whole Russian Empire and on the aims of Russian politics was added to the first part, which dealt with only European Russia. In general the World War period became the time in Hettner's scientific activities in which he almost exclusively turned to the geographical aspects of the political, economic, and military problems of war. He directed the *Geographische Zeitschrift* entirely toward these problems, and himself wrote many essays and suggested others, published a great number of pamphlets and edited the well-known series called "Theatres of War" [Kriegsschauplätze]. The largest problem he undertook was the geographical interpretation of the English-dominated world. He writes: "I had lived with an English family for-

merly, had been in England several times, had seen some English colonies, and had thoroughly worked through the geography of England for my regional geography, and therefore I believed myself to be sufficiently prepared. There is no doubt that there were better experts on England, and many others actually expressed their opinions, but I was mainly interested in the geographical point of view." This book was printed in three editions during the war, and a fourth one appeared in 1928, adjusted to the new conditions and under a slightly different title.[23] The third book that Hettner wrote during the war did not appear until the end of December, 1917.[24] This volume supported a victorious peace from the geographical point of view, but was finally submerged in the mass of so-called place literature. After the war Hettner gave up this activity, which aimed at applied anthropogeography. He resisted agitation during Germany's demise. Only once more, when there seemed to be the possibility of a territorial reorganization of Germany, did he publish an essay dealing with the question of the day; the material for this essay came from conversations and discussions with students and friends.[25] His scientific activities during the war have not been in vain. Many people were consoled by his optimism and obtained new strength through scientific understanding. This work was also fruitful for himself; this became apparent after the war, first in the basic ideas and elements of his famous anthropogeography, the manuscript of which was almost completed at that time; and, secondly, in his book on the spread of culture over the earth. The studies of the world domination by Russia and England had necessarily led him to these general and far-reaching views. In 1924 a small booklet appeared, entitled "The Spread of Culture" [Der Gang der Kultur], which he expanded to a book in 1929. This was one of Hettner's unique and valuable contributions.

Hettner's two last great works, the "Comparative Regional Geography" [Vergleichende Länderkunde], edited in four handy volumes, and his "Anthropogeography" [Geographie des Menschen], still unpublished, consisting of about four volumes, may be regarded as the product of his life work; these two publications began to crystallize after the "Outlines of Regional Geography" had appeared, after his work on the great regional geography had been given up, and after the methodological book had been finished. Many parts of these works, however, were already more or less finished, but to put them into literary shape was a huge task, which he did not begin until he was seventy. General geography takes the whole earth into consideration, but does not consider cosmic or general laws to be geographical: rather general geography interprets the earth as the largest region, to be understood by progressing from smaller to greater units. Thus Hettner regarded general geography as regional geography, which considers the arrangement of complexes and phenomena of general geography in a comparative fashion—a general comparative regional geography. On this he writes: "Many phenomena which are absolutely geographical and require geographical investigation, such as the atmospheric circulation, world traffic, world economy, and many others, go far beyond the limits of not only a simple region but even of a single continent; they extend across the whole surface of the earth, and most of the phenomena within single landscapes recur in an analogous way in other regions; they are single cases of general concepts and can be understood only from a comparative view. Because of these two reasons there has to be a general geography, or general comparative regional geography, a general chorological study of the surface of the earth, besides regional geography. It seemed to me to be an efficient task to work out such a general geography, as I had always endeavored to do in my lectures on general geography; for many colleagues still hold to geophysics [Allgemeine Erdkunde], whose difference from a general geography they do not see, whereas others do not accept general geography at all. I intended to work out the geographical character."

Soon, however, he began to realize that an equal treatment of physical geography and anthropogeography would result in a book much too lengthy. Therefore he decided to write at first a "General Comparative Regional Geography" [Allgemeine vergleichende Länderkunde], dealing mainly with physical geography and presenting man-made features only in a short appendix; general anthropogeography he would then bring out in a second long work and thus fulfill a task which had directed him to geography. The "Comparative Regional Geography" appeared during the years 1933-35. It was coolly received by critics. Frequently the title was misunderstood. In the preface of the first volume Hettner reports that he had already laid down the plan of this work in Juliaca on Lake Titicaca in 1883, at a time when he was still under the influence of Richthofen's lecture on the "Comparative Survey of the Continents"; this

[lecture], he thought, dealt only with the solid surface of the earth merely because of [Richthofen's] lack of time [to develop other aspects]. At that time he was already tempted to extend the comparative survey to all regions and also to mankind. He kept the title in order to express as clearly as possible its distinctiveness from general geography. The importance of the book does not lie in the material presented, but in the peculiarity and completeness of its methodological treatment. In this book the author's intention aims at a system of geography, and the introductory methodological paragraphs of the individual chapters will have lasting importance. This book is not a textbook but a well-composed treatise whose design and plan show the association of phenomena in magnificent perspectives.

Such a homogeneous summary of general geography as a whole can be given only by a single author, only by a scholar of great scientific experience and with philosophically and methodologically clear concepts. The insight of the young man at the age of thirty could ripen in the scientific field only at the end of his rich life. German geography also owes Hettner the posthumous publication of his nearly completed work on general anthropogeography.

Hettner's writing, as his teaching, aimed at a methodological basis and the principles of the whole structure of geography. He penetrated deeply, and just this fact directly and indirectly influenced the whole of geography. Hettner also has strongly influenced the history of this science. His memory will live as long as scientific geography exists. He conceived his ideas with the clarity of exact logic and has presented them with the passion of a man seeking for the truth. It is obvious that he fought many a scientific battle with good and sharp weapons in pursuit of his aims; but this he always did in all fairness, for he was far from questioning the honorable motives of his opponents. The controversies on Davis' method, on the aims of anthropogeography, and on the method of research and description in regional geography now belong to the past. But today we recognize that they were necessary for the development of clear concepts. It was not pugnacity that led him into these polemics, but the critical shrewdness of his thinking, the ethical obligation of having to stand for one's concepts, and most of all his sense of responsibility due to his professorship which made him an exponent of geography. He never fought with cudgels but used the sharp weapon of logical thinking and at most, sarcasm. Tirelessly he created a solid intellectual basis and acquired a knowledge which he thought could be acceptable to everyone who could think clearly and logically. Hettner was often blamed for his obstinacy, but unjustly so. I may make this statement, for I probably had the deepest insight into his character, his activities and his plans. I know that he always tried to understand the point of view of his opponents and to do justice to them. He never hated them and had a peculiar sort of benevolence for several of them, which he expressed among close friends often in a humorous but never malicious way. Basically speaking he was the Eckert of geography and wanted to protect his beloved science from erroneous tendencies. The influence of his life work has extended widely beyond the borders of Germany. It found a loud echo in imperial Russia. His "Characteristics of Regional Geography" has been translated into several different foreign languages, and he has lastingly influenced modern geography in Japan and most of all in the United States. In 1930 he was awarded the [1929] Cullum[26] gold medal, the greatest honor given by the American Geographical Society, and personally presented by the ambassador of the United States. Heidelberg, the city on the Neckar and on the stream of tourist traffic, again with surprise heard that a great man rarely known to the public lived within her walls.

During his last years Hettner lived in quiet and peace. Most of his friends had died or had moved from Heidelberg. But cherished by his wife and venerated by his students and friends, he had continued to work on his plan, which he had already perceived as a young man. His intention and work, however, to us mean obligation and ideal, the obligation to sincerity and the ideal of truth in work.

NOTES

1. Sentences given in quotation marks are cited from this manuscript.

2. He died early as a Saxon officer.

3. Ergänzungsheft No. 38 of Petermanns Mitteilungen.

4. Das Klima von Chile und Westpatagonien. Erster Teil: Luftdruck, Winde, Meeresströmungen. Bonn, 1881.

5. This map was published with the addition of astronomical positions established by Reis and Stubel in Petermanns Mitteilungen, 1888.

6. Kartographische Ergebnisse einer Reise in

den columbianischen Anden, Petermanns Mitteilungen, 1888, p. 104 ff.

7. Die Kordillere von Bogotá, Petermanns Mitteilungen, Ergänzungsheft No. 104.

8. Die Anden des westlichen Columbien; eine orographische Skizze. Petermanns Mitteilungen, 1893.

9. Forschungen zur deutschen Landes- und Volkskunde, 1887, vol. 2, Heft 4.

10. It is said that this collection still lies unpacked in the museum.

11. lst letter, 1888, p. 402; 2nd letter, 1889, p. 154; 3rd letter, 1889, p. 269; 4th letter, 1889, p. 387; 5th letter, 1890, p. 103; 76th and 7th letters, 1890, p. 232; 8th letter, 1890, p. 398. Compare H. Schwalm, "Alfred Hettners Reisen in Peru and Bolivien," Geographischer Anzeiger, 1929, p. 267.

12. Hans Schwalm's dissertation on climate, settlement, and agriculture in the Andes of Peru and northern Bolivia was written with the help of Hettner's elaborations and diaries. Iberoamerikanisches Archiv., vol. 2, pp. 17-74.

13. These assistants were: Carl Uhlig; Wiegers, later a state geologist; Franz Thorbecke; Herman Krock; Ernst Michel; and, from 1914 on, Daniel Häberle. His close relationship to Uhlig, Thorbecke, and Häberle began with this work.

14. His assistants were: Herman Krock, recently deceased; Friedrich Hauck, who died in the World War; Friedrich Metz; Heinrich Schmitthenner; and for one year (as a substitute for the last mentioned), Paul Gauss.

15. "Das System der Wissenschaft," [The System of Sciences] Preussische Jahrbucher, 1905, pp. 251-277. The [Hettner] estate contains a later, much longer, completed manuscript on this subject.

16. F. Hirt and Sons, 1927.

17. The Landforms of the Continents, Problems and Methods of Morphology [Die Oberflächenformen des Festlandes, Probleme und Methoden der Morphologie], 1st ed. 1921, 2nd ed., 1928.

18. Geographische Zeitschrift, 1904.

19. Geographische Zeitschrift, 1911.

20. Die Klimate der Erde [The Climates of the Earth], 1930.

21. Distribution of Precipitation, Vegetation, and Settlements in the Tropical Andes [Regenverteilung, Pflanzendecke und Besiedlung der tropischen Andenländer]. Berlin, 1893, pp. 199-233.

22. Jena, 1924.

23. England's World Domination and its Crisis, 1917 [Englands Weltherrschaft und ihre Krise]; England's World Domination, 1928 [Englands Weltherrschaft].

24. Peace and the German Future [Der Friede und die deutsche Zukunft], Stuttgart, Deutsche Verlagsanstalt, 1917.

25. England's World Domination and its Crisis, 1917 [Englands Weltherrschaft und ihre Krise]; England's World Domination, 1928 [Englands Weltherrschaft].

26. Named after the American military officer George W. Cullum, who was vice-president of the American Geographical Society from 1877-1899.

5. *Siegfried Passarge (1866-1958)*

Introductory Statement

Robert C. West

Like many German geographers of his generation, Siegfried Passarge first studied geology. Later he shifted his interests to physical geography and finally to a regional or chronological scheme that combined physical and human elements, an approach that he termed "Landschaftskunde," or a study of "landscape."

Enthralled as a youth by accounts of travel in Africa, early in his career he obtained a position as geologist in Southwest Africa. There he recorded field data that resulted in several treatises on the physical geographical aspects of that area, among which his book *Die Kalahari* (1904) became a classic on the detailed description and interpretation of the geomorphology of an arid to semi-arid part of the continent. An indefatigable field man, in Africa Passarge studied not only physiography, climate and vegetation associations, but also observed the lifeways of the native inhabitants in their geographical setting, as is evident from his many articles on that subject listed in his bibliography.

Perhaps Passarge's best known and widely debated contribution to geographical methodology was his concept of "Landschaftskunde." Even the term "Landschaft" is difficult to define, but is generally thought to be synonymous with a geographical region composed of a given set of physical and cultural phenomena. It has been said that Passarge produced excellent field studies, rich in detail, but that his methodological statements are often vague and confusing, so much so as to be difficult for even German speakers to interpret. Initially Passarge's concept of Landschaftskunde included studies of only the natural phenomena of an area—climate, associated vegetation, and landforms, first expounded in his *Physiologische Morphologie* (1912). He formulated a hierarchy of landscape regions beginning with the largest (Landschaftsgürtel), or broad latitudinal belts identical with climatic zones; these were divided into ever smaller units in terms of climatic type, vegetation and landforms. In 1905 the British geographer A. J. Herbertson had suggested a similar scheme,[1] but Passarge claimed he had not known of that earlier work.[2] Later Passarge included mankind and his works in his concept, as exemplified by his lengthy treatise *Vergleichende Landschaftskunde* [Comparative study of landscape]. This work appeared in five parts, or fascicules, over a period of nearly ten years (1921-1930), each part on a particular Landschaftsgürtel, or landscape zone, and its subregions (see accompanying abbreviated Table of Contents of the book). In the book, Passarge attempted to associate the human element with the various natural regions to the extent that in some instances there appears a tendency toward environmental determinism. However, the author may have been thinking more in ecologic than in deterministic terms. A shorter version of *Vergleichende Landschaftskunde* appeared as a small textbook in 1923: *Die Landschaftsgürtel der Erde. Natur und Kultur*, which Preston James used as a model for his *Outline of Geography*.

Later in life Passarge worked on economic, political, historical, and even ethnological geography, but he never abandoned his interest in the concept of the geographical landscape. Apparently few German geographers appreciated Passarge's methodological views, and he may have influenced more the thinking of some Americans.

NOTES

1. Herbertson, A. J., The Major Natural Regions: An Essay in Systematic Geography, *Geographical Journal* 25(1905): 300-10.

2. See endnote 1 in the translation of Passarge's introductory note (General Concepts) to his *Vergleichenden Landschaftskunde.*

Bibliography of Siegfried Passarge

[Most of this bibliography was compiled by the editor, with many items taken from a published list of Passarge's writings (Verzeichnis der Schriften von Prof. Dr. Siegfried Passarge, *Mitteilungen der Geographischen Gesellschaft in Hamburg*, 1939, vol. 46, pp. 98-104). The published list consists of abbreviated entries up to 1938 and usually lacks volume and page numbers of journal articles. In the present version, most of Passarge's short comments published in local German newspapers or popular journals have been deleted, and book reviews are not listed.]

1891 Das Röth im östlichen Thüringen [The Röth Formation (New Red Sandstones) in eastern Thuringia]. Phil. Fak. Inaug. Diss. *Jenaische Zeitschrift für Naturwissenschaft* vol. 26, 188 pp.

1894 Die deutsche Expedition nach dem Kameruner Hinterland [The German Expedition into the Interior of Cameroons]. *Allgemeine Zeitung* Beilage 2 [supplement 2], no. 58, pp. 57.

____ Bericht über die Expedition der Deutschen Kamerun-Komitees in den Jahren 1893/94 [Report on the Expedition of the German Cameroons Committee in the years 1893-94]. *Verhandlungen der Gesellschaft für Erdkunde zu Berlin*, vol. 21, pp. 369-78.

1895 *Adamaua. Bericht über die Expedition des deutschen Kamerun-Komitees in den Jahren 1893/94* [Adamawa. Report on the Expedition of the German Cameroons Committee in the years 1893-94]. Berlin: D. Reimer. 573 pp.

____ The German Expedition to Adamawa. *Geographical Journal* (London), vol. 5, pp. 50-53.

____ Die Höhenmessungen von Dr. Passarge in Hinterlande von Kamerun [Dr. Passarge's altitudinal measurements in the interior of Cameroons] *Mitteilungen von Forschungsreichen und Gelehrten aus den deutschen Schutzgebieten*, vol. 8, pp. 182-83.

1896 Über Laterite und Roterden in Afrika und Indien [On laterite and red earths in Africa and India]. *Report of 6th International Geographical Congress*, London 1895, pp. 67-76.

____ Garua. *Deutsche Kolonialzeitung*, Berlin, vol. 9, pp. 121–24.

____ Über seine Reise in Transvaal [On his trips in Transvaal]. *Verhandlungen der Gesellschaft für Erdkunde zu Berlin*, vol. 23, pp. 492-507.

1897 Land und Leute im Hinterlande von Kamerun [Land and people in the interior of Cameroons]. *Mitteilungen der Geographische Gesellschaft in Hamburg*, vol. 13, pp. 147-49.

____ Über seine Reisen in Süd-Afrika [On his trips in South Africa]. *Verhandlungen der Gesellschaft für Erdkunde zu Berlin*, vol. 24, pp. 142–46, 475-78.

1898 Herr Dr. Passarge über seine Reisen in Süd-Afrika [Dr. Passarge on his trips in South Africa]. *Verhandlungen der Gesellschaft für Erdkunde zu Berlin*, vol. 25, pp. 513-17.

1899 Die Besitzergreifung des Hinterlands von Kamerun [The seizure of the interior of Cameroons]. *Deutsche Kolonialzeitung*, Berlin, vol. 16, pp. 69-72.

____ Die Hydrographie des nördlichen Kalahari-Beckens [The hydrography of the basins of northern Kalahari]. *VII Internationaler Geographen-Kongress*, Berlin 1899 (Auszüge von Vorträgen), pp. 14-15.

____ Reisen im Ngami-Land [Trips in Ngami-land]. *Verhandlungen der Gesellschaft für Erdkunde zu Berlin*, vol. 26, pp. 189–204.

____ *Der Krieg in Südafrika.* Vortrag gehalten in der Abteilung Berliner Deutschen Kolonial-Gesellschaft [The war in South Africa. A lecture delivered in the Berlin chapter of the German Colonial Society]. Berlin: O. Elsner. 37 pp.

1900 Über geographische Ortsnamen in Afrika

[On geographical place names in Africa]. *Beiträge zur Kolonialpolitik und Kolonialwirtschaft*, Berlin, vol. 1, pp. 71-75.

____ Die Zukunft unserer Kolonie Kameruns [The future of our colony of Cameroons]. *Beiträge zur Kolonialpolitik und Kolonialwirtschaft*, Berlin, vol. 1, pp. 51-55.

____ Durch Karoo nach Kimberley [Through Karroo to Kimberley]. *Globus*, vol. 77, pp. 59-60, 76-80, 85-87.

1901 Ueber Winderosion [On wind erosion]. *Naturwissenschaftliche Wochenschrift*, vol. 16, pp. 369-73.

____ Die Hydrographie des nördlichen Kalahari [The hydrography of the northern basins of Kalahari]. *Verhandlungen des 7. Internationaler Geographen-Kongress*, Berlin 1899 (2nd part), pp. 774-76.

____ Beitrag zur Kenntnis der Geologie von Britisch-Betschuanaland [Report on the knowledge of geology of British Bechuanaland]. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, vol. 36, pp. 20-68.

1902 Die Kalkschlammablagerungen in den Seen von Lychen, Uckermark [The deposition of calcareous mud in the lakes of Lychen, Uckermark (Germany)]. *Jahrbuch der Königlich Preussische Geologie, Landesanstalt und Bergakademie zu Berlin*, vol. 22, pp. 79-152.

____ Die Besitzung El Caura in Venezuela. Bericht über die Expedition des Deutschen El Caura-Syndikats im Jahre 1901/02 [The estate of El Caura in Venezuela. Report on the expedition of the German El Caura syndicate in 1901-02]. (Typescript), 138 pp.

1903 Bericht über eine Reise im venezolanischen Guyana; mit Anhang: Die astronomischen Beobachtungen von W. M. Selwyn [Report on a trip in the Venezuelan Guiana; with supplement: The astronomical observations of W. M. Selwyn]. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, 1903, pp. 5-43.

____ Reise im venezoloanischen Guyana [Trip in Venezuelan Guiana]. *Mitteilungen der Geographische Gesellschaft in Hamburg*, vol. 19, pp. 253-55.

____ Reise im Gebiet des Orinoko [Trip in the area of the Orinoco (River)]. *Mitteilungen des Vereins für Erdkunde zu Leipzig*, Heft 1. 1903, pp. 33-36.

1904 Die Inselberglandschaften im tropischen Afrika [The inselberg landscape in tropical Africa]. *Naturwissenschaftliche Wochenschrift*, vol. 3, pp. 657-65.

____ Rumpfflächen und Inselberge [Peneplains and inselbergs]. *Zeitschrift der Deutsche Geologische Gesellschaft*, vol. 56 (Monatsberichte), pp. 193-215.

____ Zur Oberflächengestaltung von Kanem [On surface formation of Kanem]. *Petermanns Mitteilungen*, vol. 50, pp. 210-16.

____ *Die Kalahari.* Versuch eine physisch-geographische Darstellung der Sandfelder des südafrikanische Beckens [The Kalahari. Attempt at a physical geographical presentation of the sand areas of the basins of South Africa]. Berlin: D. Reimer. 823 pp. + atlas.

____ Die klimatischen Verhältnisse Süd-Afrikas seit dem mittleren Mesozoicum [The climatic relationships in South Africa since the mid-Mesozoic]. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, 1904, pp. 176-93.

____ Das deutsche Okawango-Sambesi Gebiet [The German Okavango-Zambezi area]. *Deutsche Kolonialzeitung*, Berlin, vol. 21, pp. 434-35.

____ Deutschsüdwestafrika und der Hereroaufstand [German Southwest Africa and the revolt of the Herero tribe]. *Mitteilungen des Vereins für Erdkunde zu Leipzig*, 1904, pp. xxx-xxxiii.

1905 Aus dem Tierleben der mittleren Kalahari [From the animal life of the middle Kalahari]. *Naturwissenschaftliche Wochenschrift*, vol. 4, pp. 337-46.

____ Das Okawangosumpfland und seine Bewohner [The Okavango swamp and its inhabitants]. *Zeitschrift für Ethnologie*, vol. 37, pp. 649-716.

____ Die Buschmänner der Kalahari [The Bushmen of the Kalahari]. *Mitteilungen von Forschungsreisenden und Gelehrten aus der Deutschen Schutzgebieten*, Berlin, vol. 18, pp. 194-293.

____ Die Grundlinien im ethnographischen Bilde der Kalahari-Region [The basis for an ethnographic presentation of the Kalahari region]. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, 1905, pp. 2-36, 68-88.

____ Die Kupfererzlager Deutsch-Südwestafrikas [The copper deposits of German Southwest Africa]. *Deutsche Kolonialzeitung*, Berlin, vol. 22, pp. 24-25.

____ Meine Reise in Venezuela [My journey in Venezuela]. *Jahresberichte der Frankfurter Verein für Geographie und Statistik*, vol. 68-

69, pp. 155-56.

____ Die Mambukuschu [The Mambukushu (African tribe in the Kalahari)]. *Globus*, vol. 87, pp. 229-34, 295-301.

____ Zum Gedächtnis Ferdinand von Richthofens [Memorial to Ferdinand von Richthofen]. *Jahresbericht der Schlesischen Gesellschaft für Vaterländische Kulture*, 1905, 10 pp.

1906 Wasserwirtschaftliche Probleme in der Kalahari [Problems of the economy of water in the Kalahari]. *Globus*, vol. 90, pp. 299-302.

____ Der paläolithische Mensch an den Viktoriafällen des Sambesi [Paleolithic man at the Victoria Falls of the Zambezi (River)]. *Globus*, vol. 89, p. 108.

1907 Zur Entstehung von Quertäler in Faltengebirge [On the formation of transverse valleys in folded mountains]. *Geographische Zeitschrift*, vol. 13, pp. 632-36.

____ Geomorphologische Probleme aus der Sahara [Geomorphologic problems from the Sahara]. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, 1907, pp. 166-72.

____ Berichtigung zu der Besprechung über "Die Buschmänner der Kalahari" [Corrections (reply) on the review of "The Bushmen of Kalahari"]. *Zeitschrift für Ethnologie*, vol. 38, pp. 411–14.

____ *Die Buschmänner der Kalahari.* Berlin: D. Reimer. 144 pp. [Reprint of 1905 ed.].

____ Das Problem der Klimaänderung in Südafrika [The problem of climatic change in South Africa]. *Globus*, vol. 92, pp. 133–34.

____ Ophir und die Simbabyekultur [Ophir and the culture of Zimbabwe (prehistoric ruin in Rhodesia)]. *Globus*, vol. 91, pp. 229-32.

1908 Beobachtungs- und Literaturgeographie [Geography through observation and literature]. *Globus*, vol. 93, pp. 369-70.

____ Wissenschaftliche Geographie [Scientific geography]. *Globus*, vol. 94, p. 140.

____ Geologische Beobachtungen in den Tropen und Subtropen [Geological observations in the tropics and subtropics]. In K. Keilack (ed.) *Lehrbuch der praktischen Geologie*, 2nd ed., pp. 226-49. Stuttgart: F. Enke.

____ Die naturlichen Landschaften Afrikas [The natural landscapes of Africa]. *Petermanns Mitteilungen*, vol. 54, pp. 147-60, 182-88.

____ Morphologische Skizze des Atlas zwischen Philippeville und Biskra [Morphological sketch of the Atlas Mountains between Philippeville and Biskra]. *Globus*, vol. 94, pp. 169-74.

____ Die ethnographischen Forschungen von L. Desplagnes im West Sudan [The ethnographical investigations of L. Desplagnes in western Sudan]. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, 1908, pp. 549-57.

____ Die Geschichte der Erforschung und Eroberung Kameruns [The history of discovery and conquest of Cameroons]. *Zeitschrift für Kolonialpolitik, Kolonialrecht und Kolonialwirtschaft*, vol. 10, pp. 557-75. (Shorter version in *Deutsche Kolonialzeitung*, Berlin, vol. 28, pp. 563-65.)

____ Die Tektonik der südafrikanischen Küsten [Tectonics of the coast of South Africa]. *Petermanns Mitteilungen*, vol. 54, pp. 140-41.

____ L. Schultzes Reise in Namaland und Kalahari [The trips of L. Schultzes in Namaland and Kalahari]. *Petermanns Mitteilungen* vol. 54, pp. 238-40.

____ *Südafrika. Eine Landes-, Völks-, und Wirtschaftskunde* [South Africa. A regional, ethnogrpahic and economic study]. Leipzig: Quelle und Meyer. 355 pp.

____ Über ein von Dr. Hartmann bei Gibeon (Südwestafrika) gefundenes vielleicht glaziale Konglomerate [On possible glacial conglomerate found by Dr. Hartmann near Gibeon (Southwest Africa)]. *Globus*, vol. 93, pp. 120-23.

1909 Verwitterung und Abtragung in den Steppen und Wüsten Algeriens [Weathering and erosion in the steppes and deserts of Algeria]. *Geographische Zeitschrift*, vol. 15, pp. 493–510.

____ Kamerun, in H. Meyer (ed.) *Das deutsche Kolonialreich, eine Länderkunde der deutsche Schutzgebiete*, [Cameroons, in H. Meyer (ed.) The German colonial empire, a regional geography of the German protectorates]. Leipzig: Verlag des Bibliographischen-Institut. vol. 1, pp. 417-636.

____ Aufgaben und Ziele der geographische Professur in Hamburg [Problems and goals of the geographical professorship in Hamburg]. *Koloniale Rundschau.*

1910 Verwitterung und Abtragung in den Steppen und Wüsten Algeriens [Weathering and erosion in the steppes and deserts of Algeria]. *Verhandlungen des 17. Deutschen Geographischentages zu Lübeck, 1909*, pp. 102-124.

____ Henry Huberts Forschungen in Dahomey [The investigations of Henry Hubert in Dahomey]. *Globus*, vol. 97, pp. 312-17.

____ Togo, in H. Meyer (ed.), *Das deutsche Kolonialreich, eine Länderkunde der deutsche Schutzgebiete*, vol. 2, pp. 1-128.

____ Geomorphologische Probleme aus Kamerun [Geomorphological problems from the Cameroons]. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, 1910, pp. 448-65.

____ Die Kalkpfannen des östlichen Damaralandes [The calcareous pans in eastern Damara Land]. *Globus*, vol. 98, pp. 216-222.

1911 Wüstenformen in Deutschland? [Are there desert formations in Germany?] *Geographische Zeitschrift*, vol. 17, pp. 578–80.

____ Die pflannenformigen Hohlformen der südafrikanischen Steppen [The pan-shaped cavern forms of the south African steppe]. *Petermanns Mitteilungen*, vol. 57, pp. 57-61, 130-35.

1912 Das Geographische Seminar in Hamburg [The geographical seminar in Hamburg]. *Geographischer Anzeiger*, vol. 13, pp. 97-99.

____ Der Wissenschaftliche Nachlass Emin Paschas [The scientific legacy of Emin Pascha]. *Deutsche Kolonialzeitung*, vol. 29, p. 291.

____ Physiologische Morphologie [Physiological morphology]. *Mitteilungen der Geographische Gesellschaft in Hamburg*, vol. 26, pp. 133-327.

____ Physiological Morphologie [Physiological morphology] *Petermanns Mitteilungen*, vol. 58, pp. 5-8.

____ Über die Abtragung durch Wasser, Temperaturgegensätze und Wind, ihren Verlauf und ihre Endformen [On the erosion by water, temperature contrasts, and wind, their time lapse and final forms]. *Geographische Zeitschrift*, vol. 18, pp. 79–98.

____ Der Sonnenkompass. Erläuterung und Tabellen [The sun compass. Explanation and tables]. *Deutsche Kolonialzeitung*, vol. 29, pp. 274-283.

____ Die Vollendung der grossen Karte von Deutsch-Ostafrika im Massstab 1:300,000 [The completion of the large map of German East Africa at the scale of 1:300,000]. *Deutsche Kolonialzeitung*, vol. 29, p. 2.

____ Ueber die Herausgabe eines physiologisch-morphologischen Atlas [On the publication of a physiologic-morphological Atlas]. *Verhandlungen des 18. Deutschen Geographischentages zu Innsbruck*, 1912, pp. 236-47.

____ Acht Reliefs von Pfannen der Kalahari [Eight illustrations of pans in the Kalahari]. Berlin: D. Reimer. 11 pp. (with text).

1913 Physiographie und Vergleichende Landschaftsgeographie [Physiogeography and comparative landscape geography]. *Mitteilungen der Geographische Gesellschaft in Hamburg*, vol. 27, pp. 121-51.

____ Trockensteppen Algeriens [Arid steppes of Algeria], in *Geologischen Charakterbilder*, Heft 17, Berlin. (ed.H. Stille).

____ Abflusslose Seen [Lakes of interior drainage]. *Handwörterbuch der Naturwissenschaft.*

1914 Morphologie des Messtischblattes Stadtremda [Morphology of the plane-table maps of Stadtremda], in *Morphologischer Atlas* (ed. by Passarge), Lieferung I [issue I]. *Mitteilungen der Geographische Gesellschaft in Hamburg*, vol. 28, pp. 1-221.

____ Grundsätze bei der Beschreibung und Namenbildung im Oberflächenformen [Bases for description and nomenclature of surface forms]. *Petermanns Mitteilungen*, vol. 60, pp. 113–15.

1915 Physiographie und Vergleichende Landschaftsgeographie [Physiography and comparative landscape geography]. *Atti del X Congresso Internazionale di Geografia.* Rome, pp. 755–86.

1916 Geologische Beobachtungen in den Tropen und Subtropen [Geologic observations in the tropics and subtropics]. In Keilhack, *Lehrbuch der praktische Geologie*, 3rd ed., Stuttgart.

1919 Die Steppenflusstalung des Okavango im Trockenwald-Sandfeld der Nordkalahari. Ein Beispiel landschaftskundlichen Forschung und Darstellung [Stream valley depressions of the steppes of Okavango in the dry-forest sand areas of northern Kalahari. An example of investigation and presentation in landscape study]. *Mitteilungen der Geographiscshe Gesellschaft in Hamburg*, vol. 32, pp. 1-40.

____ *Die Grundlagen der Landschaftskunde.* Ein Lehrbuch und eine Anleitung zu landschaftskundlicher Forschung und Darstellung, Band I. Beschreibende Landschaftskunde [The bases for the study of landscape. A textbook and a guide to the investigation and presentation of landscape studies. Vol. I.

Descriptive landscape study.]. Hamburg: L. Friederichsen. 210 pp.

____ Die Vorzeitformen der deutschen Mittelberglandschaften [Pre-Recent landforms of the German central mountain landscapes]. *Petermanns Mitteilungen*, vol. 75, pp. 41-46.

1920 *Die Grundlagen der Landschaftskunde*, Band II. Klima, Meer, Pflanzen und Tierwelt in der Landschaft [Vol. II, Climate, sea, vegetation and the animal world in the landscape]. 224 pp.; Band III, Die Oberflächengestaltung der Erde [The land configuration of the earth]. 558 pp. Hamburg: L. Friederichsen.

____ Die Errichtung wissenschaftlicher Handschriftenarchive an den deutschen Bibliotheken [The establishment of archives for scientific manuscripts in German libraries]. *Petermanns Mitteilungen*, vol. 66, p. 23.

1921 *Vergleichende Landschaftskunde* [Comparative study of landscape]. Heft 1, Aufgaben und Methoden der vergleichende Landschaftskunde [part 1, Tasks and methods of comparative study of landscape] 78 pp.; Heft 2, Kältewüsten and Kältesteppen [Cold deserts and cold steppes]. Berlin: D. Reimer. 171 pp.

____ *Erdkundliches Wanderbuch*, Band 1: *Die Landschaft* [Geographical travel book, vol. 2: The geographical landscape]. Leipzig: Quelle & Meyer. 224 pp.

1922 *Vergleichende Landschaftskunde*, Heft III, Die Mittelgürtel [The central belt (mid-latitude)]. Berlin: D. Reimer.

____ *Landschaft und Kulturentwicklung in unseren Klimabreiten* [Landscape (geographical) and cultural development in our climatic zone]. Hamburg: L. Friederichsen. 165 pp.

____ Aufgaben und Methode der vergleichenden Landschaftskunde und ihre Stellung im System der Erdkunde [Problems and method of comparative study of landscape and its place in the system of geography]. *Verhandlungen des 20. Deutschen Geographentages zu Leipzig*, 1921, pp. 175-80.

____ *Erdkundliches Wanderbuch*, Band 2: *Beobachtungen über Tier und Mensch* [Geographical travel book, vol. 2: Observations on animals and mankind]. Leipzig: Quelle & Meyer, 128 pp.

1923 *Die Landschaftsgürtel der Erde. Natur und Kultur* [The landscape zones of the earth. Nature and culture]. Breslau: F. Hirt. 144 pp.

____ Ist vergleichende Länderkunde ein selbständiger Zweig der Erdkunde? [Is comparative regional geography an independent branch of geography?]. *Petermanns Mitteilungen*, vol. 69, pp. 105-08.

____ Die Inselbergglandschaft der Massaïsteppe [The inselberg landscape of the Massai steppe]. *Petermanns Mitteilungen*, vol. 69, pp. 205-09.

____ Ist der Trockenschutt der Puna eine Jetztzeitform? [Is the debris of arid origin of the Puna a form of the Recent period?]. *Petermanns Mitteilungen*, vol. 69, pp. 23-25.

1924 Die politische Erdkunde Afrikas vor dem Eingreifen der europäischen Kolonisation [The political geography of Africa before the intervention of European colonization]. *Petermanns Mitteilungen*, vol. 70, pp. 253-61.

____ *Vergleichende Landschaftskunde*, Heft 4. Der heisse Gürtel, I, Die Landschaft [Comparative study of landscape, Part 4, the hot belt, I, the landscape]. Berlin: D. Reimer. 168 pp.

____ Das Problem der Skulptur-Inselberglandschaften. Eine landschaftskundlich-formenklärende Betrachtung [The problem of the erosional inselberg landscape. A consideration on landscape study and explanation of landforms. *Petermanns Mitteilungen*, vol. 70, pp. 66-70, 117-20.

____ Ländeskunde und vergleichende Landschaftskunde [Regional geography and comparative study of landscape]. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, 1924, pp. 331-35.

____ Madrid. Das Werden einer Grossstadt in einer Steppenlandschaft [Madrid. The growth of a large city in a steppe landscape]. *Zeitschrift für Geopolitik*, vol. 1, pp. 688-94.

____ Die geologische Wirkung des Windes [Geological action of the wind]. In Salomon, *Grundzüge der Geologie*.

____ Politische Geographie, ihre Aufgaben und Grundlagen [Political-geography, its problems and bases]. *Geographischer Anzeiger*, vol. 25, pp.201-09.

1925 [with R. Salomon] Politisch-geographische Betrachtungen über die Entstehung des Grossfürstentums Moskau [Political-geographical considerations on the origin of the Grand Duchy of Moscow]. *Petermanns Mitteilungen*, vol. 71, pp. 111-15.

____ Harmonie und Rhythmus in der Landschaft [Harmony and rhythm in the landscape]. *Petermanns Mitteilungen*, vol. 71, pp. 250-52.

____ [with E. Blanch]. Die chemische Verwitterung in den ägyptischen Wüste [Chemical weathering in the Egyptian desert]. *Abhandlungen aus dem Gebiet der Auslandskunde*, vol. 17, 110 pp.

____ Die Salsgebirge in Peru [The salt mountains in Peru]. *Die Naturwissenschaften*, Heft 2.

____ *Grunzüge der gesetzmässigen Charakterentwicklung der Völker auf religiöser und naturwissenschaftlichen Grundlage und in Abhängigkeit von der Landschaft* [Features of the lawful character development of peoples on religious and natural scientific bases and in relationship to the landscape]. (in Sammlung Borntraeger, vol. 6). Berlin: Gebrüder Borntraeger, 173 pp.

____ Der Rätzel der romischen Kornkammer in Ostjordanland [The puzzle of Roman granaries in east Jordan]. *Die Naturwissenschaften.*

1926 Die politisch-geographischen Grundlagen des Südseegebietes vor dem Eintreffen der Europäer [The political-geographical basis of the areas of the South Seas before the arrival of Europeans]. *Petermanns Mitteilungen*, vol. 72, pp. 209-12.

____ Morphologie der Klimazonen oder Morphologie der Landschaftsgürtel? [Morphology of climatic zones or morphology of landscape belts?]. *Petermanns Mitteilungen*, vol. 72, pp. 173-75.

____ [with others] Über Krustenböden und Krustenbildungen wie auch Roterden, insbesondere ein Beitrag zur Kenntnis der Bodenbildung Palästinas (On hardpans and crustifications in red earths, especially as a contribution to the knowledge of soil formation in Palestine). *Chemie der Erde*, vol. 2, pp. 348-95.

____ Georg Schweinfurth, *Mitteilungen der Geographischen Gesellschaft in Hamburg*, vol. 37, pp. 1-11.

1927 *Klima und Landschaftsbild* [Climate and the representation of landscape]. (Monographien zur Erdkunde no. 36). Bielfeld & Leipzig: Velhagen und Klasing. 119 pp.

____ *Die Erde und ihr Wirtschaftsleben* [The earth and its economic life]. 2 Bände: I. Allgemeine Wirtschaftliche Erdkunde [General economic geography], 391 pp.; II. Wirtschaftsgeographischer Ueberblick über die Erde [Economic-geographical overview of the earth], 374 pp. Hamburg & Berlin: Hanseatische Verlaganstalt. [also 1926 and 1929 editions].

____ Das Problem landschaftskundlicher Forschung und Darstellung [The problem of the investigation and presentation of the study of landscape]. *Mitteilungen der Geographische Gesellschaft in Hamburg*, vol. 38, pp. 57-68.

____ Die Ausgestaltung der Trockenwüsten in heissen Gürtel [The development of dry deserts in the hot belt (of the earth)]. *Verhandlungen der geographische Abteilung der 89. Tagung der Gesellschaft der Naturforschen und Ärzte in Dusseldorf, 1926.* pp. 54-67.

____ Aufgaben und Methoden der Landschaftskunde [Problems and methods of the study of landscape]. *Geographischer Anzeiger*, vol. 28, pp. 44-49.

____ *Charakterentwicklung des Menschen in den Grossstädten der Gegenwart* [Character development of mankind in the large cities of today]. Hamburg: Fichte-Ges.

1928 *Morphologie der Erdoberfläche* [Morphology of the earth's surface]. Breslau: F. Hirt, 152 pp.

____ Die Auffindung von Platos Atlantis [The discovery of Plato's Atlantis]. *Berliner Lokal-Anzeiger*, 13 April 1928.

____ *Panoramen afrikanischer Inselberglandschaften* [Panoramas of African inselberg landscapes]. Berlin; D. Reimer. 15 pp. and 25 photographs plus text.

____ Der Lebensraum des deutschen Volkes [Living space for the German people]. *Tagung für Deutschkunde.* Reichenburg.

1929 *Die Landschaftsgürtel der Erde.* Natur und Kultur [The landscape zones of the earth. Nature and culture]. (2nd ed.) Breslau: F. Hirt. 144 pp.

____ *Morphologie der Erdoberfläche* [Morphology of the earth's surface]. Jedermanns Bücherei, vol. 100, 152 pp.

____ *Beschreibende Landschaftskunde*, Band I. Grundlagen der Landschaftskunde [Descriptive study of landscape, vol. I. Bases for the study of landscape]. 2nd ed. Hamburg: Friederichensen, De Gruyter Co. 312 pp.

____ *Das Judentum als landschaftskundliche-ethnologisches Problem* [Jewry as a problem in a landscape-ethnological study]. Munich: J. F. Lehmann. 460 pp.

____ Das Problem der Inselberglandschaften [The problem of inselberg landscapes]. *Zeitschrift für Geomorphologie*, vol. 4, pp. 109-122.

____ Verfallsymptome in der moderne Geographie [Symptoms of decline in modern geography]. *Petermanns Mitteilungen*, vol. 75, pp. 16-18.

____ Klima und Landschaften [Climate and landscape]. *Naturwissenschaften*, vol. 17, pp. 994-

____ Die Wirkungen des Windes [The action of wind], in E. Blanck (ed.) *Handbuch der Bodenlehre*, vol. 1, pp. 288-309.

____ Wie die Landschaftskunde entstand [How landscape study came about]. *Pädagogische Warte*, vol. 36.

____ Länder, reale Landschaftskunde, ideale Landschaftstypen [Regions, real landscapes, ideal types of landscapes]. *Naturwissenschaften*, vol. 18.

