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OF

WILLIAM MORRIS DAVIS

1850–1934

BY

REGINALD A. DALY

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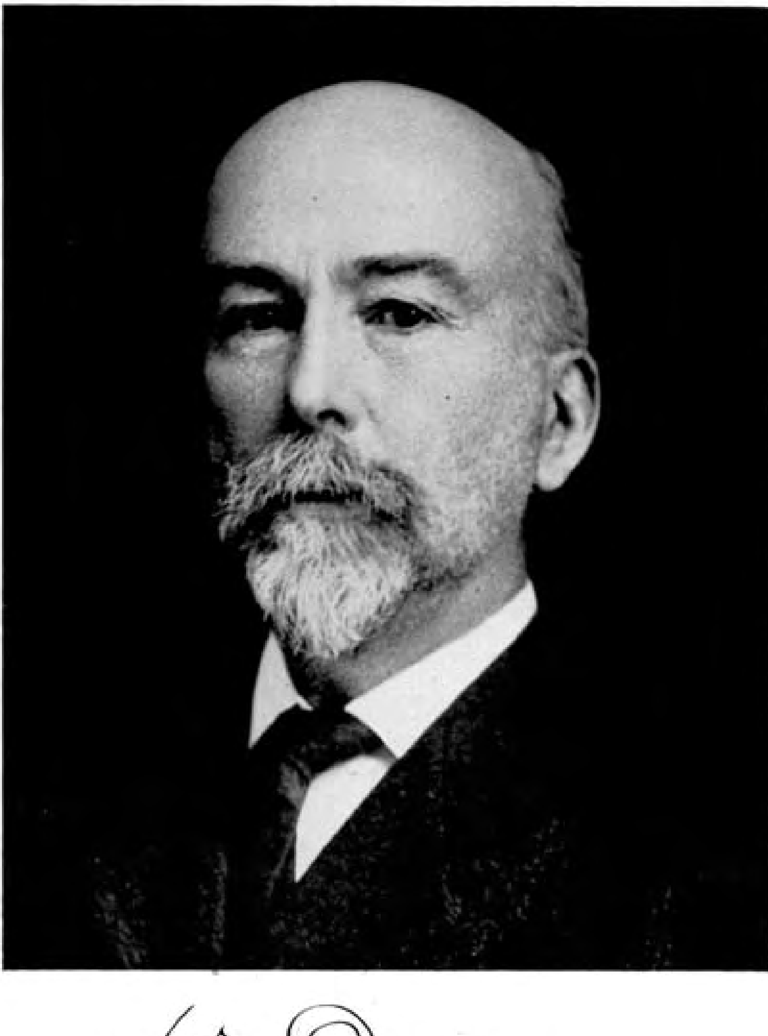

W. M. Davis

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William Morris Davis won distinction as geologist, meteorologist, and geomorphologist, but primarily as teacher. He made personal, outdoor researches in every continent except Antarctica, as well as in island groups of the Atlantic and the Pacific; yet his international fame rests chiefly on his development of a system of thought concerning the reliefs, the scenery, of our planet. His system is the "American" system, but it is applicable to the landscapes of the whole world. His early training in geology led him to the principle by which he, more than anyone else, has revolutionized the teaching of, and research on, the endlessly varied forms of the lands and coastlines. To geographers and geologists alike he was an apostle bringing to them the gospel of method in research and method in the presentation of the results of research. For him the root of the matter is evolution, orderly development. Many geologists had used this principle, so essential to understanding the protean crust of the earth, but few geographers had used it in describing land forms. Davis emphasized a mode of thinking and for its expression he devised a system which has greatly appealed to teachers and investigators in many foreign countries as well as in the United States of America. While creating his descriptive method in terms of evolutionary changes, he found our English tongue sadly deficient. He had to create a new, necessarily technical language. Every man of science knows the difficulty of such an invention. Some of his verbal tools Davis was able to adopt from the literature of earth science, an immense literature which he thoroughly mastered; other vital terms were his own. The combination has been put to constructive use by geologists and geographers, foreign and domestic, to an extent encouraging to our pioneer. He lived to see notable improvement of geographical instruction in grammar school, high school, college, and university; improvement in the reporting of geographical and geological facts by staffs of the State and Federal surveys; and improvement in the discussion of "terranes" by the more philosophically-minded historians and economists.

Knowing that even a long life could not vitalize all the dry bones of the old geography, Davis specialized on physical geography, leaving to others the problem of systematizing the infinitely varied responses of organisms to their environment. This other half of geography needs today a clarifying leader like Davis.

Davis was born in Philadelphia on February 12, 1850. At that time his father, Edward M. Davis, a business man, and his mother, Maria (Mott) Davis, were members of the Society of Friends and fully shared the best characteristics and activities of Quakers in full standing. Yet a hatred of injustice, which was to be an outstanding emotion of their son, led them into rebellion against one of the ironclad rules of the Society. Not content with helping to operate the "underground railway" for escaping slaves, Edward Mott enlisted in the Northern Army. For this action he was expelled from the Society of Friends and soon after his wife resigned from it. To both of them the question of States' rights was quite subordinate to the problem of human freedom. To break with the Society's tradition took courage of the kind shown in the remarkable life of Lucretia Mott, the mother of Maria Mott.

Theodore Tilton called Lucretia Mott, born in Nantucket, Massachusetts, "the greatest woman ever produced in this country." "She was the real founder and the soul of the woman's rights movement in America and England. She was the outstanding feminine worker in the struggle to rid our country of slavery. She advocated labor unions in a day when they were proscribed and generally considered illegal. She proscribed war, and worked diligently for liberal religion." Her crusading force "had its source in the love of freedom of her seafaring ancestry, and she feared opposition or the exploration of uncharted regions of the mind no more than they feared to venture into unknown seas" (quotations from Anita Moffett in the New York Times Book Review, August 1, 1937). That her grandson was to be a crusader, a champion for mental and moral probity, was assured by inheritance from parents and grandparent.

As a boy Davis was retiring, little interested in sports, but engrossed in his studies. For several years before attending the local schools he was taught his lessons by his mother. She, like her own mother, knew well the power of words and laid much stress on their correct use; doubtless this early training had much to do with Davis's rigor in developing a scientific vocabulary for his favorite science and his insistence on precision of speech and writing by student or professional investigator.

The boy was a good student and showed his mental calibre by winning the Harvard degrees of Bachelor of Science at the age of nineteen and Master of Engineering a year later. He immediately accepted a call to the meteorological service of the National Observatory of Argentina at Cordoba. After three years of that routine work he returned to the United States. After a term as field assistant to Pumpelly in the Northern Pacific Survey, he was appointed (1877) to an assistantship in geology at Harvard, under N. S. Shaler, with whom he gained a permanent love for earth science. In those days promotion was slow and from 1879 to 1885 he was listed as instructor in geology at Harvard, where he began a five-year term as assistant professor of physical geography in 1885. In 1890 he attained the rank of full professor in the same subject. Nine years later he became Sturgis Hooper Professor of geology, a position held until 1912, when he resigned, to be a Harvard "emeritus" for the remaining twenty-two years of his life. He had two leaves of absence. In 1908 he was appointed visiting professor at Berlin University for a year, and, in 1911, visiting professor at Paris for a year, during which he lectured also at several provincial universities of France.

With his resignation Davis was freed from his responsibilities as active Sturgis Hooper Professor and found the eagerly-sought opportunity to make many postponed field studies both in North America and abroad, and also to make personal contact with geographers and geologists and their respective workshops. Because he had a philosophy to expound, he could not refrain from accepting many invitations to lecture at western universities: California (Berkeley, 1927-1930); Arizona (1927-1931); Stanford (1927-1932); Oregon (1930); California Institute of Technology (1931-1932). With unfinished manuscripts on his desk at Pasadena he died in harness, on February 5, 1934, seven days before his eighty-fourth birthday.

The efficiency of Davis as a man of science was in no small part secured by domestic happiness. He was married three times and twice he suffered by the death of a partner. In 1879 he married Ellen B. Warner of Springfield, Massachusetts; in 1914, Mary M. Wyman of Cambridge, Massachusetts; and in 1928, Lucy L. Tennant of Milton, Massachusetts, who has survived him. All three women were truly sympathetic helpmeets, as the present writer knows from forty years of close association with this man, who needed much freedom from the cares of a household while working for and in the world outside.

The science of land forms, so intelligently enriched and organized by Davis is a planetary science; his message was addressed to geographers and geologists of every nation. That those colleagues recognized the vitality and soundness of his evolutionary ideas is indicated by the long list of honors showered on him by foreign as well as American societies. He was elected to honorary membership in the geographical societies of Amsterdam, Berlin, Budapest, Frankfurt, Geneva, Greifswald, Leipzig, Madrid, Neuchatel, New York, Petrograd, Rome, Stockholm, and Vienna, as well as the Royal Society of Natural History at Madrid, the American Meteorological Society, and the Scientific Society "Antonio Alzate" of Mexico; to corresponding-membership in the Berlin and Paris Academies of Science and the Accademia dei Lincei; to corresponding-membership in the geographical societies of Chicago, London, Munich, Paris, and Philadelphia, and the geological societies of Belgium, Liverpool, and London and the German Meteorological Society; to foreign-membership in the Academies of Sciences at Christiania, Copenhagen, and Stockholm. He was elected to membership in the American Academy of Arts and Sciences, the American Philosophical Society, the National Academy of Sciences, the Imperial Society of Natural History in Moscow, and the New Zealand Institute.

The Geological Society of America made him its acting president in 1906 and full-time president in 1911. He founded the Harvard Travelers Club, of which he was president from 1902 to 1911, and the Association of American Geographers, of which he was thrice elected president (1904, 1905, 1909). For his leadership and scholarliness he was chosen to be an associate editor of "Science" and the "American Journal of Science."

In 1886 he was awarded the H. H. Warner Medal "for scientific discovery"; in 1895, another from the University of Paris. Later awards were: the Cullom Medal from the American Geographical Society (1908); a medal from the University of Berlin (1910); a medal from the Harvard Travelers Club (1911); a medal from the Geographical Society of Philadelphia (1912); the Culver Medal from the Geographical Society of Chicago (1913); the Kane Medal from the Philadelphia Geographical Society (1913); the Hayden Medal from the Philadelphia Academy of Sciences (1918); the Patron's Medal from the Royal Geographical Society, London (1919); the Vega Medal from the Swedish Geographical Society (1920); the Loçy Jagos Medal from the Hungarian Geographical Society (1930); and the Penrose Medal from the Geological Society of America (1931). He became Chevalier of the French Legion of Honor. As Exchange Professor to France he was the first American to give regular instruction at the Sorbonne.

Davis was given four honorary degrees: S.D. by the University of the Cape of Good Hope (1905) and by the University of Melbourne (1914); Ph.D. by the universities of Greifswald (1906) and Christiania (1911).

After his death the California Institute of Technology at Pasadena, where he had made many new friends, dedicated to Davis a memorial "Gate of Knowledge," one of the entries to the grounds of the Institute, whose students and faculty he had stimulated by his courses of lectures.