____ Stadtlandschaften im arabische Orient [City landscapes in the Arabian East]. In *Stadtlandschaften der Erde.*

1930 Wesen, Aufgaben und Grenzen der Landschaftskunde [Nature, problems and limits of the study of landscape]. In H. Wagner Gedächtnisschrift [Memorial to H. Wagner], *Petermanns Mitteilungen, Ergänzungsheft* 209, pp. 29-44.

____ Ergebnisse einer Studienreise nach Südtunesiens im Jahre 1928, [Results of a study trip to southern Tunisia in 1928]. *Mitteilungen der Geographischen Gesellschaft in Hamburg*, vol. 41, pp. 96-122.

____ *Vergleichende Landschaftskunde.* Heft 5. Der Mensch im heissen Gürtel [Comparative study of landscape. Part 5. Mankind in the hot belt]. Berlin: D. Reimer. 216 pp.

____ *Stadtlandschaften der Erde* (ed.) [City landscapes of the earth]. Hamburg: Friederichsen, de Gruyter & Co. 154 pp.

____ (with M. Biehl) *Wirtschafsgeographie für Kaufleute. Grundzüge einer Rohstoff- und Industriegeographie* [Economic geography for merchants. Bases for a geography of raw materials and industry]. Hamburger Kaufmannsbücher, vol. 24, 161 pp.

____ Das geographische Parthenon [The geographical Parthenon], *Petermanns Mitteilungen*, vol. 76, pp. 116-18.

____ Die geographische Wert des Bodens [The geographical value of soils], in E. Blanck (ed.) *Handbuch der Bodenlehre*, vol. 5, Berlin, pp. 429-54.

____ Die Asphaltsee in Trinidad im Jahre 1901 [The asphalt lake in Trinidad in 1901]. *Jahrbuch der Geographische Gesellshaft zu Hannover*, 1930, pp. 94-96.

____ Die Erosionvorgänge von Amazonas. Eine vergessene Studie über die abtragende Wirkung eines grossen Stromsystem [The erosion processes of the Amazon (drainage). A forgotten study on the degradational effect of a large stream system]. *Zeitschrift für Geomorphologie*, vol. 6, pp. 19-22.

____ Normen und Modifikationen in der Landschaftskunde [Standards and modifications in the study of landscape]. *Naturwissenschaften*, vol. 18.

____ Länderkunde und landschaftskunde [Study of regions and landscape study]. *Pädagogische Warte*, vol. 37.

____ Geographisch-wissenschaftliche Photographieren [Scientific-geographic photography]. *Die Schulphotographie.*

1931 Das Rio Branco-Essequibo Problem [The Rio Branco-Essequibo problem]. *Petermanns Mitteilungen*, vol. 77, pp. 135-37.

____ Kartographische Aufnahme des Orinoko zwischen der Cauramündung und Ciudad Bolívar [Cartographic representation of the Orinoco (river) between the mouth of the Caura and Ciudad Bolívar]. *Petermanns Mitteilungen*, vol. 77, p. 183.

____ Landschaftsreiz und Landschaftszwang [The stimulus of landscape and the constraint of landscape]. *Petermanns Mitteilungen*, vol. 77, pp. 225-27.

____ Das Problem des logischen Systems der Landschaftstypen [The problem of a logical system of natural landscape types]. *Die Naturwissenschaft*, vol.19, pp. 702-04.

____ Die Methode der Landschaftsbestimmung durch Symbole [The method of defining natural landscapes by symbols]. *Geographische Zeitschrift*, vol. 37, pp. 227-30.

____ Drei Probleme diluvialgeologischer Morphologie [Three problems of the geologic morphology of the Pleistocene]. *Zeitschrift der Deutsche Geologische Gesellschaft zu Berlin*, vol. 84, pp. 408-21.

____ *Aegypten und der arabische Orient* [Egypt and the Arabic East]. Weltpolitische Bücherei, vol. 23. Berlin, 70 pp.

____ Abflusslose Seen [Lakes of interior drainage]. *Naturwissenschaften*, vol. 19.

____ Geologische Bedeutung der Atmosphäre

[Geological significance of the atmosphere]. *Handbuch der Naturwissenschaft*, Berlin.

____ Die Bedeutung der beschreibenden Landschaftskunde für die Geographie und deren Nachbarwissenschaften [The significance of descriptive landscape study for geography and the related sciences]. *Geographischer Anzeiger*, vol. 32, pp. 321-27.

____ Aufgaben und Methoden der politischen Geographie [Problems and methods of political geography]. *Zeitschrift für Politik*, vol. 21, pp. 443-60.

____ Kulturelle Lebensformen als Gegenstand länderkundlicher Spezialuntersuchungen [Cultural life styles as basis for special regional research]. *Petermanns Mitteilungen*, vol. 77, pp. 306-07.

1932 *Geomorfología* [Geomorphology], trans. Gómez de Llarena. Colección Labor. Barcelona: Editorial Labor. 189 pp.

____ Die Kulturelle Länderkunde und das Vierkräfte Problem [Cultural regional geography and the four-forces problem]. *Petermanns Mitteilungen*, vol. 78, pp. 1-5.

____ Wissenschaftliche Ergebnisse meiner Forschungsreise am Orinoko, Caura und Cuchivero [Scientific results of my trip of investigation to the Orinoco, Caura and Cuchivero (rivers)]. *Abhandlungen des 24. Deutschen Geographentages zu Danzig*, 1931, pp. 247-63.

____ Beschreibung der Formen und genetische Typen in der Morphologie [Description of the forms and genetic types in morphology]. *Zeitschrift für Geomorphologie*, vol. 7, pp. 167-69.

____ Die Kombination von Landschaftsmodifikatoren und ihre Bedeutung für spezifischlandskundliche Problemstellung [The combination of landscape modification and its significance for the arrangement of problems pertaining to specific landscapes]. *Naturwissenschaften*, vol. 20.

____ Die Hauptprobleme der Anthropologie Afrikas [The main problems of the anthropology of Africa]. Comitato italiano per lo studio dei problemi della popolazione. Rome.

____ Die Hauptprobleme der Anthropologie Afrikas. *Forschungen und Fortschritte*, vol. 8.

____ Arabische Beduinen [Arabian Bedouins]. *Raum und Volk*.

____ Die gesetzmässigen Charakterentwicklung der Völker als Grundlage der Kulturentwicklung und der Geschichtesverlauges [The character development of people according to theory as basis for cultural development and historical progress]. Comitato italiano per lo stuio dei problemi della popolazione.

____ Das jüdische Problem [The Jewish problem]. In: *Ist der Jude Schuld*? [Is the Jew to blame?].

1933 Diluvialmorphologische Probleme? [(Are there) morphological problems of the Pleistocene?]. *Zeitschrift der Deutsche Geologische Gesellschaft zu Berlin*, vol. 85, pp. 646-51.

____ *Einführung in die Landschaftskunde* [Introduction to the study of the natural landscape]. Leipzig & Berlin: B. G. Teubner. 100 pp.

____ Landschaftskundliche Charakteristik der Rhön [Characteristics of a natural landscape study of the Rhone (river)]. *Mitteilungen der Geographischen Gesellshaft in Hamburg*, vol. 42, pp. 163-266.

____ Das Problem des Kulturgeographischen Räume [The problem of the positions of cultural geography]. *Petermanns Mitteilungen*, vol. 79, pp. 1-6.

____ *Geographische Völkerkunde*. Band 2. Afrika [Geographical ethnography, vol. 2, Africa]. Frankfurt-am-Main: M. Diesterweg, 129 pp.

____ *Wissenschaftliche Ergebnisse einer Reise im Gebiet des Orinoko, Caura und Cuchivero im Jahre 1901-1902* [Scientific results of a trip in the area of the Orinoco, Caura and Cuchivero (rivers) in the years 1901-1902]. Hamburg: Friederichsen, de Gruyter & Co., 281 pp.

____ Geographische Völkerkunde und Vier-Kräfte Problem [Geographical ethnography and the four-forces problem]. *Petermanns Mitteilungen*, vol. 79, pp. 229-31.

____ Palästina als zionistisches Siedlungsland [Palestine as a Zionist area of settlement]. *Geographische Wochenschrift*, vol. 1.

____ Diluvialer Wanderschutt in der Rhön [Pleistocene migratory detritus in the Rhone (river)]. *Forschungen und Fortschritte*, vol. 9.

____ [with W. Meinardus] *Studien in der ägyptische Wüste* [Studies in the Egyptian desert]. Berlin: Weidmannsche Buchhandlung. 111 pp.

____ Geographie und nationale Erziehung [Geography and national education]. *Geographische Wochenschrift*, vol. 1.

____ Antwort auf Herrn Gripps Diluvialmorphologische Problem [Answer to Herr Gripp's morphological problem of the Pleistocene]. *Zeitschrift der Deutsche Geologische Gesellschaft zu Berlin.*

____ Geographische Völkerkunde [Geographic ethnology]. *Forschungen und Fortschritte*, vol. 9.

____ Landschaftsgürtel und Pflanzenvereine Südafrikas und Australiens [Landscape belts and plant associations of South Africa and Australia]. *Naturwissenschaften*, vol. 21.

____ Die jüdische Rassenfrage [The Jewish racial questions]. *Pädagogische Warte*, vol. 40.

____ Beschreibung der Formen und genetische Typen in der Morphologie [Description of the forms and genetic types in geomorphology]. *Zeitschrift für Geomorphologie*, vol. 7, pp. 167-69.

____ Morphologische Studien in der Gaul bei Lana [Geomorphological studies in the Gaul near Lana]. *Zeitschrift für Geomorphologie*, vol. 8, pp. 67-81.

1934 Zur Frage der Klimaänderungen in den Tropen [On the question of climatic change in the tropics]. *Geographische Wochenschrift*, vol. 2, pp. 787-802.

____ *Geographische Völkerkunde*. Band I. Einführung in die geographische Völkerkunde [Geographical ethnography. Vol. I. Introduction to geographical ethnography]. Frankfurt-am-Main: M. Diesterweg. 144 pp.

____ Landschaftsbilde Charakteristik der Rhön [Landscape characteristics of the Rhone (river)]. *Geographische Wochenschrift*, vol. 2, pp. 464-69.

____ Naturwissenschaftliche und kulturelle Landschaftsgliederung Australiens [Natural scientific and cultural landscape divisions of Australia]. *Petermanns Mitteilungen*, vol. 80, pp. 254-56. (Also in: *Die Naturwissenschaft*, vol. 21, pp. 809-11).

____ Zur Senkung der Nordseeküste (mit W. Haarnagel) [On the submergence of the North Sea coast]. *Forschungen und Fortschritte*, vol. 10.

____ Die Australier und ihre Kultur im Lichte landschaftskundlicher Betrachtungweise [The Australians and their culture in light of considerations within the study of landscape]. *Forschungen und Fortschritte*, vol. 10.

____ *Geographische Völkerkunde* [Geographical ethnography), Band III, Australien und die Südsee [Australia and the South Seas]. Frankfurt.

____ Zur Kenntnis der Meraner Landschaft [On knowledge of the Meran landscape]. *Geographische Zeitschrift*, vol. 40, pp. 464-68.

1935 Byzanz. Eine politisch-geographische Betrachtung [Byzantium. A political-geographical consideration]. *Geographischer Anzeiger*, vol. 36, pp. 484-88.

____ Politische Geographie und Geopolitik [Political geography and geopolitics]. *Petermanns Mitteilungen*, vol. 81, pp. 185–89.

____ Politisch-geographische Betrachtungen über Alt Hellas [Political-geographical considerations on ancient Greece]. *Geographische Wochenschrift*, vol. 3.

____ Wissenschaftliche Geographie, ihre Lehr- und Forschungsaufgaben [Scientific geography, its teaching and research program]. *Petermanns Mitteilungen*, vol. 81, pp. 342-49.

____ Wirtschaftsmöglichkeiten im eigentlichen Abessinien [Economic possibilities in Abyssinia proper]. *Geographische Wochenschrift*, vol. 3, pp. 809-19.

____ Der Landschaftsbau der Anden von Colombien bis Nordargentinien-Nordchile [Landscape structure of the Andes from Colombia to northern Argentina and northern Chile]. *Geographische Zeitschrift*, vol. 41, pp. 181-90.

____ Abessinien und Italien [Abyssinia and Italy]. *Geographische Wochenschrift*, vol. 5.

1936 *Geographische Völkerkunde*, Band 4. Amerika [Geographical ethnography, Vol. 4. America]. Frankfurt-am-Main: M. Diesterweg. 150 pp.

____ *Die deutsche Landschaft* [The German landscape]. Berlin: D. Reimer. 116 pp.

____ Politisch-geographische Betrachtungen über die Geschichte von Schweden und Dänemark [Political-geographical considerations on the history of Sweden and Denmark]. *Geographische Zeitschrift*, vol. 42, pp. 172-78.

____ Die grosse geopolitische Gefahrenzone Europas und ihre Raumbedingtheit [The large geopolitical danger zones of Europe and their areal relationships]. *Zeitschrift für Geopolitik*, vol. 13, pp. 137-45.

____ Versuch einer Darlegung der eigenen wissenschaftlichen Tätigkeit [Attempt at an explanation of the characteristic scientific activity]. *Zeitschrift der Gesellschaft für Erd-*

kunde in Frankfurt-am-Main, vol. 4, pp. 49-61.

____ [Introduction by Passarge] in Baedeker: *Unteritalien, Sizilien, Sardinien, Malta, Tripolis, Korfu.* Handbuch für Reisende, 17. ed.

____ Das Emanzipationsjudentum [The emancipation of the Jewish people]. *Das Volk.*

____ Das jüdische Ghetto [The Jewish ghetto]. *Das Volk.*

____ Was könnte man unter "Politischer Erdkunde" verstehen? [What can one understand by "Political Geogeography?] *Zeitschrift für Erdkunde*, vol. 4.

____ Neuartige Auffassungen über das Diluvium in Norddeutschland [New ideas on the Pleistocene of north Germany]. *Zeitschrift für Erdkunde*, vol. 4.

1937 Landschaftskundliche Karten [Maps of the natural landscape]. *Geographische Zeitschrift*, vol. 43, pp. 144-46.

____ [Foreword by Passarge] in Schultze, A.: Flammen in der Sierra Nevada de Santa Marta [Fires in the Sierra Nevada de Santa Marta (Colombia)]. *Mitteilungen der Geographische Gesellschaft in Hamburg*, vol. 45, p. 59.

____ Die Rolle der Landschaftskunde in der Geographie [The role of landscape study in geography]. *Zeitschrift für Erdkunde*, vol. 5.

1938 Talbildung (Rückschreitende Erosion) [Valley formation (Retrogressive erosion)]. *Beiheft der Reichstelle für den Unterrichtsfilm* (Folge 155). Stuttgart: Kohlhammer. 30 pp.

____ *Geographische Völkerkunde*, Band 5. Asien [Geographical Ethnography. Vol. 5. Asia]. Frankfurt-am-Main: M. Diesterweg. 148 pp.

1939 Kolonien und Kolonialgeographie [Colonies and colonial geography]. *Afrika Rundschau*, vol. 4, pp. 7-8.

____ Das geographische Seminar des Kolonial-Instituts und der Hansischer Universität, 1908-1935. Erinnerungen und Erfahrungen [The geographical seminar of the Kolonial Institut and the Hanisischer (Hanseatic) University. Recollections and experiences]. *Mitteilungen der Geographischen Gesellschaft in Hamburg*, vol. 46, pp. 1-104.

1940 Geomorphologische Probleme aus Algerien [Geomorphological problems from Algeria]. *Journal of Geomorphology*, vol. 3, pp. 108-130, 227-43.

____ Die Urlandschaft Aegyptens und die Lokalisierung der Wiege der altägyptischen Kultur [The primeval landscape of Egypt and the locating of the cradle of ancient Egyptian culture]. *Nova Acta Leopoldina*, vol. 58. Halle, Deutsche Akademie der Naturforscher. 78 pp.

____ Fayum und Moeris-See [Faiyum and Moeris Lake]. *Geographische Zeitschrift*, vol. 46, pp. 353-61.

1941 *Wissenschaftliche Ergebnisse zweir Reisen nach Algerien in den Jahren 1906 und 1907* [Scientific results of two trips to Algeria in the years 1906 and 1907]. (Hansische Univ. Abhandlungen aus dem Gebiet der Auslandskunde. vol. 52, Reihe C. Naturwisssenschaften, vol. 14). Hamburg: Friederichsen, De Gruyter & Co. 592 pp.

1944 Kulturlandschaftsforschung [Investigation of the cultural landscape]. *Geographische Zeitschrift*, vol. 50, pp. 133-37.

1949 Erinnerungen an Erich von Drygalski: zu seinen am 10.1.1949 erfolgten Tode [Recollections of Erich von Drygalski: on (occasion) of his death on October 1, 1949]. *Mitteilungen der Geographische Gesellschaft in München*, vol. 35, pp. 105–07.

____ Erdbeben und Menschwerdung in Ostasien [Earthquakes and human evolution in East Asia]. In *Festschrift zur 70. Geburtstag von L. Mecking*. Bremen: Dova. pp. 97-102.

____ Problemgeographie [Problem geography]. *Forschungen und Fortschritte*, vol. 25.

1950 Probleme einer Geschichts Geographie auf landschaftskundlicher Basis [Problems of an historical geography on a natural landscape basis]. *Forschungen und Fortschritte*, vol. 26, pp. 271-73.

____ Grundlinien im Aufbau Afrikas [Bases in the structure of Africa]. *Die Naturwissenschaften*, vol. 37, pp. 343-46.

____ *Kulturgeographie* [Cultural geography] (Typescript). Hamburg.

1951 *Geographische Völkerkunde* [Geographical ethnography]. Berlin: Safara Verlag. 660 pp.

____ *Aus achtzig Jahren. Eine Selbstbiographie* [At eighty years. An autobiography]. (Typescript). Hamburg.

____ *Problemgeographie* [Problem geography]. (Typescript). Hamburg.

____ *Der West- und Zentralsudan, eine landschaftskundlichkulturgeographische Betrachtung* [The west and central Sudan, a natural landscape-cultural geographical treatment].

(Typescript). Hamburg.

1952 *Problemländerkundliche Überblick über Arabien* [An overview of the problems in regional geography on Arabia]. (Typescript). Hamburg.

1953 Länderkundliche Probleme [Problems of regional geography]. *Forschungen und Fortschritte*, vol. 29.

1955 *Morphologische Studien in der Wüste von Assuan* [Morphologic studies on the desert of Aswan]. (Hamburg Universität, Abhandlungen aus dem Gebiet der Auslandkunde, vol. 60, Reihe C., Naturwissenschaften, vol. 17). Hamburg: Cram, De Gruyter. 63 pp.

Introduction to *Comparative Study of Landscape Regions*

Siegfried Passarge (1921)

[Translated from *Vergleichenden Landschaftskunde*, Heft 1, Aufgaben und Methoden (Comparative Study of Landscape, part 1, Tasks and Methods) 1921, with map (fig. 6)]

GENERAL CONCEPTS

The study of landscape is a new branch of geography which in my opinion will have a great future. It is the necessary basis for a scientific consideration of questions of how animals and mankind develop in their relationship to the earth in which they live.

The geography of animals breaks down into two divisions. One of these has been investigated by zoologists and shows how animal species are distributed over the earth and which historical processes one should apply. Animal kingdoms, provinces, etc. are formulated and concepts such as migration, endemism, etc. play an important role.

On the other hand, the second division, the life of animals in the landscape, still does not receive adequate attention. To be sure, the adaptation of animals to nature . . . has been the subject of ongoing investigation; to be sure, the significance of plant associations such as steppe, forest, tundra, etc., in the development and distribution of animals has long been known; but a systematic investigation of the life of animals within their milieu has been undertaken only by a few, e.g. Waibel, Hesse. Even such work as that of Brehm on animal life is based not on the milieu but on species.

It is not much better in regard to mankind. Separate branches of the science of mankind, such as the study of race, ethnology, sociology, etc. have become important disciplines; also the geography of mankind—anthropogeography—has become active through Ratzel, and economic, commercial, settlement and political geography have taken a start toward self-reliant development under the leadership of men such as v. Richthofen, Ratzel, Deckert, Eckert, Friedrich, and, recently, Supan—to name only a few German scholars. Brunhes wrote a human geography and also the English investigators, such as Herbertson, have not been inactive.

But there still have been no successful results to record. Especially economic geography remains statistics with geographical overlays; political geography—exclusive of Supan's entirely new work, which exhibits an important advance—was an area where fantasy could bloom, and one must ask, why this stagnation? Thus one must say that the basis for the development of human geography lacked chiefly the knowledge of areas. Without such knowledge all discussion hangs in limbo.

During that time of groping and doubt there appeared the work of Herbertson: The [Major] Natural Regions of the World [*Geographical Journal*, vol. 25 (1905), pp. 300-310].[1] The idea on the elaboration of "natural landscapes" was awakened and [its promotion] remained enthusiastic. As Hans Meyer sketched the plan of his "Deutschen Kolonialreich" [two volumes published in 1909 and 1910] he advanced as a fundamental principle...the elaboration of the natural landscape. This suggestion was decisive for the author [Passarge] and led to an initial attempt . . . to divide Africa into a number of natural landscapes. Maps were prepared for land configuration and structure, hydrography, plant cover, and climatic areas, and these were used for the elaboration of individual natural regions.

In [my] book on South Africa [1908] perhaps for the first time the attempt was made in the formulation of natural landscapes to consider the presentation of [cultural aspects] of mankind.

The result was by no means satisfactory, and the address that I delivered at the International Geographical Congress in Rome [1913] on the principle [of landscape study] which with the formulation of natural landscapes should have been decisive, brought forth no important response.

Only during the war [WW I], which I experienced almost entirely in Flanders, did new concepts mature [in my mind]. [If] the concept of natural

regions as living space for animals and mankind should assume credence, then one must not begin with major viewpoints, but with the consideration of the landscape itself and its appearance and forms presented in detail. The life of man and animals depends, often directly, on innumerable particulars. The presence or absence of individual factors can be decisive for the significance of large areas for animal and man, for example, a well or spring in the desert, floodplains along a river in the steppe, a belt of reeds along a lake shore.

Thus began, then, the task to find first a landscape section [Landschaftsteile], which is the foundation stone of an entire landscape area. The first attempt to realize the theoretically formed viewpoint in some example resulted in a treatise: "Die Steppen-Flusstalung des Okawango im Trockenwald-Sandfeld der Nordkalahari" [Stream valley depressions of the steppe of Okavango in the dry-forest sand areas of northern Kalahari]. [1919].

Subsequently by this time there should be [presented] in part more developed forms of major viewpoints, from which the landscape might be considered and once again summarized. Perhaps the presentation of concepts and their determination might be wearisome for the reader. But it is better to present the necessary ones together and not to develop them during the description of the landscape areas. Moreover, a simple indication of the ideas as were given in the "Grundlagen der Landschaftskunde" has not sufficed. A newly published work may be referred to: "Die Landschaftskunde von Turkestan" by Arved Schultz. We are dealing with a special work that contains much worthwhile material. Methodologically it corresponds essentially with my attempt to divide Africa into natural landscapes, for in both cases attempts are made first at local synchronization of different phenomena, from which the nature of the landscapes determined on the map are established and therefrom landscapes are derived. In this way Schultz found the core and marginal areas of the landscape. But a significant difference exists between Schultz' concept and that of the author in that animals and man, the latter even with an abundance of culture traits, can be said to establish landscapes. . . . For the problem is still obvious that the living spaces of animals and man are independently separate from the landscape and thus indicates how they have found their way about in space. One must add that man has often strongly influenced the landscape; he has even created new landscapes—the marshland of the North Sea, oases, cities!—but on the whole one knows approximately how the land appeared before its transformation into a cultural landscape. One must even introduce the concept "cultural landscape" and take into account the influence of mankind on the land and also look upon settlements as part of landscape [Landschaftsteile] and even as whole landscapes.

However, we now turn to the subject of the work under consideration.

Mainly one must be clear regarding the content and range of the study of landscape.

NOTES

1. This basic work appeared at the time I had moved to Breslau and where completely new duties confronted me. Therefore, this article, which above all broke with the prevailing opinion that morphological [physiographic] areas were decisive, unfortunately escaped my notice and had no influence on my personal development [of ideas].

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In five parts. Berlin: D. Reimer, 1921-1930

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Ed. note: Because of cost constraints, Passarge was obliged to omit the section on mankind in the mid-latitude belt, but it was published (1922) as a separate book, *Landschaft und Kulturentwicklung in unseren Klimabreiten.* Hamburg: L. Friederichen. 165 p.

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Siegfried Passarge's Thoughts on Geography

Helmut Kanter (1960)

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It is not an easy task to report on the scientific life's work of one of the important scholars. That is especially the case with Professor Dr. Siegfried Passarge, who as a student of Professor von Richthofen, evolved from a geologist and naturalist into one of the best known geographers, and, starting from the investigations of his teachers, led geography along new paths. Good fortune permitted him to be active in research for 65 years after the conclusion of his schooling, and for 42 years of teaching after his habilitation; in 1952 he celebrated his retirement 60 years after receiving his doctorate. Passarge received many honors during his long life. He was honorary member of various scientific societies and academies; in 1953 the Gesellschaft für Erdkunde zu Berlin [the Geographical Society of Berlin] awarded him the Ritter gold medal, and, in addition, in 1956 he experienced the pleasure of being named honorary doctor by the natural science faculty of the University of Hamburg. At that time the name Passarge was known not only in Germany but also abroad through his research and numerous writings.

Passarge was born on 29 November 1866 in Königsberg in Prussia. At that time his father, Louis Passarge, was a district judge, a versatile, interesting person, who acquired extensive knowledge through trips in the northern countries and later also in the Mediterranean lands, and authored several worthwhile folkloric studies as travel reports. The young Passarge attended school in the small city of Insterburg; here he grew up in the midst of fields and forests, streams and meadows, which awakened his interests in nature. However, his field of vision was widened especially by the stimulating intellectual life in his parents' house and by two trips that he made with his mother to Franzenbad and Salzungen.

The transfer of his father to Königsberg brought on more stimulation. In the library of Friedrich College, which he attended for his secondary examinations, he sought out ethnological writings and travel accounts, particularly on Africa which he read with enthusiasm. During the second half of his last year in secondary school [*Obertertia*] he came across a book that would be a deciding factor for the rest of his entire life: Zollner, *Der schwarze Erdteil und seine Erforscher* [The Black Continent and its Explorers]. After that he was quite certain that he would become a traveler to Africa and would be like those whom he had read about. When an aunt presented him with [a copy of] Credner's *Elemente der Geologie* as a confirmation gift, his resolution to study geology was assured.

In 1886 Passarge appealed to the University of Berlin, where the famous geologist and geographer von Richthofen taught, under whose leadership geography pertaining to natural sciences had experienced a strong advancement. The young student sought out this great teacher for advice on the direction he should take for his studies. To begin with, von Richthofen advised him to take chemistry and physics, followed by endeavors in mineralogy and petrology, but also to attend lectures on climatology, in order to build his studies of geology on the firmest basis possible.

By this time Passarge had settled down in Jena. Here he came into an interesting geological environment that Berlin could not offer him. Here at that time the geologist Kalkowsky was teaching, besides three African specialists whose lectures Passarge eagerly sought. They were Pechuel-Losche, the geologist Semon and Johannes Walther, who in the course of the semester would be returning to Egypt and the Sinai. These three especially influenced Passarge's scientific development. During the holidays Passarge hiked through Thuringia and the Rhone area, and in summer through the Alps from Salzburg to Venice. That year his father was retired from service and thereby the financial means at his disposal was reduced. Con-

sequently he was distressed by the thought that with unremunerative studies in geology he would be left without support. A staff-surgeon, with whom he traveled in Italy, advised him to study medicine, and thus Passarge made a final decision to embark upon an additional life's work. Without the study of medicine he would never have obtained such a broad general view of the profession of natural science; and with it [medicine] he could also provide a foundation for human geography and might never have had [the opportunity] to make an expedition to Africa so quickly.

In Freiburg (1887) he was permitted to enroll as a medical student, and since he was required to take natural science for both the first semesters, he already had passed two long semesters in physics. Accordingly he used the summer vacation for travel in Italy. He went by ship from Genoa to Naples and then wandered observing and sketching the surroundings of Naples, Sorrento and Salerno. On his way home he stopped a week in Rome and Florence. The following years (1888 to 1892) he spent as a medical student in Jena, but did not neglect geology, for Professor Kalkowsky had already in 1890 assigned him a dissertation on "Das Röth in östlichen Thüringen" [the Röth formation (new Red Sandstones) in eastern Thuringia] (Passarge, 1891). Soon after his doctoral examination he again undertook his medical studies, and at Easter 1892 successfully passed the state medical exam. He concluded by joining the military service as a one-year voluntary physician until 1893. Passarge was dismissed [from service] as a doctor's assistant. Shortly after his dismissal from the military he received an inquiry from the Deutschen Kamerun-Komite (German Committee on the Cameroons) if he would take part in a planned expedition into the interior of the Cameroons. The expedition was formed in the former period of African exploration, in which the colony's boundaries were definitely established. Thus [the time] for thorough investigations was somewhat brief, but Passarge, through surveys of routes, geological mapping, drawings and water-color paintings, attempted to establish the geological and geographical character of the land; he carried out astronomical determinations of longitude and prepared anthropological measurements of negroes. In his work "Adamaua" (Passarge 1895b), he treated his observations on the problems of crustal formations, as well as the surface layers of rocks and the formation of regional types of landscapes; [on these observations] Richthofen would pass appreciative judgement.

During the period after the return of the expedition (May 1894) [in Berlin] he completed the elaboration of his observations and [gave] lectures to the Kolonial-Gesellschaft (Colonial Society). In addition he used the opportunity to audit [lectures on] petrography and to take part in a geographical colloquium with v. Richthofen. In order not to forget his connection with medicine, he worked as a volunteer in the hospital at Friedrichshain.

In August 1895 the 6th International Geographical Congress was held in London, for which Passarge had submitted a paper on laterite and red earth (Passarge 1895a). Based on this paper and his work on Adamaua [that had] become known, the London circle made him an offer, as a geologist, to visit and investigate the completely unknown geology of Ngamiland, in which alleged gold and diamond deposits might occur. The agreement with the British Westcharterland Ltd. was quite favorable, and in May 1896 Passarge left Berlin.

After inspection and studies of the gold and diamond deposits in the environs of Kimberley and Johannesburg, he began the laborious journey to Ngamiland, during which he became ill with typhus and later with malaria. Until 1898 he carried out the investigation of the northern Kalahari, which for the Company was a negative result that indicated the occurrence of neither gold nor diamonds. So numerous were the scientific results [of his investigation] that he assembled them in his great work "Die Kalahari" (Passarge 1904). The entire area under consideration included, besides the Kalahari, the swampland of the Okavango and extended far into German Southwest Africa. In it the observations of individual areas in regard to geology and morphology were summarized in small monographs. Many were the problems that the investigator presented, and for their explanation Passarge constructed in part new, surprising and exciting processes; for example, those made by animals as morphological agents. With the setting in of their winter movement the activity of ants and termites in turning over the soil reduces [its surface] to a covering of sand particles 1 to 2 cm. thick over the grey Kalahari sands and forms a covering of sand over the rocks [so that they appear] swollen. The vleis, called sand pans and even calcareous pans, the remains of former water courses, as Passarge explains, once held numerous large animals, that even four decades before his [Passarge's] visit, lived in the Kalahari in enormous numbers. As Livingstone reported, after drinking from the pans they would wallow in the mud and

thereby caused masses of fine material to develop (Passarge 1903). The experience that Passarge attained during his British service meant for him a rich expansion of his knowledge of mankind and science. His frugal and parsimonious life-style and his scant desire to return home allowed for undisturbed participation in his field work.

Through his insight into colonial methods and the development of colonies it was possible for Passarge to concern himself with the politics of colonial life by means of lectures and writings. He was of the opinion that the task of government should be to develop the colonies slowly and systematically and not to grant extensive land concessions that would only lead to financial and land speculation and would not serve in the development of the colony.

Because of indications of such speculation and the disclosure of some secret agreements of the Southwest Africa Company and those of the Beers Company concerning the expected diamond discovery in the colony of German Southwest Africa (which would put production in the hands of the Beers Company), a scandal resulted from a lecture [given by Passarge] before the Kolonial-Gesellschaft in Coblenz in 1900. This resulted in the disappearance of the people who supported and defended the intrigues of the Society, and their influence was forgotten.

A trip to Venezuela interrupted Passarge's work in Berlin from October 1901 to May 1902. A syndicate in Cologne wished to purchase the valuable property (then in decline) of the deceased President Crespo, located on the Orinoco between the Caura and Cuchivero rivers. Passarge was entrusted by the Syndicate with the investigation [of the property]. He was concerned with questions such as agricultural settlement, stock raising, as well as transport of products, the establishment of roads, etc. Thus, [questions concerning] chiefly economic geography were foremost. The work could not be done by a rapid, superficial visit, but by a systematic cartographic and geographic undertaking of this relatively small and simple area. It was a zone of humid grassland with evergreen gallery forests. For the first time Passarge followed regional geographical [landschaftskundlichen] principles, because he established distinct natural landscape areas and elements that were basic to economic considerations. Already the Spaniards, as sharp observers of nature, had expressed many natural regional [landscape] images and given them special designations. A visit to Caracas, Valencia and Puerto Cabello as well as some of the Lesser Antilles, allowed Passarge a glimpse of the cultural geographical character of tropical lands and their inhabitants (Passarge, 1902, 1933a).

In the summer of 1903 the completion of the work on the Kalahari treatise resulted in Passarge's *habilitation* [right to teach at university level] under Richthofen in Berlin. Lectures mainly on Africa and Australia, essays on anthropogeographical problems (which were supplemented by the anthropological sections contained in the work on the Kalahari) (Passarge 1907) and various reports claimed his academic energy, but already in 1905 he was offered a professorship at Breslau as a successor to Partsch. Therewith Passarge again entered a region new to him, and with zeal made himself familiar with the geology of Silesia.

While still in Berlin Passarge had made a trip to Algeria to determine the possibility for a study, which in 1906 and 1907, once in the spring and then at the end of summer, he was able to accomplish. This became a comparative systematic investigation of the forces, processes and forms of the succession of physical landscape zones from the coast, across the Atlas, to the desert. This systematic pursuit of specific morphological processes in distinct climatic zones was of great importance for the acquisition of a more extensive viewpoint of physical, or natural, regional geography, and one might be allowed to emphasize that the trips that include these questions have contributed in an important way to the later synthesis of the study of natural regional geography [Landschaftskunde] (Passarge 1909). Already in the spring of 1908 Passarge received an inquiry if he would be prepared to come to the newly founded Kolonialinstitut [Colonial Institute] at Hamburg. After a brief hesitation he declared himself available, and thus Passarge worked in Hamburg from 1908 to 1936, nearly 30 years, first at the Colonial Institute, then at the Hansischen Universität [Hanseatic University]. For Passarge the period in Hamburg was the time for maturity and for the production of important works, which served the further development and promotion of geography. He undertook only short scientific trips to Tunisia, Egypt, Palestine and Spain. His teaching activity in Hamburg was interrupted during World War I, in which he was called up as an assistant physician with the local militia, first battalion, in Altona. However, he was soon occupied in Belgium as a geologist, but as such unfortunately he could not prevent the heavy losses in mine warfare in Flanders, because his

warnings were not taken seriously. In 1917 he became ill with dysentery and articular rheumatism. At the end of the war he was functioning as a physician in a motor transport unit in his native country.

The beginning of Passarge's academic career fell within the time that was decisive for the development of geography. The domination of morphology was facing its end, cultural geography was pushing into the foreground, but it lacked an appropriate foundation.

In 1908 the famous American geographer, [William Morris] Davis, came to Berlin as an exchange professor. His method of an explanatory description of landforms, in which he surely and clearly formulated an historically developed representation of their origin, recognized only fixed explanations of the forms through constant processes (Davis 1912). With this there was a problem in research [methods that were based on] careful surveys and positions of differential diagnosis; investigation of these different possibilities was practically dismissed by Davis. Much opposition was raised against his concept. But already despite the adverse criticism that Davis caused, he had produced an extraordinary promotional influence on geographical science. To his adversaries it was clear that the known denudational and depositional forces and processes according to number, intensity and modes of operation still presented many unsolved problems. Moreover, there still may be unknown forces and factors the neglect of which must have caused serious errors. That is true especially for climate and latitudinal shifts [of weather patterns] that took place during the Tertiary and Pleistocene periods and continue still today, and are detectable in present relief forms.

On the grounds of these considerations Passarge arrived at his "Physiologische Morphologie" (Physiologic Morphology). (Passarge 1912). This work was based on the investigation of problems derived from facts and therewith contributed importantly to reveal the weaknesses of the Davisian theory. The new viewpoint that the "Physiologische Morphologie" introduced is the concept of natural landscape geography, later called *Landschaftskunde* [generic regional geography with special reference to climate and vegetation, or natural regions]. It was directly tied to Herbertson's (and others) previously established concept of natural [or physical] landscape (Herbertson 1905). Each of these natural landscapes had their individually developed processes and characteristic range of forms. With this concept it is possible for one to formulate additional ideas and viewpoints. With the change of climate during the Tertiary and Pleistocene periods the natural landscape has also changed.

Since after a climatic change has occurred the surface forms of a former period can long remain preserved, they present within a modern natural landscape with its corresponding harmonic [or congruous] present-day forms a series of disharmonic [or incongruous] ancient forms that belong to an earlier time. Thus there can be present-day as well as ancient forms [in any landscape].

In his third volume of "Grundlagen der Landschaftskunde" Passarge attempted to sketch the content and problems of a physiological morphology of natural landscape belts [Landschaftsgürtel or major world regions]. These are the largest of the landscape units and are entirely dependent on climate [figure 6]. The role of every individual force and the resulting processes are thereby explained for each landscape belt (Passarge 1919/20 and 1929a). In later comparative natural landscape studies [Landschaftskunde], among the important works of Passarge, the processes of denudation and deposition are treated for each landscape belt (Passarge 1921/30).

The treatment of the natural region as a principal theme began with the appearance of "Physiologischen Morphologie." A natural region consists of landscape components, which are: the surface configuration (Erdkruste), climate, vegetation cover, water features, soil, also animals and people [both considered] subordinate; these represent a closely interconnected group of forces or processes. This approach emphasizes the contrast to former landscape descriptions in which the areal elements usually were more or less considered to be unrelated one to the other.

Within the natural landscape belts, mentioned as the largest of the regional units, one finds smaller areas that characteristically consist of dominant components of the landscape (for example, surface configuration, or relief, related rock type and the vegetation cover). Thus both small and large independent formative agents become prominent, and in order to produce a classification of multiples we arrive at a subdivision of the landscape belts, governed by the size of the area. From the regional (or landscape) belts follow the regional province [Landschaftsgebiete], the region [Landschaft], the regional section [Teillandschaft], and the regional part [Landschaftsteile]. One arranges his description so that the natural regional phenomena to-

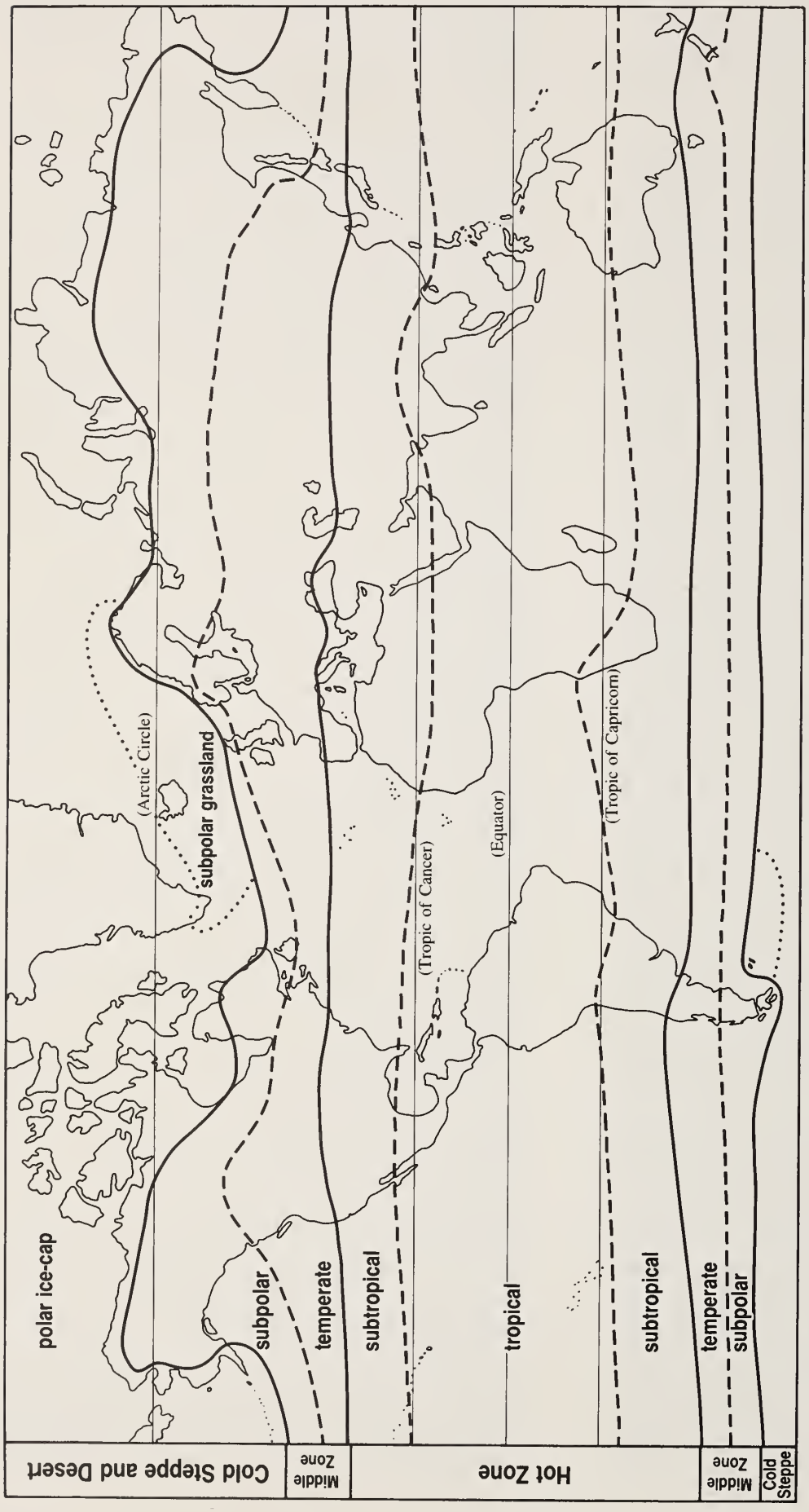

Fig. 6. Passarge's Landschaftsgürtel (landscape belts), the largest class in his heirarchy of landscape types, 1921.

gether with the formative agents result in a scientific regional description, whereby through proper nomenclature regional problems can be suggested (Passarge 1933b, 1929b).

Natural landscape description led to the study of regional problems and therewith to true scientific investigation. In this case the earth's crust relates directly with the prevailing [geologic] forces, the atmosphere with the climate, soil weathering, vegetation cover, etc. The specific earth-related phenomena and science belong to geologic morphology; those concerning climate are linked to physiological morphology. Both have close relationship to natural regional geography and thereby produce special sciences; thus, for example, regional soil science, whereby the effect of the entire region on soil formation is investigated (regional geography of soil) lies within the problem of the effect of the formative agents on soil weathering; likewise with the specific regional problems of relations concerning plant ecology, hydrology, morphology, and climatology. The threads of most natural sciences hold together the study of landscape [natural geographic regions].

With these deliberations Passarge concerned himself mainly with the study of landscape [natural or physical regional geography] as a basis for more extensive geographical investigations. By means of various publications his ideas were put in order; they revealed general considerations as well as regional landscape [geographical] presentations, such as the [formation of] stream courses in the Okavango steppe (Passarge 1919) or the scientific results of two trips in Algeria (Passarge 1941), and so on. The attempts to investigate the morphology in various landscape belts were already mentioned (Passarge 1930).

Also some works concerning questions on cultural geography were written. After establishing first the study of natural regions, around the beginning of the 1930s Passarge devoted himself to the problem of cultural geography. There was an opposition or contrast between natural landscapes [physical regions] and cultural or human geography. However, both must be considered together. The combining [of the two] produces the cultural landscape, which develops out of the natural landscape and slowly through human action more and more becomes a landscape of over-exploitation (Raublandschaft) and finally a forcefully controlled one (Zwangslandschaft). Natural forces become repressed but they still remain effective even in large cities.

As Passarge's deliberations showed, in cultural geography the natural landscape must be the most essential feature and a geographically oriented set of problems should result from the relationship between the landscape and the cultural phenomena.

According to Passarge's concept, mankind and its culture depend on four classes of forces, which are space, man, culture and history. Through the mutual relationships of these an abundance of questions arise, which, however, are only partly geographical in nature. When such problems are considered [to be] cultural-geographical they deal with the influence of space [or position] on mankind and its culture. Again, the study of the natural landscape is the most important basis for the investigation of the nature of cultural geography. Just as with the study of the natural landscape, the problem set for the study of the cultural landscape is divided into two parts. Of these for the investigation of the cultural landscape the most important questions are: what does it include and how it explained? The second [part] is concerned with the investigation of man and his works and how these are related to and influence the cultural scene. Both parts belong together and must be investigated together. Thus the geographer must also be a specialist in other fields, such as economics, history, government or anthropology. In case of the treatment of problems not directly related to the cultural landscape the geographical material is often stifled [or overlooked]. For example, the geography of commerce can easily become a study purely of trade or communication, and likewise is the case for settlement geography. In the case of economics the geographical influence is strongest with the production of raw materials, where climate, soils, geology and character of the landscape play a role, and in political geography the condition of the landscape might influence the stage of the "machinery of state." Thus cultural geography is a subject that bristles with problems (Passarge 1950). Passarge's ethnographical observations made in Africa and America gave him the suggestion to plan the characteristic features of a geographical ethnography. Ultimately these [observations] also were the simplest because the cultures of primitive people are the easiest to comprehend and are the most strongly constrained by geographical forces. Hence, the geographical component is especially strong in their cultural life. Just as geographical ethnology has mankind and its culture as its objective, so ethnographical geography should have the cultural landscape as its objective. Still today few of these

[studies] have been written, for a systematic and scientific system of landscape description is lacking (Passarge 1951b, 1951c).

Individual papers that could serve as a basis for ethnological studies were already published by Passarge. Especially the comparative landscape studies contain to a great extent geographic-ethnographic material, and the human functions in specific cultural stages of landscape development are considered in their widest dimension. There are numerous essays of Passarge's with political-geographical observations, especially those written in his later years (Passarge 1935a, 1935b, 1936). On economic geography only a few short articles and the book "Die Erde und ihr Wirtschaftsleben" [The Earth and its Economic Life] have appeared (Passarge 1926).

Concerning culture history with its numerous problems, Passarge was led into the most difficult part of geography, namely to the question: are there regional geographic [länderkundlichen] problems and is there a related study on such problems? He concerned himself with this set of questions particularly after his retirement. Von Richthofen defined regional geography as a scientific description, more the work for ordinary writers than for learned investigators, because in the study of regions he did not think that there were problems. Later, Spethmann (1931) pointed out especially the abundance of presentations on regional geography. Passarge himself had written three regional geographies: Südafrika (1908), Kamerun, and Togo (1909-10). Even at that time there were still lacking studies of landscape, which had developed the only link between natural and cultural sciences.

In order to understand the problem Passarge began to work through the history of geography from about 1700 on. The result was a "geography of problems," an extensive manuscript which on account of the war [World War II] was lost. Later he summarized the more important questions once more in a short article. The result of his investigation was that regional geographical problems must relate to the land and at the same time to its inhabitants including the total area, not just to the presentation of particular knowledge represented within the inhabited environment. This total region is composed of land and people, or the explicit inhabited area and its milieu, whereby under the term milieu is included all that has to do with the inhabitants, their works, as well as spiritual factors (Seelen-Geographie, Banse 1928). In the space of time the total region is changeable with the development of the cultural landscape by man. The physical condition of the land can change and with it, for example, the essential conditions for life and proficiency on the part of the inhabitants. An objective in the investigation of regional problems thus includes the inhabited area or living space (Lebensraum), not perhaps the landscape area, and the problems resulting from the relation between the living space and the material sciences of ethnology, folklore, economics, political science and history as well as the psychological sciences, and the humanities including religious concepts, the development of human character, etc. At least some of these cultural sciences must be investigated singly in relation to the total area and, to be sure, in all their mutual connections. Thus the working geographer must possess considerable knowledge of these sciences. On the formulation of problems one can use the effect of the four forces: place, man, culture, history, as well as the question of harmony and disharmony, which relate to the exploitation by man of the spatial conditions and also by comparative regional investigation, such as, for example, Hettner's work on comparison of Asia Minor with Spain or the Barbary states. The content of the question-set of problem-oriented regional geography is extraordinarily large in order to consider regional geography as a geographical science (Passarge 1949, 1951).

Aside from the geographical problems involved in the study of regions there is still a non-geographical problem-set for the investigation of regions; for example, economic questions whose objective is the economy and whose problems refer to the relation of the economy to nation, history, etc.

In a descriptive regional geography, in which problems are only implied, one should present the individual facts in a logical way and explain the relationship of the cultural phenomena within the inhabited area.

We now summarize Passarge's systematic research of many years, in which, proceeding from morphology of landscape to regional geography, he revealed the present problems and future investigations thereof within geography, and at the same time reflected upon the stability of geography as a safely established and firmly grounded science. In the latter part of his life Passarge had made an entire series of extant writings in typescript and for the most part unpublished, in which he tried to base his deliberations. Problems of history and folklore especially interested him (Passarge 1952, 1953).

During his restless, active life Passarge published 285 writings, which included an entire series of voluminous instructive and problem-oriented books. Not until the coming generation of geographers can his works be measured and only later can his significance for geographical science be ascertained. Until the last days of his life he remained fresh and alert, and, bedridden for only eight days, passed away quietly without suffering on 26 July 1958 in a hospital in Bremen.

LITERATURE CITED

[See accompanying bibliography of Passarge's works for complete citation]

Passarge, S. 1891 Das Röth im östlichen Thüringen, Jena (doctoral dissertation).

Passarge, S. 1895a Über Laterite und Roterden in Afrika und Indien, VI. International Geogr. Congress, London.

Passarge, S. 1895b *Adamaua*, Berlin.

Passarge, S. 1902 Die Besitzung El Caura in Venezuela (typescript), Berlin or Jena.

Passarge, S. 1903 Kalkpfannen in der Kalahari, *Zeitschrift der Gesell. für Erdkunde, Berlin.*

Passarge, S. 1904 *Die Kalahari*, Berlin.

Herbertson, A. J. 1905 The major natural regions, an essay in systematic geography. *Geographical Journal*, vol. 25, pp. 300-12.

Passarge, S. 1907 *Die Buschmänner der Kalahari*, Berlin.

Passarge, S. 1908 *Südafrika*, Leipzig.

Passarge, S. 1909 Verwitterung und Abtragung in den Steppen und Wüsten Algeriens, *Geographische Zeitschrift.*

Passarge, S. 1909-10 Kamerun, Togo, in: *Das deutsche Kolonialreich*, vols. 1 & 2.

Davis, W. M. 1912 *Die erklärende Beschreibung der Landformen*, Berlin.

Passarge, S. 1912 Physiologische Morphologie, *Mitt. der Geogr. Gesell., Hamburg*, vol. 26.

Passarge, S. 1919 Die Steppenflusstalung des Okawango..., *Mitt. der Geogr. Gesell.* Hamburg, vol. 32.

Passarge, S. 1919-20 *Grundlagen der Landschaftskunde*, 3 vols. Hamburg.

Passarge, S. 1921-30 *Vergleichende Landschaftskunde*, 5 parts, Berlin.

Passarge, S. 1926 *Die Erde und ihr Wirtschaftsleben.* Hamburg.

Banse, E. 1928 *Landschaft und Seele.* Munich.

Passarge, S. 1929a *Landschaftsgürtel der Erde*, Leipzig.

Passarge, S. 1929b *Beschreibende Landschaftskunde*, Hamburg.

Passarge, S. 1930 Wesen, Aufgaben und Grenzen der Landschaftskunde, *Petermanns Mitt. Ergh.* 209.

Spethmann, H. 1931 *Das Länderkundliche Schema in der deutschen Geographie*, Berlin.

Passarge, S. 1933a *Wissenschaftlichen Ergebnisse meiner Forschungreise am Orinoco, Caura und Cuchivero*, Hamburg.

Passarge, S. 1933b *Einführung in die Landschaftskunde*, Leipzig.

Passarge, S. 1935a Politische-geogr. Betrachtungen über Alt Hellas, *Geographische Wochenschrift*, vol. 3.

Passarge, S. 1935b Byzanz. Eine politisch-geographische Betrachtung. *Geogr. Anzeiger*, vol. 36.

Passarge, S. 1936 Politisch-geogr. Betrachtungen über die Geschichte von Schweden und Dänemark, *Geogr. Zeitschrift*, vol. 42.

Passarge, S. 1941 *Wissenschaftliche Ergebnisse zweir Reisen nach Algerien in den Jahren 1906 und 1907*, Hamburg.

Passarge, S. 1949 Problemgeographie, *Forschungen und Fortschritte*, vol. 25.

Passarge, S. 1950 *Kulturgeographie*, Hamburg. (typescript). Passarge, S. 1951a *Aus achtzig Jahren. Eine Selbstbiographie*, Hamburg. (typescript).

Passarge, S. 1951b *Geographische Völkerkunde*, Berlin.

Passarge, S. 1951c *Problemgeographie*, Hamburg. (typescript).

Passarge, S. 1951d *Der West- und Zentralsudan, eine Landschaftskundlich-kulturgeographische Betrachtung*, Hamburg. (typescript).

Passarge, S. 1952 *Problemländerkundlicher Überblick über Arabien*, Hamburg. (typescript).

Passarge, S. 1953 Länderkundliche Probleme, *Forschungen und Fortschritt*, vol. 29.

Passarge, S. 1955 *Morphologische Studien in der Wüste von Assuan*, Hamburg.

6. *Karl Sapper (1866-1945)*

Introductory Statement

Robert C. West

One of the most versatile field researchers of his period, Karl Sapper is known to geographers, geologists and anthropologists as an early scientific explorer of Central America. After obtaining his doctorate in geology at Leipzig, as a young man of 22 he traveled to Guatemala to live on his brother's coffee plantation in the northern tropical highlands of Alta Verapaz. There he was so impressed by the tropical ambience and its native inhabitants that he resolved to explore the area, traveling mainly on foot. After 12 years of arduous field work (1888-1900) he had covered the entire Central American isthmus from Chiapas in southern Mexico to Panama, accumulating an enormous data bank in his field notes on geology, volcanoes, climate, hydrography, vegetation, land use, and the languages and lifeways of the Amerindians. From such data came an outpouring of books and journal articles, most of which he published in Germany. The American vulcanologist Howel Williams has written, "Those familiar with the literature concerning the geology of Central America know that Karl Sapper is by far the principal informant, and nobody can read his writings or follow his footsteps without paying tribute to him for the magnificent pioneer work which he did under difficult conditions."[1] Moreover, Sapper's student, Franz Termer, (author of the accompanying translated biography) has described his teacher's anthropological work in Central America.[2]

In 1900 Sapper returned to Germany to begin an academic career at various universities in his country. He continued his vulcanologic investigations, visiting the West Indies, the Mediterranean, and Southeast Asia, and revisiting Central America and Mexico. The geography of the tropics was one of his favorite subjects, exemplified by his *Geomorphologie der feuchten Tropen* (1935), a significant contribution to climatic geomorphology; many articles and books on the colonization and acclimatization of Europeans in the tropics; and writings on tropical agriculture. He also wrote extensively on economic geography, outlining the geographical foundation of economics and the role of man as an economic being.[3] Carl Sauer said of Sapper's work on that subject: "The central sections of his new volume (*Allgemeine Wirtschafts- und Verkehrsgeographie* [General economic and commercial geography], 1925) are perhaps the most finished considerations of the economic landscape as a part of the cultural landscape."[4]

In terms of publication Karl Sapper may have been one of the most prolific writers of any German scientist of his time. His bibliography totals 466 items (excluding reviews), some of them short reports, others substantial journal articles and books. The disciplines of vulcanology (88), climate and meteorology (70) and ethnology (60) stand out in numbers of items. Perhaps only Friedrich Ratzel, who was credited with nearly 600 books and articles, exceeded Sapper's record.[5] With his activity in most of the earth and social sciences it is difficult to assign Sapper to any particular discipline. Possibly naturalist or explorer would be proper rubrics.

NOTES

1. Howel Williams, Volcanic History of the Guatemalan Highlands, *Univ. Calif. Publ. in Geological Sciences*, vol. 38 (1960), p. 206.

2. Franz Termer, Karl Sapper als Amerikanist, *Ethnos*, vol. 13, (1948) pp. 54-60.

3. Karl Sapper, Economic Geography, in *Encyclopedia of the Social Sciences*, vol. 6 (1931), pp. 626-28.

4. Carl Sauer, Recent Developments in Cultural Geography, in *Recent Developments in the Social Sciences*, ed. E.C. Hayes. Philadelphia, 1927, p. 206.

5. Hantzsch, Viktor, *Ratzel-Bibliographie. 1867-1905*. Munich & Berlin: R. Oldenbourg, 1906.

Bibliography of Karl Sapper

[Taken from *Karl Theodor Sapper, 1866-1945 (Leben und Wirken eines deutschen Geographen und Geologen)*, by Franz Termer. Leipzig: J.A. Barth (1966), pp. 69-89.]

1888 Über die geologischen Verhältnisse des Juifen und seiner Umgebung mit besonderer Berüchsichtigung der Liasablagerungen [On the geological relationship of the Juifen and its environment with special consideration of the depositions of Lias]. Doctoral dissertation, Faculty of Philosophy, University of Munich. Stuttgart: Bonz'Erband. 34 pp.

1889 Eine Fahrt in die neue Welt [A trip to the New World]. (Item to the *Allgemeinen Zeitung*, Munich, no. 5, pp. 65-67).

____ Ein Ausflug in die Wälder der Alta Verapaz (Guatemala) [An excursion into the forest of Alta Verapaz (Guatemala)]. (Item to the *Allgemeinen Zeitung*, Munich, no. 336, pp. 1-2).

1890 Wie ist die diluviale Nagelfluh der bayerischen Hochebene entstanden [How the diluvial conglomerate of the Bavarian Plateau is formed]. *Das Ausland*, vol. 63, pp. 213-16.

____ Über Erderschütterungen in der Alta Verapaz [On earth tremors in the Alta Verapaz]. *Zeitschrift der Deutschen Geologischen Gesellshaft*, vol. 42, pp. 160-64.

____ Die Quekchí-Indianer [The Quekchí Indians]. *Das Ausland*, vol. 63, pp. 841-44; 892-95.

1891 Das Klima der Alta Verapaz, Guatemala [The climate of the Alta Verapaz, Guatemala]. *Meteorologische Zeitschrift*, vol. 8, pp. 349-51.

____ Die Verapaz und ihre Bewohner [The Verapaz and its inhabitants]. *Das Ausland*, vol. 64, pp. 1011-17, 1034-37.

____ Ein Besuch bei den östlichen Lacandonen [A visit to the eastern Lacandon (Indians)]. *Das Ausland*, vol. 64, pp. 892-95.

____ Die soziale Stellung der Indianer in der Alta Verapaz, Guatemala [The social position of the Indians in the Alta Verapaz, Guatemala]. *Petermanns Mitteilungen*, vol. 37, pp. 44-46.

1892 Die Kettengebirge von Mittelguatemala [The mountain chain of central Guatemala]. *Zeitschrift des deutschen und österreichischen Alpenvereins*, vol. 23, pp. 367-92.

____ Meteorologische Beobachtungen in der Alta Verapaz im Jahre 1891 [Meteorological observations in the Alta Verapaz in the year 1891]. *Meteorologische Zeitschrift*, vol. 9, pp. 478-79.

____ Eine Osterreise zum Meerbusen von Amatique [An Easter trip on the Gulf of Amatique]. (Item to the *Allgemeinen Zeitung*, no. 247, pp. 3-5).

____ Eine Reise ins Petén [A trip into the Petén]. (Item to the *Allgemeinen Zeitung*, no. 261, pp. 4-6).

____ Am See von Yzabal, Guatemala [On Lake Yzabal, Guatemala]. *Petermanns Mitteilungen*, vol. 38, pp. 241-44.

____ Die Handelsbeziehungen der Indianerstämme Guatemalas [The trade relations of the Indian tribes of Guatemala]. *Das Ausland*, vol. 65, pp. 593-98.

____ Tanzspiele bei den Quekchí-Indianern [Dance music among the Quekchí Indians]. *Neue Musikzeitung*, vol. 13, pp. 93, 105.

1893 Das Projekt einer einheitlichen Erdkarte [The project for a uniform world map]. *Das Ausland*, vol. 66, pp. 643-45.

____ Bemerkungen über die räumliche Verteilung und morphologischen Eigentümlichkeiten der Vulcane Guatemalas [Remarks on the spatial distribution and morphological characteristics of Guatemala's volcanoes]. *Zeitschrift der Deutschen Geologischen Gesellschaft*, vol. 45, pp. 54-62.

____ Über die räumliche Anordnung der mexikanischen Vulkane [On the configuration of Mexican volcanoes]. *Zeitschrift der Deutschen Geologischen Gesellschaft*, vol. 45, pp. 574-

77.

____ Beiträge zur Ethnographie der Republik Guatemalas [Contributions to the ethnography of the Republic of Guatemala]. *Petermanns Mitteilungen*, vol. 39, pp. 1-14.

____ Zu dem angeblichen Ausbruch des Vulcans San Martin im mexikanischen Staat Chiapas [On the observed eruption of San Martin volcano in the Mexican state of Chiapas]. *Petermanns Mitteilungen*, vol. 39, p. 221.

____ Das Klima der Baja Verapaz (Guatemala) [The climate of Baja Verapaz (Guatemala)]. *Meteorologische Zeitschrift*, vol. 10, p. 182.

____ Von Cobán nach Guatemala und der Südseeküste [From Cobán to Guatemala and the Pacific Coast]. *Aus allen Weltteilen*, vol. 24, pp. 134-38.

____ Ein Streifzug durch Chiapas [An excursion through Chiapas]. *Petermanns Mittelungen*, vol. 39, pp. 288-91.

____ Gegenstände aus Guatemala [Materials on Guatemala]. *Zeitschrift für Ethnologie*, vol. 25, pp. 275-77.

____ Ein Ausflug nach der Südgrenze von Guatemala [An excursion to the southern border of Guatemala]. *Globus*, vol. 63, pp. 265-67.

____ Die Vulkane der Republik Guatemala [The volcanoes of the Guatemalan Republic]. *Globus*, vol. 64, pp. 1-5.

____ Über die Erhaltung mittelamerikanischer Altertümer [On the preservation of the antiquities of Central America]. *Globus*, vol. 64, p. 234.

1894 Höhenmessung in Mexiko [Altimetric measurements in Mexico]. *Petermanns Mitteilungen*, vol. 40, pp. 19-20.

____ Dr. K. Sapper, Reisen in südlichen Mexiko [Dr. K. Sapper's trips in southern Mexico]. *Globus*, vol. 66, pp. 46-47.

____ Informe sobre la geografía física y la geología de Chiapas y Tabasco [Report on the physical geography and geology of Chiapas and Tabasco]. *Boletín de Agricultura, Minería e Industrias* [Mexico], vol. 3, pp. 187-211.

____ Grundriss der physikalischen Geographie von Guatemala [Outline of the physical geography of Guatemala]. *Petermanns Mitteilungen*, Ergänzungsheft 113. 59 pp. 4 maps.

____ Über Erdschütterungen in der Alta Verapaz (Guatemala) [On earth tremors in the Alta Verapaz (Guatemala)]. *Zeitschrift der Deutschen Geologischen Gesellschaft*, vol. 46, pp. 832-38.

____ Kratertypen in Mexiko und Guatemala [Types of craters in Mexico and Guatemala]. *Petermanns Mitteilungen*, vol. 40, pp. 82-85.

____ Meteorologischen Beobachtungen in der Alta Verapaz (Guatemala) [Meteorological observations in the Alta Verapaz (Guatemala)]. *Meteorologische Zeitschrift*, vol. 11, pp. 153-55.

____ Indianische Ortsnamen im nördlichen Mittelamerika [Indian place-names in northern Central America]. *Globus*, vol. 66, pp. 90-96.

____ Entdeckungen neuer Bildwerke von Santa Lucia-Typus in Guatemala [Discoveries of new (pre-hispanic) sculptures of Santa Lucia type in Guatemala]. *Globus*, vol. 66, p. 322.

1895 Neue Beiträge zur Kenntnis der Vulkane von Guatemala [New contributions on knowledge of Guatemalan volcanoes]. *Petermanns Mitteilungen*, vol. 41, pp. 105-09.

____ Entdeckung eines Obsidianberges in San Salvador [Discovery of a mountain of obsidian in San (El) Salvador]. *Globus*, vol. 67, pp. 306-07.

____ Regenmessungen in Guatemala, Alta Vera Paz [Rainfall measurements in Guatemala, Alta Vera Paz]. *Meteorologische Zeitschrift*, vol. 12, pp. 386-87.

____ Altindianische Siedlungen und Bauten in nördlichen Mittelamerica [Ancient Indian settlements and buildings in northern Central America]. *Globus*, vol. 68, pp. 165-69; 183-89.

____ Die Gebräuche und religiösen Anschauungen der Kekchí-Indianer [The customs and religious perceptions of the Kekchí Indians]. *Internationales Archiv für Ethnographie*, vol. 8, pp. 195-207.

____ Kekchí-Gebete [Kekchí prayers]. *Internationales Archiv für Ethnographie*, vol. 8, p. 207.

____ Indianer-Rückenschmuck [Indian back ornaments]. *Internationales Archiv für Ethnographie*, vol. 8, p. 252.

____ Die unabhängigen Indianerstaaten von Yucatan [The independent Indian states of Yucatan]. *Globus*, vol. 67, pp. 197-201.

____ Musikleben in Mexiko und Guatemala [Music life in Mexico and Guatemala]. *Neue Musik-Zeitung*, vol. 16, pp. 6; 20-21.

____ Die Singvögel von Mittelamerika [Singing

birds of Middle America]. *Neue Musik-Zeitung*, v. 16, pp. 45, 56-57

1896 Sobre la geografía física y la geología de la Peninsula de Yucatán [On the physical geography and geology of the Peninsula of Yucatán]. *Boletín del Instituto Geológico de México*, no. 3, 57 pp. 4 maps.

____ Dampfquellen und Schlammvulkane in San Salvador [Steam vents and mud volcanoes in San (El) Salvador]. *Zeitschrift der Deutschen Geologischen Gesellschaft*, vol. 48, pp. 14-16.

____ Regenmessungen in Guatemala 1894 [Rain measurements in Guatemala, 1894]. *Meteorologische Zeitschrift*, vol. 13, p. 192.

____ Meteorologische Beobachtungen von Santa Tecla, Republik San Salvador [Meteorological observations of Santa Tecla, Republic of San (El) Salvador]. *Meteorologische Zeitschrift*, vol. 13, pp. 196-97.

____ Resultate der Meteorologischen Beobachtungen zu Chimax, Guatemala, 1895 [Results of meteorological observations at Chimax, Guatemala, 1895]. *Meteorologische Zeitschrift*, vol. 13, pp. 266-67.

____ Meteorologische Beobachtungen, angestellt in Quezaltenango (Guatemala) [Meteorological observations taken in Quezaltenango]. *Meteorologische Zeitschrift*, vol. 13, pp. 267-88.

____ Regenfall in Puerto Barrios [Rainfall in Puerto Barrios (Guatemala)]. *Meteorologische Zeitschrift*, vol. 13, pp. 279-80.

____ Regenmessungen in Guatemala, 1895 [Rain measurements in Guatemala, 1895]. *Meteorologische Zeitschrift*, vol. 13, p. 477.

____ Meteorologische Beobachtungen in Tabasco (Mexiko) [Meteorological observations in Tabasco (Mexico)]. *Meteorologische Zeitschrift*, vol. 13, pp. 477-78.

____ Eine Expedition durch die Cockscomb Mountains in Britisch Honduras [An expedition through the Cockscomb Mountains in British Honduras]. *Globus*, vol. 70, pp. 13-16, 28-31.

____ Altertümer aus der Republik San Salvador [Antiquities in the Republic of San (El) Salvador]. *Internationales Archiv für Ethnographie*, vol. 9, pp. 1-6.

1897 Sobre la geografía física, la población y la producción de la República de Guatemala [On the physical geography, population and production of the Republic of Guatemala]. Guatemala, 88 pp.

____ Über Erderschütterungen in der Republik Guatemala in den Jahren 1895 und 1896 [On earth tremors in the Republic of Guatemala in 1895 and 1896]. *Zeitschrift der Deutschen Geologischen Gesellschaft*, vol. 49, pp. 201-202.

____ Über die räumliche Anordnung der mittelamerikanischen Vulkane [On the spatial arrangement of Central American volcanoes]. *Zeitschrift der Deutschen Geologischen Gesellschaft*, vol. 49, pp. 672-82.

____ Über die Infiernillos von Chinameca [On the infiernillos (fumeroles) of Chinameca (El Salvador)]. *Zeitschrift der Deutschen Geologischen Gesellschaft*, vol. 49, pp. 906-08.

____ Vulkane in Salvador und Südost-Guatemala [Volcanoes in (El) Salvador and southeast Guatemala]. *Petermanns Mitteilungen*, vol. 43, pp. 1-7.

____ Regenmessungen in der Costa Cuca [Boca Costa] (Guatemala) [Rain measurements in the Costa Cuca (Guatemala)]. *Meteorologische Zeitschrift*, vol. 14, pp. 233-34.

____ Regenfall in Britisch-Honduras, 1896 [Rainfall in British Honduras, 1896]. *Meteorologische Zeitschrift*, vol. 14, p. 234.

____ Regenmessungen in der Alta Vera Paz (Guatemala) [Rain measurements in the Alta Vera Paz (Guatemala)]. *Meteorologische Zeitschrift*, vol. 14, pp. 234-35.

____ Resultate der meteorologischen Beobachtungen zu Mercedes und Puerto Barrios (Guatemala) [Results of meteorological observations in Mercedes and Puerto Barrios (Guatemala)]. *Meteorologische Zeitschrift*, vol. 14, p. 235.

____ Resultate der meteorologischen Beobachtungen in Quezaltenango (Guatemala) [Results of meteorological observations in Quezaltenango (Guatemala)]. *Meteorologische Zeitschrift*, vol. 14, pp. 235-36.

____ Resultate der meteorologischen Beobachtungen zu Chimax bei Coban, 1896 [Results of meteorological observations at Chimax near Cobán (Guatemala)]. *Meteorologische Zeitschrift*, vol. 14, pp. 378-80.

____ Regenfall im nördlichen Mittelamerika [Rainfall in northern Central America]. *Petermanns Mitteilungen*, vol. 43, pp. 117-19.

____ *Das nördliche Mittelamerika* [Northern Central America]. Braunschweig: Vieweg & Sohn. 436 pp., 8 maps.

____ Die Volksdichtigkeit der Republik Guatemala [Population density of the Republic of Guatemala]. *Globus*, vol. 71, pp. 188-91.

____ Die mittelamerikanische Ausstellung in Guatemala, 1897 [The Central American exhibition in Guatemala, 1897]. *Globus*, vol. 72, pp. 325-28.

____ Ein altindianischer Landstreit in Guatemala [An ancient Indian land dispute in Guatemala]. *Globus*, vol. 72, pp. 94-97.

____ Mittelamerikanische Caraiben [The Central American Caribs]. *Internationales Archiv für Ethnographie*, vol. 10, pp. 53-60.

____ Die ersten Kriegszüge der Spanier im nördlichen Mittelamerika [The first military expeditions of the Spaniards in northern Central America]. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, vol. 33, pp. 137-46.

1898 Meteorologische Beobachtungen zu Quezaltenango (Guatemala), 1897 [Meteorological observations at Quezaltenango]. *Meteorologische Zeitschrift*, vol. 15, p. 345.

____ Über meine Reise in Honduras [On my trips in Honduras]. *Verhandlungen der Gesellschaft für Erkunde zu Berlin*, vol. 25, pp. 128-30, 266-67, 328-30.

____ Reise in Honduras und Nicaragua [Trips in Honduras and Nicaragua]. *Petermanns Mitteilungen*, vol. 44, p. 190.

____ Revolutionzeit in einer guatemaltekischen Kleinstadt [A period of revolution in a Guatemalan provincial town]. (Item to the *Allgemeinen Zeitung* [Munich]), no. 95, pp. 1-3.

____ Informe de la comisión científica que de orden del Gobierno fué a estudiar la causa de los temblores [Report of the scientific commission, which by government order, studied the causes of the earthquakes]. Managua.

____ Über die Altertümer vom Río Ulúa in der Republik Honduras [On the antiquities from the Río Ulúa in the Republic of Honduras]. *Zeitschrift für Ethnologie*, vol. 30, pp. 133-37.

____ Die Ruinen von Mixco (Guatemala) [The ruins of Mixco (Guatemala)]. *Internationales Archiv für Ethnographie*, vol.11, pp. 1-6.

____ Ein chirurgisches Instrument der mittelamerikanischen Indianer [A surgical instrument of the Central American Indians]. *Globus*, vol. 73, p. 68.

____ Pilzförmige Götterbilder aus Guatemala und San Salvador [Fungiform (mushroom-like) images of gods from Guatemala and San (El) Salvador]. *Globus*, vol. 73, p. 327.

1899 Über Gebirgsbau und Boden des nördlichen Mittelamerikia [On mountain structure and soil of northern Central America]. *Petermanns Mitteilungen*, Ergänzungsheft no. 127, 119 pp., 3 maps.

____ Das nicaraguanische Erdbeben vom 29 April 1898 und die Maribios-Vulcane [The Nicaraguan earthquake of 29 April 1898 and the Maribios volcanoes]. *Globus*, vol. 75, pp. 201-08.

____ Neue mittelamerikanische Reisen Dr. Karl Sappers [New Central American trips of Dr. Karl Sapper]. *Globus*, vol. 75, p. 341.

____ Der Vulcan Las Pilas in Nicaragua [Las Pilas volcano in Nicaragua]. *Zeitschrift der Deutschen Geologischen Gesellschaft*, vol. 51, pp. 578-87.

____ Regenmessungen in Nicaragua [Rain measurements in Nicaragua]. *Meteorologische Zeitschrift*, vol. 16, pp. 80-81.

____ Resultate der meteorologischen Beobachtungen in der Republik Guatemala im Jahre 1897 [Results of meteorological observations in the Republic of Guatemala in the year 1897]. *Meteorologische Zeitschrift*, vol. 16, pp. 117-20.

____ Resultate der meteorologischen Beobachtungen in der Republik Guatemala im Jahre 1898 [Results of meteorological observations in Guatemala in the year 1898]. *Meteorologische Zeitschrift*, vol. 16, pp. 508-11.

____ Über Kautschukproduktion in Mittelamerika [On rubber production in Central America]. *Tropenpflanzer*, vol. 3, pp. 583-88.

____ Neues aus Honduras [News from Honduras]. *Petermanns Mitteilungen*, vol. 45, pp. 43-44.

____ Reise in Costa Rica [A trip in Costa Rica]. *Petermanns Mitteilungen*, vol. 45, p. 298.

____ Mitteilungen aus Huacas der Halbinsel Nicoya [Reports on huacas (Indian graves) of the Nicoya Peninsula]. *Zeitschrift für Ethnologie*, vol. 31, pp. 622-32.

____ Die Payas in Honduras [The Paya (Indians) in Honduras]. *Globus*, vol. 75, pp. 80-83.

____ Ein Besuch bei den Guatusos in Costa Rica [A visit with the Guatusos (Indians) in Costa Rica]. *Globus*, vol. 76, pp. 348-53.

1900 Ergebnisse seiner Reisen in Mittelamerika [Results of his (Sapper's) trips in Central America]. *Verhandlungen der Gesellschaft für Erkunde zu Berlin*, vol. (1900), pp. 417-

26.
____ Ein Besuch bei den Chirripó und Talamanca-Indianer von Costarica [A visit with the Chirripó and Talamanca Indians of Costa Rica]. *Globus*, vol. 77, pp. 1-8.
____ Abschluss der mittelamerikanischen Reisen Karl Sappers [Conclusion of Karl Sapper's trips in Central America]. *Globus*, vol. 77, p. 312.
____ Reise auf dem Río Coco [Trips to the Coco River]. *Globus*, vol. 78, pp. 249-52, 271-76.
____ *Über die geologische Bedeutung der tropischen Vegetationsformationen in Mittelamerika und Südmexiko* [On the geological significance of tropical vegetation formations in Central America and southern Mexico]. Habilitationschrift (inaugural dissertation), Faculty of Philosophy, Univ. Leipzig. 37 pp.
____ Bemerkungen über einige Vulkane von Guatemala und Salvador [Remarks on some volcanoes of Guatemala and (El) Salvador]. *Petermanns Mitteilungen*, vol. 46, pp. 149-61.
____ Meteorologischen Beobachtungen in der Republik Guatemala im Jahre 1899 [Meteorological observations in the Republic of Guatemala in the year 1899]. *Meteorologische Zeitschrift*, vol. 17, pp. 459-62.
1901 Die geographische Forschung in Mittel-Amerika im 19. Jahrhundert [Geographical research in Central America in the 19th century]. *Verhandlungen des 13. Deutschen Geographentages zu Breslau 1901*, pp. 285-302.
____ Die südlichsten Vulkane Mittel-Amerikas [The southernmost volcanoes of Central America]. *Zeitschrift der Deutsche Geologischen Gesellschaft*, vol. 53, pp. 24-51.
____ Das nördliche Mittelamerika in Bezug auf Produktion Verkehrswesen und Bevölkerung [Northern Central America in reference to production, traffic and population]. *Verhandlungen der Gesellschaft für Erdkunde zu Berlin*, vol. 28, pp. 103-05.
____ Die Alta Verapaz (Guatemala), eine landeskundliche Skizze [The Alta Verapaz (Guatemala), a regional geographical sketch]. *Mitteilungen der Geographische Gesellschaft in Hamburg*, vol. 17, pp. 78-224, 5 maps.
____ Beiträge zur Ethnographie des südlichen Mittelamerika [Contributions to the ethnography of southern Central America]. *Petermanns Mitteilungen*, vol. 47, pp. 25-40.
____ Ein Bilderkatechismus der Mazahua in Mexiko [An illustrated catechism of the Mazahua (Indians) in Mexico]. *Globus*, vol. 80, pp. 125-26.
____ Speise und Trank der Kekchí-Indianer [Food and drink of the Kekchí Indians]. *Globus*, vol. 80, pp. 259-63.
1902 Erforschung der Erdrinde. Erdrinde und Menschheit [Investigation of the earth's crust. The earth's crust and mankind]. In *Weltall und Menschheit*, ed. by Hans Kraemer, vol. 1, pp. 17-377.
____ Der Bericht der Nikaraguakanal-Kommission von 1897-99 [The report of the Nicaragua Canal Commission of 1897-99]. *Petermanns Mitteilungen*, vol. 48, pp. 25-30.
____ Das Erdbeben in Guatemala am 18. April 1902 [The earthquake in Guatemala on 18 April 1902]. *Petermanns Mitteilungen*, vol. 48, pp. 193-95.
____ Beiträge zur physischen Geographie von Honduras [Contributions to the physical geography of Honduras]. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, vol. (1902), pp. 33-56, 143-64, 231-41.
____ Die geographische Bedeutung der mittelamerikanischen Vulkane [The geographical significance of the Central American volcanoes]. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, vol. (1902), pp. 512-36.
____ Meteorologische Beobachtungen in der Republik Guatemala im Jahre 1900 [Meteorological observations in the Republic of Guatemala in the year 1900]. *Meteorologische Zeitschrift*, vol. 19, pp. 176-80.
____ Die mittelamerikanische Landschaft [The Central American landscape]. *Geographische Zeitschrift*, vol. 8, pp. 489-515.
____ *Mittelamerikanische Reisen und Studien aus den Jahren 1888 bis 1900* [Trips and studies in Central America in the years 1888 to 1900]. Braunschweig: Vieweg & Sohn. 426 pp., 4 maps.f
____ Produktion und Verkehrswesen von Mittelamerika [(Commercial) production and traffic of Central America] *Mitteilungen der Geographischen Gesellschaft in Hamburg*, vol. 18, pp. 269-71.
1903 Die vulkanischen Ereignisse in Mittelamerika und auf den Antillen [The occurrence of vulcanism in Central America and on the Antilles]. *Verhandlungen des 14. Deutschen*

Geographentages zu Köln, 1903. pp. 13-34; also published in *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, vol. (1903), pp. 359-86.

____ Der Ausbruch des Vulkans Santa María in Guatemala (Oktober, 1902) [The eruption of Santa María volcano in Guatemala (October, 1902)]. *Centralblatt für Mineralogie, Geologie und Palaeontologie*, vol. (1903), pp. 33-44, 65-72.

____ Weitere Mitteilungen über den Ausbruch des Vulcans Sta. María in Guatemala [Additional information on the eruption of Santa María volcano in Guatemala]. *Centralblatt für Mineralogie, Geologie und Palaeontologie*, vol. (1903), pp. 71-72.

____ Die jüngsten Ereignisse am Vulkan Izalco [The latest occurrence (of activity) of Izalco Volcano (El Salvador)]. *Centralblatt für Mineralogie, Geologie und Palaeontologie*, vol. (1903), pp. 103-11.

____ Ein Besuch der Insel Grenada [A visit to the island of Grenada]. *Centralblatt für Mineralogie, Geologie und Palaeontologie*, vol. (1903), pp. 182-86.

____ Bericht über einen Besuch von St. Vincent [Report on a visit to St. Vincent]. *Centralblatt für Mineralogie, Geologie und Palaeontologie*, vol. (1903), pp. 248-58.

____ Zur Kenntnis der Iseln S. Lucia, Montserrat, Nevis und S. Kitts (S. Christopher) [On information about the islands St. Lucia, Montserrat, Nevis and St. Kitts (St. Christopher)]. *Centralblatt für Mineralogie, Geologie und Palaeontologie*, vol. (1903), pp. 273-87.

____ Ein Besuch der Inseln Dominica, Eustatius, Saba und Guadeloupe in Westindien [A visit to the islands of Dominica, Eustatius, Saba and Guadeloupe in the West Indies]. *Centralblatt für Mineralogie, Geologie und Palaeontologie*, vol. (1903), pp. 305-23.

____ Ein Besuch von Martinique [A visit to Martinique]. *Centralblatt für Mineralogie, Geologie und Palaeontologie*, v. (1903), pp. 337-58.

____ Der Krater der Soufrière von St. Vincent [The crater of Soufrière on St. Vincent]. *Centralblatt für Mineralogie, Geologie und Palaeontologie*, vol. (1903), pp. 369-73.

____ St. Vincent. *Globus*, vol. 84, pp. 297-303, 377-82.

____ Regenmessungen in Cabo Gracias a Dios, Nicaragua [Rain measurements in Cape Gracia a Dios, Nicaragua. *Meteorologische Zeitschrift*, vol. 20, p. 41.

____ Meteorologische Beobachtungen, angestellt in der Republik Guatemala im Jahre 1901 [Meteorological observations made in the Republic of Guatemala in the year 1901]. *Meteorologische Zeitschrift*, vol. 20, pp. 512-16.

____ Eine Reise über den Isthmus von Panama [A trip over the Isthmus of Panama]. *Globus*, vol. 83, pp. 247-53.

____ Mittelamerikanische Waffen im modernen Gebrauch [Central American weapons in modern use]. *Globus*, vol. 83, pp. 53-63.

1904 Die vulcanischen Ereignisse in Mittelamerika im Jahre 1902 [Occurrences of vulcanism in Central America in the year 1902]. *Neues Jahrbuch für Mineralogie, Geologie und Palaeontologie*, vol. (1904), pp. 39-90.