Work in Meteorology

Davis's interest in meteorology was doubtless aroused by his study of atmospheric conditions in Argentina, from 1870 to 1873. Soon after his appointment at Harvard he undertook his first pioneering task, the creation of a systematic course on the science of the atmosphere. This course became noted for its broad scope and for the clear, logical mode of presentation; in these respects it had no rival in America and probably none anywhere else. Fortunately he was able to put the content of the course in the permanent form of his "Elementary Meteorology," published in 1894, when the course was turned over to Robert DeCourcy Ward, a capable, Davis-trained student, who greatly expanded the university offerings in meteorology and added courses in climatology. This development, together with the founding of the Blue Hill Observatory as a Harvard research institution, was an abiding satisfaction to Davis and incidentally freed him for other enterprises.

The superbly designed and executed "Elementary Meteorology," for many years the best college text on the subject and still valuable in spite of the enormous increase of meteorological data since 1894, illustrated its author's skill in compiling the best of the world's thought about the physics of the atmosphere and contained the results of his own direct observations. With the help of volunteer assistants he carried on such field investigations as could be prosecuted in New England. The results were published in papers on thunderstorms, the sea breeze, atmospheric convection, and theories of rainfall. Other papers with novel points of view were published on tornadoes, secular changes of climate, and the wind systems of the oceans. His writings on thunderstorms and the sea breeze are "classic" for teachers of meteorology. Between 1884 and 1893 he published forty papers on this general subject.

Work in Geology

Not long after Davis became associated with the inspiring Shaler, the two men published jointly a handsome volume "Illustrations of the Earth's Surface" (1881), intended to popularize some of the more dramatic and better understood processes that mold the surface of our planet. But the young instructor knew full well that effective, authoritative teaching of geology, the principal subject of his first instructorship, demanded close personal touch with Nature. To get such experience he selected for field study in detail the Triassic formation of New England and New Jersey. On those regions he published fifteen preliminary papers (1882-1896), and a monographic summary of most of his results in "The Triassic Formation of Connecticut" (1898). This gave the first full account of the Triassic volcanic history of the region, announced criteria for proving the extrusive character of some of the "trap sheets" and the intrusive character of others. He also showed how the analysis of topographic forms could be used in explaining the underground, invisible structures of Connecticut and similarly faulted areas of the earth's crust.

While working on the complex history of the Triassic areas, Davis interpolated field investigations: in Columbia County, New York, and the Catskills, where he described the northward continuation of the Appalachian structure; on the glacially-formed drumlins of New England and other regions; on the structure and origin of glacial sandplains and eskers; and on the geological history of Mount Desert Island. In later years he studied: the origin of the thick and widespread Tertiary formations of the Rocky Mountain region, showing that these are not lake beds, as had been generally assumed, but are fluviatile and alluvial-fan deposits; the origin and erosional history of the Basin Ranges of the West; the development of the Colorado Canyon; the mechanical conditions leading to the formation of limestone caverns; and the nature of geological proof, asking geologists "how do you know you are right?"—a question that illustrated the fact that he was as much concerned with the method of scientific thinking as he was in the majestic happenings of earth history. Yet Davis must have been conscious that he made a principal contribution to the philosophy of geology itself. His major contribution to earth science was the conception of the "erosion cycle." He applied it to the physiographic history of Pennsylvania, New England, the Rhine province, Turkestan, and many other, once-lofty ranges of mountains and proved that each of these regions had been reduced by slow denudation to a lowland, to an "almost-plain" or "peneplain." He further showed that after completion of a cycle, many an "old-mountain peneplain" was uplifted and again deeply dissected by its rivers. With such demonstrations, phrased in the terms of his new geographical vocabulary, Davis made more vivid than ever before the enormous length of geological time. No geologist who had carried the logic of the erosion cycle into the interpretation of the major "unconformities" visible in the strata of the earth's crust was greatly surprised when, later, the results of radioactivity in rocks gave a minimum age of about two billion years to that crust.

Work in Geography

Davis gave much thought to the question as to the content of scientific geography, a subject which, because of the world-wide problems of both war and peace, is likely to be in long-continued demand in our colleges and universities as well as in secondary schools. In the first yearbook of the National Society for the Scientific Study of Education (1902) he wrote:

"Geography as a mature subject is capable of a higher development than it has yet reached. In this connection it will be well to review briefly the three stages of development recognizable in the progress of our venerable subject. Until within about a hundred years the content of geography consisted of a body of uncorrelated facts concerning the earth and its inhabitants. The facts were described empirically, and as a rule very imperfectly. Their location was noted, but their correlations were overlooked; it had not indeed been clearly made out that correlations existed. This blindly inductive first stage was followed by a second stage, which was opened by Ritter's exposition between the earth and its inhabitants; . . . such relationships as were noted had to be explained on the old doctrine of teleology—the adaptation of the earth to man—instead of on the modern principle of evolution—the adaptation of all the earth's inhabitants to the earth. It is this principle which characterizes the third stage of progress, and along with it goes a principle of almost equal importance; namely, that all the items which enter into the relation between the earth and its inhabitants aid so powerfully in observing and appreciating the facts of nature." . . .

"Geography has today entered well upon its third stage of progress. The 'causal notion' is generally admitted to be essential in the study. . . . Thus understood, geography involves the knowledge of two great classes of facts: first, all those facts of inorganic environment which enter into relationship with the earth's inhabitants; second, all those responses by which the inhabitants, from the lowest to the highest, have adjusted themselves to their environment. The first of these classes has long been studied as physical geography, although this name has been used as a cover for many irrelevant topics. In recent years there has been a tendency to compress the name into the single word 'physiography.'

"The second of the two classes of facts has not yet reached the point of being named, but perhaps it may come to be called ontography. Ecology, to which increasing attention is given by biologists, is closely related to what I here call ontography, yet there is a distinction between the two, in that ecology is concerned largely with the individual organism, while ontography is intended to include all pertinent facts in structure, physiology, individual, and species.

"Neither physiography nor ontography alone is geography proper, for geography involves the relation in which the elements of its two components stand to each other. Each of the components must be well developed before geography can be taken up as a mature study."

Davis held that "teachers of geography should be better taught"; that the subject should be treated more scientifically both here and abroad; that it is far more than the "location of things"; that emphasis on principles rather than on items cannot fail to foster the "intelligence as well as the memory" of pupils in secondary schools; that even in such schools the causal notion should be stressed—"how" and "why" as well as "where" and "what," about things as we find them. "Elementary geography may still deal with the salient facts and place man conspicuously in the foreground; more advanced geography may include examples of greater complexity, by always selecting important rather than trivial matters; but the investigator must study the trivial items along with the greater ones, and all must be duly scrutinized, described, and classified."

The delay of the subject to reach mature treatment did not surprise Davis, who regarded it as "perhaps the most complex of all sciences." Although he did not mention it, not the least of the complications in human geography is man's free will, so often obscuring his responses to physiographic controls. Thus for more than one reason Davis himself did comparatively little in illustrating his fundamental principle of relationship between organisms and environment. He wisely restricted himself to spade work on the inorganic side of the vast subject.

In his chosen field Davis worked on the principle that, while geology is the study of the past in the light of the present, physiography is the study of the present in the light of the past. The one science complements the other and it is no accident that his influence on geological research has been at least as great as his influence on geographical research.

On many occasions he told of his deeply-felt indebtedness to American geologists, particularly Lesley, the staff of the Geological Survey of Pennsylvania, and Powell, Gilbert, Dutton and Holmes of the great western surveys. It was while reading their published writings that "geography gained a new interest" for Davis. That interest culminated in the development of his most famous idea, that of the "cycle of erosion." He visualized a structural unit in the terrestrial landscape and then deduced the topographic results of erosion of this unit by rivers born on its original surface or developed on the unit during the later, systematic evolution of its river system.

"The sequence of forms assumed by a given structure during its long life of waste is determinate, and . . . the early or young forms are recognizably different from the mature forms and the old forms. A young plain is smooth. The same region at a later date will be roughened by the channeling of its larger streams and by the increase in number of side branches, until it comes to 'maturity,' that is to the greatest variety or differentiation of form. At a still later date the widening of the valleys consumes the intervening hills, and the form becomes tamer, until in 'old age' it returns to the simple plain surface of 'youth' " (*National Geographic Magazine,* vol. 1, 1888, p. 15).

In another place he wrote:

"In whatever way a new mass is offered to the wasting forces, let us call the forces that uplift it constructional forces; and the forms thus given, constructional forms. Let all the forces of wasting be called destructional forces; let the sea-level surface, down to which a sufficiently long attack of the destructional forces will reduce any constructional form, be called the ultimate baselevel; and let the portion of geological time required for the accomplishment of this task be called a geographical cycle. Construction, destruction, baselevel and cycle are our primary terms." (*Journal of Geology,* vol. 2, 1894, p. 72.)

It should be noted that "cycle" is here used in the figurative sense of a long period of time. The "plain" of extreme old age could never attain the form of the youthful stage, the greatly multiplied branches of the master rivers and also the inter-stream areas having individual slopes quite different from the general slope of the young plain, both in magnitude and azimuth. Thus at the ultimate stage of development of the ideal cycle we have an almost-plain with a relief which, though gentle, is vastly more varied than the relief of the young plain. To this final form Davis gave the name "peneplain," which, like "cycle," has won a permanent place in the vocabulary of physiographers and geologists.

Similarly, Davis worked out the ideal cycle as a means of vividly describing the erosional changes suffered by terranes of much greater variety of initial relief, such as mountain ranges and volcanic provinces. With sufficient study any actual unit of the earth's topography can be interpreted in terms of the erosion cycle, with its three dominating ideas, structure, process, and stage.

Nevertheless Davis knew well that the scheme of a simple cycle can rarely suffice for a full scientific description of land forms. He saw that at any stage of its history a topographic unit may be affected by uplift or subsidence, with corresponding effect on the power of eroding streams and on the fashioning of reliefs. Thus the deductive scheme was enlarged to the conception of multiple cycles, separated by "interruptions" due to changes of level. Then, too, the landscape in question may have had its drainage system affected by change of climate or by volcanism—complications to which he gave the technical name "accidents."

In the Proceedings of the American Philosophical Society (1902) Davis further explained his mode of thought as teacher and investigator in the following words:

The geographer "must generalize in order to bring the observable items within the reach of descriptive terms, and as soon as he generalizes, the use of idealized types is practically unavoidable. Such types have long been in current use, but they have been too few and too empirically defined for the best results. They need to be greatly increased in number, and at the same time they must be correlated with structure, process, and time; for only by following the path of nature's progress can we hope to store our minds with types that shall imitate nature's products. It may be fairly urged that the larger the store of types a geographer possesses, and the more careful and numerous the comparisons with nature by which the types have been rectified, the better progress can the geographer make in new fields of observation.

"But the geographer who adopts the explanatory methods in a whole-souled fashion will find himself called upon not only to imagine a large series of type forms; he must also call into exercise his deductive faculties and employ them to the fullest, if he would make the best progress in the newer phases of his subject, however purely inductive he has imagined it to be. In setting up a store of types, there is need of deducing one type from another at every step; and it may be confidently urged that whoever hesitates to recognize this principle will fail of his effort to describe through explanation. But as a matter of fact, geography has some time been more deductive than geographers have supposed it to be; and the newer phase of the science is not characterized so much by introducing deduction for the first time, as by insisting on its whole-souled acceptance as an essential process in geographical research.