____ Die vulcanischen Kleinen Antillen und die Ausbrüche der Jahre 1902 und 1903 [The volcanic Lesser Antilles and the eruptions of the years 1902 and 1903]. *Neues Jahrbuch für Mineralogie, Geologie und Palaeontologie*, vol.(1904), pp. 1-70.

____ Neurere vulcanische Ereignisse in Mittelamerika [New volcanic occurrences in Central America]. *Centralblatt für Mineralogie, Geologie und Palaeontologie*, vol. (1904), pp. 449-50.

____ Die catalonischen Vulkane [Catalonian volcanoes (Spain)]. *Zeitschrift der Deutsche Geologische Gesellschaft*, vol. 56, pp. 240-48.

____ Meteorologische Beobachtungen, angestellt in der Republik Guatemala in den Jahren 1902 und 1903 [Meteorological observations made in the Republic of Guatemala in the years 1902 and 1903]. *Meteorologische Zeitschrfit*, vol. 21, pp. 578-81.

____ Neue Beiträge zur Kenntnis von Guatemala und West Salvador [New contributions to the knowledge of Guatemala and Western (El) Salvador]. *Petermanns Mitteilungen*, vol. 50, pp. 203-10.

____ Der mittelamerikanische Urwald [The virgin forest of Central America]. [In:] *Zu Friedrich Ratzels Gedächtnis* [Memorial to Friedrich Ratzel]. Leipzig: Seele & Co., pp. 321-336.

____ Der gegenwärtige Stand der ethnographischen Kenntnis von Mittelamerika [The

present status of ethnographic knowledge of Central America]. *Archiv für Anthropologie*, [new series], vol. 3, pp. 1-38.

1905 Vulkanausbrüche und ihre Folgen [Volcanic eruptions and their consequences]. In *Aus der Nature* (Leipzig), pp. 39-90.

____ Ein neuer Vulkanausbruch in Mittelamerika (Momotombo) [A new eruption in Central America (that of Momotombo, Nicaragua)]. *Centralblatt für Mineralogie, Geologie und Palaeontologie*, vol. (1903), pp. 172-75.

____ Ergebnisse der Regenmessungen im südlichen Guatemala [Results of the rain measurements in southern Guatemala]. *Meteorologische Zeitschrift*, vol. 22, pp. 85-86.

____ Ergebnisse der Metorologische Beobachtungen in San Salvador, 1889-1900 [Results of the meteorologic observations in San (El) Salvador, 1889-1900]. *Meteorologische Zeitschrift*, vol. 22, p. 87.

____ Elektrische Erscheinungen bei den Vulkanausbrüchen in Mittelamerika [Electrical phenomena near volcanic eruptions in Central America]. *Meteorologische Zeitschrift*, vol. 22, pp. 139-40.

____ Über Gebirgsbau und Boden des südlichen Mittelamerika [On mountain structure and soil of southern Central America]. *Petermanns Mitteilungen*, Ergänzungsheft no. 151, 82 pp., 2 maps.

____ Grundzüge des Gebirgsbaues von Mittelamerika [Characteristics of mountain structures in Central America]. In *Report of the Eighth International Geographical Congress*, Washington, D.C., pp. 231-38.

____ *In den Vulkangebieten Mittelamerikas und Westindiens*. Reiseschilderungen und Studien über die Vulkanausbrüche der Jahre 1902 bis 1903, ihre geologischen, wirtschaftlichen und sozialen Folgen [In the volcanic areas of Central America. Travel descriptions and studies of the volcanic eruptions of 1902 and 1903, their geologic, economic and social consequences]. Stuttgart: Schweizerbart, 334 pp.

____ Ergebnisse der neueren Untersuchungen über der jüngsten mittelamerikanischen und westindischen Vulkanausbrüche [Results of new investigations on the most recent volcanic eruptions in Central America and the West Indies]. *Verhandlungen des 15. Deutschen Geographentages*, Danzig, pp. 102-34.

____ Das Territorium Quintana Roo [The territory of Quintana Roo]. *Globus*, vol. 88, pp. 165-67.

____ Der Charakter der mittelamerikanischen Indianer [The character of the Indians of Central America]. *Globus*, vol. 87, pp. 128-31.

____ Die Zukunft der mittelamerikanischen Indianerstämme [The future of the Indian tribes of Central America]. *Archiv für Rassen- und Gesellschftsbiologie*, vol. 2, pp. 383-413.

____ Aztekische Ortsnamen in Mittelamerika [Aztec place-names in Central America]. *Zeitschrift für Ethnologie*, vol. 37, pp. 1002-1007.

____ Cuba unter der nordamerikanischen Militärregierung und als Republik [Cuba under the North American military rule and as a republic]. *Petermanns Mitteilungen*, vol. 51, pp. 145-49.

1906 Zur geologie von Chiapas und Tabasco [On the geology of Chiapas and Tabasco]. *Petermanns Mitteilungen*, vol. 52, pp. 235-40.

____ Erdbebenserie von Masaya (Nicaragua), 1 bis 5 Januar 1906 [A series of earthquakes at Masaya (Nicaragua), from 1 to 5 January]. *Centralblatt für Mineralogie, Geologie und Paleontologie*, vol. (1906), pp. 257-59.

____ Der Matavanú-Ausbruch auf Savaii 1905-1906 [The eruption of Matavanu on Savaii (island) 1905-1906]. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, vol. (1906), p. 686.

____ Regenmessungen in der Republik Guatemala, 1904 [Rain measurements in the Republic of Guatemala, 1904]. *Meteorologische Zeitschrift*, vol. 23, pp. 127-29.

____ Antipassat in Westindien und Mittelamerika [The anti-trade wind in the West Indies and Central America]. *Meteorologische Zeitschrift*, vol. 23, pp. 315-16.

____ Meteorologische Beobachtungen, angestellt in den Republiken Guatemala und Salvador, 1905 [Meteorological observations, made in the republics of Guatemala and (El) Salvador, 1905]. *Meteorologische Zeitschrift*, vol. 23, pp. 562-64.

____ Título del Barrio de Santa Ana, agosto 14 de 1565 [Title of the barrio of Santa Ana, August 14, 1565]. *Internationale Amerikanisten-Kongress*, 14 Tagung, Stuttgart, 1904, pp. 373-402.

____ Sitten und Gebräuche der Pokonchí-Indianer nach Vicente A. Narciso [Customs and

usages among the Poconchí Indians, according to Vicente A. Narciso]. *Internationale Amerikanisten-Kongress*, 14 Tagung, Stuttgart, pp. 403-17.

____ Spiele der Kekchí-Indianer [Games of the Kekchí Indians]. In *Boas Memorial Volume* (New York), pp. 283-89.

____ Der Einfluss des Menschen auf die Gestaltung des mexikanisch-mittelamerikanischen Landschaftsbildes [Human influence on the shaping of the Mexican and Central American landscape]. *Globus*, vol. 89, pp. 149-52.

____ Inseln des Ägäischen Meeres [Islands of the Aegean Sea]. *Geographische Zeitschrift*, vol. 12, pp. 38-47.

____ Die Kanarischen Inseln [The Canary Islands]. *Geographische Zeitschrift*, vol. 12, pp. 481-506.

____ Beiträge zur Kenntnis von Palma und Lanzarote [Contributions to the knowledge of Palma and Lanzarote (Canary Islands)]. *Petermanns Mitteilungen*, vol. 52, pp. 145-53, 173-84.

____ Ackerbau auf den östlichen Canarischen Inseln [Agriculture in the eastern Canary Islands]. *Tropenpflanzer*, vol. 10, pp. 305-11.

1907 Mittelamerikanisches Wirtschafsleben einst und jetzt [Central American economic life then and now]. *Mitteilungen des Ostschweizer Geographisch-Commerciellen Gesellschaft*, vol. (1907), pp. 1-26.

____ Choles und Chorties [Chol and Chorti (Indians)]. *Congrès Internationale des Américanistes*, 15e Session, Quebec 1906, pp. 423-65.

____ Grenada. *Globus*, vol. 91, pp. 232-39.

____ Über einige isländische Lavavulkane [On an Icelandic lava volcano]. *Monatsberichte der Deutschen Geologischen Gesellschaft*, vol. 59, pp. 104-09.

1908 Meteorologische Beobachtungen, angestellt in den Republiken Guatemala und Salvador, 1906 [Meteorological Observations made in the Republics of Guatemala and (El) Salvador]. *Meteorologische Zeitschrift*, vol. 25, pp. 178-81.

____ Der Panamakanal unter den Nordamerikanern [The Panama Canal under the North Americans]. *Internationale Wochenschrift für Wissenschaft, Kunst und Technik*, vol. 2, pp. 377-82, 409-16.

____ Mexiko und Mittelamerika [Mexico and Central America]. *Internationale Wochenschrift für Wissenschaft, Kunst und Technik*, v. 2, pp. 711-34.

____ *Wirtschaftsgeographie von Mexiko* [Economic geography of Mexico]. Halle-Saale: Gebauer-Schwetschke, 115 pp.

____ Über einige isländische Vulkanspalten und Vulkanreihen [On some Icelandic volcanic fissures and volcanic alignments]. *Neues Jahrbuch für Mineralogie, Geologie und Palaeontologie*, vol. 26, pp. 1-43.

____ Einige Bemerkungen über Karl Schneiders Schrift "Zur Geschichte und Theorie des Vulkanismus" [Some remarks on Karl Schneider's publication "On the history and theory of vulcanology"]. *Centralblatt für Mineralogie, Geologie und Palaeontologie*, vol. (1908), pp. 526-31.

1909 Erdbeben und Erdoberfläche [Earthquakes and the earth's crust]. *Geographische Zeitschrift*, vol. 15, pp. 65-80.

____ Neu-Mecklenburg [New Mecklenburg]. *Geographische Zeitschrift*, vol. 15, pp. 425-50. [Also published in] *Verhandlungen des 17. Deutschen Geographentages, Lübeck*, pp. 141-68.

____ Die Rauchwolken hoher Vulkane in den Tropen als Windfahnen [The smoke clouds of high volcanoes in the tropics as wind vanes]. *Neues Jahrbuch für Mineralogie, Geologie und Palaeontologie*, vol. 26, pp. 1-43.

____ Bemerkungen über einige javanische Vulkane und über A. Bruns Untersuchungen derselben [Remarks on some Javanese volcanoes and on A. Brun's research on the same (topic)]. *Centralblatt für Mineralogie, Geologie und Palaeontologie*, vol. (1909), pp. 609-15.

____ Die Aussichten der Indianerbevölkerung Guatemalas [The prospects of Guatemala's Indian population]. *Archiv für Rassen- und Gesellschaftsbiologie*, vol 6, pp. 44-58.

1910 Kartographische und topographische Seminarübungen [Cartographic and topographic seminar exercises]. *Geographische Zeitschrift*, vol. 16, pp. 154-60.

____ Der Spitzbergenausflug des Internationalen Geologenkongresses [The excursion to Spitzbergen of the International Geology Congress]. *Petermanns Mitteilungen*, vol. 56, pp. 248-49.

____ Über isländische Lavaorgeln und Hornitos [On lava pipes and fumaroles in Ice-

land]. *Zeitschrift der Deutschen Geologischen Gesellschaft*, vol. 62, pp. 115-21.

____ Der gegenwärtige Stand der Vulkanforschung [The present status of research on volcanoes]. *Fortschritte der Naturwissenschaftlichen Forschung*, vol. 2, pp. 115-62.

____ Die geographische Bedeutung der Vulkane und ihrer Ausbrüche, inbesondere in Bezug auf dem Menschen and seine Wirtschaft [The geographical significance of volcanoes and their eruptions, especially in relation to mankind and its economy]. *IXe Congrès International de Géographie. Compte rendu des Travaux du Congrès*, Geneva, 1908, vol. 2, pp. 262-85.

____ Wissenschaftliche Ergebnisse einer amtlichen Forschungssreise nach dem Bismarck Archipel im Jahre 1908 [Scientific results of an official research trip to the Bismarck Archipelago in the year 1908]. *Mitteilungen aus den Deutschen Schutzgebieten*, Ergänzungsheft no. 3.

____ Geologische Verhältnisse von Kaiser-Wilhelms-Land [Geological relationships in Kaiser Wilhelms Land]. *Petermanns Mitteilungen*, vol. 56, pp. 185-88.

____ Beiträge zu einer Landeskunde von Neumecklenburg und seinen Nachbarinseln [Contributions to a regional geography of New Mecklenburg and its neighboring islands]. *Mitteilungen aus den Deutschen Schutzgebieten*, Ergänzungsheft no. 3.

____ Beiträge zur Kenntnis Neupommerns und des Kaiser-WilhelmsLandes [Contributions to the knowledge of New Pomerania and Kaiser Wilhelm Land]. *Petermanns Mitteilungen*, vol. 56, pp. 189-93, 255-56.

____ Das Hinterland der Nordküste des Kaiser-Wilhelms-Landes (Neuguinea) [The hinterland of the north coast of Kaiser Wilhelms Land (New Guinea)]. *Petermanns Mitteilungen*, vol. 56, pp. 185-86.

____ Der Feldbau der mittelamerikanischen Indianer [Agriculture of the Central American Indians]. *Globus*, vol. 97, pp. 8-10.

____ Einige Bemerkungen über primitiven Feldbau [Some remarks on primitive agriculture]. *Globus*, vol. 97, pp. 345-47.

1911 Die jüngsten Anschauungen über das Wesen der vulkanischen Erscheinungen [The latest views on the nature of volcanic phenomena]. *Aus der Natur*, vol. 7, pp. 193-99, 236-44.

____ Die jüngsten vulkanischen Vorgänge in Mittelamerika [The latest occurrences of vulcanism in Central America]. *Centralblatt für Mineralogie, Geologie und Palaeontologie*, vol. (1911), pp. 531-34.

____ Die Höhe des Vulkans Ghaie auf Neupommern [The elevation of Ghaie volcano on New Pomerania]. *Petermanns Mitteilungen*, vol. 57, p.133.

____ Die Tätigkeit der Vulkane Ghaie und Raluan (Neupommern) [The activity of Ghaie and Raluan volcanoes (New Pomerania)]. *Petermanns Mitteilungen*, vol. 57, pp. 135-39.

____ Der Matavanú auf Savaii am 9. April 1911 [Matavanu (volcano) on Savaii, 9 April 1911]. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, vol. (1911), pp. 485-91.

____ Nachrichten über den Ausbruch des Matavanú auf Savaii aus den Jahren 1909 und 1910 [Information on the eruption of Matavanu on Savaii during the years 1909 and 1910]. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, vol. (1911), pp. 172-80.

____ Das Ende des Matavanú-Ausbruchs auf Savaii. Nach Mitteilungen von Dr. W. Grevel und Pater Mennel [The end of the eruption of Matavanü on Savaii. According to reports of Dr. W. Grevel and Father Mennel]. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, vol. (1911), pp. 701-04.

____ Die wirtschaftlichen Verhältnisse der Kleinen Antillen [The economic relationships of the Lesser Antilles]. *Petermanns Mitteilungen*, vol. 57, pp. 125-27, 180-84.

1912 Das Erdbeben von Sarchí (Kostarica) am 6. Juni, 1912 [The earthquake at Sarchí (Costa Rica) on 6 June 1912]. *Petermanns Mitteilungen*, vol. 58, pp. 340-41.

____ Über vulkanische Baue, ihre Benennung und geographische Verbreitung [On the formation of volcanoes, their nomenclature and geographical distribution]. *Centralblatt für Mineralogie, Geologie und Palaeontologie*, vol. (1912), pp. 1-7.

____ Vulkanausbrüche als Indikatoren der Luftströmungen in höheren Regionen Mittelamerikas [Volcanic eruptions as indicators of the wind currents in the higher regions of Central America]. *Meteorologiche Zeitschrift*, vol. 29, pp. 133-34.

____ Nachklänge zum Matavanú-Ausbruch (Savaii). Aus Briefen von Pater Mennel und Dr. W. Grevel zusammengestellt [Aftermath of the eruption of Matavanu

(Savaii), combined from letters from Father Mennel and Dr. W. Grevel]. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, vol. (1912), pp. 445-51.

____ Über Fliesserde und Strukturboden auf Spitzbergen [On soil creep and soil structure in Spitzbergen]. *Petermanns Mitteilungen*, vol. 57, pp. 125-27, 180-84.

____ Regenmessungen in der Republik Guatemala, 1910 [Rain measurements in the Republic of Guatemala, 1910]. *Meteorologische Zeitschrift*, vol. 46, pp. 339-40.

____ Über den Kulturwert der verschiedenen Landschaftstypen in den Tropen, insbesondere in Mittelamerika [On the agricultural value of the various landscape types in the tropics, especially in Central America]. *Geographische Zeitschrift*, vol. 18, pp. 305-17, 387-401.

____ Die Ansiedlung von Europäern in den Tropen [Settlement of Europeans in the tropics]. In Sapper, Van Blom, u. Nederburgh: *Mittelamerika, Kleine Antillen, Niederländisch West- und Ostindien*, Schriften des Vereins für Sozialpolitik, vol. 2. Leipzig: Duncker u. Humblot.

____ Der 18. Internationale Amerikanistenkongress in London, 27 Mai bis 1 Juni 1912 [The 18th international Americanist Congress in London, 27 May to 1 June, 1912]. *Petermanns Mitteilungen*, vol. 58, p. 86.

____ Über einige Sprachen von Südchiapas [On some (native) languages in southern Chiapas]. Reseña de la 2a sesión del XVII Congreso International de Americanistas efectuada en la ciudad de Mexico durante el mes de septiembre de 1910, pp. 295-320.

1913 Das Experiment in der physikalischen Geographie [Experiment in physical geography]. *Petermanns Mitteilungen*, vol. 59, pp. 1-2.

____ Zum Studien der Landschaftsformen [Toward studies of landscape forms]. In: *Das Jahr 1913, ein Gesamtbild der Kulturentwicklung*, ed. Sarason, Leipzig, pp. 383-93.

____ Über vulkanische Baue, ihre Benennung und geographische Verbreitung [On volcanic structures, their nomenclature and geographical distribution]. *Centralblatt für Mineralogie, Geologie und Palaeontologie*, vol. (1913), pp. 1-7.

____ Die mittelamerikanischen Vulkane [The volcanoes of Central America]. *Petermanns Mitteilungen*, Ergänzungsheft, no. 178, 173 pp., 1 map.

____ Entwurf von Höhenschichtlinien der mittleren Vulkanregion Nicaraguas [Sketch of the altitudinal alignment of the central volcanic region of Nicaragua]. *Petermanns Mitteilungen*, vol. 59, pp. 310-11.

____ Regenmessungen an der pazifischen Abdachung der Republik Guatemala [Rain measurements on the Pacific slope of the Republic of Guatemala]. *Meteorologische Zeitschrift*, vol. 30, pp. 95-96.

____ Regenmessungen in Sonsonate (Republik Salvador) 1910 und 1911 [Rain measurements in Sonsonate (Republic of (El) Salvador) 1910 and 1911]. *Meteorologische Zeitschrift*, vol. 30, p. 315.

____ Meteorologische Beobachtungen in der Alta Verapaz und an der atlantischen Küste von Guatemala, 1911 [Meteorological observations in the Alta Verapaz and in the Atlantic coast of Guatemala]. *Meteorologische Zeitschrift*, vol. 30, pp. 404-05.

____ Regenfall in Guatemala [Rainfall in Guatemala]. *Meteorologische Zeitschrift*, vol. 30, p. 572.

____ Ackerbau in den Altos von Guatemala [Agriculture in the Altos of Guatemala]. *Tropenpflanzer*, vol. 17, pp. 191-99.

____ Das tägliche Leben der Kekchí-Indianer [The daily life of the Kekchí Indians]. *International Congress of Americanists*, 18th sess., London, 1912, pp. 362-71.

1914 Die Hölle von Masaya [The caves of Masaya]. *Neues Jahrbuch für Mineralogie, Geologie und Palaeontologie*, vol.39, pp. 415-45.

____ Die Bildung der Vulkaninsel Raluan (Neupommern) [The structure of the volcanic island of Raluan (New Pommerania)]. *Petermanns Mitteilungen*, vol. 60, p. 337.

____ Neue Beobachtungen am Kilauea und deren Bedeutung für die Theorie des Vulkanismus [New observations on Kilauea and significance thereof for the theory of vulcanism]. *Aus der Natur*, vol.(1914), pp. 551-60.

____ Über Abtragungsvorgänge in den regenfeuchten Tropen und ihre morphologischen Wirkungen [On erosion processes in the rainy (humid) tropics and their morphological consequences]. *Geographische Zeitschrift*, vol. 20, pp. 5-18, 81-92.

____ Erdfliessen und Strukturboden in polaren und

subpolaren Gebieten [Solifluction and structure of soils in polar and sub-polar areas]. *Internationale Mitteilungen für Bodenkunde*, vol. 4, pp. 52-67.

____ Meteorologische Beobachtungen, angestellt zu Quezaltenango, Guatemala in den Jahren 1912 und 1913 [Meteorological observations taken at Quezaltenango, Guatemala in 1912 und 1913]. *Meteorologische Zeitschrift*, vol. 31, pp. 251-52.

____ Meteorologische Beobachtungen auf der atlantischen Abdachung von Guatemala im Jahre 1912 [Meteorological observations on the Atlantic slope of Guatemala in 1912]. *Meteorologische Zeitschrift*, vol. 31, pp. 401-03.

____ Regenmessungen an der pazifischen Abdachung und auf den Hochland der Republik Guatemala, 1913 [Rain measurements on the Pacific slope and in the highland of the republic of Guatemala, 1913]. *Meteorologische Zeitschrift*, vol. 31, pp. 442-44.

____ Das Schutzgebeit Deutsch-Neu-Guinea in der Gegenwart [The protectorate of German New Guinea at present]. *Mitteilungen der Gesellschaft für Erdkunde und Kolonialwesen zu Strassburg (1913)*, pp. 76-104.

____ *Die Bevölkerung Mittelamerikas* [The population of Central America]. (Schriften der Wissenschaftlichen Gesellschaft in Strassburg, no. 22). Strassburg: Trübner, 32 pp.

1915 Erdfliessen [Earth movements]. *10 Congresso Internazionale di Geografia*, Roma, 1913, pp. 1-9.

____ Rasenabschälung [Stripping of the sod]. *Geographische Zeitschrift*, vol. 21, pp. 105-09.

____ Bericht über vulkanische Ereignisse der Jahre 1895-1913 [Report on the occurrences of vulcanism in the years 1895-1913]. *Gerlands Beiträge zur Geophysik*, vol. 14, pp. 85-97, 99-155.

____ Einige Bemerkungen über Wasserausbrüche [Some remarks on geysers]. *Zeitschrift für Vulkanologie*, vol. 2, pp. 82-89.

____ Der Ausbruch des Colima 1913 und die Berichterstattung von Localzeitungen [The eruption of Colima (Mexico) 1913 and reports from local newspapers]. *Zeitschrift für Vulkanologie*, vol. 2, pp. 232-33.

____ Alte und neue Bilder des Masaya und Momotombo [Old and new pictures of Masaya and Momotombo (volcanoes in Nicaragua)]. *Zeitschrift für Vulkanologie*, vol. 2, pp. 226-31.

____ Regenmessungen, angestellt zu Sonsonate, Republik San Salvador, in den Jahren 1912 und 1913 [Rain measurements, taken at Sonsonate, republic of San (El) Salvador, years 1912 and 1913]. *Meteorologische Zeitschrift*, vol. 32, p. 281.

____ Meteorologische Beobachtungen, angestellt in der Alta Verapaz (atlantische Abdachung von Guatemala) im Jahre 1913 [Meteorological observations, taken in the Alta Verapaz (Atlantic slope of Guatemala) in 1913]. *Meteorologische Zeitschrift*, vol.32, pp. 281-93.

____ Meteorologische Beobachtungen, angestellt in Trece Aguas, Alta Verapaz, Republik Guatemala [Meteorological observations taken in Trece Aguas, Alta Verapaz, republic of Guatemala]. *Meteorologische Zeitschrift*, vol. 32, p. 477.

____ Regenmessungen, angestellt 1914 an der pazifischen Abdachung von Guatemala [Rain measurements taken in 1914 on the Pacific slope of Guatemala]. *Meteorologische Zeitschrift*, vol. 32, pp. 555-56.

____ Der gegenwärtige Stand der Länderkunde [The present status of regional geography]. *Naturwissenschaft*, vol. 3, pp. 89-95.

____ Vulkanismus [Vulcanism]. *Handwörterbuch der Naturwissenschaften*, vol. 10, pp. 335-63.

1917 *Geologischer Bau und Landschaftsbild* [Geologic structure and landscape]. Braunschweig: Vieweg & Sohn, 208 pp.

____ Beiträge zur Geographie der tätigen Vulkane [Contributions to the geography of active volcanoes]. *Zeitschrift für Vulkanologie*, vol. 3, pp. 65-197.

____ *Katalog der geschichtlichen Vulkanausbrüche* [Catalog of historic volcanic eruptions]. Strassburg: Trübner, 358 pp. (Schriften der Wissenschaftliche Gesellschaft in Strassburg, no. 27).

____ Die amerikanischen Mittelmeerländer und die Vereinigten Staaten [The American Mediterranean (Caribbean) lands and the United States]. *Geographische Zeitschrift*, vol. 23, pp. 177-97.

____ Der Panamakanal im Jahre 1915-16 [The Panama Canal in years 1915-16]. *Petermanns Mitteilungen*, vol. 63, pp. 238-41.

____ *Österreich-Ungarn [Land, Völker und Staat]* [Austria-Hungary. Land, People and State].

Munich: Verlag "Natur und Kultur." 48 pp.

____ Aussprache über Amerika–U.S.-America [Pronouncements on America–U.S.-America]. *Petermanns Mitteilungen*, vol. 63, pp. 308-09.

____ Die Bedrohung des Bestandes der Naturvölker und die Vernichtung ihre Eigenart [The threat to the stability of primitive peoples and the destruction of their individuality]. *Archiv für Rassen- und Gesellschaftsbiologie*, vol. 12, pp. 268-320, 417-39.

____ Über eine verzierte Baumkalebasse aus dem Sumo-Gebiet (Nicaragua) [On a decorated tree gourd in the Sumo (Indian) area (Nicaragua)]. *Proceedings of the 19th International Congress of Americanists, Washington, 1915*, pp. 206-210.

____ Das Deutschtum im Auslande [Germanism (German customs) in foreign countries]. *Die Grenzboten*, vol. 76, pp. 107-13.

1918 Geschwistervulkane in Guatemala [Sibling volcanoes in Guatemala]. *Zeitschrift für Vulkanologie*, vol. 4, pp. 1-4.

____ Über Gebirge und Gebirgsgrenzen. Eine anthropogeographische Skizze [Mountains and mountain boundaries. A human-geographical sketch]. *Geographische Zeitschrift*, vol. 24, pp. 43-56, 115-29.

____ Meteorologische Beobachtungen zu San Salvador (Republik El Salvador), 1912 [Meteorological observations at San Salvador (Republic of El Salvador)]. *Meteorologische Zeitschrift*, vol. 52, p. 311.

____ Tropenwirtschaft [Tropical economy]. *Die Grenzboten*, vol. 77, pp. 153-59.

____ Arthur Wichmanns Forschungsreisen in Nord-Neu-Guinea im Jahre 1903 [Arthur Wichmann's research trips in northern New Guinea in the year 1903]. *Petermanns Mitteilungen*, vol. 64, pp. 169-70.

____ Die Völker und Staaten Europas [The People and States of Europe]. *Schützengrabenbücher*, vol. 98.

____ Nachrichten über Zukunftsaussichten der Eskimobevölkerung von Grönland und Labrador [Information on the future outlook for Eskimo population of Greenland and Labrador]. *Petermanns Mitteilungen*, vol. 64, pp. 215-18.

____ Das Deutschtum im Ausland [Germanism in foreign countries]. In: *Deutschen Staat und Deutsche Kultur*, ed. Heeresgruppe Herzog Albrecht. Strassburg., pp. 149-73.

1919 Georg Gerland (1833-1919) [an obituary]. *Geographische Zeitschrift*, vol. 25, pp. 329-40.

____ Über Hornitos und verwandte Gebilde [On fumaroles and related structures]. *Zeitschrift für Vulkanologie*, vol. 5, pp. 1-39.

____ Über Akklimatisation in den Tropen [On acclimatization in the tropics]. *Sitzungsberichte der Physikalisch-medizinischen Gesellschaft zu Würzburg*, 1920, pp. 21-32.

1920 Reise im mexikanischen Territorium Quintana Roo (Sánchez und Toscano) [Travels in the Mexican territory of Quintana Roo (Sánchez and Toscano)]. *Petermanns Mitteilungen*, vol. 66, pp. 31-32.

____ Sydney Power's Forschungen in Mittelamerika [Sydney Power's research in Central America]. *Petermanns Mitteilungen*, vol.66, p. 32.

____ Fahrt nach dem Indianergebiet San Blas [Trip into the Indian area of San Blas]. *Petermanns Mitteilungen*, vol. 66, p. 100.

____ Der Ausbruch der Katla auf Island [The eruption of Katla (volcano) on Iceland]. *Petermanns Mitteilungen*, vol. 66, pp. 137-38.

____ Sapper, K. und F. Plieninger: Kos und Nisyros [Kos and Nisyros (Greek islands)]. *Petermanns Mitteilungen*, vol. 66, pp. 162-63, 194-97, 213-19, 255-59.

____ Der gegenwärtige Zustand westindischer Vulkane [The present status of the West Indian volcanoes]. *Petermanns Mitteilungen*, vol. 66, p. 240.

____ *Natur und Lebensbedingungen in tropischen und tropennahen Gebieten.* [Nature and essential conditions for life in the tropics and near-tropics]. Auslandswegweiser #3. Hamburg: Friederichsen und Co., 115 pp.

____ Über Stenothermie der Tropenbewohner [On the small temperature range tolerance of inhabitants of the tropics]. *Mitteilungen der Geographisch-Ethnographischen Gesellschaft in Zürich*, vol. 19, pp. 25-34.

____ Regenfall in Honduras und El Salvador [Rainfall in Honduras and El Salvador]. *Meteorologische Zeitschrift*, vol. 37, pp. 299-300.

1921 Regenfall in den Republiken Guatemala und El Salvador in den Jahren 1908 bis 1920 [Rainfall in the republics of Guatemala and El Salvador, 1908-1920]. *Meteorologische Zeitschrift*, vol. 38, pp. 279-81.

____ *Auswanderung und Tropenakklimatisation*

[Emigration and acclimatization in the tropics]. Würzburg: Kabitzsch und Mönnich, 86 pp.

____ *Mittelamerika*: Auslandswegweiser #5 [Central America: guide for foreign areas #5]. Hamburg: Friederichsen und Co., 124 pp.

____ Der Südrand der Puna de Atacama (nach W. Penck) [The southern edge of the Puna de Atacama (according to W. Penck)]. *Geographische Zeitschrift*, vol. 27, pp. 265-71.

____ Hamilton Rices letzte Reise nach dem Oberen Orinoka — W.R. Allens ichthyologische Untersuchung der Zuflüsse des Oberen Amazonenstroms [Hamilton Rice's latest trip to the upper Orinoco—W.R. Allen's ichthyological investigation of the tributaries of the upper Amazon]. *Petermanns Mitteilungen*, vol. 67, p. 23.

____ Das Heidentum unter den christlichen Indianern Guatemalas [Heathen beliefs among the Christian Indians of Guatemala]. *Petermanns Mitteilungen*, vol. 67, p. 69.

____ Dyotts Reisen in den peruanischen Anden [Dyott's trips in the Peruvian Andes]. *Petermanns Mitteilungen*, vol. 67, p. 166.

____ Ausgrabungen in den Ruinen von Teotihuacan [Excavations in the ruins of Teotihuacan]. *Petermanns Mitteilungen*, vol. 67, p. 166.

____ Entdeckung grosser Wasserfalle in Guayana [Discovery of large waterfalls in Guayana]. *Petermanns Mitteilungen*, vol. 67, p. 198.

____ Palacios Ruinenforschungen in Staate Oaxaca [Palacios' investigation of ruins in the state of Oaxaca (Mexico)]. *Petermanns Mitteilungen*, vol. 67, p. 232.

____ Geologische Forschung in Mexiko [Geological investigation in Mexico]. *Petermanns Mitteilungen*, vol. 67, p. 232.

____ Untersuchung der Sierra de Tepoztlán [Investigation of the Sierra de Tepoztlán (Mexico)]. *Petermanns Mitteilungen*, vol. 67, p. 232.

____ H. Case Willcox' Aufnahme des Río de Oro in Kolumbien-Venezuela [H. Case Willcox's survey of the Río de Oro in Colombia-Venezuela]. *Petermanns Mitteilungen*, vol. 67, p. 232.

1922 *Geologischer Bau und Landschaftsbild* [Geologic structure and landscape]. 2nd ed. Braunschweig.

____ Die Vulkanberge Neu-Guineas [The volcanic mountains of New Guinea]. *Zeitschrift für Vulkanologie*, vol. 6, pp. 1-14.

____ Deutschtum und Kaffeebau in Mittelamerika [Germanism (German influence) and coffee cultivation in Central America]. *Koloniale Rundschau*, vol. (1922), pp. 251-60.

____ Die geographischen Gesichtspunkte für die Beurteilung der Frage der Claes-Pietersz-Bucht in Neu-Mecklenburg (Neu-Irland) [The geographical viewpoints on the question of the evaluation of Claes Pietersz Bay in New Mecklenburg (New Ireland)]. *Mitteilungen der Geographisch- Ethnographischen Gesellschaft zu Zürich*, vol. 21, pp. 35-43.

____ Die Lokalisation der Claes-Pietersz-Bucht in New Irland (zusammen mit O. Schlaginhaufen und G. Friederici) [The location of the Claes-Pietersz-Bucht in New Ireland (with O. Schlaginhaufen and G. Friederici)]. *Mitteilungen der Geographisch-Ethnographischen Gesellschaft zu Zürich*, vols. 16 and 21, 59 pp.

____ Über den Charakter und die geistige Veranlagung der Kekchí-Indianer [On the character and spiritual organization of the Kekchí Indians]. In *Festschrift für Eduard Seler*, Walter Lebermann, ed., pp. 401-40.

1923 *Karte der mittleren jährlichen Bevölkerungszunahme der Erde* [Map of the mid-year population census of the earth]. München and Berlin: Oldenbourg.

____ *Die Tropen* [The tropics]. Stuttgart: Strecker und Schröder, 152 pp.

____ *Amerika. Übersicht des Doppelkontinents* [America. Overview of the two continents]. Berlin and Leipzig: de Gruyter & Co., 2 vols. vol. 1, 112 pp., vol. 2, 156 pp.

1924 Vulkanische Ereignisse. Der Stromboli am 20. April 1923 [Volcanic events. Stromboli, 20 April 1923]. *Zeitschrift für Vulkanologie*, vol. 8, pp. 14-24.

____ Bericht über im Auftrag der geographischen Gesellschaft zu Hamburg 1923 bis 1924 unternommene Reise nach Mittel- und Südamerika [Report on the trips to Central and South America undertaken on behalf of the Geographical Society of Hamburg, 1923-1924]. *Mitteilungen der Geographische Gesellschaft zu Hamburg*, vol. 36, pp. 29-136.

____ Eine neue Karte von Guatemala [A new map of Guatemala]. *Geographische Zeitschrift*, vol. 30, pp. 164-68.

____ El Instituto Físico-Geográfico de Costa Rica [The physical geographical institute of Costa Rica]. *Revista de Costa Rica*, vol. 5, pp. 271-76.

____ Die Zahl und Volksdichte der indianischen Bevölkerung in Amerika vor der Conquista und in der Gegenwart [The number and density of Indian population in America before the (Spanish) Conquest and at present]. *Proceedings of the 21st International Congress of Americanists*, The Hague, vol. 1, pp. 95-104.

1925 *Die Vulkane* (von Alfred Bergeat, herausgegeben von K. Sapper) [Volcanoes (by Alfred Bergeat, edited by K. Sapper)]. Breslau: Hirt, 96 pp.

____ *Los volcanes de la América Central* [The volcanoes of Central America]. Halle: Niemeyer, 116 pp.

____ *El infierno de Masaya.* Documentos históricos publicados con introducción [The caldera of Masaya. Published historical documents with an introduction]. Halle: Niemeyer, 65 pp.

____ *Allgemeine Verkehrs- und Wirtschaftsgeographie* [General commercial and economic geography]. Leipzig und Berlin: Teubner, 300 pp.

____ Eine Reise nach Mittel- und Südamerika 1923-24 [A trip to Central and South America, 1923-24]. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, vol. (1925), pp. 1-13.

____ La destrucción de los bosques en Colombia [The destruction of the forests in Colombia]. *Anales de la Sociedad Argentina de Estudios Geográficos "Gaea,"* vol. 1, pp. 385-93.

____ Über Brujería in Guatemala [On witchcraft in Guatemala]. *Compte Rendu, 21e session du Congrès Internationale des Américanistes*, Göteborg, pp. 391-405.

____ Das Heilwesen der Indianer Guatemalas [Medical practices of the Indians of Guatemala]. *Petermanns Mitteilungen*, vol. 71, p. 195.

____ Zur Wirtschaftspolitik und Wirtschaftsgeschichte von Chile [On political economy and economic history of Chile]. *Zeitschrift für Gesamte Staatswissenschaft*, vol. 79, pp. 530-40.

1926 Die vulkanische Tätigkeit in Mittelamerika im 20. Jahrhundert [The volcanic activity in Central America in the 20th century]. *Zeitschrift für Vulkanologie*, vol. 9, pp. 156-203, 231-70.

____ Reise in Mittelamerika, 1923-24 [Trips in Central America, 1923-24]. *Verhandlungen des 21. Deutschen Geographentages*, Breslau 1925, pp. 30-49.

____ *Mittelamerika. Ein Wegweiser für Auswanderer, Pflanzer, Kaufleute, Lehrer* [Central America. A guide for emigrants, planters, merchants, teachers]. 2nd ed. Halle: Niemeyer, 128 pp.

____ Verkehrsverhältnisse der Republik Honduras [Commercial relations of the Republic of Honduras]. *Petermanns Mitteilungen*, vol.72, p.279.

____ Das Heilwesen bei den Indianern Guatemalas [Medical practices among the Indians of Guatemala]. *Mitteilungen für den Deutschen Amerikanistenvereinig* (Würzburg)., vol. 1, pp. 1-4.

____ Prinzessin Therese von Bayern (Nachruf) [Princess Therese of Bavaria (in memorium)]. *Berichte für den Deutschen Amerikanistenvereinig*, vol. 1, pp. 2-3.

1927 *Vulkankunde.* Mit petrographische Einleitung von E. Bergeat [Vulcanology, with petrographic introduction by E. Bergeat]. Stuttgart: Engelhorns Nachfolger, 424 pp.

____ Die tätigsten Vulkangebiete der Gegenwart [The most active volcanic areas of today]. *Zeitschrift für Vulkanologie*, vol. 11, pp. 181-87.

____ Ein Besuch des Inselvulkans Santorin im Mai 1926 [A visit to the island volcano of Santorin in May 1926]. In: Schnass, F. und R. Wilckens: *Erdkundliches Quellenbuch*, Europa. vol. 2, pp. 170-75.

____ Las regiones tropicales como lugares de colonización y de producción de materias alimenticias [Tropical areas as places for colonization and production of foodstuffs]. *Anales de la Sociedad Argentina de Estudios Geográficos "Gaea,"* vol. 2, pp. 469-73.

____ Origen del relieve y de los contornos actuales de la América Central [Origen of the present relief and outline of Central America]. *Boletín de la Academia Nacional de Ciencias de Córdoba* (Argentina), vol. 30, pp. 327-34.

____ Die Amerikanischen Mittelmeerländer [The American Caribbean area]. In: Andree-Heidrich-Sieger: *Geographie des Welthandels*, 2nd ed., pp. 758-822.

____ Mittelamerika und Westindien [Central America and the West Indies]. *Zeitschrift für Geopolitik*, vol. 4, pp. 334-44, 448-61, 534-

39, 612-30.
____ Die Volkszählung in der Republik Mexiko im Jahre 1921 [The population census of the Republic of Mexico in the year 1921]. *Petermanns Mitteilungen*, vol. 73, pp. 153-58.
____ Volksdichte und Rinderbestand in Mexiko [Population density and numbers of cattle in Mexico]. *Petermanns Mitteilungen*, vol. 73, map.
____ La lengua Tapachulteca [The Tapachulteca language]. *El México Antiguo*, vol. 2, pp. 259-68.
____ Strassburg. In: Schnass, F. und R. Wilckens: *Erdkundeliches Quellenbuch*, Deutschland, vol. 2, pp. 202-10.
1928 Die Vulkankunde von der Mitte des 19 Jahrhunderts bis zur Gegenwart [Vulcanology from the middle of the 19th century until the present]. *Naturwissenschaftliche Monatshefte*, vol. 25, pp. 204-220.
____ 40 Jahre Vulkanforschung [40 years of investigations on volcanoes]. *Verhandlungen für physicalisch-Medizinische Gesellschaft zu Würzburg*, new ser., vol. 53 (Sonderband), pp. 139-54.
____ Abtragung durch flächenhafte Abgleitung [Denudation through surface slumping]. *Geographische Zeitschrift*, vol. 34, pp. 607-10.
____ Ein Beitrag zur Paläogeographie Mittelamerikas [A contribution to the paleogeography of Central America]. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, Jubiläums Sonderband, pp. 57-67.
____ La población autóctona de la América Central [The indigenous population of Central America]. *Anales de la Sociedad de Estudios Geográficos "Gaea"*, vol. 15, pp. 5-15.
____ Der Handel Mittelamerikas mit Deutschland [Central American commerce with Germany]. *Der Auslandsdeutsche*, vol. 11, pp. 568-70.
____ Die Grenzfrage zwischen Guatemala und Honduras [The boundary question between Guatemala and Honduras]. *Petermanns Mitteilungen*, vol. 74, pp. 225-29.
____ Eine moderne Grenzfrage [A modern boundary question]. *Zeitschrift für Geopolitik*, vol. 5, pp. 955-68.
____ A modern boundary question. Translated and published by the Boundary Commission in Guatemala, 15 pp.
____ *Mexiko. Land, Volk und Wirtschaft* (vollstandig neubearbietet Auflage der *Wirtschaftsgeographie von Mexiko*) [Mexico. Land, people and economy (completely newly worked edition of Economic Geography of Mexico, 1908)]. Vienna: Seidel und Sohn, 164 pp.
____ Zahl, Rasse und Dichte der mexikanischen Bevölkerung [Number, race and density of the Mexican population]. *Atti del 22 Congresso Internazionale degli Americanisti, Roma 1926*, pp. 307-21.
____ Deutschlands Flüsse, Kanäle und Küsten [Germany's rivers, canals, and coasts]. In: *Deutchland. Die natürlichen Grundlagen seiner Kultur* (Leipzig), pp. 38-63.
1929 Reise nach Süd- und Mittelamerika, 1927-28 [Trips through South and Central America, 1927-28]. *Mitteilungen der Geographischen Gesellschaft zu Würzburg*, vol. 3/4, pp.1-177.
____ Das deutsche Reich und das deutsche Volk. Festrede gehalten an der Reichsgründungsfeier, den 18 Januar 1929 Universität Würzburg [The German empire and the German people. Jubilee report for the Empire-Founding celebration [1879], 18 January 1929, Würzburg University]. *Zwei Rektoratsreden im Studienjahr 1928-29* (Würzburg), pp. 3-23.
____ Das Aussterben der Naturvölker. Festrede gehalten am 347. Stiftungsfest der Universität Würzburg am 11 Mai 1929 [The extinction of primitive people. Jubilee report given on the 347th celebration of the founding of the University of Würzburg on 11 May 1929]. In: *Zwei Rektoratsreden im Studienjahr 1928-29*, pp. 25-53.
____ Das Aussterben der Naturvölker [The extinction of primitive people]. *Zeitschrift für Geopolitik*, vol. 6, pp. 490-508.
1930 Der neue "Supan" [The new Supan]. *Geographischer Anzeiger*, vol. 31, pp. 226-29.
____ Schuttabtragungen unter der Vegetationsdecke [Erosion of debris under the vegetation cover]. *Zeitschrift für Geomorphologie*, vol.5, pp. 267-69.
____ Der Ausbruch des Vulkans Santa María in Guatemala vom 2-4. November 1929 (zusammen mit Franz Termer) [The eruption of the volcano Santa María in Guatemala from 2 to 4 November 1929 (with Franz Termer]. *Zeitschrift für Vulkanologie*, vol. 13, pp. 73-101.
____ Neue Mitteilungen uber die jüngste Tätigkeit

der salvadornischen Vulkane Izalco und San Míguel (zusammen mit Frans Termer) [New reports on the most recent activity of the Salvadorian volcanoes Izalco and San Miguel (with Franz Termer)]. *Zeitschrift für Vulkanologie*, vol. 13, pp. 193-96.

____ Die Vulkanizität Island [Volcanic activity (on) Iceland]. *Vierteljahresschrift der Vereiningung Gesellschaft zu Islandfreund*, vol. 17, pp. 87-91.

____ *Vulkanausbrüche* [Volcanic eruptions]. Breslau: Ferd. Hirt, 80 pp.

____ Das Landschaftsbild in seiner Abhängigkeit von Boden (Landschaftsformen) [Landscape in its relationship to soils (Landscape forms)]. *Handbuch der Bodenlehre*, vol. 5, pp. 228-70.

____ *Allgemeine Wirtschafts- und Verkehrsgeographie* [General economic and commercial geography]. 2nd ed. Leipzig and Berlin: Teubner, 392 pp.

____ Der Kaffeebau [Coffee cultivation]. *Pädagogische Warte*, vol. 37, pp. 503-11.

____ Der Kaffeebau in seiner siedlungs- und wirtschaftsgeographischen Bedeutung [Coffee cultivation in regard to its significance to settlement and economic geography]. *Erde und Wirtschaft*, vol. (1930), pp. 109-16.

____ Die Europäisierung der Erde [The Europeanization of the earth]. *Petermanns Mitteilungen*, vol. 76, pp. 1-9.

____ Tropenakklimatisation in ihrer Bedeutung für Siedlung und Wirtschaft [Acclimatization in the tropics in its significance for settlement and economy]. *Unterrichtsblätter für Mathematik und Naturwissenschaften*, vol. 36, pp. 228-31.

____ Die Spanier als Tropenkolonisatoren [The Spaniards as colonizers of the tropics]. In: *Homenaje a Bonilla y San Martín* (Facultad de Filosofía y Letras de la Universidad Central, Madrid), vol. 2, pp. 375-81.

____ Der Pamamakanal [The Panama Canal]. In: *Erdkundliches Quellenbuch*, Franz Schanss and Rudolf Wilckens, eds. Äussereuropa, vol. 2, pp. 39-43.

____ Der gegenwärtige Stand der kartographischen Darstellung Mittelamerikas [The present status of the cartographic representation of Central America]. *Petermanns Mitteilungen*, Ergänzungsheft 209, pp. 65-73.

____ Die Erhaltung der altindianischen Stein-Denkmäler [The preservation of ancient Indian stone monuments]. *Proceedings of the 23rd International Congress of Americanists 1930, New York*, pp. 223-32.

1931 Volcanoes, their activity and their causes. *Bulletin of the National Research Council*, Washington, no. 77, pp. 1-33.

____ Der Stromboli in September 1929 [Stromboli (volcano) in September 1929]. *Zeitschrift für Vulkanologie*, vol. 14, pp. 22-37.

____ Die anthropogeographische Bedeutung des Renntieres [The human geographical significance of reindeer]. *Geographische Zeitschrift*, vol. 513-35, 599-608.

____ Tropenakklimatisation in ihrer Bedeutung für Siedlung und Wirtschaft [Acclimatization in the tropics and its significance for settlement and economy]. *Geographischer Anzeiger*, vol. 32, pp. 1-5, 39-45.

____ Der Regenfall um Puerto Cortez (Honduras) und Bemerkungen über tropischen Regenfall im allgemeinen [Rainfall in Puerto Cortés (Honduras) and remarks on tropical rainfall in general]. *Meteorologische Zeitschrift*, vol. 48, pp. 104-05.

____ Zur Kenntnis des Klimas des Petén (Nordguatemala) [Information on the climate of the Petén (northern Guatemala)]. *Meteorologische Zeitschrift*, vol. 48, pp. 232-33.

____ Die geographische Bedingtheit der altamerikanischen Hochkulturen [The geographical limitations of ancient high civilizations of the Americas]. *Petermanns Mitteilungen*, vol. 77, pp. 178-82, 245.

1932 Athanasius Kircher als Geograph [Athanasius Kircher as a geographer]. In: Aus der Vergangenheit der Universität Würzburg. *Festschrift zum 350 jähren Bestehen der Universität*, pp. 355-62.

____ Klimakunde von Mittelamerika [Climatology of Central America]. In: *Handbuch der Klimakunde*, W. Köppen and R. Geiger, eds. vol. 2, Teil-H, 74 pp.

____ Mittelamerikanische Regenmessungen, 1930 [Rain measurements in Central America]. *Meteorologische Zeitschrift*, vol. 49, pp. 124-25.

____ Regenmessungen aus Guatemala und El Salavador [Rain measurements Guatemala and El Salvador]. *Meteorologische Zeitschrift*, vol. 49, pp. 438-39.

____ Altas zur Landeskunde, Geschichte, Kultur und Wirtschaft eines deutschen Landes [Atlas on geography, history, culture and econ-

omy of some German areas]. *Geographische Zeitschrift*, vol. 38, pp. 225-30.

____ Über die Grenzen der Akklimationsfähigkeit des Menschen [On the limitations of acclimatization capability in humans]. *Geographische Zeitschrift*, vol. 38, pp. 385-98.

____ Klimaänderungen und das alte Mayareich [Climatic changes and the ancient Maya kingdom]. *Gerlands Beiträge zur Geophysik*, vol. 34, pp. 333-53.

____ Indianer und Neger in Amerika [Indians and negroes in America]. In: *Festschrift Karl Uhlig*, pp. 326-32.

____ Die Verbreitung der künstlichen Feldbewässerung [The distribution of artificial field irrigation]. *Petermanns Mitteilungen*, vol. 78, pp. 225-31.

____ Südamerika, Land und Volk [South America. Land and people]. In: *Südamerika. Auslandskundlische Vorträge der Technischen Hochschule in Stuttgart*, vol. 4, pp. 7-25.

____ Die Indianer und ihre Kultur einst und jetzt [Indians and their culture then and now]. *Zeitschrift für Geopolitik*, vol. 8, pp. 235-39, 306-13, 383-87.

1933 Einige Bemerkungen über tätige Vulkane von Guatemala und El Salvador [Some remarks on the active volcanoes of Guatemala and El Salvador]. *Zeitschrift für Vulkanologie*, vol.14, pp. 271-87.

____ Die anthropogeographische Bedeutung der geomorphologischen Gebilde [The anthropogeographical significance of geomorphological forms]. *Geographischer Anzeiger*, vol. 34, pp. 274-81.

____ Über Akklimatisation und koloniale Betätigung innerhalb der gleichen Zonen [On acclimatization and colonial activity within similar (climatic) zones]. *Geographische Zeitschrift*, vol. 39, pp. 385-402.

____ Beiträge zur Ernährungsgeographie von Mittelamerika [Contributions to the geography of nutrition (food) of Central America]. *Ibero-amerikanische Archiv*, vol. 7, pp. 140-52.

____ Quiché und Kekchí. *Ibero-amerikanische Archiv*, vol. 7, pp. 288-94.

____ Die Besitzergreifung Amerikas durch die Indianer [The occupation of America by the Indians]. *Ibero-amerikanische Archiv*, vol. 7, pp. 350-68.

____ Die tropichen Inseln der Südsee [The tropical islands of the South Pacific]. *Kolonische Rundshau*, vol. 25, pp. 156-76.

____ Einige Atolle in der Marshallgruppe [Some atolls in the Marshall Islands]. *Petermanns Mitteilungen*, vol. 79, pp. 289-91.

1934 Geographie der Erdbeben und Vulkane [Geography of earthquakes and volcanoes]. *Petermanns Mitteilungen*, vol. 80, pp. 5-6.

____ Regenmessungen aus Mittelamerika [Rain measurements in Central America]. *Meteorologische Zeitschrift*, vol. 51, pp. 82-84.

____ Mittelamerikanische Regenmessungen des Jahres 1933 [Rain measurements in Central America for 1933]. *Meteorologische Zeitschrift*, vol. 51, pp. 378-81.

____ Regenmessungen von Puerto Castilla, Republik Honduras [Rain measurements of Puerto Castillo, Republic of Honduras]. *Meteorologische Zeitschrift*, vol. 51, pp. 381-82.

____ Die dauernde frostfreien Räume der Erde (zusammen mit R. Geiger) [The permanently frost-free areas of the earth (with R. Geiger)]. *Meteorologische Zeitschrift*, v. 51, pp. 465-68.

____ Klima und Leben in den Tropen [Climate and life in the tropics]. *Pädagogische Warte*, vol. 41, pp. 656-64.

____ Raumbewältigung und Weltverkehr [The mastering of space and world commerce]. In: Karl Haushoffer, *Raumüberwindende Machte*, pp. 278-317.

____ Hydrographie des Maya-Gebietes in Britisch-Honduras [Hydrography of the Maya areas in British Honduras]. *Petermanns Mitteilungen*, vol. 80, pp. 218-20.

____ Der Kulturzustand der Indianer von der Berührung mit den Europäern und in der Gegenwart [The cultural status of Indians at European contact and at present]. *Verhandlungen der 24. Internationale Amerikanisten Kongress, Hamburg 1930*, pp. 73-96.

____ Geographie der altindianischen Landwirtschaft [Geography of ancient Indian agriculture]. *Petermanns Mitteilungen*, vol. 80, pp. 41-44, 118-21.

____ Die feldbauliche Anpassung der Indianer Guatemalas an die geographischen Bedingungen iher Wohnorte [The agricultural adjustment of Guatemalan Indians to the geographical conditions of their place of settlement]. *Actas y Trabajos Científicos del 25 Congreso Internacional de Americanistas, La Plata 1932*, pp. 309-21.

1935 Eine neue Vulkaninsel im japanischen Bereiche [A new volcanic island in Japanese territory]. *Petermanns Mitteilungen*, vol. 81, p. 26.

____ *Geomorphologie der feuchten Tropen* [Geomorphology of the humid tropics]. Leipzig & Berlin: Teubner, 154 pp.

____ Ergebnisse meteorologischen Beobachtungen des nördlichen Honduras [Results of meteorological observations in northern Honduras]. *Meteorologische Zeitschrift*, vol. 52, pp. 116-17.

____ Regenmessungen der atlantischen Abdachung von Costa Rica, 1932-1933 [Rain measurements of the Atlantic slope of Costa Rica, 1932-1933]. *Meteorologische Zeitschrift*, vol. 52, p. 119.

____ Regenfall in der Republik Nicaragua, 1929 und 1930 [Rainfall in the Republic of Nicaragua, 1929 and 1930]. *Meteorologische Zeitschrift*, vol. 52, p. 340.

____ Über Bodenbewirtschaftung der Erde [On soil management of the earth]. *Petermanns Mitteilungen*, vol. 81, pp. 350-57.

____ Romane als Quellen länderkundlicher Erkenntnis [Novels as sources of geographical knowledge]. *Geographischer Anzeiger*, vol. 36, pp. 88-89.

____ Bienenhaltung und Bienensucht in Mittelamerika und Mexiko [Beekeeping and bee management in Central America and Mexico]. *Ibero-amerikanische Archiv*, vol. 9, pp. 13-198.

____ Der deutsche Anteil an der Erforschung Iberoamerikas [The German part of the research on Ibero-America]. *Zeitschrift für Erdkunde*, vol. 8, pp. 375-83.

____ Vulkanismus [Volcanism]. In: *Handwörterbuch der Naturwissenschaften*, 2nd ed., vol. 10, pp. 310-41.

1936 Geographische Zeitschriften in Mittelamerika [Geographical journals in Central America]. *Petermanns Mitteilungen*, vol. 82, p. 136.

____ Kampf mit der Lava des Mauna Loa im Dezember 1935 [Battle with the lava from Mauna Loa in December 1935]. *Petermanns Mitteilungen*, vol. 82, pp. 284-85.

____ Akklimatisation und Rasse [Acclimatization and race]. *Zeitschrift für Rassenkunde*, vol. 3, pp. 225-42.

____ Über Akklimatisation von Weissen in den Tropen [On acclimatization of whites in the tropics]. *Forschungen und Fortschritte*, vol. 12, pp. 427-28.

____ Regenmessungen in Mittelamerika im Jahre 1935 [Rain measurements in Central America in the year 1935]. *Meteorologische Zeitschrift*, vol. 53, pp. 348-52.

____ Geographie und Geschichte der indianischen Landwirtschaft [Geography and history of Indian agriculture]. *Ibero-Amerikanischen Studien*, vol. 1, 98 pp.

____ Die Verapaz im 16. und 17. Jahrhundert. Ein Beitrag zur historischen Geographie und Ethnographie des nordöstlichen Guatemala [The Verapaz in the 16th and 17th centuries. A contribution to the historical geography and ethnography of northeastern Guatemala]. *Abhandlungen der Bayerischen Akademie der Wissenschaften. Mathematisch- naturwissenschaftliche Abteilung*, new ser. vol. 37, 46 pp. [English transl: Gutman, Theodore F., "The Verapaz in the sixteenth and seventeenth centuries: A contribution to the historical geography and ethnography of Northeastern Guatemala. UCLA occasional papers in Archaeology, no. 13, 1985]

____ Fray Bartolomé de las Casas und die Verapaz (Nordost-Guatemala) [Fray Bartolomé de las Casas and the Verapaz]. (Festschrift Georg Friederici) *Baessler Archiv*, vol. 19, pp. 102-07.

____ Pipiles und Mayavölker. Zu Schultze Jena's "Indiana" [Pipil (Indians) and Maya folk]. *Ibero-amerikanisches Archiv*, vol. 10, pp. 78-86.

1937 Zur Frage der Ausbruchsregen und Wasserausbrüche [On the question of rain from eruptions and geysers]. *Zeitschrift für Vulkanologie*, vol. 17, pp. 173-79.

____ Über ein neu endecktes Vulkansystem in der Republik Panama [On a newly discovered volcanic system in the republic of Panama]. *Zeitschrift für Vulkanologie*, vol. 17, pp. 180-85.

____ Mittelamerika [Central America]. *Handbuch der regionalen Geologie*, vol. 8, 160 pp.

____ Beiträge zur Geologie von Chiriquí nach Mitteilungen von R. A. Terry [Contributions to the geology of Chiriquí according to reports of R. A. Terry]. *Geologische Rundschau*, vol. 28, pp. 451-53.

____ Santorin und seine jüngsten Ausbrüch [Santorin (volcano) and its latest eruptions]. *Petermanns Mitteilungen*, vol. 83, pp. 38-41.

____ Grenzfragen der Republiken Guatemala und

Honduras und ihre Folgen für die Kartographie [Boundary questions of the republics Guatemala and Honduras and their consequences for cartography]. *Petermanns Mitteilungen*, vol. 83, pp. 210-11.

____ Vulkanausbrüche bei Rabaul (Neupommern) [Volcanic eruptions near Rabaul (New Pomerania)]. *Petermanns Mitteilungen*, vol. 83, pp. 279-80.

____ Regenmessungen aus der Republik Guatemala, 1935 [Rain measurements in the Republic of Guatemala, 1935]. *Meteorologische Zeitschrift*, vol. 54, p. 33.

____ Regenfall in den Republiken Guatemala, El Salvador, Costa Rica, und Nicaragua 1936 [Rainfall in Guatemala, El Salvador, Costa Rica and Nicaragua, 1936]. *Meteorologische Zeitschrift*, vol. 54, pp. 380-84.

____ Über Höhenakklimatisation [On acclimatization in high altitudes]. *Geographische Zeitschrift*, vol. 43, p. 121.

____ Das Deutschtum in Mittelamerika [On Germanism in Central America]. *Ibero-Amerikanisches Rundschau*, vol. 3, pp. 140-42.

1938 Der Kampf gegen die vulkanischen Gewalten [The fight against volcanic hazards]. In: Première Conférence Internationale pour la protection contre les Calamités Naturelles, Paris, 1937, pp. 124-37.

____ Hans Reck (obituary). *Zeitschrift für Vulkanologie*, vol. 17, pp. 225-32.

____ Ein Beitrag zur Glutwolkenfrage [A contribution to the question of incandescent clouds]. *Zeitschrift für Vulkanologie*, vol. 17, pp. 276-79.

____ Beiträge zur Besitzergreifung Amerikas und zur Entwicklung der altamerikanischen Landwirtschaft durch die Indianer [Contributions to the occupation of the Americas and on the development of ancient American agriculture by the Indians]. *Mitteilungen aus dem Museum für Völkerkunde in Hamburg*, vol. 19, 44 pp.

____ Neue Beiträge zur Bienenzucht in Mittelamerika [New contributions on bee management in Central America]. *Iberoamerikanisches Archiv*, vol. 11, pp. 497-505.

____ Der mittelamerikanisch-westindische Raum als Musterbeispiel tropischer Akklimatisation von Europäern und als Versuchfeld deutscher Ansiedlung [The Central American-West Indian area as a model example of tropical acclimatization for Europeans and as an experiment for German settlement]. *Kolonialische Rundschau*, vol. 28, pp. 313-30.

____ Meine Erinnerungen an den Deutschen Verein in Cobán aus den Jahren 1888 bis 1900 [My recollections about the German Union in Cobán in the years 1888 to 1900]. In: *Deutschtum in der Alta Verapaz. Erinnerungen.* Herausgegeben anlässlich des 50 jahrigen Bestehens des Deutschen Vereins zu Cobán, Guatemala, 1888-1938, pp. 61-64.

1939 Georg Wegener (obituary). *Petermanns Mitteilungen*, vol. 85, pp. 281-82.

____ Regenmessungen aus Mittelamerika, 1937 [Rain measurements in Central America]. *Meteorologische Zeitschrift*, vol. 56, pp. 41-44.

____ Beiträge zum Klima von San José de Costa Rica [Contributions on the climate of San José, Costa Rica]. *Meteorologische Zeitschrift*, vol. 56, p. 83.

____ Über das Problem der Tropenakklimatisation von Europäern, vor allem von Nord- und Mitteleuropäern [On the problem of acclimatization in the tropics for Europeans, especially for northern and central Europeans]. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, vol. (1939), pp. 363-77.

____ Über Höhenschichtung und Arbeitskraft tropischer Rassen [On high altitudes and energy for work of tropical races]. *Geographische Zeitschrift*, vol. 45, pp. 1-10.

____ *Die Ernährungswirtschaft der Erde und ihre Zukunftsaussichten für die Menschheit* [The food economy of the earth and its future outlook for mankind]. Strömungen der Weltwirtschaft, vol. 5, 160 pp.

____ Die Dominikanerprovinz Vera Pa· in Guatemala als Vorbild der südamerikanischen Missionstaaten [The Dominican province of Vera Paz in Guatemala as a prototype of the mission areas of South America]. *Iberoamerikanisches Archiv*, vol. 13, pp. 217-44.

____ Jagdwirtschaft, Tierhaltung und Tierzüchtung der Indianer in vorkolumbischer Zeit [Hunting economy, animal management and animal breeding among the Indians in pre-Columbian times]. *Mitteilungsblatt der Deutschen Gesellschaft für Völkerkunde*, vol. 9, pp. 41-56.

____ Deutsche als Kolonialpioniere in den Tropen [Germans as colonial pioneers in the tropics]. *Zeitschrift für Politik*, vol. 29, pp. 39-52.

1940 Georg Gerland (1833-1919). In: *Lebensbilder aus Kurhessen und Waldeck*, vol. 2, pp. 1-12.

____ Mittelamerika [Central America]. *Geologische Jahresberichte*, vol. 2, pp. 452-59.

____ Ein japanischer Vulkan als Grossförderer von Schwefel [A Japanese volcano as a large-scale conveyor of sulphur]. *Petermanns Mitteilungen*, vol. 86, p. 92.

____ Über Verkahlung und Rutschungen an oberbayerischen Bergen [On calcification and rock slides in upper Bavarian mountains]. *Mitteilungen der Geographischen Gesellschaft in München*, vol. 33, pp. 9-18.

____ Regenmessungen aus Mittelamerika, 1938 [Rain measurements in Central America, 1938]. *Meteorologische Zeitschrift*, vol. 57, pp. 39-43.

____ Zur Ernährungsfrage in polaren Gebeiten [On the questions of nutrition in polar areas]. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, vol. (1940), pp. 214-16.

____ Lamas und Alpacas. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, vol. (1940), pp. 375-84.

____ Die Gebietsansprüche der Republik Guatemala auf Belice (Britisch-Honduras) [The territorial claims of Guatemala on Belize (British Honduras)]. *Petermanns Mitteilungen*, vol. 86, pp. 185-91.

____ Der deutsche Anteil an der Erforschung Iberoamerikas [The German part in the research in Ibero-America]. *Zeitschrift für Erdkunde* (Frankfurt-am-Main), vol. 8, pp. 375-84.

1941 *Der Naturfreund und der Bergsteiger in Vulkangebieten* [Nature lovers and the mountain climbers in volcanic areas]. Ulm: Höhn, 138 pp.

____ *Der Wirtschaftsgeist und die Arbeitsleistungen tropischer Kolonialvölker* [The economic spirit and work performance of colonial folk in the tropics]. Stuttgart: Enke, 167 pp.

____ Das jüngste Mayareich [The latest Maya Empire]. *Ibero-amerikanisches Archiv*, vol. 15, pp. 57-79.

1948 Beiträge zur Frage der Volkszahl und Volksdichte der vorkolumbischen Indianerbevölkerung [Contributions on the question of population numbers and densities of the pre-Columbian Indians]. *Reseña y Trabajos Científicos del 26. Congreso International de Americanistas, Sevilla 1935*, vol. 1, pp. 456-78.

Karl Theodor Sapper, 1866-1945. Life and Works of a German Geographer and Geologist

Franz Termer (1966)

[Translation of *Karl Theodor Sapper, 1866-1945. Leben und Wirken eines deutschen Geographen und Geologen* [Karl Theodor Sapper, 1866-1945. Life and Works of a German Geographer and Geologist], by Franz Termer. Leipzig: J. A. Barth, 1966. (Lebensdarstellungen deutscher Naturforscher, no. 12. Deutsche Akademie der Naturforscher Leopoldina, Leipzig.)]

FOREWORD

The close scientific and personal acquaintance of geographer and explorer Karl Theodor Sapper with Central America and its inhabitants was manifested, after his death in the post-war years, in the desire for a biographical sketch of the deceased; [this] was proposed to me as his student and follower. This I attempted in a biography written in Spanish, which was expanded by adding his bibliography [the publication of which] was lacking at that time. Because of the large number and widely scattered writings of Sapper, and because he himself had never compiled a list of his publications, the assemblage of this bibliography required longer than originally planned, so that both the biography and bibliography could not appear until 1956. They [both] were published in the *Anales de la Sociedad de Geografía e Historia de Guatemala* under the title "Carlos Sapper, explorador de Centro América (1866-1945)."

For the occasion of the centennial of Karl Sapper's birth, it was reported that a German edition [of the biography] was to be published as an honorable remembrance, because of his former membership in the [Deutsche Academie der Naturforscher] Leopoldina, to which he had belonged since 6 June 1917. In that way the opportunity occurred to include in the biography a few additions which in the Spanish text were not given space. In the bibliography a supplement was inserted and altitudinal values in the text were corrected according to the latest results of the land surveys in Guatemala. In biographical sketches one must record a complete picture of his trips to reveal Sapper's character and accomplishments as an explorer, so that today's readers can follow how, with little technical expenditure and financial support, and with what simple travel methods in a difficult tropical environment scientific accomplishments of high quality could still be attained at the end of the nineteenth century.

Prof. Franz Termer
Hamburg-Hochkamp
27 February 1965

YOUTH AND EARLY EDUCATION

Karl Theodor Sapper was born 6 February 1866 in Wittislingen, a small village near the border of Bavaria and Swabia [Württemberg]. Thus his Swabian descent and the nature of this village in southern Germany were clearly apparent in his personality. That is to say, his energy and tenacity to overcome any difficult situation or to withstand bodily fatigue; his jovial character, his optimism and his ability to understand people whose nature was different from his. He grew up in the geographic ambiance of the Jura Mountains, that picturesque area with its rocky crags and limestone cliffs, in which innumerable fossils attracted even the attention of children; mountain chains from whose summits one could discern an extensive view across the Swabian Plateau to the Alps with their snowy peaks. It is a native region that awakens the appreciation of the beauty of nature and instills in youth a desire to undertake long journeys.

The boy was reared in the midst of his large family, protected by his father, who was gifted with rare musical ability. Karl inherited from him a deep feeling for this art that he nourished until the end of his life. He was gifted with a fine ear for music that led him to record even the bird calls when he later trod through the tropical forests of Central America. He played the viola very well and was

able to improvise on the piano admirably. He was always an admirer of Mozart's music.

He took his secondary schooling in the old city of Ravensburg. His weak physical constitution necessarily caused him to learn to overcome fatigue. Thus, since early youth he began to take excursions into the Alps and in that way absorb with pleasure all aspects of the landscape, be it vegetation, animals, landforms, or evidences of cultural creations of inhabitants in the past. During these years the foundation of Sapper's extraordinarily wide interests was formed, which later would manifest itself in his scientific research.

When he left high school in 1884 he had not yet decided whether it might be better to dedicate himself to the study of theology or the sciences. Finally he preferred the latter and enrolled in the University of Munich. Geology so interested him that he chose it as his main subject under the direction of the famous geologist Karl von Zittel. At the same time he continued his excursions into the Alps. At age 21 he undertook a long trip on foot from Munich to Rome, via Brescia, Parma and Florence, and continued on to Naples. His first ascent of Vesuvius impressed him so that he resolved to dedicate himself to the study of vulcanism and to climb more volcanoes in the future.

Having passed the examination for college teaching in 1887, he changed residence to Sicily in order to restore his fragile health in the mild climate of the island; then he spent three months of study in the Zoological Institute in Naples. In 1888 he obtained the doctorate at the University of Munich. As his thesis he presented a geological monograph on the Juifen Mountain in the northern Alps. This work revealed his ability to make exact observations and a great talent for taking topographic measurements and drawing geological profiles.

TRAVEL YEARS IN CENTRAL AMERICA

After completing his education, Sapper's delicate health urgently required a prolonged stay in a temperate climate. Good fortune led him toward a course that would prove to be decisive for his life's calling.

His older brother Richard had emigrated to Guatemala in 1884, when the growing of coffee was being strongly developed in the Republic, mainly in the newly opened areas of the highland forests of Alta Verapaz. People of initiative were attracted to the northern highlands of Guatemala during the last 60 years of the nineteenth century. The region had not yet been exposed to modern economic methods, but a relatively dense local Indian population offered favorable conditions for obtaining labor. The geographical ambiance provided an excellent climate for coffee in the *tierra templada*, thanks to the different altitudinal levels on the mountain slopes, the variable temperatures, and copious rains for most of the year. Only communications were poor. For the most part roads were negotiable only by foot or by horseback; there were few roads for wheeled vehicles. Only Livingston (Guatemala) and Belize (British Honduras) on the Caribbean offered ports for overseas exports.

As one of the first German settlers Heinrich Dieseldorff had established himself in Cobán around 1860 and was soon followed by Franz Sarg. These two established commercial houses in the departmental capital (Cobán) while other foreigners started cultivating coffee that produced the excellent quality product, "Café de Cobán." The success of the first colonists attracted other Germans, among whom were Richard Sapper and Erwin P. Dieseldorff. Richard Sapper's efforts in coffee were so successful that he purchased various lands and fincas. One of these was Chimax (1,300 m. elevation) near Cobán. Later he enlarged his holdings buying virgin land in areas farther north in the department, establishing new fincas in the rain forest. A planter had to live on his holdings, isolated from his compatriots and the mestizo population, and in the midst of his Indian workers, few of whom spoke Spanish, so that the owner had to learn the Kekchí language. During this period the Alta Verapaz was practically unknown scientifically. Little was known of its geography, geology or climate. Only in the far north and northwest, during the demarcation of the boundary with Mexico, had some topographic and hydrographic data been obtained in the drainage basin of the Usumacinta River and its Guatemalan tributaries, knowledge owed to the distinguished German naturalist and engineer, Edwin Rockstroh, as well as to the famous English archaeologist, Alfred P. Maudslay, who had worked in Mayan archaeology in the tropical forests in the northern part of the Republic. But maps were lacking or were inexact. Few astronomical data existed to fix topographic positions, so that many villages and towns were inaccurately placed on maps by as

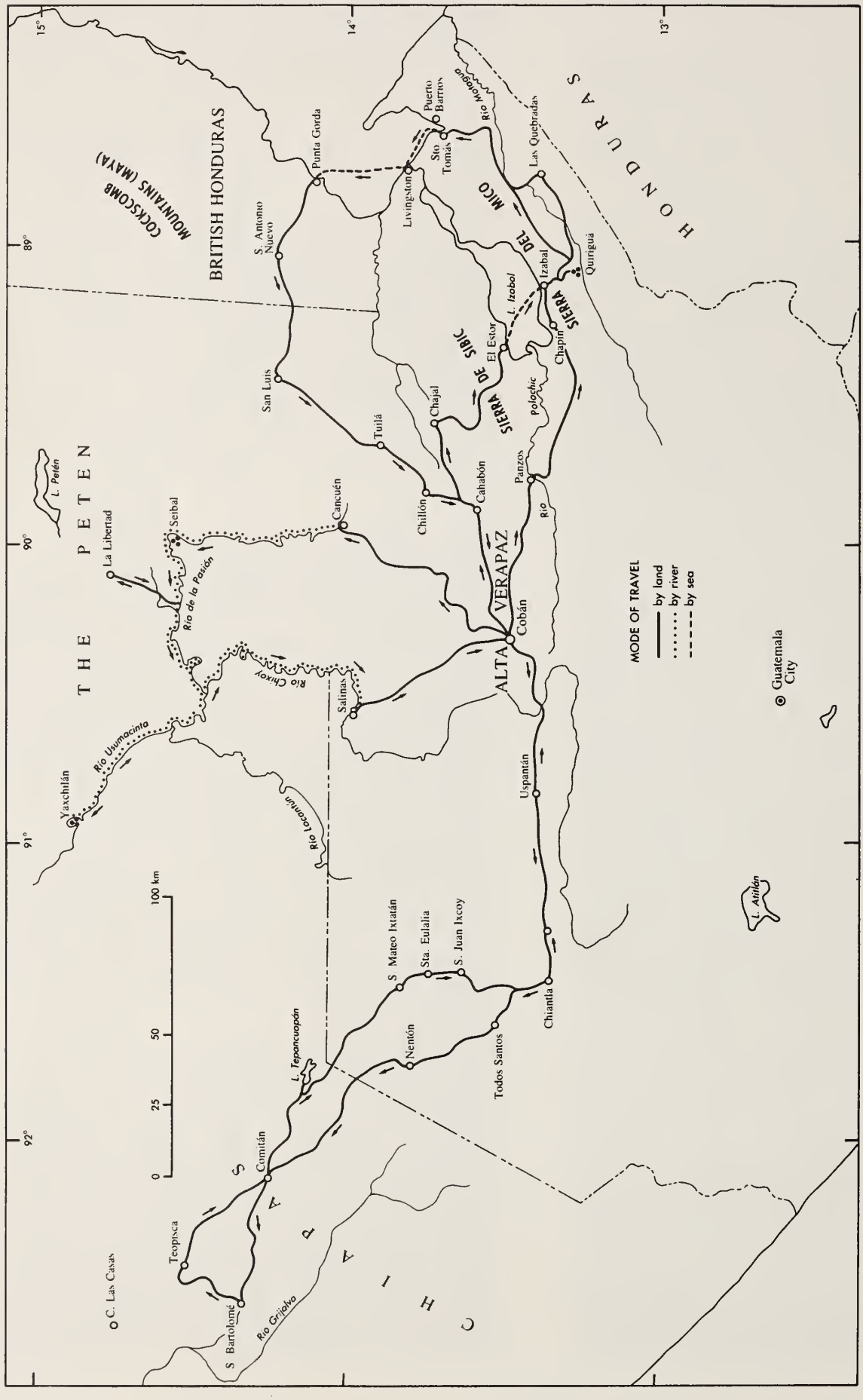

Fig. 7. Sapper's early trips, 1889-1891.

much as several kilometers. All of these circumstances would attract a young, well versed explorer having wide interests.

Such was the situation of the Alta Verapaz when Richard Sapper invited his brother, Karl, to come to Cobán to improve his health in the tropical *tierra templada.* Karl agreed, and after crossing the Atlantic and coasting along the Caribbean shores of Nicaragua and Honduras, landed in Livingston, whence he arrived in Cobán in 1888.

In the pretty colonial-styled departmental capital he encountered a small colony of Swabian compatriots, the vanguard of a group of important planters and merchants who had contributed much to the economic development of the Alta Verapaz. Thus Karl was able to familiarize himself quickly with the life and customs of the country. He mastered Spanish and started to learn the Kekchí language. Soon he visited the area around Cobán to acclimatize himself to the tropical setting. Of course, his interests leaned toward geology, but he realized that such studies depended upon the most exact knowledge possible of the topography. Also, the customs and folklore of the natives attracted him. He recognized the importance of investigating the ethnography of the Indians, of observing their social structure in prehispanic and colonial times, and of studying their spiritual life with its mixture of pagan and Christian beliefs, traits which at that time they still practiced in a more primitive form than three decades later, when the rapid progress of modern technical and economic development had destroyed the typical aspects of the native population.

Karl Sapper had to provide himself with funds to expand his knowledge of the local scene by making extended trips throughout the Republic of Guatemala. Thus, he resolved to take on practical work. He accepted jobs as land surveyor in the fincas, work that proved very useful because it took him to the tierra caliente of the northern Alta Verapez, at that time recently opened to traffic and commerce.

Having earned sufficient funds, in 1889 he undertook his first exploration trip on which he learned the way to travel according to his modest means, his desire to go alone and on foot to observe quietly, and to carry light equipment—techniques that proved to be practical in Central America. Certainly, to travel on foot, to record his route by compass and pace, demanded slow locomotion. This method still today has its advantages over the haste that modern travelers use, traversing the isthmus by car or airplane. Karl could operate in his own way because he arranged to hire as carriers and guides Kekchí Indians whom he could trust, the men having been procured by his brother Richard, who chose them from among his finca workers. Three of them eventually became his permanent companions who untiringly endured good and bad days, suffering hunger and thirst, carrying loads weighing 45 to 50 kilos. Until his last years Karl remembered with deep gratitude his faithful Kekchí, all of whom preceded him in death.

His first trip in 1889 began in the latter part of the rainy season (*invierno*) [fig. 7].[1] He went from Cobán to San Miguel Uspantán by way of the old horse trail, crossing the deep and magnificent transverse valley of the Río Chixoy, and thence via Cunén (1830 m.) to Chiantla (1922 m.) along the majestic escarpment of the Altos de Cuchumatanes, a highly interesting area geologically and geomorphologically. From Chiantla Karl climbed to the summit of La Ventana (3370 m.), and then descended to the picturesque pueblo of Todos Santos (2470 m.), center of the Mam Indians with their rich folklore of Spanish colonial times. Continuing his route along the western slope of the Cuchumatanes, he arrived at the Mexican frontier via the towns of Jacaltengo and Nentón (815 m.). He traveled across the monotonous savannas that were interrupted by "islands" of pines, passing through the hacienda "San Vicente" to Comitán (1,620 m.) on September 18. Without stopping he continued westward by way of the haciendas "Yaalzi" and "Caijob" to Soyatitán (870 m.). Heavy rains caused rivers and arroyos to flood and travel became more difficult day by day. Thus, Sapper was obliged to return to San Bartolomé de los Llanos (790 m.). Having already climbed the Cerro de San Bartolomé (1190 m.), he continued northward via Teopisca (1790 m.) to Amatenango (1820 m.), the village of Yerba Buena (2230 m.), and the hacienda "Ahayax," arriving again at Comitán September 27. Despite the inclement weather he continued his journey to the Laguna de Tepancuapán (1450 m.) and the hacienda "Jotola" (1500 m.), to Gracias a Dios (1230 m.), a lonely place at the sharp turn of the Guatemalan border. Then he climbed a wretched trail to the Cuchumatanes Plateau where he followed the old colonial route via the Chuj Indian pueblos San Mateo Ixtatán (2540 m.), Santa Eulalia (2590 m.), Soloma (2240 m.) and San Juan Ixcoy (2170 m.). Once again he found himself in Chiantla whence he returned home via the same road he had negotiated at the beginning of the trip.

In November of 1889 Dr. Sapper arrived in the capital city of Guatemala for the first time. From there he undertook an excursion to the valley of the Motagua to Zacapa (220 m.) and Gualán (130 m.), traveling during the middle of the hot dry season (*verano*), which made that part of the narrow wind-protected valley a veritable oven.

He spent the year 1890 in Cobán and in the Alta Verapaz arranging his observation notes made during the last trips and occupying himself in practical work by surveying the coffee plantations. At the same time, together with the planter Edwin P. Dieseldorff, he made some archaeological excavations in a limestone cave near the pueblo of Santa Cruz (1390 m.). He also investigated various mounds in the Sierra de Panpacché northwest of San Cristóbal Cajcoj. He sent part of the ceramic finds, mainly clay figurines, to the Royal Museum of Ethnology in Berlin and presented other objects to the Ethnographic Museum in Stuttgart. In the future he lacked the opportunity to continue such studies, although he was always interested in Maya archaeology, manifested not only by the numerous plans of Maya ruins made on his trips in Central America, but also by his many archaeological papers published even in his old age.

With the end of the rainy season, in October of 1890 he undertook a trip from Cobán to Lake Izabal. Passing through San Pedro Carchá (1280 m.) and Senahú (990 m.), he descended via the hacienda "Trece Aguas" (870 m.) to the valley of the Polochic River as far as Panzós (50 m.) [fig. 7]. He took a difficult trail which at that time followed the southern edge of the valley through a virgin rain forest, today well cleared by banana plantations. He forded many large streams that flowed copiously from the extremely steep slopes of the Sierra de las Minas. He passed through ponds and swamps, reaching the village of El Chapín (15 m.) near the shores of Lake Izabal. From there he arrived at the town of Izabal (10 m.), crossed the Sierra del Mico over a slippery trail and visited the ruins of Quiriguá (20 m.), returning via Puerto Barrios and Livingston to Cobán. In his account of the excursion he left to posterity one of the most beautiful descriptions of Lake Izabal, a jewel of Guatemala, that vividly impresses all who might enjoy the sublime tranquility of a tropical scene, the green shores of the lake dominated by mountains clothed in dense forest, and the play of atmospheric colors that alternate with bright calm days and those of sudden rainstorms. Permit me to note here that Karl Sapper never took photographs during his Central American trips. He was not a photographer, like the contemporary investigators, the archaeologists Theodor Maler and Alfred P. Maudslay. On the other hand he left us his wonderful descriptions of landscape that equal those that Friedrich Ratzel composed with a masterly hand.