"It is only by giving the fullest exercise to the faculties of imagination and deduction that the cycle of erosion becomes serviceable. Here the geographer who hesitates is lost. . . .

"Thus comparing the partial view of the landscape, as seen by the outer sight, with the complete view of the type as seen by his inner sight, [the geographer] determines, with great saving of time and effort, just where his next observations should be made in order to decide whether the ideal type he has provisionally selected fully agrees with the actual landscape before him. When the proper type is thus selected, the observed landscape is concisely and effectively named in accordance with it; and description is thus greatly abbreviated."

As he put the case in 1894, "one of the chief aids to sharp outsight is clear insight." To illustrate, he cited the need of special training for the maker of topographic maps.

"Even the best surveys are necessarily sketched in great part; and the topographer must appreciate his subject before he can sketch it. He must have a clear insight into its expression; his outer eye must be supplemented by his inner eye." . . . Let us therefore strive to complete a deductive geographical scheme . . . until it shall at last be ready to meet not only the actual variety of nature, but all the possible variety of nature."

Davis gave still another summary of the method he recommended to the geographer who aspired to be truly scientific. The savage may do little more than observe natural happenings. The barbarian may go a step further and invent hypotheses in explanation of those events; although his hypotheses are generally wild, he may be said to have a two-faculty approach to Nature. The modern, well-trained naturalist takes four steps. He observes, invents, deduces, and verifies; he deduces the consequences of each hypothesis and then goes back to Nature to improve his deductive scheme and to verify the correct hypothesis if he has been fortunate enough to create it. He has the four-faculty approach to Nature. Two generations of workers in earth science have benefited by Davis's insistence on the value of multiple hypotheses, even "outrageous" hypotheses, in search for the truth about the outdoor world. By such thinking all around the subject, that is, by inventing all of the more reasonable, conceivable solutions to the problem at issue, the investigator is put on the alert. His field record becomes automatically charged with crucial observations and kept free from a load of hit-or-miss, unessential observations. Valuable as it is, the scheme of the erosion cycle is not so important for research in earth science as the underlying philosophy, which makes deduction no whit inferior to induction in the tool-chest of the naturalist.

It seems equally clear that the application of Davis's method of thinking about land forms is of great worth in the training of young students. That method is based on the exercise of the imagination, the highest faculty of the mind; it is the faculty of seeing things as they are and not as they appear to be. To develop it in the youth of school and college is the most precious privilege of the teachers, and for this purpose few high school subjects are comparable with the evolutionary treatment of landscapes.

In 1889, five years after his first announcement of the cycle idea, Davis published the most remarkable of all of its many applications. The subject of this study is entitled "The Rivers and Valleys of Pennsylvania." In this masterpiece of acute reasoning and close observation in a complicated terrane he traced the influence of a whole set of differing geological structures on the development of highly varied land forms and of the associated river system. The results of this path-breaking research make this early paper a classic, the conclusions of which stand fast after more than half a century has added to our knowledge of the Pennsylvanian region.

Other broad units of the earth's relief were similarly treated in scores of later papers. At first their author went into the more easily accessible fields which were already covered by reasonably accurate topographic maps: for example, northern New Jersey, southern New England, and Virginia. Then, as a result of many visits to Europe and travels in central Asia, South Africa, Australia, and New Zealand, he tested, far and wide, his art of describing land forms genetically, in terms of structure, process and stage. As he himself expected, he found new complications, but none that could not be fitted into the general scheme, so long as each individual region is affected by the normal climate. Arid regions, however, demanded different treatment, and, aided by the writings of Passarge and others, Davis worked out a scheme for "the desert cycle." His personal inspection of the great topographic changes wrought by mountain glaciation in central France, the Alps, Norway, and our western Cordillera led him to an incomplete but illuminating version of a "glacial cycle," this to include evolutionary stages *quite different from, though in some instances analogous to,* the systematic stages demonstrated in regions exposed to normal climatic conditions. From his field studies of the New England and other coastlines, supplemented by examination of large-scale maps of continental and island shores the world over, Davis aided by his pupil, F. P. Gulliver, showed how shoreline forms can be systematized and scientifically described in the terms of the "cycle of marine erosion."

Two masterly, advanced courses in physical geography, one on the United States and the other on Europe, claimed the unfading admiration of those who listened. Illustrated with a host of large-scale topographic maps of States and European countries, these lectures showed the solid worth of Davis's philosophy, though in scholarly fashion he gave full weight to the opinions and methods of other investigators on the two continents. Probably because of the difficulty of adequately reproducing the maps around which the discussion centered, the material of these unique lectures was never published. To spread his gospel Davis relied chiefly on what he used to call "the rapid-fire gun," propagandizing with hundreds of papers, a number of which were written in French and German and printed in Europe. To the teachers in secondary schools he offered his elementary "Physical Geography" (1898) and a second book, "Practical Exercises in Physical Geography" (1908), but the only comprehensive statement of his matured philosophy was published in German with the title "Die Erklärende Beschreibung der Landformen" (1912). In English we have a convenient assembly of twenty-six among the more important papers dealing with methods of teaching geomorphology and with the general idea of the erosion cycle. This volume of nearly 800 pages was edited by the late Douglas W. Johnson, fellow member of the National Academy of Sciences, with the title "Geographical Essays" (1909).

Not the least merit of Davis's papers and books is their profuse illustration with block diagrams, which tell his story with extraordinary clarity and conciseness. His sureness of penstroke and his sense of values in selecting the essential features of the thousand landscapes he pictured entitle him to the name artist. In this art no geographer nor geologist has ever rivaled him. Everyone who saw him do it marvelled at his simultaneous use of both hands when drawing block diagrams on the blackboard—with amazing speed and practically without erasures.

In 1912 Davis resigned from the professorship of geology which he had held for thirteen years, after having been Harvard's leading geographer for fourteen years. Thus for nearly thirty years he had been a bridge-builder between the two sciences. It was natural that he should be attracted to the problem of coral reefs, which is obviously in the border field. In 1914 a grant from the Shaler Memorial Fund of his university enabled him to visit many islands in the Fiji, New Hebrides, Cook, Loyalty, and Society groups as well as Oahu, New Caledonia, and a long stretch of the Queensland coast inside the Great Barrier Reef of Australia. In 1923 he added to his field experience by travel among the reef-bearing islands of the Lesser Antilles. For twelve years his time was largely spent on the study of his own observations, of the multitude of island charts issued by the hydrographic offices of the world, and on the voluminous literature on the controversial subject of reef origin. At intervals he published the results of his correlations, producing twenty-eight papers and a book on the Antilles. In 1928 there appeared his weighty monograph, entitled "The Coral-Reef Problem," giving his complete views concerning the relative merits of the many hypotheses which have been offered as solutions to the reef problem.

Davis was fascinated by the beauty and apparent cogency of the Darwin-Dana view that atolls and barrier reefs are best regarded as the products of slow subsidence of the foundations on which these structures are built, and at first (1915) thought the subsidence hypothesis to be alone competent in explanation. Later he accepted the idea of "Glacial controls" as useful in accounting for the "platform foundations" and crowning reefs in the marginal areas of the earth's coral-reef zone. His treatment of the problem was dominated by the double principle of deduction and verification, but in the opinion of the present writer Davis failed to give adequate consideration to some of his premises, including the geological dates when the reef foundations were prepared and when the wave-resisting species of corals became abundant in the tropical ocean. Nor was sufficient attention paid to the relatively enormous areas and remarkable flatness of the lagoons inside atoll and barrier reefs—features which are almost universal and not to be expected on the Darwin-Dana hypothesis. It may further be remarked that this hypothesis is not supported by the findings at test bore-holes in Bermuda and at Michaelmas Cay and Heron Island inside the Australian Great Barrier Reef.

Notwithstanding such failure to secure the premises on which the author of "The Coral-Reef Problem" based his own conclusions, this book will long remain the Bible for geologists and geographers who need a richly illustrated handbook summarizing the facts known about these marvelous structures of the coral seas, or are interested in the relation of the reef controversy to the fundamental question as to the strength and stability of the earth's crust.

Personal Characteristics

Davis had a wonderful capacity for continuous labor. Great physical endurance helps to explain his keen zest for life as well as his success in systematizing a world-embracing science. It took zeal and courage to attempt wholesale reform of the geography taught before his time; both qualities were confirmed as he saw his heresies become gradually accepted principles. His favorite tool was logic. Although at heart he was capable of deep emotion, he would rarely allow emotion to appear in his writings or in his college lectures. Partly for this reason the writings did not appeal to the general public, nor the lectures to the rank and file of Harvard students. Davis was sometimes severely critical of student or colleague who, in order to lighten style of presentation, used simile, metaphor, or other figure of speech which could in the least obscure orderly expression of the thought. Rigorous with himself, he was rigorous with his students. He detested sloppiness and made disciplined thought and precision the outstanding aims of his courses in both college and graduate school. Yet he was sympathetic with honest endeavor and spent much time and energy helping special students who through no fault of their own, had not been properly prepared for imaginative and logical attack on scientific problems.

By his Quaker upbringing Davis was endowed with a high ethical standard. As we have already noted, his family was forced to leave the Society of Friends, but Davis kept one concrete relic of that early association. Even into old age he addressed each member of his own family with the pronoun "thee." Perhaps this habit of speech was rooted so deeply because of a scene witnessed during his plastic childhood. Then he heard a Quaker boy, fighting with another boy who was not of the Friends, intersperse his blows with the taunt: "Thee little You, thee!" The influence of his forbears was particularly shown in Davis's craving for fairness and justice in the world and in his religious tolerance. He used to say: "Who am I to 'tolerate' anybody's belief? I want to respect it even if I cannot agree." He affiliated himself with the Unitarian church. Two months after his death his last paper, "The Faith of Reverent Science," was published. He there declared his ideal for the human race—progress ever upward "to a truly Christian standard."