In 1891 we find Dr. Sapper as administrator of the "Campur" coffee finca (850 m.) in northern Alta Verapaz, a property of his brother. Several months as manager gave him an opportunity to become well acquainted with the Indian workers. Subsequently he acquired greater practice in the cultivation of coffee on the finca "Chiacám" (850 m.), and thus retained throughout his life a keen interest in the economic development of the tropics. His stay on the latter finca was interrupted by a second journey, from March through April 1891, that led him from "Chiacám" into the northeast of the Republic, to the southern part of the British colony of Belize (British Honduras), and thence to the southern section of the Petén. His route took him from "Chiacám" to Cahabón (280 m.), by foot, accompanied by his carriers, across the mountains to the north along a miserable trail northward to the village of Chajal (190 m.), then southward across the forested Sierra de Sibic to El Estor (10 m.) on Lake Izabal, which he crossed in a small sailboat to the pueblo of Izabal [fig. 7]. He then followed the old colonial road that he had traveled previously across the Sierra del Mico to the valley of the Motagua, arriving at Las Quebradas (70 m.). At that time a North American company was exploiting gold mines in the area (one Mr. Knight, the manager). Sapper inspected pre-Columbian mounds and platforms in the vicinity before continuing his trip to the coast, often through torrential rains. He crossed the Motagua River near Tenedores (27 m.), climbed through a defile north of San Francisco Tequincó (150 m.), arriving at the port of Santo Tomás on April 6. There he had difficulty in obtaining lodging, for there were no hotels. He finally found shelter in a private house, but since he traveled on foot with Indian carriers, the locals were a bit shy of him. After taking a sailboat across the bay to Livingston (10 m.), he decided to continue through British Honduras, attracted by the geology and geography of the Cockscomb Mountains, today called the Maya Mountains.

As soon as he arrived at the small port of the Punta Gorda, he began his trip into the interior, stopping near the foot of the Cockscombs at the pueblo of San Antonio Nuevo (120 m.). Kekchí

Indians were living there, having started in former years to immigrate into British Honduras owing to trouble with the authorities of Alta Verapaz. An advance into the mountains was not deemed prudent, because Sapper felt that he was not sufficiently equipped for the difficult undertaking, and the season was not favorable. Thus, traveling westward, Sapper and his carriers crossed the Río Sepusilhá (350 m.) to the pueblo of San Luis (440 m.) in Guatemalan territory (April 18). There the travelers found one Maya family, some Kekchí, and two Mexicans, apart from two Guatemalan government employees. In San Luis, Sapper started to return across the deep limestone chasms south of the town. Crossing the Río Cancuén (240 m.) and passing through the villages of Tuilá (310 m.) and Chillón (200 m.), situated in an arid area, he arrived at Cahabón 27 April 1891.

Hardly a month later he was ready for another long excursion, during which he fulfilled his wish to become acquainted with the Petén, the jungle-covered part of northernmost Guatemala. For the trip he chose the months of June and July, a period of less rain [*veranillo*] during the wet season, so as to pass more easily through the swamps. He left Cobán June 3 on horseback for the finca "Setal" (730 m.), located in the foothills of the sierras farther north. From there he continued on foot with his carriers eastward and northeastward to Chibut (320 m.) near the Río Chajmayic (170 m.); from there he went northward across limestone country, uninhabited and waterless, via a terrible trail to the Río San Simón, whose full-flowing limestone springs formed the most picturesque place of the trip. North of the river within the plains of the Petén they encountered the small hamlets of San Antonio (230 m.) and Xalihá (190 m.) before arriving at the logging camp of El Porvenir on the Río Cancuén, an upper tributary of the Río de la Pasión [fig. 7]. From there two of the carriers returned, so that Karl Sapper had to continue his journey with only one boy. He descended the river by canoe, passing the ruins of Seibal, discovered in 1889, and arrived at the Río Subín, a northern tributary. Above its confluence he found the place of Paso Real (80 m.). The trip by canoe lasted five days, during which Dr. Sapper drew a sketch of the course of the Río Cancuén. Finally he arrived at the village of Paso Tanahí on the Río Subín, where the river trip ended.

At that point his remaining carrier had to return to Cobán because of a wound, but fortunately Sapper was able to obtain pack mules and drivers to transport his equipment, he and the arrieros following the animals on foot as far as La Libertad (170 m.). Sapper stopped there several days, enjoying the hospitality of the firm Jamet y Sastré, at that time famous for its traffic in lumber. He still was not sure of the route he should take to return to Cobán, when the opportunity arose to continue the trip west to the Río Usumacinta, thus necessarily abandoning plans for an excursion to Lake Petén. On the first of July he departed on horseback, accompanied by an agronomist of the Jamet y Sastré firm. They traveled through savannas and swamps to Paso Tanahí and thence (by boat) down the Río Subín to its confluence with the Río de la Pasión and down the latter to the logging camp of La Unión (or Akté) during days of heavy downpours typical of the area during the rainy season. From this place Sapper visited one of the few Lacandón camps that existed at that time east of the Usumacinta.

Proceeding down the Usumacinta, they passed the confluences of the Chixoy and Lacantún rivers, arriving at the logging camp of La Constancia, then located on the east bank of the river, but moved to the Río Lacanjá before 1895. A geologic reconnaissance of the area was impossible owing to the high water of the river, so that Dr. Sapper was obliged to rest for a few days among the inhabitants, who were afflicted by fevers and other tropical ailments. Only by July 17 was he able to move on, arriving as far as the logging camp of El Desenpeño, where he stayed for several days. He was then able to visit the ruins of Yaxchilán (70 m.), which impressed him profoundly. His notes are characteristic of the way he observed: ". . . with astonishment and wonderment I observed the massive temples and buildings with their characteristically beautiful workmanship executed in the excellently preserved bas-reliefs. The strong canopy of the rain forest arches silently over the site; shrubs and trees grow out of the cracks in the ruins; in slender, gracious lines the lianas climb to the top of the structures or in friendly embrace hang from the building blocks, from the base of which sprout splendid palms; all this presents a distinctive contrast between the shapely beauty of the living plant world and the rigid lines of the man-made buildings; nothing rests in the forest, and if one enters a building, entire flocks of bats fly out to escape the unexpected intrusion. God knows: this is a place of dreams, reflections and meditations on the fleeting nature of things in this world. Nonetheless, one remains consoled and

reconciled by the beauty and exuberance of the vegetation, even though contemplation of the ruins incites sad thoughts."

Those who have visited the famous ruins of Palenque before and after the clearing of its forest for archaeological purposes, will confirm Karl Sapper's remarks as to the importance that vegetation lends to the enjoyment of Maya ruins placed in the midst of virgin tropical forests.

From Yaxchilán our traveler undertook his return upriver, again passing by La Constancia and arriving at the confluence of the Chixoy on July 30. He entered the latter and following its meanders passed by the villages of Santa Elena and El Limón as far as the Salinas de los Nueve Cerros (130 m.), where on 9 August 1891 he encountered some carriers sent by his brother Richard. With them he started on August 10 the return to his point of departure, which he carried out via the finca "Cubilgüitz" (290 m.), reaching Cobán on August 13. Only one who has suffered the hardships of walking through those regions at the height of the rains can fully appreciate the fatigue that Karl Sapper underwent on that trip.

In November 1891 we find our scholar again on an excursion to the southern margins of Lake Izabal. Following a narrow trail he traveled along the south bank of the Río Polochic, crossing through heavy virgin rain forest via Las Tinajas. From there he visited the ruins of Chacujal, which in 1525 were visited by a contingent of the Hernan Cortés party. Via Machaquita he went as far as the villages of Chapín and Izabal. From those points he returned to Cobán.

Up to then Karl Sapper's travels had permitted him to reconnoitre the geography and geology of northern Guatemala, never before accomplished by any modern explorer. During these trips he gathered valuable data for special maps, thanks to his notes and sketches of routes on both land and river. And he gained fame as an author describing vividly the landscape and the tropical scene. Moreover, he took pains to write up his impressions and publish them not only in scientific journals for the learned, but also general accounts for the interested public. Thereby he obtained international fame as an expert on countries that he investigated scientifically.

After returning from his Lake Izabal trip Sapper spent several weeks working as a planter on the "Chibut" finca (ca. 350 m.) located in northern Alta Verapaz, where he experimented with the cultivation of Castilla rubber trees and sarsaparilla root. But already in 1892 we find him in the eastern part of Guatemala. Departing from Gualán (130 m.) in the arid Motagua Valley and proceeding south via Roblarón and Hacienda Grande (730 m.), he reached Copán, where he stopped to visit the Maya ruins. Next, he went to Jocotán (479 m.) and turning southward by way of Santa María Olopa (1350 m.) he arrived at Esquipulas (950 m.) in the vicinity of which he made several geologic surveys. He then traveled northwest and west via Quezaltepeque (620 m.) and Ipala (823 m.) and climbed Ipala volcano (1650 m.) to the south of the pueblo [fig. 8]. This was the first of his many ascents of the volcanoes of Central America. He had climbed 60 in all when he finally ended his trips in 1928. With the Ipala volcano he returned (from his initial introduction in southern Italy) to the study of vulcanism in Central America, an important and special work he engaged in during subsequent travels. Thus he continued and refined the earlier vulcanological work begun by the French geologists A. Dollfus and E. de Mont-Serrat as well as the German K. von Seebach, and since then Sapper became the leading vulcanologist for Central America. From the current trip he returned to Cobán, passing through Pinula (1098 m.), Jalapa (1362 m.) and Salamá (940 m.).

On 13 June 1892 Sapper began another study trip on volcanoes, which proved to be extremely arduous owing to the rains. He left Cobán via Uspantán, Sacapulas (1196 m.) and Santa Cruz del Quiché (2020 m.) and proceeded to Huehuetenango (1900 m.) after a side excursion to the ruins of Cometancillo (1800 m.), located on the southern slopes of the Río Negro valley, and where he found a well-preserved ballcourt. Walking along the lower edge of the Cuchumatanes and skirting the Mam Indian town of Chimaltenago (1800 m.), he descended to the Río Selegua Valley, arriving at San Pedro Nectá (1510 m.). He continued down valley to Trapechillo (1240 m.) and climbed a treacherous trail to the steep Cerro El Papal (3180 m.), whose slopes can be seen rising in the distance from many heights of the Altos. From there Sapper descended southward to Cuilco (1160 m.) in the torrid, cactus-covered valley of the Río Cuilco. Again he ascended the volcanic massif to the south, passing through El Carrizal to Tectitán (2180 m.), a typical Mam Indian village, and to Tacaná (2440 m.), a commercial center in extreme western Guatemala. From there he climbed Tacaná volcano (4092 m.) on 2 July 1892 and descended to the Mam village of Sabinal (2580 m.). He

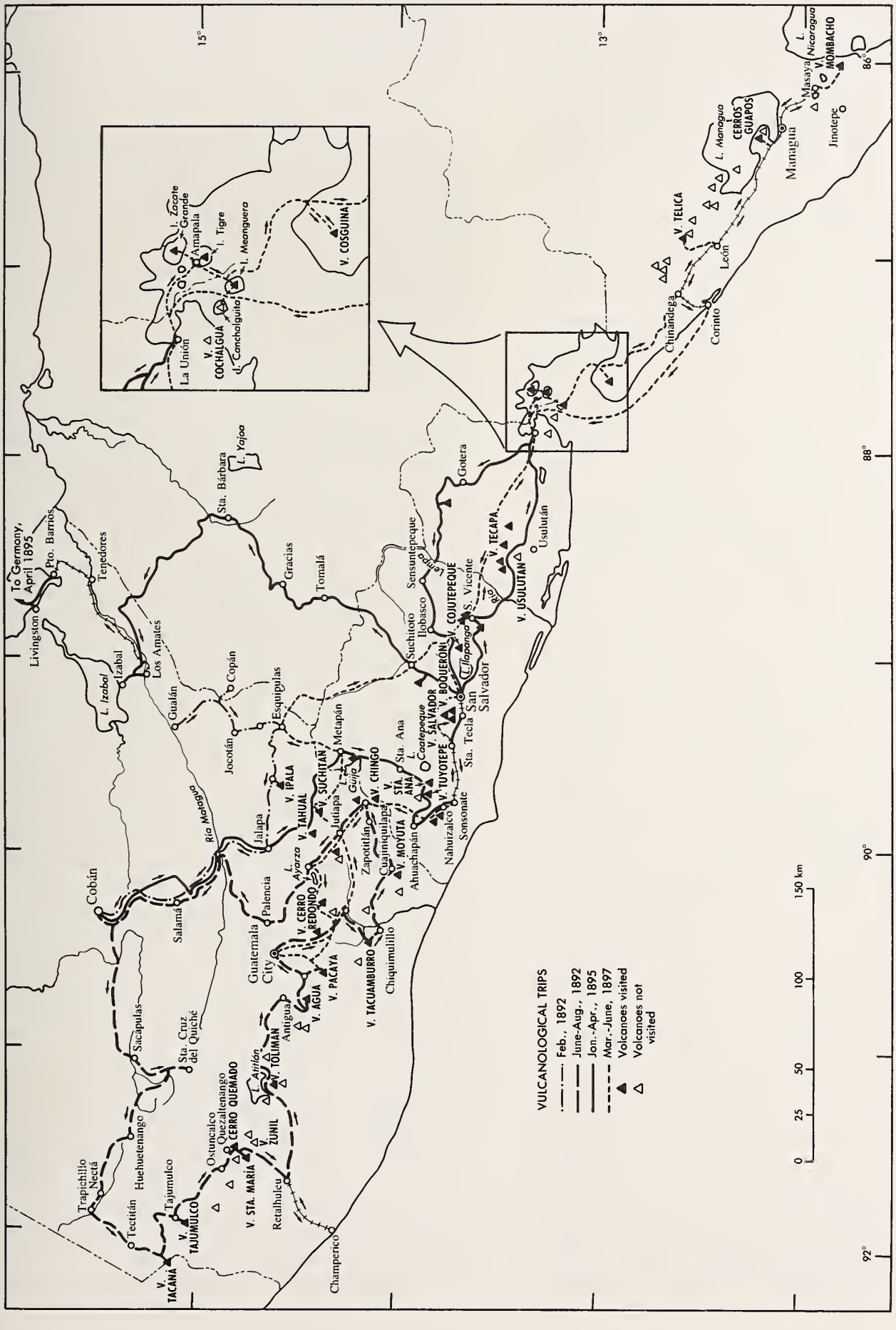

Fig. 8. Sapper's vulcanological trips, 1892-1897.

then traversed the Ixchiguán Plateau (3230 m.), ill famed because of the cold of its high altitude. Detouring from the road to San Sebastian, on July 4 he succeeded in ascending Tajamulco volcano (4220 m.), the highest point in Central America.

The frigid air caused the temperature to fall to 2.2 degrees Centigrade, and on the following day the summit revealed itself covered with a layer of snow, a phenomenon rarely observed on the volcanoes in northern Central America having elevations over 3500 meters above sea level. Sapper descended into the crater that was covered at the bottom with snow. His Kekchí boy, who had never before seen snow, was filled with wonder and called the snow in his native language "Ratzam li ke," which means "the salt of the cold."

On 6 July, after a hard march, Sapper was in the Valley of Pinel at the foot of Cerro Quemado (3027 m.) which he had reached passing through El Suj (2600 m.) and San Juan Ostuncalco (2502 m.). He climbed the western slope of the Cerro, a dormant volcano, along a difficult trail and reached the summit that was so engulfed in cloud that it was impossible to make observations. He descended by the same trail and spent the night in an Indian ranch on the northeast slope of Santa María volcano (3772 m.), which he ascended July 8, also amidst clouds and fog. From the same ranch he took the old route of the Quiché Indians toward the coast by way of Santa María Jesús (1604 m.) to the town of Retalhuleu (239 m.), which he entered July 9 after an outstanding trip over an old Indian trail that connected highland with lowland and which Pedro de Alvarado, the Spanish conqueror of Guatemala had followed in 1524. Having completed an excursion to the port of Champerico nearby, he left Retalhuleu July 11 and traveled through the coastal plain via Chicacao (494 m.) and the finca "Metzebal" and ascended the escarpment of Los Altos, arriving at Santiago Atitlán (1592 m.). Taking the road that follows the southern shore of Lake Atitlán, Sapper climbed to the lava dome called Cerro de Oro, 300 meters above the lake level. The same day he reached San Lucas Tolimán (1591 m.). On July 15 he climbed the double cone of Tolimán volcano (3158 and 3134 m.) and the following day continued on from San Lucas via the heights that border the eastern side of the lake, passing through Godínez (2165 m.) as far as Patzún (2235 m.). He spent July 19 going through Patzicia (2090 m.) to La Antigua (1530 m.), the earthquake-ravaged colonial capital of Guatemala. The 20th we find the scholar passing through Santa María (690 m.) and climbing Agua volcano (3766 m.). He then continued via Amatitlán (1200 m.) and Pacaya (1540 m.) as far as the hacienda "Las Calderas" (1780 m.) located on the northern slope of Pacaya volcano (2552 m.) which he climbed on the 21st. Because of strong winds he could stay only a short time at the summit. He immediately descended to Amatitlán, passing again through "Las Calderas" and entered the capital city of Guatemala on the 22nd. After a few days' rest Dr. Sapper made a quick call on Edwin Rockstroh, known for his meritorious work on the cartography and topography of the country, and on the 30th continued his trip to the southeast of the Republic.

On that trip he passed by the Cerro Redondo (1080 m.) to the Valle de los Esclavos and the sulphureous lake of Ixpaco (1120 m.). On August 2 he ascended the Tecuamburro volcano (1962 m.) from the hacienda "Tempisque" (1340 m.), where a nearby volcanic vent was seen. He immediately descended to Chiquimulilla (295 m.) and there recorded a vocabulary of the peculiar Xinca language, apparently unrelated to other Central American tongues. On August 3 he crossed the Río de los Esclavos on a swinging bridge (hamaca) and approached the sierra in a north and northeastern direction.

The hamlets of Santa Ana (1320 m.), Estanzuela (1290 m.) and the hacienda "Santa Bárbara" (860 m.) marked the route that he had to follow to explore a volcanic mass called La Cruz, part of the deeply eroded valley of the Río de los Esclavos. In contrast, the old road, used in prehispanic days, leads to the low coastal plain of southeastern Guatemala, from Chiquimulilla, via Nancinta and Pazaco, the route that Pedro de Alvarado took on his march to conquer Cuzcatlán in El Salvador. Karl Sapper crossed the rapid Río Santa Margarita (370 m.) where it flows in a hot depression covered by xerophytic vegetation. He passed by the "Melchor" hacienda (800 m.), arriving at the pueblo of Moyuta (1283 m.), from which he climbed the Moyuta volcano (1662 m.). He searched in vain for linguistic remnants of the little known language of Moyuta and Conguaco, at that time already extinct. He visited Conguaco (1233 m.) going northward as far as Jalpatagua (557 m.) in order to continue the trip eastward by way of the old camino real to Comapa (1250 m.). In those two pueblos the Pipil language was still spoken, a Nahuatl dialect formerly widely used along the Pacific side of Guatemala. On August

7 he crossed the deep barranca of the Río Paz (450 m.) on his way to Zapotitlán (880 m.) and took the road leading northward, over the hills near Papaturro (1040 m.) toward the pueblo of Chingo Arriba (720 m.). From the finca "El Joto" (830 m.) he ascended the Chingo volcano (1783 m.) on August 8. In Chingo Arriba his Kekchí companions insisted on returning to Alta Verapaz; thus Sapper had to interrupt his journey to return via Jutiapa (1906 m.), Mataquescuintla (1650 m.) and Palencia (1330 m.) to Cobán, arriving 18 August 1892, "healthy and happy, although somewhat thin," as he wrote later. His notes characterize the nature of that excessively difficult trip:

"At times the journey has been very hard; occasionally we were less than adequately supplied with food, because it was not possible to purchase sufficient supplies in the small pueblos. Also at times the weather treated us badly. But there was no disproportion between the great expenditure of bodily strength and the aesthetic pleasure that stemmed from the trouble suffered in climbing volcanoes, in contrast to the excursions in the forest-covered sierras in central Guatemala. I can't fail to recommend to all alpinists who visit these areas that they climb the high volcanoes, so close to the more important cities of the country. In fact, a magnificent panorama awaits the tourist, and the exertions are relatively minor."

Sapper spent the rest of 1892 finishing a geologic map of the Republic of Guatemala, scale 1:500,000, which he sent to the World's Fair at Chicago. There it was awarded a prize, but it disappeared without a trace after the fair's closure. The loss later caused Sapper to draw another, on which he depicted the routes of his trips completed at that time. The well-known German firm of Justus Perthes of Gotha published it in 1899 at a scale of 1:1.1 million in Ergänzungsheft no. 127 of the *Petermanns Geographische Mitteilungen.* This was the first exact modern map of the country. It has the advantage that all the unsurveyed river courses are shown as broken lines, which increases the scientific value of this map; it also shows, besides Sapper's routes, those of previous travelers.

Meanwhile Karl Sapper received from the Mexican government a proposal to join the geological service of that country to carry out surveys in Chiapas, Tabasco and Yucatan. He accepted the offer with pleasure and left Cobán in January 1893. Passing through the Guatemalan capital, he continued to the port of San José and embarked for Salina Cruz (Mexico) where he arrived January 16 [fig. 9]. He traveled across the Isthmus of Tehuantepec by rail and on the 19th began a trip, partly by horse, partly on foot, across the state of Oaxaca bound for the capital city of Mexico. Crossing the gloomy, mountainous homeland of the Zapotecs via Tlacolula (1620 m.), he entered the city of Oaxaca (1560 m.) January 24.

After a quick look at the famous ruins of Mitla, he took a train from Oaxaca to Puebla and Mexico City, arriving there January 29. While formalities for his admission to the Institute of Geology were being arranged, Sapper climbed the volcano Nevado de Toluca (4578 m.) from the town of San Juan (February 12-14) and Popocatepetl (5452 m.) from Amecameca (February 17-20). At last he was able to leave for his investigations in Tabasco and Chiapas.

He entrained to Orizaba to climb Citlaltepetl, or Pico de Orizaba (5747 m.), leaving from San Andrés Chalchicomula, and by the first of March the traveling scholar was in the port of Veracruz whence two days later he embarked for Coatzacoalcos. He then conducted a short excursion up the Río Coatzacoalcos to Minatitlán to acquaint himself with the geological formations of the area and to learn of local mining activity. On the 8th he continued along the Gulf of Mexico by boat to Frontera in Tabasco and the next day up the Río Grijalva to San Juan Bautista (Villahermosa) where he obtained supplies for a trip into the interior. In those days such a trip involved many inconveniences and almost unimaginable hardships compared with today's facilities, and much more since Sapper lacked his Kekchí companions. He followed the meanders of the rivers Grijalva and Blanquillo as far as Pichucalco (100 m.), arriving 16 March 1893. From there travel difficulties began, obliging him to forward to Tuxtla Gutiérrez part of his equipment using hired Chontal Indian porters. On March 22 he left with an experienced guide to make a geological reconnaissance of the trail. He walked via Solosuchiapa (225 m.) to the Río Teapa through heavy rain forest. An excursion to the gold and silver mines of Santa Fe (510 m.) gave him valuable information on the status of mining in remote transisthmian Mexico. The trail became ever more difficult with steep ascents to the summits of the foothills of the sierra of northern Chiapas encountered near the hacienda "Zacualpa" (390 m.) on March 25. As the trail became increasingly narrow within the highly decomposed outcrops covered with slippery mud, he had to

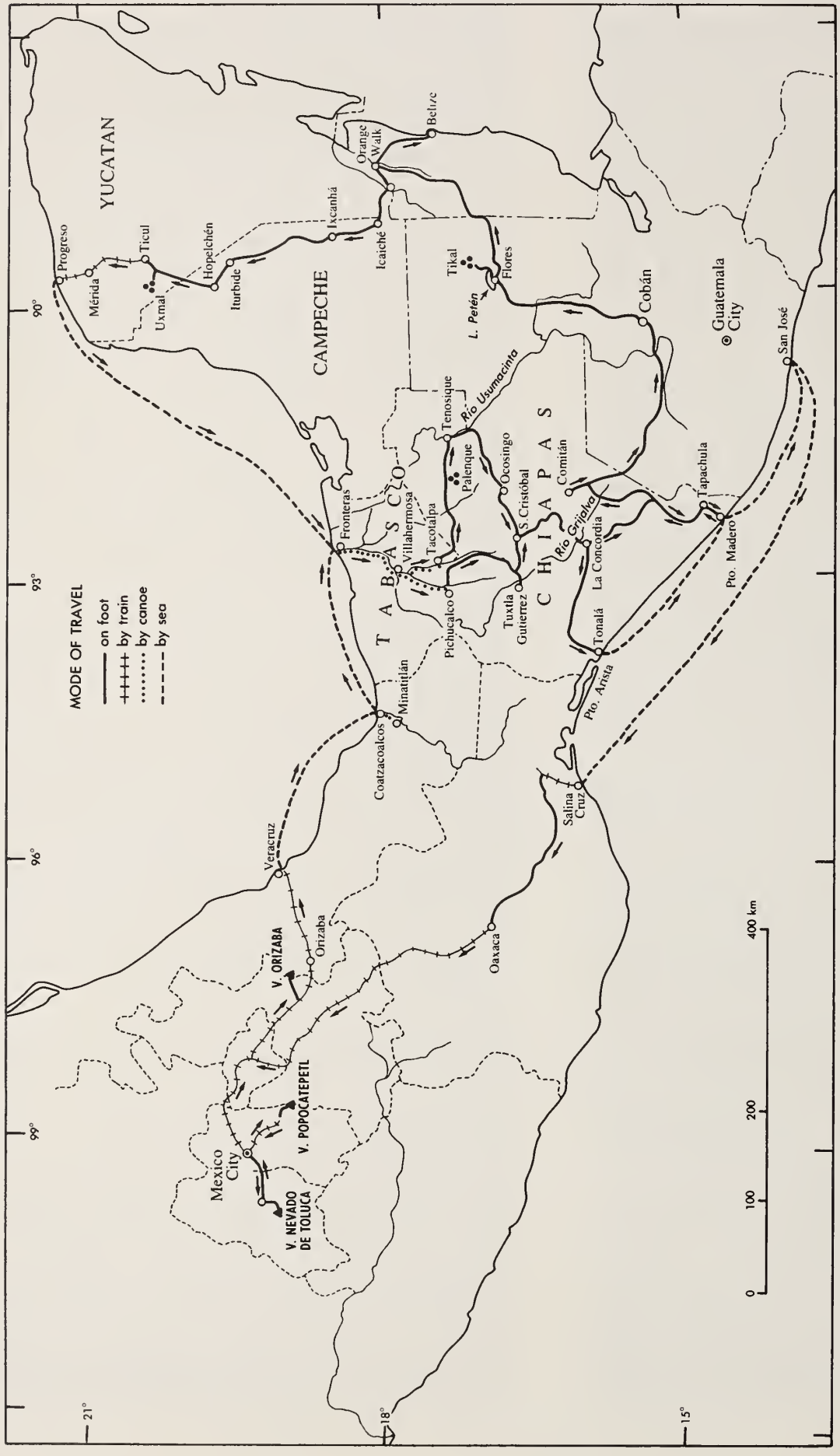

Fig. 9. Sapper's field trips under auspices of the Geological Survey of Mexico, 1893-1894.

unload the pack animal, he and his guide carrying the load on their shoulders. He then reached the summit of La Ventana (2040 m.) after passing through the hamlets of Ixhuatán (515 m.), Tapilula (820 m.) and San Bartolomé Comistlahuacán (1385 m.) and entered the pine- and oak-covered areas typical of the Chiapas highlands. The trip down to El Sacramento (990 m.) was along one of the worst trails that Sapper had ever negotiated until then; he later described it in the following manner:

"It is really a crime on the part of the state of Chiapas to have such detestable paths as main lines of communication without having made any attempt at maintenance. Here the horseman has to travel on foot, for it would be dangerous to ride along a steep and narrow trail that on one side is bordered by a perpendicular rock wall, while on the other a bare slope falls suddenly into an abyss. A pack animal that stumbles here falls to the bottom of the valley without stopping and without possibility of salvation."

Beyond the [Atlantic] watershed the trail descended into the valley of the Río Sacramento, passing by the important pre-Columbian ruins in the valley of Sabina to Sacramento hacienda, where Sapper arrived on March 26. He left the same valley near Rosario hacienda (890 m.) to cross again a mountainous barrier in which he encountered the villages or towns of Bochil (1100 m.), San Vicente Soyalo (1390 m.) and Tenestaquín (1090 m.). He then descended via Iztapa (1070 m.) and Calvario hacienda (1040 m.) to the basin of the Río Grijalva or Chiapa, and passing through the towns of Chiapa (today Chiapa de Corzo, 420 m.) entered Tuxtla Gutiérrez (536 m.) on April 1. Only a year previous, in 1892, the governor Emilio Rabasa, for personal reasons, had raised this city to the rank of state capital. Formerly the capital had been the old and pretty colonial city of San Cristóbal de las Casas (2113 m.) which enjoys a delightful and healthful climate in the *tierra fría* in contrast to the hot, dry ambiance of Tuxtla Gutiérrez. Sapper continued his trip from Tuxtla Gutiérrez via Chiapa and the salt deposits of Iztapa to San Cristóbal Las Casas, which delighted him as it has all travelers up to the present. On April 12 he crossed the plateau with four carriers en route to the canyon of Mitztón (2400 m.) and descending by way of San Bartolomé de los Llanos (790 m.) and Soyatitán (870 m.) arrived at Amatenango (815 m.). Along this trail Sapper found the extensive prehispanic ruins of Bolonchac (1150 m.) near the summit of a "volcano," from which the surrounding Indians had carried many stone idols to their homes. He arrived at Laja Tendida hacienda (545 m.) on April 17 and affirmed that the steep conical hill was not a volcano, as the locals had pretended, but a limestone formation, at whose summit he found a place where Indian witchcraft was practiced. He crossed the Chiapas River near San José de la Canoa (530 m.) on April 19 and walked through the stiflingly hot basin to La Concordia (530 m.), where he studied the salt deposits. Continuing westward he went through the Frailesca de Chiapas, a dry, hot area that extends from the south bank of the river to the Sierra Madre [de Chiapas]. Then Sapper climbed the northern slope [of the range] to the summit at Rastrojo (ca. 1440 m.), passing by El Carmen (520 m.), Trinidad (620 m.), Santa Bárbara (740 m.), and down to the lowland of Soconusco, arriving at the Barra de Tonalá (today Puerto Arista). After a short stop in Tonalá (55 m.) he continued by ship to San Benito (today Puerto Madero), a small roadstead for the busy commercial city of Tapachula (180 m.). From there he began a geological profile across the eastern part the Sierra Madre [de Chiapas]. He walked via Huehuetán (35 m.), Mazapa (1220 m.) and Amatenango (860 m.), followed the valley of the Cuilco River passing by Tapitsalá (700 m.) to Cuxhú (740 m.), crossed the Río de Chipas near Santa María (610 m.), and, via Zapaluta (1530 m.), arrived at Comitán. From there he returned, always on foot, to Cobán, where he ended his trip end of May.

He took advantage of the rainy season [*invierno*] resting from the rigors of his trip and evaluating his route, geological profiles, and observations, as well as preparing for new trips for the following year. The Yucatan Peninsula was one of the areas that interested Sapper, and for his purpose it seemed to him that the most appropriate route would be through Alta Verapaz, but making a detour through British Honduras, and then southeast and south, turning north across the peninsula. At that time this was a risky enterprise, because the so-called "Race War" (Guerra de las Castas), chiefly in eastern Yucatan, had not yet terminated and the local Maya Indians of Chan Santa Cruz still [considered themselves] as good as independent and carried on a merciless war against whites and mixed-bloods.

Departure was set for January 1894. Sapper started on this onerous trip with three Kekchí Indians, a trip that was to traverse little-known areas in the very center of the peninsula. It was a land that had been abandoned since the time when

brave missionaries penetrated the dense rain forest during the 16th and 17th centuries in search of the last independent territory of the Mayas located on the shores of Lake Petén.

Sapper left Cobán crossing southern Petén as far as the town of Flores (127 m.) and visited the extensive ruins of Tikal (ca. 220 m.). Using the old mule trail that runs east from Lake Petén, from Flores he set out for British Honduras. He found the Maya ruins of San Clemente (250 m.) at a distance of no more than 200 meters from the trail amidst the rain forest; he drew a plan of the archaeological site and continued his journey via El Cayo (60 m.), Branch Mouth (55 m.) and San Pedro (60 m.), going north, then east, as far as Africa, located on Labouring Creek, thence down New River as far as Fireburn (20 m.) and Orange Walk. There, he was informed that his plan to pass through the territory of Chan Santa Cruz Mayas was impossible because of the social-political situation of those Indians, who were still at war with Mexican government troops and who were hostile to all foreigners. Thus, Sapper decided to follow another route west of that area across territory held by peaceful Indians who resided in small areas that were practically independent, called Ixcanhá and Icaiché, in the present state of Quintana Roo.

Before embarking on that expedition Sapper visited [the town of] Belize and returned by boat to Orange Walk February 20. The next day he left for Corazalito on the Río Hondo, which he crossed. After a three-day march through uninhabited forest he reached Icaiché (163 m.) on February 25, 1894. Because of his official title of "geological engineer" in the service of Mexico, he was feted by the Maya governor, "General" Tamay. Sapper departed the poor little village accompanied by three additional Maya carriers, who knew the trail. The hikers passed along many series of limestone hills and through dense rain forest in which they found little drinkable water. Near the trail Sapper discovered the ruins of Ixtintá (230 m.), and farther north the forest became less dense. March 6 they arrived at the modest hamlet of Halutún (250 m.), which no longer exists, and entered the zone of dry forests in Yucatan. Again, along this part of the trail Sapper found various archaeological sites. He passed by the small Zooh lagoon (240 m.), a dry lake, as the Mayan name indicates, where later an important logging camp and plyboard factory were formed.

On March 8 the group reached Ixcanhá (250 m.), center of the second independent territory of the Yucatecan Maya, governed by "General" Eugenio Arana. Without stopping Sapper continued his trip via Chunchintok (80 m.) to Iturbide (140 m.), where the Mexican government had installed a military base with a telegraph office, at that time the southernmost in the peninsula. Having visited the ruins of Dzibilnocac on March 15 he encountered en route in the pueblo of Hopelchen (60 m.) the famous archaeologist and photographer Teobert Maler. On March 16 we find our scholar in Santa Elena (60 m.) where two Mexican gentlemen, members of a German colony established during the period of Maximilian, still lived. Sapper visited the ruins of Uxmal (80 m.) on March 17 and went on to Ticul (25 m.), where he dismissed his Mayan mozos of Icaiché and continued on to Mérida by train with his faithful Kekchí. He always recalled his rest amidst the kind inhabitants of this beautiful city. On March 24 he embarked with his Kekchí at El Progreso for Tabasco and arrived at Fronteras.

The trip to Yucatan resulted in important geological and morphological knowledge of the southern and central parts of the peninsula. Unfortunately, all of the samples of stones, rocks, and fossils gathered on the trip were lost, because the Mayan carriers from Icaiché secretly discarded them en route. They thought that collecting the samples was a crazy idea of the scholar and to carry them was not worthwhile.

The result of the trip was an important treatise on the geology of Yucatan, which in many respects information given on the central part of the peninsula has not been improved upon and still serves as background for modern geological research in the area. Today with profound admiration we realize the vigor and energy of Karl Sapper, who, unsatisfied with his exhausting journey to Yucatan, immediately embarked on another no less fatiguing trip across the uninhabited northeastern and eastern parts of Chiapas.

He began this trip in Villahermosa navigating the Río Blanquillo and Río Tacotalpa, as in the year previous, to the town of Tacotalpa (60 m.). From there he traveled on foot along the slope of the Sierra Chiapaneca eastward. From Jicotencal (80 m.) he climbed to Moyos (680 m.) and proceeded via Sabanilla (330 m.) and Tila (1160 m.) to Tumbalá (1620 m.). He descended northeastward along a bad trail to San Pedro Sábana (180 m.), located on the Tulijá River, and visited the Maya ruins of Palenque (210 m.); this site impressed him deeply, as it probably has every visitor, even at present, despite the widespread clearing of the

virgin forest. He continued his trip crossing an uninhabited area, and always following along the foot of the sierra, crossed the Chicama River and arrived at the Río Usumacinta near Pomoná and finally reached Tenosique (60 m.). From there he went westward, walking along the southern bank of the Usumacinta to the hamlet of San Antonio where he traversed the river. There followed an especially difficult section of the trip over narrow paths and trails with innumerable twists and turns in the limestone mountains through virgin forest. He crossed the Río Chocoljá (120 m.), negotiated the narrow dolomite canyon of Espejo (530 m.), and descended to Lake Pethá (620 m.), as he called it, now known as Laguna Metzooc. Along its shores he found a group of Lacandón Indians, from whom he was able to obtain for the first time valuable knowledge of their primitive civilization.

Sapper then walked westward, passing by lakes Caribe (680 m.) and Los Pinos (910 m.) toward the valley of the Río Santa Cruz (630 m.) where he detoured via El Real (630 m.) to the hacienda Tecajá (560 m.). He took the trail that leads along the mountain slopes north of the valley of the Jacaté River, via the hacienda San Antonio (890 m.) and studied the ruins of Toniná (980 m.) before arriving at Ocosingo (890 m.). He continued walking to Sivacá (975 m.), Cancuc (1430 m.) and Tenejapa (1970 m.) until he reached his route taken in 1893 near San Cristóbal las Casas, where he arrived May 17, 1894.

He then proceeded to southern Chiapas to complete geologic observations made the year before, following the road from San Cristóbal via Totolapa (670 m.) and Laja Tendida (545 m.) in the Río Chiapas basin which he crossed near San José de la Canoa (510 m.). From La Concordia (530 m.) he proceeded southeastward along the Sierra Madre [de Chiapas] and passed by San Antonio (540 m.) and San Vicente (540 m.) as far as Chicomucelo (580 m.). There he had the good fortune to obtain a vocabulary of the Chicomucelteco language, thereby introducing it for the first time in modern linguistic study. He then climbed the Sierra Madre and via Mal Paso (700 m.) and Porvenir (2800 m.) arrived at Motocintla (1300 m.) where, again, he recorded a vocabulary of the Mayan language, Motocintleco. From Mazapa (1200 m) he returned to Cobán, traveling through Huehuetán, and Tapachula to the port of San Benito, and by boat to San José, Guatemala.

On this second expedition made through request of the Mexican government, he obtained the first data on the geology of the central part of the Yucatan Peninsula and the southeastern section of the state of Chiapas. Many of the altitudinal measurements made then are still today the only ones that exist of those parts of transisthmian Mexico. Also the first modern observations on life and the cultural and social status of the Lacandones in eastern Chiapas were of great importance, so much so that Alfred M. Tozzer thoroughly investigated this Mayan tribe 12 years later, beginning the most exact studies on the ethnology of this small remnant of Mayan people in the tropical rain forest. Soon afterwards the tribe rapidly diminished, as shown by other recent visits by ethnologists, such as that of Jacques Soustelle and lately by the investigations of the untiring Franz Blom and Gertrude Blom-Duby. Thanks to their impartial work and their sympathy with the deplorable fate of this remnant indigenous population that previously was dominant in the humid lowlands of Chiapas and Guatemala, the last vestiges of their culture were saved for ethnological science. With respect to Karl Sapper it can be said that his second trip to Mexico was a first in the geographical exploration of the transisthmian area of that country.

After his return to Cobán, Dr. Sapper needed a rest. Nevertheless, he interrupted the months of recreation to make a short trip for vulcanological studies and to perfect his observations that were badly made in 1892 when impeded by inclement weather. Besides, he wanted to familiarize himself with the cultivation of coffee on the southern coast of Guatemala. He enjoyed a few days of rest in Antigua Guatemala, an enchanting city that Sapper used to proclaim the most beautiful, after Cuzco in Peru, which he visited in 1928. He made a stop in Retalhuleu (240 m.) and in the finca Santa Margarita, a short distance north of the departmental capital. He then continued to Los Altos [the highlands] where he repeated the ascents of volcanoes Santa María (3772 m.), Cerro Quemado (3027 m.), San Pedro (3020 m.), Tolimán (3158 m.), Atitlán (3537 m.), and finally Acatenango (3975 m.). For the remainder of the year Sapper dedicated himself to correcting and analyzing his geologic reconnaissance in Mexico.

Having made an agreement with the Mexican government for three years' work, he was obliged to travel for a third time into that republic; but that trip did not take place, because the political status between Mexico and Guatemala at that time became quite delicate, and, in addition, because the

doctor's health became too weakened by attacks of malaria, which prevented his stay in the humid forests. One event demonstrates the energy and will of the scholar to dedicate all of his time to his work, and again we see him disposed to undergo a trip in January 1895. His program consisted of vulcanological reconnaissances in El Salvador and geologic observations in the republic of Honduras. Finally Karl Sapper later decided to accompany his brother Richard to Germany, because a prolonged change of climate was necessary to give the explorer new strength to his weakened constitution.

Thus, Sapper left Cobán January 11, 1895 by horseback and journeyed via San Cristóbal (1330 m.) and Tactic (1470 m.) to Purulhá (1560 m.), a town situated at the northern foot of the Sierra de las Minas. There he found his three competent Kekchí companions who had arrived in advance at that point, where the party began the trip on foot. They climbed the slope of the Sierra along a traverse less steep than farther east. They passed through the villages of Unión Barrios (1620 m.) and Niño Perdido (1,560 m.) and descended to San Jerónimo (990 m.) located in the hot basin of Salamá. Sapper and party followed the main trail that leads into the Baja Verapaz to the valley of Motagua via the town of Morazán (370 m.) and crossed the Motagua River at the Rancho de San Augustín (220 m.). The travelers forded the river at place where at present there is a hanging bridge, constructed during the administration of president Lázaro Chacón. The trip continued southward along the trail, which, zig-zagging through the valley of Guastatoya, passes through the villages of Amates and San Ignacio and ascends to the city of Jalapa (1380 m.) [fig. 8].

Before entering the latter city, Sapper climbed the Volcán de Jamay (2160 m.) that rises to the east of the road. Immediately thereafter he suffered strong attacks of fever, so that his daily marches across the hot chaparral-covered plain of Las Monjas were very short. Along the road he observed various archaeological sites. On January 21 he was on the shore of Laguna del Hoyo (1000 m.), located at the bottom of a lateral crater of Tahual volcano. Unfortunately, he could not make the ascent to the top of the main crater (ca. 1700 m.).