KEY TO ABBREVIATIONS USED IN THE BIBLIOGRAPHY

Am. Ac. Pr. = American Academy of Arts and Sciences Proceedings
Am. Assn. Pr. = American Association Proceedings
Am. Assn. Adv. Sc. Pr. = American Association for the Advancement of Science Proceedings
Am. G. = American Geologist
Am. Geog. Soc. Bull. = American Geographical Society Bulletin
Am. Geog. Sp. Pub. = American Geographical Special Publication
Am. Geophys. Tr. = American Geophysical Union Transactions
Am. J. Sci. = American Journal of Science
Am. Met. J. = American Meteorological Society Journal
Am. Nat. = American Naturalist
Am. Ph. Soc. Pr. = American Philosophical Society Proceedings
An. Rep. Astron. Obs. Harvard Coll. = Annual Report of the Director of the Harvard Astronomical Observatory
An. Géog. = Annales de Géographie
Assn. Am. Geog. An. = Association of American Geographers Annals
Atl. Mo. = Atlantic Monthly
Biog. Mem. Nat. Acad. Sci. = Biographical Memoirs, National Academy of Sciences
Boll. R. Soc. Geog. = Bollettino Royal Società Geografica
Boston Soc. N. H. Pr. = Boston Society of Natural History Proceedings
Brit. Assn. Adv. Sci. Rep. = British Association for the Advancement of Science Report
Bull. Volcanologique = Bulletin Volcanologique
Calif. J. Mines and Geol. = California Journal of Mines and Geology
Conn. Sch. Doc. = Connecticut School Document
Ed. Rev. = Educational Review
Eng. Mo. J. = Engineers Monthly Journal
Franklin Inst. J. = Franklin Institute Journal
Geog. Anzeiger = Geographischer Anzeiger
Geog. J. = Geographical Journal
Geog. Rev. = Geographical Review
Geog. Soc. Phila. Bull. = Geographical Society of Philadelphia Bulletin
Geog. Teacher = Geography Teacher
G. Assn. Pr. = Geologists Association Proceedings
G. Mag. = Geological Magazine
G. Rundschau = Geologische Rundschau
G. Soc. Am. Bull. = Geological Society of America Bulletin
G. Soc. Am. Pr. = Geological Society of America Proceedings
Ges. Deutsch. Naturf. u. Ärtze = Gesellschaft Deutscher Naturforscher und Ärtze
Ges. Erdk. Berlin Zs. = Gesellschaft Erdkunde Berlin Zeitschrift
Goldthwaite's Geog. Mag. =Goldthwaite's Geographical Magazine

Harvard Coll. Mus. C. Z. Bull. = Harvard College, Museum of Comparative Zoology Bulletin
Harvard Grad. Mag. = Harvard Graduates' Magazine
Int. Cong. Geol. C. R. = International Congrès Géologique Compte Rendu
Internat. Wochenschr. = Internationale Wochenschrift für Wissenschaft Kunst und Technik
J. Franklin Inst. = Journal of the Franklin Institute
J. G. = Journal of Geology
J. Geog. = Journal of Geography
J. N. E. Waterworks Assn. = Journal of New England Waterworks Association
J. Sch. Geog. = Journal of School Geography
Johns Hopkins Univ. Cir. = Johns Hopkins University Circular
Liverpool G. Soc. Pr. = Liverpool Geological Society Proceedings
Mass. St. Bd. Educ. Ann. Rep. = Massachusetts State Board of Education Annual Report
Meriden Sci. Assn. Tr. = Meriden Scientific Association Transactions
Meteorologische Zeit. = Meteorologische Zeitschrift
Mo. Wea. Rev. = Monthly Weather Review
Nat. Acad. Sci. Pr. = National Academy of Sciences Proceedings
Nat. Geog. Mag. = National Geographic Magazine
Nat. Geog. Mon. = National Geographic Monograph
Nat. Herbart Soc. = National Herbart Society
Nat. Hist. = Natural History
Nat. Research Council = National Research Council
Pan-Am. Geol. = Pan-American Geologist
Pan-Pac. Sci. Cong. Pr. = Pan-Pacific Scientific Congress Proceedings
Pop. Sci. Mo. = Popular Science Monthly
Proc. New Eng. Met. Soc. = Proceedings New England Meteorological Society
Quart. J. Geol. Soc. London = Quarterly Journal of the Geological Society of London
Quart. J. Royal Met. Soc. = Quarterly Journal of the Royal Meteorological Society
R. I. Ed. Pub. = Rhode Island Educational Publication
Roy. Geog. Soc. J. = Royal Geographical Society Journal
San Diego Soc. Nat. Hist. Tr. = San Diego Society of Natural History Transactions
Science = Science
Sci. Mo. = Scientific Monthly
Sci. Prog. = Science Progress
Scottish Geog. Mag. = Scottish Geographical Magazine
Tr. Edin. Geol. Soc. = Transactions of the Edinburgh Geological Society
Tr. N. Z. Inst. = Transactions of the New Zealand Institute

U. S. Dept. Ag. Wea. Bur. Bull. = United States Department of Agriculture Weather Bureau Bulletin
U.S.G.S. Ann. Rep. = United States Geological Survey Annual Report
Van Nostrand's Eng. Mag. = Van Nostrand's Engineering Magazine
Ver. Erdk. Leipzig Mitt. = Verein für Erdkunde Leipzig Mitteilungen
Wash. Acad. Sci. J. = Washington Academy of Sciences Journal

BIBLIOGRAPHY OF WILLIAM MORRIS DAVIS

1880

Banded Amygdules of the Brighton Amygdaloid. Boston Soc. N. H. Pr. 20: 426-8.

1881

Illustrations of the Earth's Surface; Glaciers. (With N. S. Shaler.) Science 2: 581-4, 624-30.
Remarks on the Geology of Mt. Desert, Me. Boston Soc. N. H. Pr. 21: 117-8.

1882

Glacial Erosion. Boston Soc. N. H. Pr. 22: 19-58.
On the Classification of Lake Basins. Boston Soc. N. H. Pr. 21: 315-81. (Abst.) Am. Nat. 16: 1028-9.
The Little Mountains East of the Catskills [N.Y.] Appalachia 3: 20-33.
On the Triassic Trap Rocks of Mass., Conn. and N. J. Am. J. Sci. (3) 24: 345-9.

1883

Becraft's Mountain [Columbia Co., N. Y.] Am. J. Sci. (3) 26: 381-9, map.
Deflective Effect of the Earth's Rotation. Van Nostrand's Eng. Mag. 28: 297-8.
Charcoal as Applied to the Deposition of Gold from Copper and Other Impurities. Franklin Inst. J. 85: 274-87.
The Folded Helderberg Limestones East of the Catskills. Harvard Coll. Mus. C. Z. Bull.: 7 (g s 1) 311-29, map.
Lake Bonneville. Science 1: 570.
The Nonconformity at Rondout, N. Y. Am. J. Sci. (3) 26: 389-95, map.
Lakes and Valleys in Northeastern Pennsylvania. Science 1: 304-5.
The Origin of Cross Valleys. Science 1: 325-7, 356-7.
On the Relations of the Triassic Traps and Sandstones of the Eastern United States. Harvard Coll. Mus. C. Z. Bull.: 7 (g s 1): 249-390.
The Structural Value of the Trap Ridges of the Connecticut Valley. Boston Soc. N. H. Pr. 22: 116-24.

1884

The Distribution and Origin of Drumlins. Am. J. Sci. (3) 28: 407-16.
Drumlins. Science 4: 418-20.
Gorges and Waterfalls. Am. J. Sci. (3) 28: 123-32.
How Do the Winds Blow Within the Storm-Disk? Science 3: 402-3.
Light in the Deep Sea. Science 4: 94.
Local and Tropical Weather Conditions. Am. Met. J. 1: 245-7.
Meteorological Charts of the North Atlantic. Science 3: 654-7.
The Older Wind-Charts of the North Atlantic. Science 3: 593-7.
[On the Definition of a Tornado] Am. Met. J. 1: 159-60.
Paleozoic High Tides. Science 3: 473-4.
Rainfall Maps. Am. Met. J. 1: 302-3.
The Relation of Tornadoes to Cyclones. Am. Met. J. 1: 121-7.
Ueber Samum und Böen. Meteorologische Zeit. 1: 243-5.
Whirlwinds, Cyclones, and Tornadoes. 90 pp., Boston, Lee and Shepard, Publishers.
The Winds and Currents of the Equatorial Atlantic. Am. Met. J. 1: 48-56.

1885

The Deflective Effect of the Earth's Rotation. Am. Met. J. 1: 516-24.
Earthquakes in New England. Appalachia 4: 190-4.
Geographic Classification, Illustrated by a Study of Plains, Plateaus, and Their Derivatives. (Abst.) Am. Assn. Pr. 33: 428-32.
The Meteorological Observatory on Blue Hill. Science 5: 440.
Mountain Meteorology. Appalachia 4: Pt. I, 225-44; Pt. II, 327-51.
The Reddish-Brown Ring Around the Sun. Science 5: 455-6.
Reduction of Barometer Readings to Latitude 45°. Am. Met. J. 1: 516-24.
Relation of Tornadoes to Cyclones. Am. Met. J. 1: 48-56.
Terminology of Atmospheric Vapour. Am. Met. J. 2: 6-7.
Winds and Currents of the Equatorial Atlantic. Am. Met. J. 1: 48-56.

1886

American Contributions to Meteorology. Philadelphia, Nov. 19. Reprinted from J. Franklin Inst. 127: 27 pp.
Bishop's Ring Around the Sun. Pop. Sci. Mo. 28: 466-74.
Bishop's Ring During Solar Eclipses. Science 7: 239-40.
Brief Notices of Papers Read Before the Geological Section of the American Association. Am. J. Sci. (3) 32: 319-24.
'Chinook Winds'. Science 7: 55-6.
Chinook Winds of the North-West. Boston Soc. N. H. Pr. 23: 249-50.
Cyclones, Anticyclones and Pericyclones. Am. Met. J. 3: 117-8.
Derivation of the Term "Trade Wind." Am. Met. J. 3: 111-2.
Earthquakes in New England. Appalachia 4: 190-4.

The Festoon Cloud. Science 7: 57-8.

Foreign Studies of Thunder-Storms. Am. Met. J. 2: 489-99, 3: 40-8, 65-6, 69-79.

(With A. McAdie.) Height and Velocity of Clouds. Ann. Rep. Astron. Obs. Harvard Coll. 40: 10.

Mechanical Origin of the Triassic Monoclinal in the Connecticut Valley. (Abst.) Am. J. Sci. (3) 32: 321 (1886) Am. Assn. Pr. 35: 224-7 (1887) Boston Soc. N. H. Pr. 23: 329-41 (1887).

On the Methods of Study of Thunder-Storms. Am. Ac. Pr. 21: 336-47.

Mountain Meteorology. Appalachia 4: 225-44, 327-50.

Notes on Studies of Thunderstorms in Europe. First Papers: Am. Met. J. 3: Reprinted. 11 pp.

A Recent Ice-Storm. Science 7: 190.

The Recent Cold Wave. Science 7: 70-1.

Relation of the Coal of Montana to the Older Rocks. U. S. 10th Census. 15: 697-712.

(With Shaler, N. S., and Harris, T. W.). A series of twenty-five colored geological models and twenty-five photographs of important geological objects, each accompanied by a letter-press description. [D. C. Heath & Co.]

The Structure of the Triassic Formation of the Connecticut Valley. Am. J. Sci. (3) 32: 342-52.

Temperature Diagrams. Am. Met. J. 2: 169-75.

The Temperature of Mediterranean Seas. Am. Met. J. 3: 49.

A Thunder-Squall in New England. Science 7: 436-7.

Thunderstorms in New England in the Summer of 1885. Am. Ac. Pr. 22: 14-58.

Weather Prediction in New Zealand. Am. Met. J. 3: 103-5.

Winter on Mount Washington. Science 7: 40-2.

1887

Advances in Meteorology. Science 9: 539-41.

The Classification of Lakes. Science 10: 142-3.

The Foehn in the Andes. Am. Met. J. 3: 507. Reprinted.

The Height of Cumulus Clouds. Am. Met. J. 3: 492-4.