Later he traveled through the savanna amidst the gourd trees [*Crescentia alata*], a plant formation typical of eastern Guatemala, passing through the villages of Sabaneta (1130 m.) and La Arada (1090 m.), dominated to the south by the impressive Suchitán (or Santa Catarina) volcano (2043 m.). Sapper had to forego visits to this mountain as well as others in the area, because of fatigue. He walked eastward to the pueblo of Santa Catarina, passing through Papalhuapa (880 m.) and its small volcano as far as Piñuelas (800 m.), where the road turns southeastward toward Matalapa and Metapán (520 m.). Here Sapper entered the republic of El Salvador, whose rich cultivated areas and pretty aspects of the countryside profoundly impressed him, and whose affable people left him pleasant remembrances. He described his impressions in the following phrases:

"When the association with the inhabitants is very agreeable, the beauty of the country should not be neglected. Here the exuberant tropical forests of Guatemala and southern Mexico are almost totally lacking; equally absent are the large mountain massifs that we admire in northern Central America; nor are there the extraordinary variety of climates and vegetation and the outline of the picturesque sierras and varied animal life that lend special attraction to the trips in Guatemala; but nevertheless the scenes of El Salvador offer much beauty, and with pleasure I remember my trips in this small, fortunate and densely populated country."

These comments reveal his reaction to the difficult trips in the Petén, Yucatán and Chiapas, in contrast to that of 1895 made in open countryside with vast horizons.

Sapper left Metapán for San Diego (400 m.), climbed the volcano of that name (813 m.), and visited the pre-Columbian ruins located on the eastern shore of Lake Güija near Zacualpa (520 m.). The next day he crossed the outlet of the lake near the village of Desagüe (440 m.) and walked through Texistepeque (420 m.), Cujucuyo (380 m.) and San Jacinto (400 m.) as far as Santa Ana (660 m.). He stopped there only a short time to continue via San Antonio (700 m.) and Metasano (830 m.) to the finca La Montañita (1290 m.), arriving January 29. He climbed the volcano of Santa Ana (2181 m.) on January 30 and the following day continued to Naranjo volcano (1984 m.). He then descended to the village of Juayúa (1030 m.) and continued northward by San Juan de Dios (1470 m.) to the hacienda Cuyanasul (1180 m.) from which he visited the famous mud geysers, known since the Spanish colonial period of the sixteenth century. Later he reached the city of Ahuachapán (760 m.) and then went south via Apaneca (1460 m.) and Nauizalco (540 m.) to Sonsonate (200 m.).

From there he left with his Kekchí Indians by

train to La Ceiba, where at that time the rail line ended, but was projected to reach the capital city via Santa Tecla. Sapper took the route that today corresponds to the Interamerican Highway. In Santa Tecla he again took the train, arriving in San Salvador February 6, 1895. This railway is now abandoned, after the line was built running north of the slopes of Boquerón volcano, passing by Sitio del Niño and Quezaltepeque. Today the old line is an embankment without rails along the side of which the Interamerican Highway was constructed between the capital and Santa Tecla.

Karl Sapper was generously entertained in the prosperous Salvadorean capital by Dr. Prowe, a German physician interested in geographic and ethnographic studies of El Salvador. However, our traveler did not rest for any length of time, since already by February 10 and 11 he had climbed San Salvador volcano (1950 m.) and its neighbor, the densely forested Boquerón (1890 m.) and had made the difficult descent to the bottom of the deep crater which at that time contained a small lake. Soon he began his walking trip toward the eastern part of the country. He chose the route south of Lake Ilopango, and passing through the towns of San Marcos, San Miguel Tepezontes (800 m.), and San Juan Tepezontes (800 m.), he crossed the deep canyon of the Jiboa River and continued northeastward to Santa María Ostuma (600 m.). He ascended the eastern peak of San Vicente volcano (2173 m.) from the town of Verapaz (620 m.) located in a fertile plain at the foot of the double-peaked mountain (also called Chichontepec), and descended by way of Istepeque (500 m.) to the city of San Vicente (450 m.).

He then took the road along the eastern slope of the volcano visiting the ruins of Opico situated on the land belonging to the hacienda León de Piedras (today San Diego). First mentioned by G. E. Squier in the 1850s, the site to this day has never been investigated. From Tecoluca (250 m.) he proceeded eastward to the hacienda Guajoyo (70 m.) on the right bank of the Río Lempa. He continued walking southward to Callejas (50 m.) where he turned east and northeast via Redoncito (50 m.), approaching the group of Usulután volcanoes. He ascended the grade toward San Agustín (290 m.) and El Arenal hacienda, located on the north slope of Taburete volcano (1171 m.), which he climbed to the crater rim as he did that of Tecapa (1603 m.). He soon arrived at the town of Santiago de María (930 m.), where he began to investigate the volcano of Usulután (1453 m.) before entering again the lowlands near Santa Elena (190 m.). He walked through San Rafael (180 m.) and Calle Nueva (60 m.), passed Jocotal Lake (35 m.) and following the east bank of the Río San Miguel, arrived at Lake Camalotal (0 m.), today L. Olomega. On the detour to the south and east, passing the town of Camalotal (today Olomega), he encountered the old *camino real* that runs between San Miguel and the Bay of Fonseca; he joined it near the village of El Carmen (120 m.). He followed this road as far as Sirama (10 m.) and then turned south to the town (260 m.) and volcano (1250 m.) of Conchagua.

From La Unión Sapper began his return trip, not by any direct route, but detouring through the eastern part of the republic to study older volcanic phenomena in contrast to the more recent volcanoes near the coast. At the village of Sirama he turned north via Tisate (170 m.) and Yucuaiquín (510 m.) as far as the city of Gotera (260 m.). Turning northwest toward the volcanic massif of Cacaguatique (1651 m.) and passing by Chilanga (350 m.), he stopped in the town of Cacaopera (580 m.), taking advantage of the opportunity of gathering a vocabulary of the little known Cacaopera language, at that time nearly extinct. This work was not published until 1920 by Dr. Walter Lehmann. (*Die Sprachen Zentral-Amerikas*, Berlin 1920. vol. 2, pp. 616–18.)

Sapper again turned westward toward Osicala (640 m.) and San Simón (620 m.) and climbed the andesitic massif of Cacaguatique (1651 m.), afterward descending to the town of the same name (950 m.). He continued westward, passing by Belén (640 m.) and San Luis de la Reina (570 m.), a village near the Lempa Valley, which he crossed near San Juan (90 m.) to arrive at the city of Sensuntepeque (760 m.). He traversed an area of volcanic tuff that was highly dissected by erosion, toward the town of Ilobasco (720 m.) and farther south, near San Rafael, he reached the "camino real" that today is the route followed by the Interamerican Highway. He climbed Cojutepeque volcano (1020 m.) and then returned to the capital, San Salvador.

Whoever has visited the eastern part of El Salvador during the months of February and March will remember the annoyance caused by the fine volcanic dust that covers the entire area changing the color of the vegetation to a monotonous grey and, besides, affects breathing and covers the sky with tiny particles, obscuring the horizon and scenery. When all this coincides with the thin smoke produced from burning fields at the end of

the dry season, from March to April, a grey-brown layer of air covers the countryside, through which only the peaks of the volcanoes that rise over 2,000 meters are discernable. The surface heat demands even more energy from the traveler to support the physical and mental fatigue of daily journeys. And in the case of Dr. Sapper, we must also consider that at the same time he was suffering from malarial attacks. Thus we can understand that our traveler might have wished to rest a long while in San Salvador. However, he limited his rest to a few days, and on March 19, 1895 left the capital with some Indian carriers to cross Central America from the Pacific to the Atlantic.

Leaving the capital he took a northeastern route, where deep canyons have carved the white volcanic deposits as far as the thriving towns of Tonacatepeque (650 m.) and San José Guayabal (590 m.) within the rough slopes of Guazapa volcano. From the hacienda Montepeque (630 m.) on March 20 Sapper climbed to the top of this volcanic mass which had been badly eroded into steep crests and ridges positioned radially around the peak called El Roblar (1,410 m.). From this isolated point, when the atmosphere is clear and translucent, one may enjoy one of the most perfect panoramas of El Salvador. But Sapper was not so favored, owing to the thin smoke of the burning fields that dimmed the view. Also, he was assaulted by an attack of fever that prevented him from making observations. Unfortunately, also, the rock samples were lost later during the trip.

Consequently he returned to Montepeque and on March 21 took off for Suchitoto (390 m.), walking across the dry area without shade and covered with the lamentable volcanic dust until he reached the Río Lempa (230 m.) which he crossed on a raft. He continued on his way to Chalatenango (340 m.), where he obtained food for the ascent into the sparsely settled Honduran highlands. On March 22 he went through a pass (790 m.) between spurs of the high and massive mountains and descended via Zapotal (640 m.) along rough and rocky trails to the Río Zumpul which he crossed at an elevation of 230 m. above sea level. Soon he entered the town of Guarita (880 m.), already in Honduran territory. He found the town nearly deserted and for that reason could obtain food only with difficulty. On March 24 he took the trail up a deep and winding valley as far as the hamlets of Tambla (1110 m.) and Tomalá (1050 m.), where he entered an area of pine forest characteristic of the landscape of western Honduras. Arriving at the hamlet of San Lorenzo (750 m.) he climbed a slope north of town, reaching an altitude of 2000 meters. He felt relieved by the freshness of the pine and oak forests, after having suffered so much in the dry, hot climate of El Salvador. He appropriately described the landscape with the following words:

"Truly, rarely have I seen so mountainous a region as southwestern Honduras. Not because the ranges reach considerable heights, but principally because the deep valleys with their steep slopes composed of volcanic rock formations always force the trails to descend to the valley bottoms and to abandon the heights once gained."

From Colosuca (1560 m.) Dr. Sapper descended northward to the valley of the Mocal River (1100 m.) and then climbed to the nearly abandoned town of Coloete (1410 m.), and from there to the continental divide at an elevation of 1770 meters above sea level. The trail passed through pine forests and mountain meadows as far as the city of Gracias (710 m.). Sapper continued his trek downstream along the eastern bank of the Río Mejocote, crossing it via Paso de Guayaba in order to ascend northeastward to a range covered by dense forest of large conifers and oaks—a sparsely inhabited area. Passing by the hamlet of Conal he arrived at the valley of the Río Cargaco whose lower course is called Río Balaja and which, after its confluence with the Zacapa River empties into the Río Ulúa. Thus, Sapper arrived at the departmental seat, Santa Bárbara (190 m.), from which his route continued north and northeast. He crossed the Ulúa River near the hamlet of Gualojo (150 m.) and passed through a very hot area arriving at the town of Colinas (380 m.) where there was a scarcity of food. He then proceeded across a range within the jurisdiction of the village of Cuchillo de las Tablas (930 m.) and forded the Chamelecón River near the small town of La Criba (220 m.). In Sula (230 m.) he began the ascent of the mountain on the frontier of Honduras and Guatemala, that is, the steep Sierra del Espíritu Santo, covered by virgin rain forest. Part of the trail was especially tiring because of lack of water. He descended from the crest (1360 m.) by way of a steep trail to the valley of the Motagua River, which he crossed at Las Quebradas (70 m.), a place he had been on a previous trip and whose gold mine he visited once again. He then took the usual route to Izabal, where he hoped to meet his brother Richard with his family in order to sail with them to Europe. This was April 8, 1895; but Richard had been obliged to delay his departure from Cobán.

To make use of this involuntary wait, Karl decided to employ the two weeks for another excursion to the Sierra del Espíritu Santo, a trait typical of his energy and overpowering drive.

To this end he returned with his Indians to Los Amates (80 m.) in the Motagua Valley. He traveled by train as far as Tenedores (25 m.) and crossed the river by canoe. On April 12 he climbed via a narrow path to the summit of the Sierra del Espíritu Santo (1030 m.) and descended to the valley of the Chamelecón from which he continued to La Criba and La Florida. He again crossed the same range northward visiting El Paraíso (740 m.), a place that had been recently established by a religious sect. In the vicinity he discovered some pre-Columbian ruins. The path descended along the Rio Morjá to the Motagua; and, finally, Sapper entered Los Amates on April 19. He visited again the ruins of Quiriguá and returned to Izabal where he found his relatives.

Now assembled, the group sailed from Livingston April 28, 1895. The ship set out for Jamaica, touching at Puerto Barrios and Belize. The brothers, Richard and Karl, took advantage of the stop in Kingston for an excursion across the island through Spanish Town, Evarton, Moneague [Montego?] and St. Ann's port on the north coast. On May 7 they left for New York. Hardly had he landed in this metropolis Karl suffered a grave attack of fever. The Sapper family finally left the New World on May 16, arriving in Hamburg on the 22nd, and by the 24th Karl reached Swabia which he had not seen for seven years.

Several months of rest and recreation until autumn followed his arrival. The scholarly traveler jealously dedicated himself to the preparation of the results that he obtained in Central America and even attended the classes and seminar of the famous paleontologist Professor Dr. von Zittel at the University of Munich. Although Karl had continued his fondness for music in Cobán, where he had formed a small orchestra, he playing the viola, many times he attended opera and concerts to make up for so many musical abstentions during his peripatetic life. In November 1895 he returned to Guatemala.

Some time earlier Karl Sapper had received an invitation to undertake a geologic reconnaissance in the British colony of British Honduras (Belize), an invitation proffered officially by Governor Sir Alfred Moloney. He accepted with pleasure, because in that way he was able to realize the project that so long ago he had formed to make a traverse of the Cockscomb Mountains [Maya Mountains].

Around the first of January 1896 he departed Cobán with his three Kekchí carriers [fig. 10]. He utilized the rainy season, still dominant in the northern lowlands, to undertake a trip to the northwestern part of the Republic of Honduras. As in 1895, he traveled first southward to Purulhá (1560 m.) and climbed the summit of the Sierra de las Minas, passing through the hacienda Sabó (1300 m.) and the town of Panimá (560 m.). The trail followed along the crest of a lateral extension of the sierra and passed over a stretch so narrow (caused by landslides) that the travelers had to traverse it by straddling on the seat of their pants. Neither before nor after in Central America did Sapper encounter so narrow a crest.

Passing through the village of Chilascó (1860 m.) he descended to the Motagua Valley and arrived in Zacapa (220 m.) where he continued the trip upstream along the Río Copán via Jumusná-Jocotán (479 m.) and Camotán (471 m.) as far as Copán. After another short visit to the [Maya] ruins he took the trail to Santa Rita (670 m.), crossed the range (1320 m.) that separates the Copán and Chamelecón rivers near the village of Río Armarillo (790 m.), and arrived in La Florida (490 m.). The route to La Criba (220 m.) was the same he had traversed in 1895. He then hiked the old horse trail along the Chamelecón River downstream as far as the important trade center, San Pedro Sula (550 m.), and without stopping finally entered Puerto Cortés.

During the last days of January he traveled by boat to Belize, where he prepared for the expedition into the interior of the British colony. He departed the capital on foot in a northerly direction, passing over the plains along the bank of Belize River and arrived in Orange Walk which he knew previously. To obtain food he went to the town of Corozal and returning to Orange Walk followed New River upstream via Fireburn (20 m.) and Hill Bank to Africa. There he turned westward as far as Yalbac (40 m.) and then south and southwest via San Pedro (60 m.) and El Cayo (60 m.), where he stopped a few days before starting the trip to the Cockscomb Mountains.

Fortunate is the one who may have seen under a clear sky the notched crests of this group of mountains, for most of the year covered by dense, black threatening clouds—an uninhabited area profoundly dissected by erosive forces and whose suggestive name "Cockscomb" was recently changed to "Maya Mountains." Only by great efforts an English expedition from the coast, in

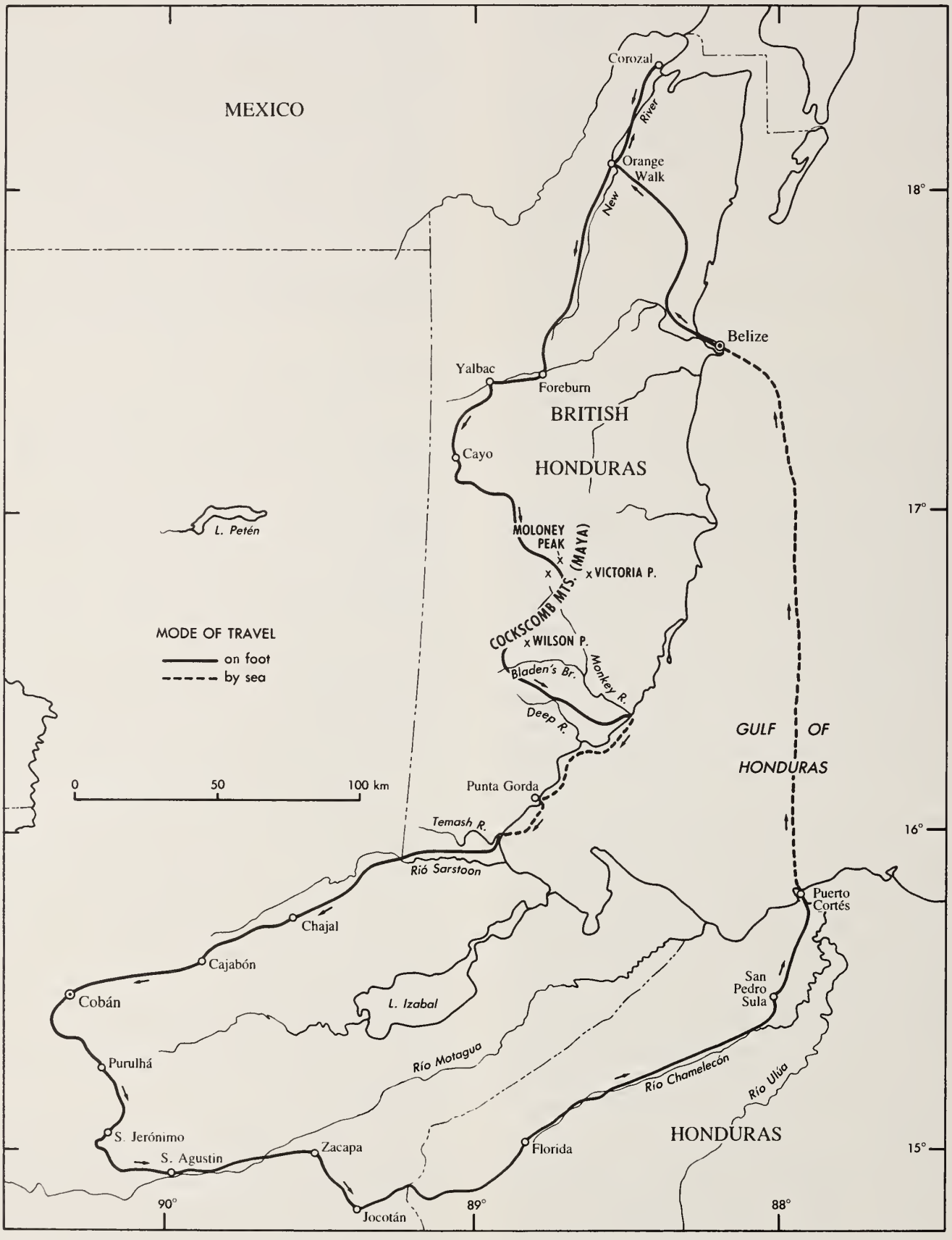

Fig. 10. Sapper's trip into British Honduras (Belize), 1896, under auspices of the British colonial government.

1888, penetrated as far as the highest point called "Victoria Peak" (1023 m.). Karl Sapper now wanted to reach the same peak from the other side, that is from the west and to traverse the range southeastward toward the sea. Taking into account the small number of members of his expedition and their modest equipment, such an undertaking was quite adventurous. The group left El Cayo March 3, 1896, via San Felipe, a coffee finca, and climbing the steep calcareous range, reached a small granitic mesa covered by piney woods and meadows, where they found the village of Pine Ridge (370 m.), the last settlement in this region. Nearby Sapper discovered some Maya ruins consisting of platforms [terraces?] with stairways constructed of granitic flagstones. This archaeologic site was the only one found during the entire trip. On March 5 Sapper had gained Fowler Peak (930 m.) in very difficult terrain that called for continuous ascents and descents between crests and canyons, and, in addition, the crossing of deep valleys that extend in directions perpendicular to the route. There were no trails so that the hikers had to open paths through the woods. Proceeding in this manner, they could advance only five kilometers daily. They crossed the source of the Pasión River (560 m.) on March 10 and Sapper climbed Moloney Peak (980 m.) a summit which forms the beginning of the crest of the Maya Mountains. Dr. Sapper tried to reach the very top of the peak, but thick clouds and fog covered the rough, almost perpendicular quartzite cliffs, each separated from another by deep chasms filled with virgin forest. He and his Kekchí companion, Botzoc, finally succeeded in climbing to the summit of "Allan Peak" (915 m.) without being able to ascend Bellamy Peak (820 m.) and "Victoria Peak," as the weather turned excessively bad. Their provisions were diminishing and the surface relief was getting increasingly dangerous, so that the continuation of that part of the excursion became impossible. Consequently they determined to go southwestward toward San Antonio. The small group then entered the lonely mountains along the slopes of "Wilson Peak" (990 m.). The difficult terrain, poor in game and edible plants, forced the exhausted men to move southeast to reach the coast and adequate shelter more quickly. They followed the crests, valleys, rivers, and finally a waterless limestone area as well as the deep canyon of Bladen's Branch (115 m.), source of Monkey River. After a pathless trek that lasted three weeks through virgin forest, our explorer found a trail that led to Williams' logging camp on Deep River. Nearly dead from hunger, the hikers were hospitably received by the black Carib lumberjacks on March 27. After passing through pine-covered hills, rain forests, and cultivated fields, they finally reached the mouth of Monkey River and by canoe navigated along the coast of Punta Gorda on the Guatemala border.

It might be supposed that Sapper would take a long rest after the most wearisome and dangerous of his expeditions, but as an example of another proof of his energy he stopped only two days in Punta Gorda. Already on March 31 we find him on a boat bound for Barranco and the mouth of the Temash River. Incredibly, from there he returned to Cobán on foot. His route led him through the rain forest between the Temash and Sarstoon rivers. He walked from San Pedro Sarstoon (20 m.) upstream via Chajal (220 m.) and Chipacché (400 m.) to Cahabón, reaching Cobán in April 1896. This stupendous feat was made possible only through his bodily strength acquired during his stimulating sojourn in Germany the previous year. The prize he obtained [from the Belize trip] was the knowledge, still today unsurpassed, of the western and southern part of the "Maya Mountains," to the extent that recent investigations still are based on his geographic and geologic observations of 1896. Until the last years of his life he enthusiastically described his hunger-ridden expedition, although rarely did he expound on personal remembrances of his journeys.

In 1897 Sapper extended his trips into the southern part of Central America [fig. 8]. As previously, he was assisted by two experienced Kekchí and continued using his method of traveling on foot. During the latter part of the dry season [*verano*] he left the capital of Guatemala to complete his vulcanological observations of 1892 in the southeast of the republic. March 30 he made a second ascent of Pacaya volcano, this time from Belén, on the southeastern shore of Lake Amatitlán, via Las Calderas to the eastern cone (Cerro Grande) and made observations of the wooded terrain between this peak and the active cone, which revealed at least five craters that were partially destroyed. As on the first trip, clouds impeded a complete investigation of this mountain, so that Sapper descended to Las Calderas and on April 1 continued his route via Barillas (1730 m.), crossing the lava flows of Cerro Alto (1600 m.) and walking as far as Las Viñas (980 m.). On April 2 he visited the small Sumasate volcano (1320 m.) near Barbarena (1220 m.) and continued his journey

northeastward to Santa Rosa (947 m.), where he climbed Jumaytepeque volcano (1815 m.) from whose summit he obtained a lateral view of the Guatemalan volcanic axis. From Santa Rosa he proceeded through Tapalapa (1180 m.) to Ayarza Lake, where he located a small crater of ash and scoria on its eastern shore. He called it "Volcán El Naranjo" (1890 m.) after the neighboring town of that name. During the journey toward Jutiapa he made other ascents of the volcanoes Flores (1600 m.) and Buenavista (1200 m.). Many of the cones in the vicinity of Jutiapa were classified as to their form, especially Amayo (1050 m.), Culma (1027 m.), and two cinder cones called Los Cerritos. In addition he visited Suchitán volcano (2040 m.) (or Santa Catarina), Cerro Colorado (1840 m.) and Lake Retena, which was dry at that time.

He then turned eastward following the Río Tamasulapa, tributary to lake Güija. In the same valley he observed many small volcanoes on the northern and southern slopes and ascended the crater of Amahuaque (680 m.) composed of loose red cinder. Passing through the hacienda El Platanar he reached the picturesque city of Metapán (510 m.), known for its magnetite deposit (at that time worked out). From there he trekked north through Anguiatú (710 m.), Ermita de Alotepeque (790 m.) and Concepción las Minas (750 m.) as far as Esquipulas (950 m.). He then veered southeast and south, entering the republic of Honduras. Walking through Santa Anita (820 m.) toward Ocotepeque (805 m.), he crossed the frontier of El Salvador. The towns of San Ignacio (1030 m.), La Palma (1010 m.), La Reina (440 m.) Tres Ceibas and the hacienda Santa Bárbara (290 m.) were along the route to the Lempa River which he crossed at an elevation of 250 m. above sea level. Dr. Sapper reached Suchitoto (390 m.) via the hacienda of San Cristóbal (260 m.) and continued to Siguera (390 m.), Tejutepeque (730 m.), and Santo Domingo (680 m.) as far as the industrious city of San Vicente (440 m.). He again crossed the Lempa River near the hacienda La Barca (60 m.) and walked along the camino real eastward to Las Mercedes (440 m.), Jucuapa (500 m.) and Chinameca (590 m.). There he investigated the Limbo (1365 m.) and Chinameca (1402 m.) volcanoes and descended into the canyon between the volcanoes Chinameca and San Miguel. On April 27, 1897 he climbed the latter (2132 m.) from the finca Mendiola (930 m.) located on the western slope. He then descended to San Miguel (120 m.), whence he continued to the port of La Unión to undertake a trip into the Republic of Nicaragua.

In a sailboat he reached Amapala [in the Gulf of Fonseca] on May 3, 1897 and climbed the volcano Cerro del Tigre (800 m.). The next day he ascended the well eroded volcano that rises to an elevation of about 700 meters on the island of Zacate Grande, and on May 6 by canoe crossed to the island of Meanguera to investigate Cerro Polco (450 m.). Afterward he arrived at Conchagüita without being able to complete a reconnaissance of that island because of a malarial attack that caused him to return to Meanguera. Once having recovered, Sapper crossed the Gulf of Fonseca and after a voyage of eleven hours disembarked at the hacienda Capulinada on the northeastern slope of Cosigüina volcano near the sea. On May 9 the scholar was on the rim of the Cosigüina's circular crater (770 m.) at the bottom of which was a small green lake that spewed suffocating steam. From Capulinada he took the road to the city of El Viejo, passing through a dusty landscape and extreme heat that made the trip on foot even more uncomfortable. Our traveler felt so weary that he journeyed by train to Managua, arriving May 14 and resting there a few days. Meanwhile the rains had come limiting Sapper's plans for investigating the volcanoes of the republic. During good weather he was able to visit only the volcanoes of Santa Catarina or Pacayita (625 m.), Masaya (650 m.), and the Cerros Guapos with its caldera, Apoyo (91 m.). He also climbed Telica volcano (1040 m.) and Mombacho (1360 m.), but with no success owing to the dense fog that covered the summits and due to copious rains. Because of these unfavorable circumstances Sapper cancelled other excursions in Nicaragua as well as the trip to Costa Rica. By train he left Managua for the port of Corinto and in a small sailboat in five days reached La Unión June 12.

The interruption of the trip in Nicaragua suggested to Sapper to take advantage of his return to Guatemala in order to undertake excursions that would help him to supplement certain vulcanological observations made previously. Toward this end he rewalked his previous routes from La Unión through San Miguel, Chinameca and Jucuapa as far as San Vicente. He investigated the small volcanoes of El Teconal (ca. 750 m.) and Santa Rita (ca. 760 m.), located north of San Vicente, and arrived at the capital, San Salvador. He left the capital going northwest and west via Nejapa (470 m.) and Quezaltepeque (420 m.) to Playón volcano (ca. 690 m.) that rises on the slopes northwest of Boquerón, and reached pretty

Lake Chanmico (490 m.). He traveled by train from Sitio del Niño to Sonsonate and on June 25 climbed to the height of San Juan de Dios passing through Nauizalco (540 m.), the large Pipil town, in order to investigate the Laguna Verde volcano (1851 m.) with its crater lake and the group of volcanoes in the vicinity of Apaneca (1460 m.). From San Juan he continued northward via Atiquizaya (590 m.) near the Guatemalan frontier to Jeréz (640 m.), located at the southern foot of Chingo volcano. Sapper climbed to the symmetrically shaped rim of Chingo's crater (1783 m.) from which can be seen a remarkable volcanic landscape. He also investigated the adventive cinder cone of La Hoya (930 m.) on the side of Chingo. Afterward he walked through a region covered by a multitude of cinder cones and small craters north of Chingo, via Contepeque (870 m.) to Atescatempa (690 m.), where he discovered Las Víboras volcano (1090 m.) a short distance north of town. Returning to Contepeque he followed a trail to Yupiltepeque (ca. 1050 m.) and Jutiapa (906 m.) toward GuatemalaCity. Along the way he found two small volcanoes near the town of Los Esclavos and investigated Cerro Redondo volcano (1267 m.) before entering the capital, from which he left for Cobán.

For the year 1898 Sapper planned a trip through the central and eastern sections of the Republic of Honduras, areas that for the most part had not been investigated by trained geologists and geographers. The Berlin Geographical Society (Gesellschaft für Erdkunde zu Berlin) patronized this expedition, contributing funds as a token of its acknowledgement of the investigations that had theretofore been financed by Sapper himself.

On January 12, 1898 Dr. Sapper departed Cobán accompanied by three Kekchí Indians, following routes taken earlier toward the Motagua Valley and Copán [fig. 11]. The only section of the route that he had not traversed was that between San Diego (640 m.), Chiquimula (424 m.) and Jocatán (500 m.). Passing through this section he completed his geologic reconnaissance of that part of the department of Chiquimula in the "Oriente," or eastern Guatemala. He diverged from the old route at Santa Rita (670 m.) going southeast and east, via La Libertad (970 m.), San Agustín (1270 m.) and Oromilaca (980 m.) to Santa Rosa de Copán (1,160 m.). He then turned north via Quezailica (650 m.) to La Misión (340 m.) in valley of the Río Jicatuyo, and turned east through Agua Blanca (720 m.) and Tulcaya (560 m.) toward Colinas (330 m.) and along the northwest margin of the Ulúa Valley via Chinda (100 m.), Venado (680 m.) and Villaneuva (70 m.) toward the city of San Pedro Sula (60 m.). He took this route to obtain a good idea of the complicated geology of northwestern Honduras. Because of torrential rains he could not visit the town of El Palmar with its Jicaque Indian inhabitants, situated southwest of the city. For the same reason Sapper left San Pedro Sula by train for La Pimienta (ca. 40 m.) and began a long journey on foot southward across the republic to the Pacific. He walked from Potrerillos (ca. 40 m.) via Sosoa (90 m.) and Yojoa (100 m.) to Aguacate, and crossed Lake Yojoa (650 m.) toward the southeast shore to San José (680 m.) in the department of Santa Bárbara. He continued to Ulúa (520 m.), in Intibucá department, to the Valley of Otoro through which he went on via San Rafael (1,060 m.), Jesús de Otoro (660 m.), Carrizal (1,050 m.) as far as San José (1,350 m.), also in Intibucá. He climbed the Sierra de Opatoro in a southwest and southeast direction, passing by Marcala (1270 m.) and Santa Ana (1740 m.) and descending via San Sebastian (1400 m.) and Monteca to the Goascorán River. He continued the journey by way of Aramecina (200 m.) and Langue (200 m.) to Nacaome (40 m.) in the lowland north of the Gulf of Fonseca. From there he turned north walking by Pespire (1660 m.) and Sabana Grande (1100 m.) to Tegucigalpa (980 m.), arriving February 23, 1898.

He enjoyed a few days' rest in the attractive Honduran capital before leaving on the 28th toward the northeast. He visited the mines of Santa Lucía (1510 m.), Valle de Los Angeles (1370 m.) and San Juancito (1230 m.), afterward entering the valley of the Río Guayape via Cantarramas (540 m.) and Talanga (820 m.) and then northeast via Juticalpa (450 m. and Catacamas (540 m.) to Culmí (550 m.), where he did some important ethnological and linguistic studies among the Paya Indians. He abandoned his original plan to go northeast to the port of Iriona, since he recognized that this region was insufficiently interesting for a geologist. Therefore, he continued his journey from Culmí northward, climbing the central mountain range of Olancho, and going past San Agustín (780 m.) and along the crest of the Sierra de Soledad (1140 m.) he descended into the valley of the Sico River. Leaving the valley near the village of Paso Real (230 m.), he climbed the Sierra de Paya and crossed the lowland of the Río Aguán in order to reach the port of Trujillo. He left there March 24,

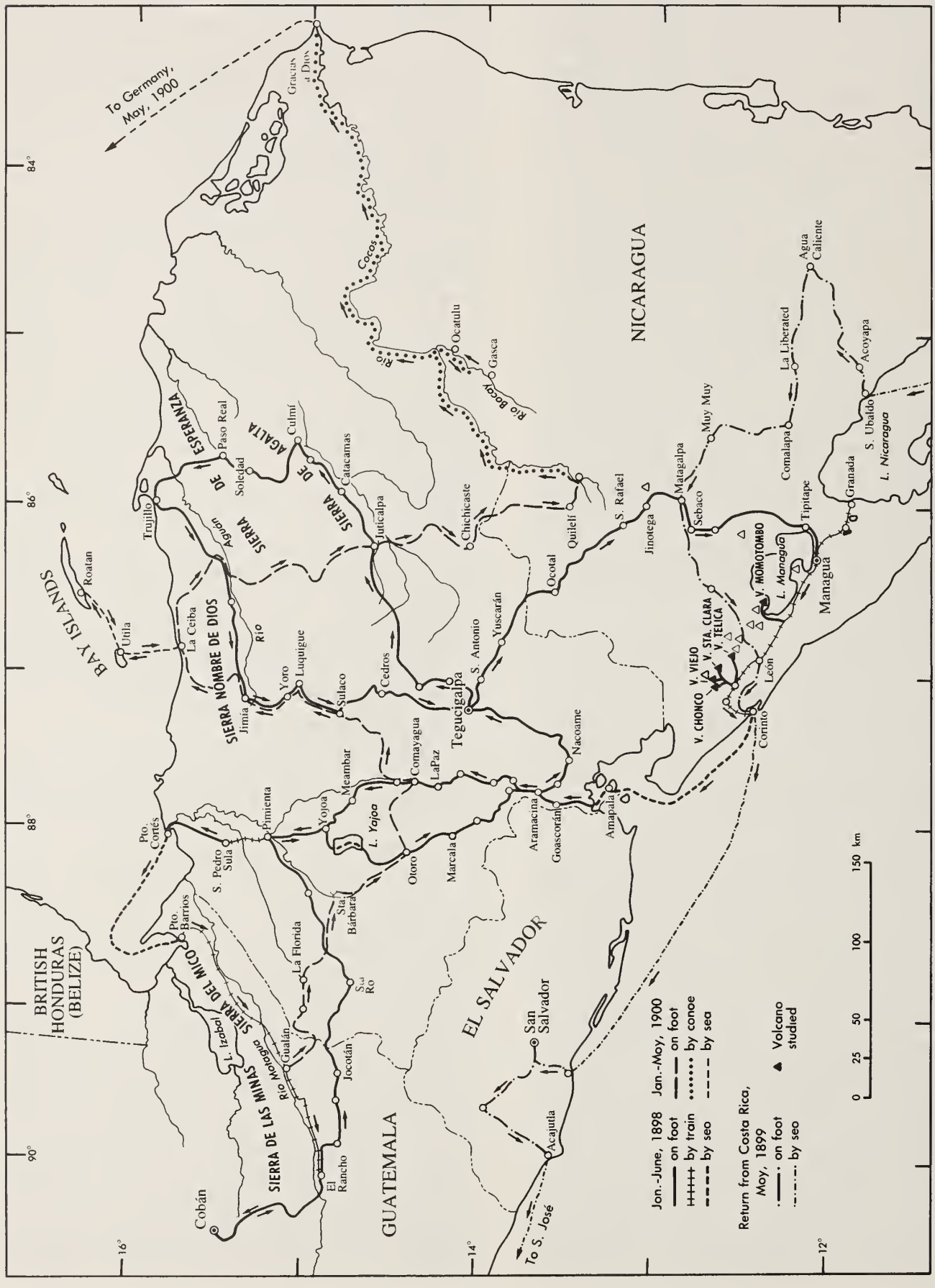

Fig. 11. Sapper's trips in Honduras and Nicaragua, 1898, 1899, and 1900.

passed over the summit of the coast range near the town of El Zapote (280 m.), and followed the valley of Aguán westward via Ilanga (60 m.) and Sonaguera (90 m.) to Olanchito (170 m.). He made some ethnological observations among the Jicaque Indians in the village of Aguas Calientes and Jimía (1,160 m.) and then went southward over the highlands to the city of Yoro (720 m.), across the Sierra de Yoro via Luquigai (745 m.), walking through the miserable pueblo of Sulaco (480 m.), the picturesque town of Cedros (1,030 m.), Jalaca (875 m.) and the banana plantation of Cofradía (1,100 m.), once again reaching Tegucigalpa on April 7.

On April 11 he departed southeastward to Yuscarán (1030 m.) and visited the mines of Monserrate (1470 m.). He crossed the frontier with Nicaragua near Alauca (570 m.) and trekked via Diplito (930 m.), Ocotal (640 m.), and San Rafael del Norte (1150 m.) to the coffee zone of Jigüina (1140 m.), arriving at the active city of Matagalpa (705 m.) in a fertile, charming, healthful highland region, the center of coffee cultivation in Nicaragua. Finally, going past Sébaco (530 m.), Metapa (515 m.) and Tipitapa (45 m.), he reached the capital city of Managua on April 30. The following day he was in the town of Masaya (230 m.), where he encountered the geologist and mining engineer Dr. Bruno Mierisch.

The itinerary to the Pacific area and the encounter with the German engineer, who worked for the mining companies in northeast Nicaragua, were motivated by the serious earthquake that affected a large part of the country on April 29, 1898, that is, one day before Sapper arrived in Managua. The worst damage occurred in the cities of Managua, León and Chinandega. The government took advantage of the presence of the two geologists by charging them with the investigation of the cause of the seismic disturbance. Thus we see that the two collaborators immediately began to study the graben that extends parallel to the coast of all Nicaragua and continues to the border between El Salvador and Guatemala—one of the most important geologic zones of Central America and seat of recent vulcanism and frequent seismic movements. Before undertaking this assignment, Dr. Sapper participated in the sounding of Lake Masaya, under the supervision of señor Mueller. Subsequently Sapper and Mierisch left Masaya, passing through Managua, bound for their first study objective, the volcano of Momotombo (1258 m.) which many thought to be the source of the earthquake. This was the first ascent of this steep peak undertaken in historic times. A German physician, Dr. Rothschuh, took part in this enterprise, aside from the three Kekchí. The excursion, which took place on May 9, was difficult but provided important observations of the crater, in which the experts investigated the fumaroles and later drew a sketch of the volcano and its surroundings. Immediately thereafter they went to the area of Léon and Chichigalpa, from which they climbed the volcanoes Telica (1040 m.), Santa Clara (1037 m.), Viejo (1781 m.) and Chonco (1077 m.). They returned via Chichigalpa and Managua to Masaya May 19, where they assembled their report for the government, affirming that the earthquake was tectonic in origin and not volcanic.

On May 28 Sapper with his Indians went by train to Corinto and by steamer to Amapala, whence he continued by canoe to Aceituno (10 m.), located on the Honduran shore of the Gulf of Fonseca. Karl Sapper's hardiness was admirable, for, although he had walked for five months almost without rest through a large part of Honduras and Nicaragua, nevertheless he undertook his return to Guatemala and Cobán again through western Honduras, always traveling on foot from the Pacific to the Caribbean.

He left Aceituno northward via Goascorán (60 m.) to Aramecina (200 m.), crossing the route by which he came. He continued northward via Lauterique (540 m.), Barrancaray (460 m.), Aguanqueterique (460 m.), Lamaní (790 m.) as far as La Paz (750 m.) and Comayagua (630 m.). He continued to the valley of the Humuya River, passing by Cacaguapa (530 m.), Carrizal (810 m.), Meámbar (480 m.), Yure (630 m.), Santa Cruz de Yojoa (520 m.), where coffee fincas were starting to be formed, and then via Yojoa to Potrerillos and San Pedro Sula. On June 14 Karl Sapper was in Puerto Cortés. The next day he took a sailing canoe to the small island named Rocky Cay, part of a group of cays called Sapodilla, on June 11 and disembarked in Puerto Barrios during a furious storm. He traveled by train as far as El Rancho and in two days walked to Salamá, where he continued on horseback to Cobán, June 20. His Indian companions arrived two days later.

Technically considered, this trip on foot furnished valuable inferences on pre-Columbian trade in Central America. Such could be accomplished only on foot by carriers loaded with trade goods. And perhaps inferences on the duration of trips and trail conditions might also be made. In Sapper's time such phenomena could hardly have changed

from pre-Columbian conditions in this underdeveloped area. In contrast, at present, through changes in the landscape, especially deforestation and introduction of modern transport methods, travel conditions hardly correspond to those of the last part of the nineteenth century.

The result of this long trip consisted of scientific disclosures of the geology and the physical and human geography of the central, northern and southeastern parts of the Republic of Honduras and was augmented by valuable ethnographic data taken among the Paya and Jicaque Indians. In addition, Dr. Sapper contributed many new facts on the geology and vulcanism of northwestern Nicaragua. But certainly a definite misfortune did occur: all of the rock samples gathered during the trip were lost after Sapper had sent them from Honduras to Cobán. For that reason it was impossible to construct geological profiles as was done for the other expeditions. The collaboration with Dr. Mierisch was useful since this person, knowledgeable on Nicaragua, had previously reconnoitered large areas of the country and had investigated many volcanoes. For me [Franz Termer], during my stay in Nicaragua in 1954, it was a pleasant surprise to know that Dr. Mierisch was still alive, very old but healthy, in Matagalpa.