Instruction in Geological Investigations. Am. Nat. 21: 810-25.

Land and Sea Breezes. Am. Met. J. 4: 2 pp.

Snow as a Cause of Cold Weather. Am. Met. J. 3: 389-90.

Water-Vapor and Radiation. Am. Met. J. 3: 443-5.

1888

A Classification of the Winds. Am. Met. J. 4: 512-9.

Geographic Methods in Geologic Investigation. Nat. Geog. Mag. 1: 11-26.

Local Weather Predictions. Am. Met. J. 4: 409-12.

[On the Use of Meteorological Maps in Schools.] Am. Met. J. 4: 489-92.

The Structure of the Triassic Formation of the Connecticut Valley. U.S.G.S. Ann. Rep. 7: 455-90.

Synclinal Mountains and Anticlinal Valleys. Science 12: 320.

The Topographic Map of New Jersey. Science 12: 206-7.

Two Chapters on the Physical Geography and Climate of New England. Cambridge, 10 pp.

Wasp-Stings. Science 11: 50.

1889

The Ash Bed at Meriden and Its Structural Relation. Meriden Sci. Assn. Tr. 3: 23-30.

The Contoured Map of Massachusetts. Science 14: 422-3.

The Faults in the Triassic Formation Near Meriden, Conn. Harvard Coll. Mus. C. Z. Bull. 16 (g s 2): 61-87.

(With Wood, J. Walter, Jr.) The Geographic Development of Northern New Jersey. Boston Soc. N. H. Pr. 24: 365-423.

The Glacial Origin of Cliffs. Am. G. 3: 14-8.

The Intrusive and Extrusive Triassic Trap Sheets of the Connecticut Valley. Harvard Coll. Mus. C. Z. Bull. 16 (g s 2): 99-138.

Methods and Models in Geographic Teaching. Am. Nat. 23: 566-83. (Abst.), Johns Hopkins Univ. Cir. 8: 62.

Report of Investigation on the Sea-Breeze. Am. Met. J. 6: 4-6.

A River Pirate [Deer Run, Pa.] Science 13: 108-9.

The Rivers and Valleys of Pennsylvania. Nat. Geog. Mag. 1: 183-253.

Some American Contributions to Meteorology. J. Franklin Inst. 127: 104-15; 176-91.

1890

Dr. Hann's Studies on Cyclones and Anticyclones. Science 15: 332-3, 1891, 4-5.

[The Features of Tornadoes and Their Distinction from Other Storms] Am. Met. J. 7: 433-6.

Ferrel's Convectional Theory of Tornadoes. Am. Met. J. 6: 337-49; 418-63.

Investigations of the New England Meteorological Society in the year 1890. An. Rep. Astron. Obs. Harvard Coll. 21 (Pt. 2): 105-213.

The Iroquois Beach. Am. G. 6: 400.

The Lawrence Tornado of July 26, 1890. An. Rep. Astron. Obs. Harvard Coll. 31 (Pt. 1): 119-137.

The Level of No Strain. Am. G. 5: 190-1.

Oscillations of Lakes (Seiches). Science 15: 117.

An Outline of Meteorology. Johns Hopkins Univ. Cir. 9: 71-2.

The Rivers of Northern New Jersey, with Notes on the Classification of Rivers in General. Nat. Geog. Mag. 2: 81-110.

Secular Changes in Climate. Am. Met. J. 7: 67-81.
Structure and Origin of Glacial Sand Plains. G. Soc. Am. Bull. 1: 195-202.
Types of New England Weather Observations and Investigations of the New England Meteorological Society. 1888-1889. Investigation of the Seabreeze. An. Rep. Astron. Obs. Harvard Coll. 21 (Pt. 1): 215-65.
Vertical Components of Motion in Cyclones and Anticyclones. Science 15: 388.

1891

The Catskill Delta in the Postglacial Hudson Estuary. Boston Soc. N. H. Pr. 25: 318-35. (Abst.) J. G. 1: 97-8. (1893)
Cumulus Clouds Over Islands. Am. Met. J. 7: 563-4.
European Weather Predictions. Am. Met. J. 8: 53-8.
The Geological Dates of Origin of Certain Topographic Forms on the Atlantic Slope of the United States. G. Soc. Am. Bull. 2: 545-86.
(With Hiram F. Mills and H. H. Clayton). The Lawrence Tornado. Proc. New Eng. Met. Soc., Am. Met. J. 7: 433-43.
The Lost Volcanoes of Connecticut. Pop. Sci. Mo. 40: 221-35.
The Physical Geography of Southern New England. Johns Hopkins Univ. Cir. 10: 78-9.
The Story of a Long Inheritance—Nebula to Tornado. Atl. Mo. 68: 68-78.
Tornadoes; A Story of Long Inheritance. Johns Hopkins Univ. Cir. 10: 78.
The Triassic Sandstone of the Connecticut Valley. Johns Hopkins Univ. Cir. 10: 79.
(With Loper, S. W.) Two Belts of Fossiliferous Black Shale in the Triassic Formation of Connection (with discussion by C. H. Hitchcock and B. K. Emerson). G. Soc. Am. Bull. 2: 415-30.
Was Lake Iroquois an Arm of the Sea? Am. G. 7: 139-40.

1892

The Ancient Shore-Lines of Lake Bonneville. Goldthwaite's Geog. Mag. 3: 105, 1 pl.
The Appalachian Mountains of Pennsylvania. Goldthwaite's Geog. Mag. 3: 343-50.
The Cañon of the Colorado. Goldthwaite's Geog. Mag. 3: 98-102, 1 pl.
The Catskill Delta in the Post-Glacial Hudson Estuary. Boston Soc. N. H. Pr. 25: 318-35.
The Convex Profile of Bad-Land Divides. Science 20: 245.
On the Drainage of the Pennsylvania Appalachians. Boston Soc. N. H. Pr. 25: 418-20.
Ferrel's Contributions to Meteorology. Am. Met. J. 8: 348-59.
The Folds of the Appalachians. Goldthwaite's Geog. Mag. 3: 251-5.
The Loup Rivers in Nebraska. Science 19: 107-8, 220-1.

Meteorology in the Schools. Am. Met. J. 9: 1-21.
Mirage on a Wall. Am. Met. J. 8: 525-6.
Notes on Winter Thunderstorms. Am. Met. J. 9: 164-70.
Observations of the New England Meteorological Society in the Year[s] 1890 [-91]. An. Rep. Astron. Obs. Harvard Coll. 31: (Pt. 1) 1-93.
Outline of Elementary Meteorology. Cambridge, 13 pp.
The Subglacial Origin of Certain Eskers. Boston Soc. N. H. Pr. 25: 477-99. (Abst.) J. G. 1: 95-96 (1893).
The Theories of Artificial and Natural Rainfall. Am. Met. J. 8: 493-502.

1893

Artificial and Natural Rainfall. Boston Commonwealth, Mar. 26.
The Deflective Effect of the Earth's Rotation. Am. Met. J. 10: 195-8.
The General Winds of the Atlantic Ocean. Am. Met. J. 9: 476-88.
Geographical Illustrations; Suggestions for Teaching Physical Geography Based on the Physical Features of Southern New England. 46 pp. Harvard University, Cambridge, Mass.
Geographic Work for State Geological Surveys. G. Soc. Am. Bull. 5: 604-8.
The Improvement of Geographic Teaching. Nat. Geog. Mag. 5: 68-75.
Memorial of James Henry Chapin. G. Soc. Am. Bull. 4: 406-8.
Note on Winter Thunderstorms. Am. Met. J. 9: 164-70.
Observations of the New England Meteorological Society in the Year[s] 1890 [-91]. An. Rep. Astron. Obs. Harvard Coll. 31: (Pt. 2) 161-2.
[On the Difficulties in Weather Forecasting.] Am. Met. J. 9: 550-3.
The Osage River and the Ozark Uplift. Science 22: 276-9.
Proposed Subjects for Correlated Study by the State Weather Services. Am. Met. J. 9: 68-74.
The Redfield and Espy Period—1830-1855. Rep. of the Inter. Met. Congress held at Chicago, Aug. 1893. U. S. Dept. Ag. Wea. Bur. Bull. 11: 305-16.
The Theory of Cyclones. Am. Met. J. 10: 319-21.
Winter Thunderstorms. Am. Met. J. 9: 238-9.
The Winds of the Indian Ocean. Am. Met. J. 9: 333-43, 2 charts.

1894

The Ancient Outlet of Lake Michigan. Pop. Sci. Mo. 46: 217-29.
(With King, C. F. and Collie, G. L.) Conference on Geography, Chicago, Dec. 28-30, 1892. Report on Governmental Maps for Use in Schools Prepared by a Committee of the Conference on Geography Held in Chicago, Ill., December 1, 1892. New York. 65 pp.
(With Griswold, L. S.) Eastern Boundary of the Connecticut Triassic. G. Soc. Am. Bull. 5: 515-30; (Abst.) Am. G. 13: 145-6; Am. J. Sci. (3) 47: 136-7.

Elementary Meteorology. Boston. pp. xii + 355. Maps and Wdcts.

Facetted Pebbles on Cape Cod, Mass. Boston Soc. N. H. Pr. 26: 166-75; (Abst.) Am. G. 13: 146-7.

Festooned Mammiforms and Pocky Clouds. Am. Met. J. 11: 151-3.

Geographical Work for State Geological Surveys. G. Soc. Am. Bull. 5: 604-8; (Abst.) Am. G. 13: 146.

List of Geographical Lantern Slides. Cambridge. pp. 17.

Papers from the Physical and Geographic Laboratory of Harvard University 11. Reprinted from Ann. Rep. School Comm. of the City of Cambridge for 1893.

Meteorology in the Schools. [Hamilton, N. Y.] pp. 11. School Review ii: 529-39.

Note on Croll's Glacial Theory. Tr. Edin. Geol. Soc. 7: 77-80.

Note on Diffusion of Water Vapor and on Atmospheric Absorption of Terrestrial Radiation. Am. Met. J. 11: 147-51.

An Outline of the Geology of Mount Desert. In Flora of Mount Desert Island, Maine: A preliminary catalogue of the plants growing on Mount Desert and the adjacent islands, by Edward L. Rand and John H. Redfield: 43-71. Cambridge [Mass.].

Physical Geography in the University. J. G. 2: 66-100.

A Speculation in Topographic Climatology. Am. Met. J. 10: 333-43.

A Step Towards Improvement in Teaching Geography. Harvard Teachers Assoc. Leaflet No. 11.

1895

The Absorption of Terrestrial Radiation by the Atmosphere. Science 2: 485-7.

Bearing of Physiography on Uniformitarianism. (Abst.) G. Soc. Am. Bull. 7: 8-11. Am. G. 16: 243-4. Science n.s. 2: 280.

The Development of Certain English Rivers [London]. Geog. J. 5: (no. 2) 127-46, Diagrs.

Notes on Geological Excursions. (Abst.) Science n.s. 2: 744.

The New England States. Boston, pp. 31. Supplement to Frye's Complete Geography. (Also 1902 edition.)

The Physical Geography of Southern New England. Nat. Geog. Soc., Nat. Geog. Mon. 1, No. 9: 269-304.

Physiography as an Alternative Subject for Admission to College: Official Report of the 10th Annual Meeting of the New England Association of Colleges and Preparatory Schools, 38-46.

La Seine, La Meuse et La Moselle. Paris. An. Géog. 5e année. No. 19: 25-9. pl. 2.

Theories of Ocean Currents. Science 2: 824.

Winds and Ocean Currents. Science 2: 342-3.

1896

An Elemenary Presentation of the Titles. Science 3: 569-70.
Large Scale Maps as Geographic Illustrations. J. G. 4: 484-513.
The Outline of Cape Cod. Am. Ac. Pr. 31: 303-32. (Abst.) Am. G. 17: 95-6; Science, n.s. 3: 49-50.
The Peneplain of the Scotch Highland. G. Mag. 3: 525-8.
Plains of Marine and Subaerial Denudation. G. Soc. Am. Bull. 7: 377-98. (Abst.) Am. G. 17: 96-7. Science n.s. 3: 501.
The Physical Geography of Southern New England: The Physiography of the United States (Nat. Geog. Soc.): 269-304, N. Y., American Book Co.
[Physiographic Features of the Middle Susquehanna Region, Pa.] Science n.s. 3: 786-7.
The Quarries in the Lava Beds at Meriden, Conn. Am. J. Sci. (4) 1: 1-13, map.
The Seine, the Meuse and the Moselle. Nat. Geog. Mag. 7: 89-202, 228-38, pls. 21-24, 26.
The Soaring of Birds and Currents of Air. Auk. 13: 92-3.
A Speculation in Topographical Climatology. Am. Met. J. 12: 372-81.
The State Map of Connecticut as an Aid to the Study of Geography in Grammar and High Schools. Conn. Sch. Doc. No. 6: 14 pp.
The State Map of New York as an Aid to the Study of Geography in Grammar and High Schools and Academies. Univ. State of N. Y. Exam. Bull. No. 11: 503-26.
The State Map of Rhode Island as an Aid to the Study of Geography in Grammar and High Schools. R. I. Ed. Pub.: 15 pp.
Josiah Dwight Whitney. Harvard Grad. Mag. 5: 206-9.

1897

The Coastal Plain of Maine. Brit. Assn. Adv. Sci. Rep.: 719-20.
Is the Denver Formation Lacustrine or Fluviatile? Science n.s. 6: 619-21.
(With Curtis, G. C.) The Harvard Geographical Models with Notes on the Construction of the Models by C. G. Curtis. Boston Soc. N. H. Pr. 28: 85-110.
The Present Trend in Geography. A Paper Delivered at the 35th Convocation, Senate Chamber, Albany, New York, June 29: 192-201.
Science in the Schools. Ed. Rev. 13: 429-39.
The State Map of Massachusetts as an Aid to the Study of Geography in Grammar and High Schools. Mass. St. Bd. Educ. 60th Ann. Rep.: 18 pp.
Winds and Ocean Currents. Scottish Geog. Mag. 13: 515-23.

1898

Geography as a University Subject. Scottish Geog. Mag. 14: 24-9.
The Grading of Mountain Slopes. (Abst.) Science n.s. 7: 81.

The Equipment of a Geographical Laboratory. J. Sch. Geog. 2, No. 5: 170-81.

(Assisted by Snyder, W. H.) Physical Geography. 428 pp. Boston.

Systematic Geography. 4th Yearbook Nat. Herbart Soc.: 81-91.

The Triassic Formation of Connecticut. U. S. G. S. Ann. Rep. 1896-97 (1898). 18. Pt. 2: 1-192. pl. 1-20.

Waves and Tides. J. Sch. Geog. 2, No. 4: 122-32.

1899

Balze Per Faglia Nei Monti Lepini. Presso La Società Geografica Italiana. Roma. Bollettino Della Società Geografica Italiana, Fasc. XII: 3-17 (Translated by Fr. M. Pasanisi).

The Circulation of the Atmosphere. Quart. J. Royal Met. Soc. 25. No. 110: 160-9.

Die Cirkulation der Atmosphäre. Das Wetter. Jahr. 16, 201-3, 228-32, 253-59.

Continental Deposits of the Rocky Mountain Region. G. Soc. Am. Bull. 11: 596-601.

The Drainage of Cuestas. G. Assn. Pr., London 16: 75-93.

Un Exemple de Plaine Côtière. La Plaine du Maine (États-Unis) An. Géog. 8: 1-5.

The Geographic Cycle. Geog. J., London 14: 481-504.

"Helen-Wind" Beobachtet In Den Cevennen. Meteorologische Zeit. 16: 124-5.

The Peneplain. Am. G. 23: 207-39. An. Géog., Paris, B.: 289-303, 385-404.

The Rational Element in Geography. Nat. Geog. Mag. 10: 466-73.

The System of the Winds. School World 1: 244-7.

1900

The Basin Deposits of the Rocky Mountain Region. (Abst.) Science n.s. 11: 144.

The Conditions of Formation of Conglomerates, and Criteria for Distinguishing Between Lacustrine and Fluviatile Beds. (Abst. with discussion.) Science n.s. 11: 429-30.

Continental Deposits of the Rocky Mountain Region. (Discussion by S. F. Emmons and W. Cross.) G. Soc. Am. Bull. 11: 596-604; (Abst.) Science n.s. 11: 144.

Les Enseignements du Grand Canyon du Colorado. La Géographie. Bulletin de La Société de Géographie. 15 Janvier. 339-51.

Fault Scarp in the Lepini Mountains, Italy. G. Soc. Am. Bull. 11: 207-16, pls. 18, 19.

The Fresh-Water Tertiary Formations of the Rocky Mountain Region. Am. Ac. Pr. 35: 345-73.

The Geographic Cycle. Paper Read at the VII Intl. Geog. Congress of Berlin. Verhandl. d. vii Internat. Geog. Kongr. Berlin. 1899 (1900). 22-31.

Glacial Erosion in France, Switzerland and Norway. Boston Soc. N. H. Pr. 29: 273-322.

Glacial Erosion in the Valley of the Ticino. Appalachia ix: 136-56, pls. 15, 16.

History of the Cincinnati Anticline (discussion). G. Soc. Am. Bull. 11: 604-5.

Local Illustrations of Distant Lands. I. A Temporary Sahara. J. Sch. Geog. 4. no. 5: 171-5.

Notes on the Colorado Canyon District. Am. J. Sci. (4) 10: 251-9.

Note on River Terraces in New England. (Abst.) G. Soc. Am. Bull. 12: 483-4.

Peneplains of Central France and Brittany. (Abst.) G. Soc. Am. Bull. 12: 481-3.

Physical Geography in the High Schools. The School Review 8: 388-404, 449-56.

The Physical Geography of the Lands. Pop. Sci. Mo. 57: 157-70.

Physiographic Terminology with Special Reference to Land Forms. Science 11: 99.

Practical Exercises in Geography. Nat. Geog. Mag. 11: 62-78.

1901

The Causes of Rainfall. J. N. E. Waterworks Assn. 15: 338-50.

An Excursion in Bosnia, Hercegovinia, and Dalmatia. G. Soc. Am. Bull. 3: 21-50, pl. 1-4.

An Excursion to the Grand Canyon of the Colorado. Harvard Coll. Mus. C. Z. Bull. 38 (g s 5): 107-201; (Abst.) G. Soc. Am. Bull. 12: 483; G. Mag. (4) 8: 324; Science n.s. 13: 138.

The Geographical Cycle. Int. Cong. Geog. VII, Verh. Pt. 2: 221-31.

Local Illustrations of Distant Lands. J. Sch. Geog. 5: 85-8.

Maps of the Mississippi River. J. Sch. Geog. 5: 379-82.

Note on River Terraces in New England (Abst.). G. Soc. Am. Bull. 12: 483-5.

Peneplains of Central France and Brittany. [Abst.] G. Soc. Am. Bull. 12: 481-3, pls. 44-5.

Practical Exercises in Physical Geography. Proceedings Annual Conference N. Y. State Science Teachers Association, Albany, 11 pp.

Les enseignements du Grand Canyon du Colorado. La Géographie, 4: 339-351.

1902

Base Level, Grade and Peneplain. J. G. 10: 77-111.

Elementary Physical Geography. Boston. Ginn and Co. vviii + 401 pp. [Also 1926 printing.]

Field Work in Physical Geography. J. Geog. 1: 17-24, 62-9.
The New England States. Boston. Supplement to Frye's Complete Geography. [Also 1895 edition.]
The Progress of Geography in the School. Chicago, pp. 49. (In National Society for Scientific Study of Education. 1st Yearbook, Pt. II: 7-49.)
River Terraces in New England. Harvard Coll. Mus. C. Z. Bull. 38 (g s 5): 281-346.
Systematic Geography. Am. Ph. Soc. Pr. 41: 235-59.
The Terraces of the Westfield River, Mass. Am. J. Sci. (4) 14: 77-94.

1903

The Basin Ranges of Utah and Nevada. (Abst.) J. G. 11: 1201.
Block Mountains of the Basin-Range Province. (Abst.) Science n.s. 17: 301; G. Soc. Am. Bull. 14: 551; Eng. Mo. J. 75: 153.
The Blue Ridge in Southern Virginia and North Carolina. (Abst.) J. G. 11: 121.
The Blue Ridge of North Carolina. (Abst.) Science n.s. 17: 220.
The Development of River Meanders. G. Mag. (4) 10: 145-8.
Effect of Shore Line on Waves. (Abst.) Science n.s. 15: 88; G. Soc. Am. Bull. 13: 528.
An Excursion to the Plateau Provinces of Utah and Arizona. Harvard Coll. Mus. C. Z. Bull. 42 (g s. 6): 1-50.
The Fresh-Water Tertiaries at Green River, Wyo. (Abst.) Science n.s. 17: 220-221; G. Soc. Am. Bull. 14: 544; J. G. 11: 120.
The Mountain Ranges of the Great Basin. Harvard Coll. Mus. C. Z. Bull. 42 (g s. 6): 129-77.
Practical Exercises in Physiography. J. Geog. 2: 516-20.
The Question of Seminars. Harvard Grad. Mag. pp. 8.
A Scheme of Geography. Geog. J. 22: 413-23. London.
The Stream Contest Along the Blue Ridge. Geog. Soc. Phila. Bull. 3: 213-44.
Walls of the Colorado Canyon. (Abst.) Science n.s. 15: 87; G. Soc. Am. Bull. 13: 528.

1904

A Flat-Topped Range in the Tian-Shan. Appalachia 10: 277-84.
Glacial Erosion in the Sawatch Range, Colo. Appalachia 10: 392-404.
Geography in the United States. Am. G. 33: 156-85; Am. Assn. Adv. Sc. Pr. 53.
The Relations of the Earth Sciences in View of Their Progress in the Nineteenth Century. J. G. 12: 669-87.
A Summer in Turkestan. G. Soc. Am. Bull. 36: 217-28.

1905

The Bearing of Physiography Upon Suess' Theories. Am. J. Sci. (4) 19: 265-73; (Abst.) Int. Cong. Geog. VIII, Rp.: 164.