It is interesting to learn the influence of the hardships suffered during the trips on the physical condition of Dr. Sapper and his Kekchí Indians, as indicated by data on bodily weight of each person before and after the journey (data compiled by Sapper):

	age	height (cm)	weight (lbs) on departure 11 Jan 1898		weight (lbs) on return 22 Jan 1898	
			body	cargo	body	cargo
Karl Sapper	32	167.0	136	–	122	–
Macedonio Tox	26	145.5	102	107	95	91
Sebastian Ical	28	158.0	129	112	127	98
José Chub	25	162.5	123	103	122	102

In 1899 Karl Sapper finally realized his previous project of extending his investigations to the Republic of Costa Rica, for which he again resolved to carry out the trip from Cobán on foot, accompanied by the Kekchí carrier Sebastian Ical. He left January 19 from the port San José de Guatemala by ship for Corinto (Nicaragua), from there by train to Managua and Granada (60 m.), and on to the island of Ometepe [in Lake Nicaragua], climbing the volcano Concepción (1,570 m.) on January 25 [fig. 12]. On the following day he reached Rivas (55 m.) and there obtained equipment for the long trip to the south. On January 27 he departed for San Juan del Sur and passed through picturesque country along the Pacific coast as far as Salinas Bay, crossing the frontier with Costa Rica on the 29th. He arrived at the frontier village of La Cruz (250 m.) located on the slopes of the Costa Rican volcanic range. He followed the old colonial road crossing the Río Sapoa near the site of Sapoa and passed through the haciendas Animas (200 m.) and El Hacha (350 m.) near Orosí volcano which he ascended on February 1, but without being able to make observations because of the dense clouds that covered its summit. He returned to El Hacha and on February continued south via the hacienda Santa Rosa (320 m.) toward Liberia (150 m.), chief city of Guanacaste Province. He trekked southwest toward Sardinal (20 m.), then south and southeast to El Belén (55 m.) and via Santa Cruz (35 m.) reached Nicoya (120 m.). Unable to obtain an experienced guide to lead him across the virgin forest that extends to the Pacific in this part of the Nicoya Peninsula, he had to settle for an excursion to the last inhabited place, the hacienda Las Huacas (560 m.), well known for its many archaeological sites in the form of tombs and stone foundations, vestiges of ancient houses, as well as small clay objects. Soon thereafter the famous Swedish archaeologist C. V. Hartman made important excavations in the same region.

Sapper returned to Nicoya, and visited the small agricultural colony founded in the early 1890s by some 70 Cuban immigrants, of whom Sapper found only eight remaining. On February 12 he walked to Puerto Jesús on the coast of the Gulf of Nicoya, where at that time only one house existed. From there he went by boat to the island of Chira and near La Coloradita climbed the highest hill (260 m.). He continued in a small sailboat across the gulf, but because of bad weather the crew was obliged to land on the island of San Lucas, used as a prison for sentenced criminals. Finally Sapper arrived at Puntarenas February 14 and the following day continued by train as far as Esparta (216 m.), at the end of the line. He hiked via San Mateo (280 m.), ascending the slope of Monte de Aguacate (1,040 m.), passed through Atenas (744 m.) to Alajuela (950 m.), where he again entrained for the

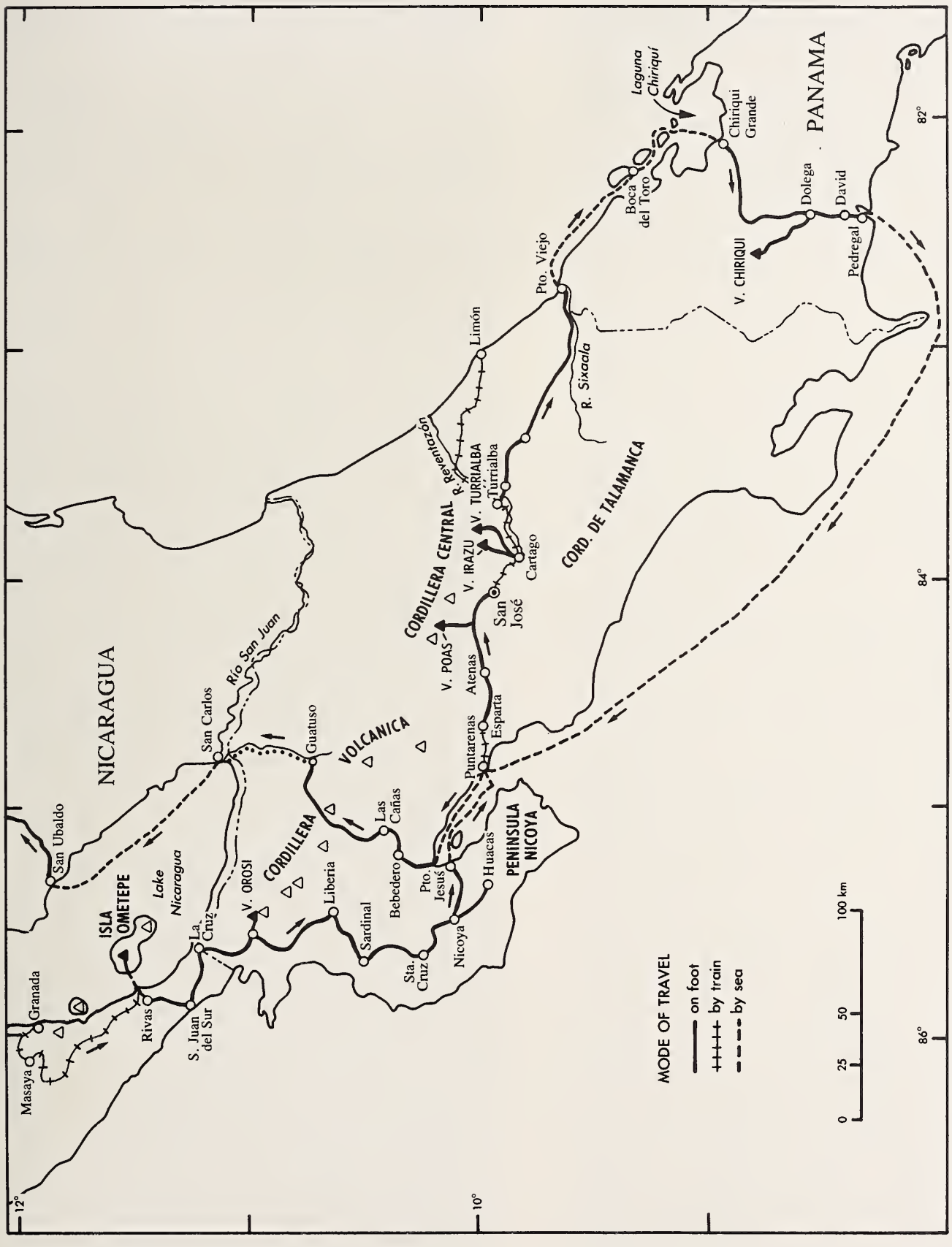

Fig. 12. Sapper's trips into Costa Rica and Panama, 1899.

capital of San José (1,150 m.), arriving on February 17.

Together with the eminent Swiss naturalist Henri Pittier de Fábrega he made an excursion to the Caribbean lowland to see the railway line and to study the geological and agricultural status of the coastal region. He visited the finca Buena Esperanza of the Compañía Platanera Alemán-Costarricense, a German-Costa Rican concern cultivating bananas and cacao. They went to Puerto Limón to see the banana plantation Westphalia and undertook a geologic excursion to the valley of the Río Banano. On the return trip they left the train at a bridge over the Reventazón River and on foot followed the rail line upvalley to Turrialba (621 m.) to investigate that part of the Reventazón area.

During his stay in the Costa Rican capital (February 26–March 18) Sapper made excursions to San Marcos de Dota (1,423 m.) and the volcanoes Irazú, Poas and Turrialba (February 27–28). He ascended Irazú (3432 m.) on horseback from Tierra Blanca via Yerba Buena; Poas (2722 m.) on foot from Alajuela and San Pedro de la Calabaza (1120 m.), March 5 and 6; and Vol. Turrialba (3328 m.) 11–15 March from Cartago via Capellada.

Subsequently he trekked to the southern part of the republic, spurred by the little information known on the orography and geology of the Sierra de Talamanca and its slope down to the Caribbean lowlands. Previously this region had been visited by the botanist and geographer Pittier de Fábrega and the famous bishop, Dr. Bernhard Thiel, in search of scattered and isolated groups of Chirripó and Talamanca Indians. Professor Pittier persuaded Sapper of the desirability of traversing the same route that Bishop Thiel had covered and of taking measurements of the trails, data neglected by Dr. Thiel.

Accordingly, Sapper departed San José on March 18 by train as far as Tucurrique and walked along the railway embankment to Turrialba (621 m.) studying once more the geologic formations in the cleared areas along the line. The next day he started his expedition into the Talamancas at the hacienda Aragón (650 m.) near Turrialba and followed the road via Angostura (530 m.), Tuís, where he passed the night at the finca La Suiza (700 m.), Moravia (1,100 m.) and as far as Chirripó (1,100 m.), then called El Arenal. He made ethnographic observations among the Chirripó Indians, inhabitants of Chirripó village, continued his route along narrow trails eastward through virgin forest, crossing many streams all tributaries of the Estrella and Sixaola rivers, and reached Sipurio (70 m.) on March 29. By canoe he ventured downstream along the Uréa and Sixaola rivers to Cuabre, whence he walked over the ridge of the low coastal range (190 m.) arriving at Puerto Viejo. He spent the nights of April 1 and 2 in a sailboat going to Bocas del Toro [in Panama] and in another boat through the Chiriquí lagoon, landing at Chiriquí Grande on April 5, 1899. From there Dr. Sapper began the exhausting trip over the cordillera [in Panama] along the Guabo and Malí rivers, passing through the village of Bonito (960 m.) to the summit at 1770 meters, which was covered with dense fog and swept by strong, frigid winds. He descended to the villages of Guayabo (1550 m.) and Las Calderas (400 m.) to Dolega (260 m.). He then undertook the difficult climb to Chiriquí volcano (3370 m.), via the hacienda El Hato de los Lambres (1260 m.) to the summit, where he made important observations of the complicated configuration of the crater. He returned to Dolega and on April 15 hiked to David (65 m.), whence, because of the daytime heat, he walked on the night of April 17 to the port of Pedregal. From there he sailed to Puntarenas, arriving the following day.

After a rest of only two days Karl Sapper continued his trip on April 20, now taking a route through the forested area along the northern slope of Costa Rica's volcanic axis to study the Guatuso Indians, a tribe theretofore visited in a scientific sense only by Bishop Thiel. Sapper crossed the Gulf of Nicoya to the mouth of the Tempisque and Bebedero rivers, landed at Bebedero village, whence he hiked to Las Cañas. He climbed Cerro Pelado (720 m.), until then considered to be of volcanic origin, but now Sapper proved it otherwise. On April 23 he began his march to Río Frío via the hacienda Julian Alvarado (660 m.) and following a trail that crossed the drainage divide (780 m.) between Atlantic and Pacific, he descended into the virgin rain forest that extended to the Nicaraguan frontier. On April 26 he reached the village, or frontier post, of Guatuso (60 m.), today called San Rafael de Guatuso, at the confluence of the Frío and Cote rivers. Dr. Sapper visited various settlements on "palisades" of the Guatusos that he found both in the valley bottom or on the mountain spurs. He was able to add new data to those made previously by Dr. Thiel regarding house types and other material traits of this interesting indigenous population already well reduced in numbers. In the palisades of Margarita and Tojibar Sapper discovered a large stone covered

with ancient sculptured inscriptions, among which were shell-like figures that attracted his attention. Returning from the Guatuso excursion on April 28 he proceeded downstream by canoe on the Río Frío, spent the night at Caño Negro and reached San Carlos [at the outlet of the Río San Juan] on Lake Nicaragua.

From there he arrived by another boat at the port of San Ubaldo (35 m.) on the northern shore of Lake Nicaragua. Despite the hardships suffered up to then on such a long trip, Dr. Sapper still had sufficient energy to undertake a return trip across the Atlantic slope of Nicaragua, at that time one of the least explored areas in Central America. He traveled on foot through the semi-arid bush that covered the hot, rolling plains along the northeastern shore of the lake reaching the town of Acoyapa (135 m.), where the old trail to the mining district in the mountainous Atlantic slope began [fig. 11]. Taking that route via Guiscolar (90 m.) he immediately climbed the Cerro Cosmatepe, a cone-shaped feature considered by local inhabitants to be of volcanic origin, but Sapper proved it to be a product of normal erosion. He continued the trip by way of Rejeque (110 m.), La Manga (165 m.) and El Chile (140 m.) to Agua Caliente (35 m.) on the bank of the Mico River. From there he turned westward via San Antonio (100 m.), to La Libertad (490 m.), center of mines exploited around the mid-nineteenth century, and finally to Comalapa (320 m.). Now he went north through Comoapa (560 m.), and Muy Muy (360 m.) reaching Matagalpa, where he again encountered the route taken on his incoming journey. Along the entire route of his outgoing trip he made for the first time a geologic sketch that clarified many facts of physical geography of this isolated area. Years later with these data he drew geologic profiles that were the only ones that existed for this part of Nicaragua, until the modern geological survey of Nicaragua was organized in 1957. From Matagalpa he continued through Chigüitillo (585 m.), crossing the row of volcanoes called Los Maribios between the cone of La Rota (829 m.) and that of Las Pilas (1072 m.) and at last entered the city of León. From the port of Corinto he took a boat to la Libertad [El Salvador] and walked from the port to the capital San Salvador and on to Santa Ana. Inclement weather impeded another visit to the volcanoes in the area of Izalco. Those conditions and the political uncertainty in the frontier zone between Guatemala and El Salvador caused Dr. Sapper to interrupt his trip. Consequently, he went to Acajutla where he took a steamer to San José in Guatemala and returned directly to Cobán. Thus ended one of his longest excursions, the geographic and geologic results of which considerably increase knowledge of the physical geography of the Central American isthmus, to which should be added the ethnographic materials obtained in Costa Rica.

At the turn of the century Karl Sapper had been in Central America for 12 years. He had gained fame as the most celebrated explorer of the isthmus between Mexico and Panama, and he was recognized as the most erudite modern geographer and geologist in this region; his extensive work in the area had introduced him to the scientific societies in both the Old and New Worlds. He was now 34 years of age, and it was natural that he wished to return to Germany to dedicate himself to a university career. But it was typical of this man, obsessed with the desire to learn more, that he could not return to Europe without undertaking one more excursion. His initial plan to visit Costa Rica and Chiriquí again was changed in favor of a trip to Honduras and neighboring parts of Nicaragua, a region that he had traversed in 1898. The reason for a second visit was the loss of his geologic specimens referred to earlier.

He departed Cobán on foot in January 1900 over trails that he had repeatedly traversed across Baja Verapaz to the Motagua Valley [fig. 11]. He walked from Gualán to El Paraíso (740 m.), crossing the Sierra de la Grita, and continued via La Florida to Santa Bárbara and Comayagua (630 m.). He then went northeastward to Sulaco (480 m.) discovering Cretaceous fossils near Esquinas (720 m.). From Yoro (720 m.) he hiked [across the coastal Sierra] to La Ceiba, where he embarked for the islands of Utila and Roatán, whose geology he investigated for the first time. During the return to the mainland a tremendous *norte* struck, so that the boat had to seek refuge in the Cochinas islands.

Thereafter Sapper started again on a trip into interior Honduras. He walked along the coast but turned inland by way of Papaloteca (15 m.) into the Aguán river valley to Sonaguera (90 m.). He crossed the Aguán River and followed the trail over the Sierra de Olancho to Juticalpa (450 m.) and continued through the southeastern mountain area via Cuajinicuil (440 m.), Chichicaste (480 m.) and Quilalí (510 m.) on the river of that name, a tributary of the Río Coco, which he crossed near Santa Cruz (390 m.), and arrived in Jinotega, Nicaragua (1030 m.). Sapper always remembered that route as the most tiring of all that he took

in Central America. The trails were wretched and made worse by the torrential rains that strongly afflicted him.

He returned to Santa Cruz accompanied by Hans Heiland, and took a *bongo* (canoe) down the Río Coco to its mouth. On this trip Sapper made a sketch of the river course, a project theretofore unrealized. He also canoed the Río Bocay from Bocay pueblo via Limnanbu and Ocatuto to Gasca, obtained ethnographic data on the Sumu and Misquito Indians living along the Coco and Bocay rivers, and collected weapons and other utensils.

Finally he reached Gracias a Dios around May 1, 1900, where he took the German steamer "Erna" to Jamaica and New York and then to Germany, terminating [for the moment] his exploration trips in Central America.

THE YEARS IN ACADEME AS PROFESSOR AND RESEARCHER

Immediately after his move to Germany Sapper was offered two possibilities to obtain a university teaching appointment—in Berlin with Ferdinand von Richthofen or in Leipzig with Friedrich Ratzel. He opted for Leipzig because the strong emphasis there on anthropology and ethnography met his interests more than a restriction to physical geography. Moreover, he still was under the influence of a latent antipathy toward Prussia and Berlin, as he was inherently a Swabian. Consequently, in November 1900 he was inaugurated as "Privatdozent" [lecturer] in the University of Leipzig on the basis of his validating dissertation ("Habilitationsschrift") entitled "Über die geologische Bedeutung der tropischen Vegetationsformen in Mittelamerika und Südmexiko" [On the Geologic Significance of Tropical Vegetation in Central America and Southern Mexico]. The theme of his inaugural lecture was "Ethnography of Central America." Sapper cultivated this combination of geography and ethnography, à la Ratzel, as shown by his occasional lectures on ethnography and his regular attendance of the International Congress of Americanists. In 1902 he obtained the position of "extraordinary" [associate] professor of geography at the University of Tübingen in southern Germany and in 1908 was promoted to full professor. In 1910, as a replacement for Georg Gerland, he obtained a full professorship in geography at Strassburg, and in 1919 accepted the same rank in Würzburg in Bavaria, which he held until his retirement in 1932, despite various offers from other universities. He preferred a small university that would guarantee him free and quiet time for his scientific research.

Between 1900 and 1914, as well as from 1923 to 1928 Sapper undertook many trips in Europe and overseas. His special interests in vulcanological problems resulted from a suggestion of Ratzel. At that time Ratzel was editor of a series of geographical manuals ("Geographische Handbücher"), and as such persuaded Sapper, an internationally known expert on vulcanology, to write a handbook on that subject. Without hesitation he consented to assume all of the work that the subject would demand in order to present a world coverage of volcanic phenomena. Within 25 years his *Vulkankunde* was published (in 1927).

The motives of Sapper's first trip abroad during his period as university professor were the enormous eruptions of Soufrière volcano on the West Indian island of St. Vincent and of Mt. Pelée on neighboring Martinque that occurred May 6 and 8, 1902. Also motivating was the severe earthquake that devastated a large part of the western Pacific coast of Guatemala on April 18, 1902. The inquiry into such a catastrophe required the services of trusted investigators familiar with the area, which prompted Sapper to undertake new field observations. Besides, he wanted to visit El Salvador again to study volcano Izalco, then in eruption, and to acquaint himself with the Lesser Antilles.

Accordingly, Sapper departed Tübingen at the end of August 1902, going first to the United States, where he visited Yellowstone National Park and its geysers, San Francisco, and the Grand Canyon, the high points of that short sojourn. He then continued his trip through northern and central Mexico to Acapulco, where on October 21 he embarked for San José, Guatemala. He landed October 24 and the same day reached Guatemala City, where the populace was preparing the Fiesta of Minerva, an institution created by President Manuel Estrada Cabrera. At that time Sapper received a telegram from his brother Richard with the news that loud explosions were being heard in Cobán, which may have augured a serious volcanic eruption. On October 26 such sounds were heard in Guatemala City without knowledge of which volcano was active. In view of these accounts Sapper resolved to leave immediately for the western part of the republic on horseback with a muleteer obtained through the generosity of Roderich Schlubach, merchant and planter originally from Hamburg.

Sapper traveled first to Sololá, near Lake Atitlán, where it happened that the nearby volcano Santa Maria, theretofore inactive, erupted with a strong explosion. On October 30, by way of Santa Lucía Utatlán (2491 m.) and Santo Tomás La Unión (780 m.) Sapper reached the finca Chocolá. On the following day he went to San Felipe, accompanied by the finca manager, H. Kummerfeld, and found himself already in the coastal zone afflicted by the catastrophe. He continued in Quezaltenago and on November 2 climbed Cerro Quemado, this time in good weather, and on the following day the inactive Siete Orejas volcano (3370 m.) whose large crater he found enveloped in dense fog. From the village of San Martin Sacatepéquez he climbed Chicabel volcano (2800 m.) whose crater lake was covered by a layer of pumice some 30 cm thick, which originated from the eruption of Santa María. (Around the same lake, when the author of this biography was there in 1925, the pumice had been piled up along the shore and covered with a thin cover of soil.) Sapper continued from the coffee finca Las Mercedes into the coastal lowlands to the cattle ranch Caballo Blanco and the town of Retaluleu, observing everywhere the alterations of the landscape caused by the ashfall and the small landforms made by stream erosion of the soft, newly deposited volcanic material.

Returning to Quezaltenango, on November 12 Sapper traveled by way of Totonicapán (2495 m.) and Patzité (2330 m.) to Santa Cruz del Quiché (2021 m.), where he visited the archaeological site near Utatlán, the ancient center of the Quiché Indians. He then proceeded on horseback via Zacualpa (2520 m.) to Joyabaj (1433 m.) and on the way confirmed the source of the Río Motagua between Santa Cruz del Quiché and the village of Chitalul. On the 15th he arrived at Cubulco (1000 m.) by way of the southern slope of the Sierra del Chuacús and then returned to Guatemala City. For the second time he climbed Pacaya volcano via its southern slope from the finca Hamburgo and briefly visited Santa Lucía Cotzumalhuapa and Pantaleón to see the ancient stone monuments of this coastal area. He then left on a short excursion to El Salvador where he visited the volcanoes in the vicinity of Izalco, climbing those of San Marcelino (1324 m.) and Cerro Chino (1390 m.). On December 18, 1902 he arrived in Santa Ana (2181 m.) and investigated the south shore of Lake Coatepeque, which he classified as a "maar," not a large caldera, or collapsed basin, as formerly thought. He climbed Cerro Verde to observe the active Izalco volcano with regard to the recent striking volcanic disturbances in Central America. He descended to the town of Izalco, inhabited by Pipil Indians, and via the lively town of Sonsonate reached the port of Acajutla. There on December 22 he embarked for Panama and the city of Colón to continue his trip to the Lesser Antilles.

On January 9, 1903 he landed in Martinique and at once undertook an excursion from Fort de France to the interior of the island, going on foot by way of Gros Morne and Fonds-St. Denis to the area destroyed by the terrible eruption of Mt. Pelée. Near Morne Rouge he found the surface devastated by the disastrous nuée ardente (incandescent cloud), but was unable to make good observations because of torrential rains that forced him to return to Fort de France. With the famous French geologist Dr. A. Lacroix he visited the ruins of the totally destroyed city of Saint-Pierre and afterward went to the southern part of the island, where the police impeded his geologic studies for the ridiculous suspicion of espionage. Consequently, Sapper interrupted his stay in Martinique to proceed to other islands of the Lesser Antilles, visiting the following:

1903	
St. Lucia	20 Jan.
St. Vincent	21-28 Jan.
Grenada	28 Jan.-3 Feb
St. Vincent	4-11 Feb.
St. Lucia	11-17 Feb
Dominica	18-26 Feb
Montserrat	27 Feb.-5 Mar.
Nevis	5-7 Mar.
St. Christopher	7-11 Mar.
St. Eusatius	11-15 Mar.
Saba	17 Mar.
St. Thomas	18-22 Mar.
(There he met the German geographer, Georg Wegener, with whom he continued the trip.)	
Martinique	23-30 Mar.
Guadeloupe	31 Mar.-Apr. 3

On his second visit to Martinique Sapper had the opportunity to observe from an observation post an occurrence of a nuée ardente and also a fortunate view of a strong intrusion of a volcanic plug. From

Guadeloupe Karl Sapper returned to Germany to continue his teaching duties at the University of Tübingen. The results of his recent trip produced a multitude of studies on vulcanology, physical and cultural geography and on the economic situation resulting from the seismic and volcanic catastrophes, in addition to works on the ethnology of the Carib inhabitants on St. Vincent.

The following decade until World War I offered Sapper many opportunities to expand his investigations, mainly on vulcanology and geography, and to adjust those on geomorphology and climatology, in various parts of the world. In 1904 he traveled to the eastern Mediterranean, where he studied volcanic phenomena on the islands of Kos, Nisyros and Santorin along the coast of southwestern Asia Minor. In 1905 we find him in the Canary Islands, where he investigated geologic problems, especially the caldera on La Palma and the extensive lava flows on Lanzarote, formed by the enormous eruptions of 1730-1736. On his return to Europe he visited the volcano Olot in Catalonia, northeastern Spain. In 1906 he traveled to Iceland to study the fissures caused by ancient eruptions and the formation of the volcanic landscape in this northern climatic zone.

In 1908 Sapper received an order from the Imperial Colonial Department in Berlin to undertake a geographic and geologic reconnaissance of the islands of New Pomerania (today New Britain) and New Mecklenberg (today New Ireland), two German colonies in Melanesia. Accompanying him was the famous internationally known scholar, Dr. Georg Friederici, who had dedicated himself to ethnologic and linguistic studies of the tribes in the Bismark Archipelago. Both investigators returned with rich results from their fruitful investigations in Melanesia and Polynesia. Friederici continued his journey through Polynesia, while Sapper stayed for a time in Java, where he had hoped to climb the volcano Smeru (3680 m.). However, the superstitious people who lived in the vicinity of the mountain would not permit him to do so. He continued his trip, and after a short stay in Canton (China), Sapper returned home in Tübingen in 1909.

Soon thereafter, in 1910, he was appointed full professor to take charge of the geography department at the University of Strassburg, replacing the famous geophysicist and geographer Professor Georg Gerland, who had retired. In the same year Sapper traveled to Sweden, Lappland, and as far as Spitzbergen, where he studied geomorphological phenomena related to erosion processes in the Arctic in contrast to those in the tropics.

In 1914 Sapper received an offer from Princess Theresa of Bavaria (1850-1925) to accompany her as scientific advisor on a world tour, which he quickly accepted. The plan called for a trip by land from Germany to Moscow and across Siberia to Japan, then across the Pacific to the Sandwich Islands to visit the volcanoes of Hawaii, continuing the sojourn via California and Panama to South America, where the princess had previously carried out ethnographic investigations among the Amazonian tribes. Just before the beginning of August a large amount of baggage had been sent from Antwerp en route to Japan, but the outbreak of World War I thwarted forever this world tour; thus Sapper was never able to study the Hawaiian volcanoes. The baggage was lost as a sacrifice to the hostilities at sea.

THE YEARS OF OLD AGE

The Treaty of Versailles, which gave Alsace to France at the end of the war, caused Dr. Sapper to lose his university post and home in Strassburg. But early in 1919, due to the retirement of Norbert Krebs, he was offered the position of full professor at the University of Würzburg in Bavaria, a post that he held until his retirement in 1932, despite many offers from various larger universities. Nonetheless, he preferred the more tranquil life in the pretty baroque city so as to devote himself to his scientific work, apart from his teaching duties. In 1923 he organized the Institut für Amerikaforschung an der Universität Würzburg [Americanist Institute of the University of Würzburg]. Under Sapper's supervision and collaboration with the romanist Arthur Franz and the hispanicist Adelbert Hämel, the Institute would underwrite a publication entitled "Studien über Amerika und Spanien" [Studies on America and Spain], to be organized around a geographical, ethnographic-historic and philologic-literary series. Not least was the generous support from Latin American and North American libraries for the establishment of a valuable book collection, and an active exchange program with European and overseas institutions and businesses was arranged. Because of the inflation in Germany, the Institute, despite all efforts, was hindered in development, and with the departure of Franz Termer, Sapper's successor, the Institute's activity weakened even further. The destruction of the valuable library through the bombing of Würzburg near the end of

World War II finished the Institute.

Despite the grave inflation in Germany, Karl Sapper undertook his first overseas trip after the war, thanks to the commercial house of Schlubach, Thiemer & Co. of Hamburg. He left in September 1923 for Mexico, where he climbed the Nevado de Toluca (4518 m.), from which he received a foot injury. Since the trip was mainly to reestablish scientific relations between Germany and Latin America, it was important to reserve time for lectures, receptions, and other scientific obligations. However, he still found time to complement earlier observations and to close gaps in his knowledge of the areas. He traveled by rail to the Isthmus of Tehuantepec, making a stop in the petroleum zone near Minatitlán that had been under development for several years. He arrived in Guatemala City November 18, where he was received honorably by the government and cordially by his numerous Guatemalan and German friends. Trips were made through the Guatemalan highlands (Los Altos) and the Pacific coast, on which he was accompanied by professor Josef Lantz, one of his former students at the University of Strassburg. He reached Quezaltenango and Chocolá, visited the hacienda El Reposo near Retalhuleu and a few more fincas in the El Tumbador area. He climbed Tajumulco volcano (4220 m.), where he studied the question of Pleistocene glacial remains with negative results. Only in 1954 did Professor Weyl of Kiel University confirm such phenomena in the high peaks of the Sierra de Talamanca in Costa Rica. On his excursion Sapper observed figures sculptured on rock at an altitude of 3600 meters, somewhat below the saddle between two elevations on Tajamulco volcano, drawings that had been discovered earlier by the English archaeologist Robert Burkitt. Sapper also ascended Santa María volcano to observe activity of the lava dome called El Santiago that had been formed two years previously in 1922. After having seen the Indian sorcery practiced in Momostenango Sapper reached Huehuetenango and visited the hacienda Chochal in the Cuchumatanes highland and the town of Todos Santos. He followed the road from Huehuetenango via Aguacatán to Nebaj and Cotzal where he passed through the newly developed coffee zone, arriving at the finca San Francisco Cotzal. He continued the trip to Uspantán and San Cristóbal Verapaz as far as Cobán. A few visits to various fincas in the Alta Verapaz were very instructive for him, since he acquainted himself with the modern techniques used for the processing of coffee beans. Sapper returned via Panzós, Livingston and Puerto Barrios to Guatemala City. There the Geographic and Historical Society of Guatemala presented him with one of its first three honorary memberships, the other two being given to Dr. Sylvanus G. Morley and Dr. William Gates, the occasion later celebrated in public on March 9, 1924. The National University of Guatemala distinguished Sapper with an honorary degree.

On February 5, 1924 Sapper left by car for El Salvador. He made an excursion through the western part of the country accompanied by the naturalist and historian Jorge Lardé, who took him to Lake Güija and the island of Ipaltepeque to see its pre-Columbian ruins and stone sculptures. They visited Santa Ana and Izalco volcanoes, the lessened activity of the latter permitting a climb to its crater. Soon thereafter Sapper traveled to the eastern part of the country to climb San Miguel volcano in order to study the changes in the configuration of its crater made after the eruption in 1920.

He continued the trip by boat to Nicaragua, landing at Corinto March 2, on the 5th climbed Masaya volcano, and went to León the next day, where the University authorities presented him with an honorary professorship. He visited Cerro Negro volcano which in 1923 had intensified its activity, and on March 15 departed Corinto landing the following day at Puntarenas (Costa Rica). The earthquake of March 4, 1924 that had devastated various areas of Costa Rica awakened Sapper's interest in studying the damages and their influence on the country's economy.

Soon after his arrival in San José he was named member of a commission which the government had charged with the study of the earthquake's origin. The commission members Fidel Tristán, Anastasio Alfaro and Ricardo Fernández Peralta investigated several areas of the country and ascended Irazú, which, because of its activity, was thought to have been one of the epicenters. Receptions and conferences consumed the rest of Sapper's time in Costa Rica. On April 17 he left by ship from Puerto Limón to Cristóbal in Panama, and for a week remained in the country that he had not visited for 22 years, before the construction of the Canal. He was surprised at the development of the Canal Zone and of the Republic, where roads had been modernized and the cities changed. He was enthused by such progress that to him seemed the most significant in Central America at the time. On April 24 he left Cristóbal for

Buenaventura (Colombia), arriving on the 26th. He had to limit his stay in Colombia to only a few days, so that he went directly from the port to Bogotá (2650 m.) by way of the usual route through Cali (990 m.), Armenia (1470 m.), Quindío Pass (3280 m.) and Girardot (325 m.), reaching the capital on May 5. He remained there ten days, occupied with conferences and visits with the authorities and scientific institutions. He left on May 16, again via Girardot, whence he flew in a hydroplane to Barranquilla. He sailed from Puerto Colombia for Puerto Cabello (Venezuela), using a stop in Curaçao to cross the island to the north coast. From Puerto Cabello he traveled by car to Valencia (450 m.) and Caracas (900 m.). A group of professors took Dr. Sapper to Maracay and Lake Valencia, visiting haciendas and coffee plantations in the vicinity. He departed La Guaira on June 8 in a Dutch ship that called at the ports of Brighton Harbor and Port of Spain on the island of Trinidad. Thus, Sapper was able to visit Asphalt Lake by car before arriving in Port of Spain, where he took the same ship to Europe. By June 26 he had returned to Würzburg.

In 1925 and 1926 we find Sapper on trips to the volcanoes of Stromboli and Santorin, the latter in full eruption. Finally, in the summer of 1927 until 1928 he made the last trip of his life.

Various institutions in Argentina invited Sapper to lecture in Buenos Aires, an estimable invitation that he accepted willingly. For some time he had wanted to visit South America to promote scientific interchange between South Americans and Germans and at the same time learn for himself about the development of German settlements in southern Brazil and Chile. Moreover, he would plan to return by way of Central America. The trip lasted from June 30, 1927 until March 2, 1928. He sailed from Hamburg to Rio de Janeiro, where he stayed one week as well as visiting Petropolis (800 m.). By train he went to São Paulo, thence to the port of Santos, inspecting coffee plantations near Campinhas (660 m.) and traveling to Curitiba (900 m.). He acquainted himself with Blumenau and other German colonies as well as coffee plantations in the state of Rio Grande do Sul. Continuing through Uruguay, he arrived on August 3 in Buenos Aires, where he stayed until September 29. There followed a twoweek excursion to Paraguay and then a trip to Chile by train. He spent a fortnight in southern Chile going as far as Puerto Montt. After short stays in Santiago and Valparaiso he continued northward by land, visiting the nitrate plants, mainly those of Rica Aventura and Chuquicamata. He reached La Paz (Bolivia) by train, crossed Lake Titicaca and arrived in Cuzco (3950 m.), ancient capital of the Incas, which profoundly impressed him. He considered it and Antigua Guatemala as the two most beautiful colonial cities in the Americas. He proceeded via Arequipa (Peru) to Mollendo and Callao and enjoyed Lima, the capital, where the famous archaeologist Dr. Julio C. Tello showed him the archaeological treasures in public and private collections. He continued to Ecuador by way of Guayaquil to Quito where he encountered the renowned German archaeologist Max Uhle. Two weeks later he left Guayaquil for Balboa [Panama], whence he arrived by sea at Amapala [Gulf of Fonseca, Honduras] on December 23, 1927.

In 1924, because of a revolution, there was no opportunity to include Honduras in Sapper's revisit to Central America, but now he found no difficulty to return to a country he had traversed 30 years previously. By boat he passed from Amapala on the Isla del Tigre to the port of San Lorenzo and continued by car by way of Sabana Grande to Tegucigalpa. The authorities, even President Miguel Paz Barahona; the scientific societies including the recently formed Sociedad de Geografía e Historia; the archbishop, Dr. Hornbach; and many other distinguished people received Sapper honorably, entertaining him during his short stay in the small and picturesque colonial city. He continued to the north coast to Puerto Cortés, astonished at the economic development in the area of San Pedro Sula with its extensive banana plantations. By boat he left Puerto Cortés for Puerto Barrios, arriving January 9, 1928. He remained a month in Guatemala, during which time he made a trip with Franz Termer to the western part, traversing the region between Antigua Guatemala and San Andrés Osuna, the highland betwen Teopán and Quezaltenango, and the coffee zone of the Costa Cuca (Boca Costa). Accompanied by G. Hurter and Franz Termer, he climbed Siete Orejas volcano (3360 m.) on January 21, the last vulcanological trip of his life. He visited the hacienda and fincas of Las Mercedes, El Raposo and Tiquisate, the latter then managed by a Swedish-American consortium. Thus, he was informed of the new technical methods of clearing virgin tropical forests, on the use of badly exhausted fields, and experiments in introducing new crops, such as tobacco along the Pacific coast. Before returning to Guatemala City Sapper and Termer went through the archaeological zone of Santa Lucía Cotzumalguapa with a visit to the finca

of El Baul.

After attending the re-inauguration of the National University of Guatemala on January 15 Sapper presented a lecture on the indigenous population of Central America to the Society of Geography and History, followed by another on the problems of the Spanish Conquest in Latin America to the German Club. On February 2 with Franz Termer he left the capital for Quiriguá to revisit the ruins now cleared of forest, an action that Sapper deplored, for he felt deeply that the romantic aspect associated with the tropical rain forest that once enveloped the site had been lost. The two researchers were kindly received by Dr. McPhail in the local hospital where they enjoyed interesting conversations with General Enrique Aris who happened to be present. They arrived later at Livingston and took excursions to the Lámpara River, San Vicente, and the finca San Humberto, reaching Macho Creek (a small stream that empties into the Gulf of Amatique between Livingston and Puerto Barrios), where they tried in vain to solve the problem of the first temporary Spanish settlement at Nito in relation to the physical characteristics of the site.

On the last excursion before his departure from Livingston Dr.Sapper unfortunately contracted a case of myiasis. One of his leggings became loose without his notice. Within a small gap between two spirals of the legging a "colomoyote" had deposited eggs, and soon after his departure maggots had hatched, penetrating his skin. The progress of the inflammation caused such pain that immediately after landing in Amsterdam and later in Würzburg operations to remove the maggots were necessary. In Mexico and Central America "colomoyote" refers to a local botfly *Dermatobia caniventris*, whose larvae develop from eggs deposited in the skin causing painful conditions. The word stems from the Nahuatl "col" and "moyotl" that translate to "curved biting fly" or mosquito, "curved" referring to the hook-shaped appendix of the larva.

On February 8 Sapper sailed from Puerto Barrios on the German ship "Sesostris" and after the stop in Amsterdam arrived in Würzburg in midrMarch.

With the last trip Sapper had completed a period of about 40 years of field work and study, much of it in the Central American tropics with its great variety of relief, climate and vegetation. This period can be divided into three phases: the first is related to exploration by an expert geologist and geographer who was able to dedicate himself to his studies as a person free from all official functions; the second phase included investigations on problems in vulcanology and those in general and comparative geography of a universal character; the third phase was devoted to the completion of various projects; mainly with respect to observations on economic geography and, after World War I, to official duties involving the establishment of scientific interchange between Germany and Latin America. Still today, from Mexico to Chile, Sapper's reputation is held in great esteem.

Today, in our period of specialization in all disciplines, we are astonished by the vast area of knowledge and interest of Karl Sapper, as his long bibliography indicates. His interests are manifested not only in the many subdivisions of geography, but also in geology, vulcanology, ethnography and economics. In all these branches of science he has contributed new knowledge and concepts, be they related to the Americas or to all continents. For example, [these contributions are seen in] his work in geomorphology and soil science for all tropical areas; his general economic geography; his contributions to landscape analysis, including his excellent work on "Geological Structures and Landscape"; his worldwide study of vulcanology; his sensitive observations on the character of the Maya Indians and their beliefs. His work also demonstrates practical results and much field experience, as well as a bent for sensitive landscape description similar to that of Friedrich Ratzel. Sapper was more pragmatic and less disposed to theory than Ratzel.

Shortly after his return from his last trip, Sapper was elected rector of the University of Würzburg for the academic year 1928-29. During subsequent years until his retirement he devoted himself only to teaching and publication. A large number of students always attended his lectures and seminars. The audience appreciated his lively delivery and clarity, many times seasoned with sensitive and ingenious humor, a typical trait inherited from his Swabian homeland. Sapper never established an academic school of geographers. That was not in accord with his personality, which was that of an explorer and not of an instructor. But those of us (as the author of this biography) who had close contact with him based on the same scientific interests, admired his unforgettable personality of a liberal, generous and extremely stimulating teacher. The respect and authority that he enjoyed in all international circles emanated from his modesty, linked to his self control, a quality that was a great advantage for him in

dealing with indigenous peoples. Despite his gentle and modest mien toward others, he was a man of enormous drive and energy to the extent of demanding exaggerated efforts from his body. He suffered from hunger and thirst and all the trials of a traveler's life in difficult climates and regions unfavorable for a European. I still well remember one night, when we had returned to Quezaltenango from an excursion of nearly 14 hours over rough trails tiring for the professor who was then age 62. All of us felt extremely tired and longed for bed, but he remained at the table after supper writing letters and cards to friends and colleagues in Germany well after midnight. And the next day we had to rise early at five in the morning to continue our trip to the Costa Cuca (Boca Costa).

Not surprisingly, Sapper began to feel tired after such a difficult life, mainly after his term as rector of the University. Consequently, in 1932 he retired from all of his employment and official academic posts, moving to the pretty town of Garmisch in the Bavarian Alps. There he found at his disposal the house that belonged to the family of his wife, Mrs. Auguste von Limprien-Sapper, to whom he was married in 1905. Thereafter he dedicated himself to the preparation of several papers related to his field investigations and published a multitude of articles, monographs and books. The political developments in Germany since 1933 and the Second World War totally robbed him of his optimism, a disillusionment that he could not overcome. Weakened in body and spirit, he suffered a grave case of apoplexy after the death of his wife in 1944. During the last days of his life his physical and mental suffering affected his reason, until a welcome death ended his rich and profitable existence on March 29, 1945, just before Garmisch was occupied by United States troops. The German geographical community, as well as Central and South America, had lost a noble person, a pioneering scholar and explorer, a good friend and wise counselor of both young and old colleagues.

NOTES

1. The accompanying maps showing Sapper's travel routes in Central America and Mexico were compiled by the translator and editor, following Franz Termer's text.