[The Colorado Canyon. (Abst.)] Science n.s. 21: 860.
Complications of the Geographical Cycle. Int. Congr. Geog. VIII Rp.: 150-63.
A Day in the Cévennes. Appalachia 11: 110-14, pl. 16-17.
The Geographical Cycle in An Arid Climate. J. G. 13: 381-407.
Glaciation of the Sawatch Range, Colo. Harvard Coll. Mus. C. Z. Bull. 49 (g s 8): 1-11.
Home Geography. J. Geog. 4: 1-5.
Illustration of Tides by Waves. J. Geog. 4: 290-4.
An Inductive Study of the Content of Geography. n.p. pp. 18.
"A Journey Across Turkestan." Explorations in Turkestan. R. Pumpelly. Expedition of 1903. xii + 324 pp.: Washington, D. C.
Levelling Without Base-Leveling. Science n.s. 21: 825-8.
An Opportunity for the Association of American Geographers. Amer. Geog. Soc. Bull. 37: 87-6.
Tides in The Bay of Fundy. Nat. Geog. Mag. 16; no. 2, 71-6.
The Wasatch, Canyon and House Ranges, Utah. Harvard Coll. Mus. C. Z. Bull 49 (g s 8): 17-56.

1906

Biographical Memoir of George Perkins Marsh, 1801-82. 1st Copy: Washington, 1906, pp. [10], 1 pl. 2nd Copy: Washington, 1907. pp. [10], 1 pl. Biogr. Mem. Nat. Acad. Sci. 1909. 6: 71-80 and Portr.
The Colorado Canyon and Its Lessons. Liverpool G. Soc. Pr. 10: 98-102.
The Geographical Cycle in an Arid Climate. Geog. J. 27: 70-73.
Incised Meandering Valleys. Geog. Soc. Phila. Bull. 4, no. 4: 1-11 (182-192).
The Mountains of Southernmost Africa. Am. Geog. Soc. Bull. 38: 593-623.
Observations on South Africa. G. Soc. Am. Bull. 17: 377-450, pls. 47-54.
The Physical Factor in General Geography. The Educational Bi-Monthly 1: 112-22.
The Physiography of the Adirondacks. [Formation of scarps.] Science n.s. 23: 630-1.
The Relations of the Earth Sciences in View of Their Progress in the Nineteenth Century. Cong. Arts and Sci. (St. Louis, 1904) 4: 488-503.
The Sculpture of Mountains by Glaciers. Scottish Geog. Mag. 22: 76-89. (Abst.) Brit. Assn. Rep. 75: 393-4.
Professor Nathaniel S. Shaler. Am. J. Sci. (4) 21: 480-1.

1907

(With Johnson, D. W., and Bowman, Isaiah) Current Notes on Land Forms. Science n.s. 25: 70-3, 229-32, 394-6, 508-10, 833-6, 946-9; 26: 90-3, 152-4, 226-8, 353-6, 450-3, 837-9; 27: 31-33.

Hanging Valleys. Science n.s. 25: 835-6.
Hettner's Conception of Geography. J. Geog. 6: 49-53.
The Place of Coastal Plains in Systematic Physiography. J. Geog. 6: 8-15.
The Terraces of the Maryland Coastal Plain. [Review.] Science n.s. 25: 701-7.

1908

Causes of Permo-Carboniferous Glaciation. J. G. 16: 79-82.
Die Methoden der Amerikanischen Geographischen Forschung. Internationale Wochenschrift für Wissenschaft, Kunst, und Technik, Berlin, Nov. 14.
Practical Exercises in Physical Geography. Boston. pp. 12 + 148. Atlas 50 pp.
The Prairies of North America. Internat. Wochenschr. 2: 1011-18, 1045-50.
Der Grosse Canyon des Colorado. Leipzig, pp. 15. In Ges. Deutsch. Naturf. u. Ärzte 1908 (1909). 1: 157-69.

1909

The Colorado Canyon: Some of the Lessons. Geog. J. 33: 535-40; Am. Geog. Soc. Bull. 41: 345-54; (Abst.) Brit. Assn. Adv. Sci. Rep. 78: 948-9.
Geographical Essays, VI, 777 pp. Boston. Ginn & Co. [Edited by Douglas W. Johnson.]
Glacial Erosion in North Wales. Quart. J. Geol. Soc. London. 65: 281-350, pl. 14.
Der Grosse Cañon des Colorado. Himmel und Erde. 22: 22-41.
Der Grosse Cañon des Colorado-Flusses. Ges. Erdk. Berlin Zs. 3: 164-72.
The Physiographic Subdivisions of the Appalachian Mountain System, and Their Effects Upon Settlement and History (Abst.). Brit. Assn. Adv. Sci. Rep. 78: 761-2.
The Rocky Mountains. pp. 16. In Internat. Wochenschr.
The Systematic Description of Land Forms. Geogr. Journ. Roy. Geogr. Soc. 34: 300-26.
The Valleys of the Cotswold Hills. G. Assn. Pr. 21: 150-2.

1910

American Studies on Glacial Erosion Extrait du Compte Rendu du XI: e Congrès Géologique International. 419-27.
Antarctic Geology and Polar Climates. Am. Ph. Soc. Pr. 49: 200-2.
Deutsche und Romanische Flussterminologie. Geog. Anzeiger. 121-3.
Experiments in Geographical Description. Science n.s. 31: 921-46; Am. Geog. Soc. Bull. 42: 401-35; Scottish Geog. Mag. 26: 561-86.
Notes on the Description of Land Forms. Am. Geog. Soc. Bull. 42: 671-5, 840-4.

Practical Exercises in Physical Geography (Abst.). Int. Cong. Geol. IX, 2: 169-70.
The Theory of Isostasy (Abst. and discussion). G. Soc. Am. Bull. 21: 777.
Die Umgestaltung der Gebirgsformen durch die Gletscher. (Abst.) Ver. Erdk. Leipzig. Mitt. 28-9.

1911

The Colorado Front Range, a Study in Physiographic Presentation. Assn. Am. Geog. An. 1: 21-84. (Abst.) Science n.s. 33: 906.
The Disciplinary Value of Geography. Pop. Sci. Mo. 78: 105-9, 223-40.
Geographical Descriptions in the Folios of the Geologic Atlas of the United States. (Abst.) G. Soc. Am. Bull. 22: 736.
Geographical Factors in the Development of South Africa. Journal Race Development 2: 131-46.
Grundzüge der Physiogeographie. Leipzig pp. [12] + 322. (Also edition 1915-17.)
Notes on the Description of Land Forms. Am. Geog. Soc. Bull. 43: 46-51, 190-4, 598-604, 679-84, 847-53.
Repeating Patterns in the Relief and in the Structure of the Land. [discussion] (Abst.) G. Soc. Am. Bull. 22: 717.
Short Studies Abroad—The Seven Hills of Rome. J. Geog. 9: 197-202, 230-3.

1912

American Studies on Glacial Erosion. Int. Cong. Geol. XI, Stockholm, 1910, 419-27.
The Colorado Front Range. Assn. Am. Geog. An. 1: 21-84, pl. 1-5.
Die Erklärende Beschreibung der Landformen. XVIII; 565 pp. Leipzig. B. G. Teubner.
L'Esprit Explicatif dans la Géographie Moderne. Paris. Annales de Géographie 21: 3-21.
Guidebook for the Transcontinental Excursion of 1912. Am. Geog. Soc., New York, 144 pp.
Notes on the Description of Land Forms. Am. Geog. Soc. Bull. 44: 908-13.
Relation of Geography to Geology (Annual address of the president). G. Soc. Am. Bull. 23: 93-124.

1913

Dana's Confirmation of Darwin's Theory of Coral Reefs. Am. J. Sci. (4) 35: 173-88; Nature 90: 632-4; (Abst.) Science n.s. 37: 724.
A Geographical Pilgrimage from Ireland to Italy. Assn. Am. Geog. An. 2: 73-100.
The Grand Canyon of the Colorado. J. Geog. 11: 310-14.
Human Response to Geographic Environment. Philadelphia. 40 pp.
Kelvin on "Light" and "The Tides." Lect. Dr. Eliot's Five-Foot Shelf of Books. Science 3: 29-32.

Nomenclature of Surface Forms on Faulted Structures. G. Soc. Am. Bull. 24: 187-216.
The Rhine Gorge and the Bosphorus. J. Geog. 11: 209-15.
Speculative Nature of Geology (Abst.). G. Soc. Am. Bull. 24: 686-7.
Submerged Valleys and Barrier Reefs. Nature 91: 423-4.
Valli Conseguenti e Subseguenti. Roma. pp. 6. Boll. R. Soc. Geog. 12: 1429-32.

1914

The Home Study of Coral Reefs. Am. Geog. Soc. Bull. 46: 561-77, 641-54, 721-39.
Meandering Valleys and Underfit Rivers. Assn. Am. Geog. An. 3: 3-28 [1914?].
Sublacustrine Glacial Erosion in Montana. (Abst.) G. Soc. Am. Bull. 25: 86.
Der Valdarno; eine Darstellungstudie. Berlin, pp. 68, 2 pls. In Zeitschr. Gesellsch. f. Erdk.

1915

Biographical Memoir of John Wesley Powell, 1834-1902. Biog. Mem. Nat. Acad. Sci. 8: 11-83, port.
Biographical Memoir of Peter Lesley, 1819-1903. Biog. Mem. Nat. Acad. Sci. 8: 155-240, port.
The Development of the Transcontinental Excursion of 1912. Mem. Vol. Transcontinental Excursion, 1912. Am. Geog. Soc. 3-7.
The Mission Range, Montana. (Abst.) Assn. Am. Geog. An. 4: 135-6.
The Mission Range, Montana. Nat. Acad. Sci. Pr. 1: 626-8.
The Origin of Coral Reefs. Nat. Acad. Sci. Pr. 1: 146-52.
Physiography of Arid Lands. (Discussion.) Brit. Assn. Adv. Sci. Rep. 84: 365-6.
Preliminary Report on a Shaler Memorial Study of Coral Reefs. Science n.s. 41 :455-8.
Problems Associated with the Origin of Coral Reefs Suggested by a Shaler Memorial Study of the Reefs . . . (Abst.) Science n.s. 41: 569.
Sculpture of the Mission Range, Mont. (Abst.) Science n.s. 42: 685.
A Shaler Memorial Study of Coral Reefs. Am. J. Sci. (4) 40: 223-71.

1916

Clift Islands in the Coral Seas. Nat. Acad. Sci. Pr. 2: 284-8.
Coral Reef Problem. (Abst.) G. Soc. Am. Bull. 27: 46.
Extinguished and Resurgent Coral Reefs. Nat. Acad. Sci. Pr. 2: 466-71.
Marcellus Hartley Memorial Medal. Mo. Wea. Rev. 44: 205-7.
The Mission Range, Montana. Geog. Rev. 2: 267-88.
The Origin of Certain Fiji Atolls. Nat. Acad. Sci. Pr. 2: 471-5.
Practical Exercises on Topographic Maps. J. Geog. 15: 33-41.

The Principles of Geographical Description. Assn. Am. Geog. An. 5. 61-105. [1916.]

Problems Associated with the Study of Coral Reefs. Sci. Mo. 2: 313-33, 479-501, 557-72.

Sinking Islands Versus a Rising Ocean in the Coral-Reef Problem. (Abst.) Science n. s. 43: 721.

(With others) Symposium on the Exploration of the Pacific. Nat. Acad. Sci. Pr. 2: 391-437.

1917

Excursions Around Aix-les-Bains. Cambridge. pp. 27. Published for Y. M. C. A. National War Work Council by Appalachian Mountain Club of Boston.

Les Falaises et La Récifs Coralliens de Tahiti. Paris. pp. 41. An. Géog. 27: 241-84.

The Great Barrier Reef of Australia. Am. J. Sci. 44: 339-50.

Grundzüge der Physiogeographie. Pts. 1-2, Ed. 2. Leipzig. B. G. Teubner, 1915-17. (Also edition 1911.)

The Isostatic Subsidence of Volcanic Islands. Nat. Acad. Sci. Pr. 3: 649-54.

The Structure of High-Standing Atolls. Nat. Acad. Sci. Pr. 3: 473-9.

Sublacustrine Glacial Erosion in Montana. Nat. Acad. Sci. Pr. 4: 695-702.

Topographic Maps of the United States. National Highways Association, Division of Physical Geography, Physiographic Bulletin No. 1: 15 pp.

1918

The Cedar Mountain Trap Ridge Near Hartford. Am. J. Sci. (4) 46: 476-7.

Coral Reefs and Submarine Banks. J. G. 26: 198-223, 289-309, 385-411.

Fringing Reefs of the Philippine Islands. Nat. Acad. Sci. Pr. 4: 197-204.

Geological Terms in Geographical Descriptions. Science n. s. 48: 81-4.

Grove Karl Gilbert. Am. J. Sci. (4) 46: 669-81.

A Handbook of Northern France. Cambridge. Harvard University Press. Pp. 11 + 174, ills.

Metalliferous Laterite in New Caledonia. Nat. Acad. Sci. Pr. 4: 275-80.

Praktische Übungen in physische Geographie. Leipsig etc. B. G. Teubner. pp. xii + 115 [1] and atlas of 38 pls.

The Reef-Encircled Islands of the Pacific. J. Geog. 17: 1-8, 58-68, 102-7.

Subsidence of Reef-Encircled Islands. G. Soc. Am. Bull. 29: 71-2 (Abst.), 489-574.

1919

Drainage Evolution on the Yünnan-Tibet Frontier. Geog. Rev. 7: 413-5.

Passarge's Principles of Landscape Description. Geog. Rev. 8: 266-73.

Pumpelly's Reminiscences. Science 49: 61-3.

The Significant Features of Reef-Bordered Coasts. Tr. N. Z. Inst. 51: 6-30.
The Young Coast of Annam and Northern Spain. Geog. Rev. 7: 176-80.

1920

African Rift Valleys. Science 52: 456-8.
The Framework of the Earth. Am. J. Sci. (4) 48: 225-41; (Abst.) G. Soc. Am. Bull. 31, No. 1: 110.
The Function of Geography. Geog. Teacher. 10: 286-91.
Geography at Cambridge University, England. pp. 4. J. Geog. 207-10.
The Islands and Coral Reefs of Fiji. Geog. J. 55: 34-45, 200-20, 377-88, 6 pls.
The Penck Festband. (A Review.) Geog. Rev. 10: 249-61.
The Small Islands of Almost-Atolls. Nature 105: 292-3.

1921

The Coral Reefs of Tutuila, Samoa [New York] pp. 7. Science 53: 559-65.
Features of Glacial Origin in Montana and Idaho. Assn. Am. Geog. An. 10: 75-147, 16 figs.
Lower California and Its Natural Resources. (A review.) Geog. Rev. 11, No. 4: 551-62.

1922

The Barrier Reef of Tagula, New Guinea. Assn. Am. Geog. An. 12: 97-151, pl. 24.
Coral Reefs of the Louisiade Archipelago. Nat. Acad. Sci. Pr. 8: 7-13.
Deflections of Streams by Earth Rotation. Science n. s. 55: 478-9.
Dixey's Physiography of Sierra Leone. Philadelphia, pp. 1-11. Geog. Soc. Phila. Bull. 20: 131-41.
Faults, Underdrag and Landslides of the Great Basin Ranges. G. Soc. Am. Bull. 33, No. 1: 92-6, 2 figs.
Geological Overthrusts and Underdrags. (Abst.) Science n. s. 55: 493.
A Graduate School of Geography. Science 56: 121-33.
Memoir of Frederic Putnam Gulliver. Assn. Am. Geog. An. 11: 112-6.
Peneplains and the Geographical Cycle. G. Soc. Am. Bull. 33, No. 3: 587-98.
The Reasonableness of Science. Sci. Mo. 15: 193-214.
Topographical Maps of the United States. Sci. Mo. 15, No. 6: 557-60.

1923

The Cycle of Erosion and the Summit Level of the Alps. J. G. 31: 1-41.
The Depth of Coral-Reef Lagoons. Nat. Acad. Sci. Pr. 9: 296-301.
Drowned Coral Reefs South of Japan. Nat. Acad. Sci. Pr. 9: 58-62.
The Explanatory Description of Land Forms. Alfred Hettner: Die Oberflächenformen des Festlandes. [Review] Geog. Rev. 13: 318-21.

The Halligs, Vanishing Islands of the North Sea. Geog. Rev. 13: 99-106.
The Island of Oahu. J. Geog. 22, No. 9: 354-7, 3 figs.
The Marginal Belts of the Coral Seas. Am. J. Sci. 5th s., 6: 181-95.
New Zealand Land Forms, C. A. Cotton: Geomorphology of New Zealand. Pt. I . . . [Review] Geog. Rev. 13: 321-2.
The Shaping of the Earth's Surface. (A review) Geog. Rev. 13: 599-607.
A Working Model of the Tides. Sci. Mo. 16: 561-72.

1924

Classification of Oceanic Islands. (Abst.) Pan-Am. Geol. 42, No. 4: 319. G. Soc. Am. Bull. 36, No. 1; 216-7.
Die Erklärende Beschreibung der Landformen. Deutsch Bearbeitet von A. Rühl. Aufl. 2. Leipzig, B. G. Teubner. pp. 31, [I], 565, ills.
The Explanatory Description of Land Forms. Belgrade. pp. 50. Recueil de travaux à Jovan Cvijić . . . 287-336, 10 figs.
The Formation of the Lesser Antilles. Nat. Acad. Sci. Pr. 10, No. 6: 205-11.
Gilbert's Theory of Laccoliths. (Abst.) Wash. Acad. Sci. J. 14, no. 15: 375.
Modification of Darwin's Theory of Coral Reefs by the Glacial-Control Theory. (Abst.) Pan-Am. Geol. 42, no. 1: 73-4; Brit. Assn. Adv. Sci. Rep. 92 Meeting: 384-5, 1925.
Notes on Coral Reefs. Pan-Pac. Sci. Cong., Australia, 1923 Pr. 2: 1161-3.
The Oceans. Nat. Hist. 24: 554-65.
The Progress of Geography in the United States. Assn. Am. Geog. An. 14, no. 4: 159-215.
Shaded Topographic Maps. Science n.s. 60: 325-7.
A Tilted-Up, Beveled-Off Atoll. Science n.s. 60: 51-6, 2 figs.; (Abst.) 59: 544; Pan-Am. Geol. 42, no. 1: 74; Brit. Assn. Adv. Sci. Rep. 92d Meeting: 385, 1925.

1925

The Basin Range Problem. Nat. Acad. Sci. Pr. 11, no. 7: 387-92.
[Comment on Dr. C. W. Kochel's "Abstraktionen in der Geologie."] G. Rundschau 16: 313-14.
Laccoliths and Sills. (Abst. with discussion.) Wash. Acad. Sci. J. 15, no. 18: 414-5. Bull. Volcanologique 2ᵉ ann. nos. 5-6: 323-4.
A Roxen Lake in Canada [Lake Timiskaming]. Scottish Geog. Mag. 41, no. 2: 65-74, 2 figs.
The Stewart Bank in the China Sea. Science 62: 401-3.

1926

Biographical Memoir of Grove Karl Gilbert, 1843-1918. Nat. Acad. Sci. Mem. 21, 5th mem.: 303 pp., 18 figs. and pls. (incl. portraits).

Les Côtes et les Récifs Coralliens de la Nouvelle-Calédonie. Paris. pp. 120, Ills. An. Géog. 34, nos. 189, 190, 191, 192.

Elementary Physical Geography. Boston. Ginn and Co. pp. xviii + 401, Ills. [Also another printing 1902.]

The Lesser Antilles. Am. Geog. Soc., Map of Hispanic America, Pub. 2, 207 pp., 66 figs., 16 pls.

Origin of the Lesser Antilles. (Abst.) G. Soc. Am. Bull. 37, no. 1: 220-1.

Subsidence Rate of Reef-Encircled Islands. Nat. Acad. Sci. Pr. 12, no. 2: 99-105, 2 figs.

The Value of Outrageous Geological Hypotheses. Science n.s. 63: 463-8.

1927

Channels, Valleys, and Intermont Plains. Science n.s. 66: 272-4.

A Migrating Anticline on Fiji. Am. J. Sci. (5) 14: 333-51.

The Rifts of Southern California. Am. J. Sci. (5) 13: 57-72, 6 figs.

1928

The Coral-Reef Problem. Am. Geog. Sp. Pub. no. 9, 596 pp., 227 figs. and pls., New York.

Die Entstehung von Korallenriffen: Ges. Erdk. Berlin Zs. nos. 9-10: 359-91, 13 figs.

The Formation of Coral Reefs. Sci. Mo. 27, no. 4: 289-300, 6 figs.

1929

Geological Map of New Mexico. (Comments on Darton's Map.) Science n.s. 70: 68-70.

Wharton's and Darwin's Theories of Coral Reefs. Sci. Prog. 93: 42-56.

1930

The Desert of the Great Southwest. Harvard Grad. Mag. June, 1930.

The Earth As a Globe. J. Geog. 29: 330-44.

[Elementary Physical Geography.] [In Japanese.] pp. [446]. Ills. Various paging. (Also editions in English; 1902, 1926.)

(With Brooks, Baylor.) The Galiuro Mountains, Arizona. Am. J. Sci. (5) 19: 89-115, 9 figs.

(With Daly, Reginald Aldworth.) Geology and Geography, 1858-1929: The Development of Harvard University, S. E. Morison ed., Chap. 19, pp. 307-328, 4 pls, port., Cambridge, Mass., Harvard University Press.

Origin of Limestone Caverns. G. Soc. Am. Bull. 41: 475-628, pls. 7-8.

The Peacock Range, Arizona. G. Soc. Am. Bull. 41: 293-313.

Periodicity in Desert Physiography. (Abst.) Pan-Am. Geol. 53: no. 4, 320.

Physiographic Contrasts, East and West. Sci. Mo. 30: nos. 5 and 6, 395-415, 501-519, 7 figs., 4 pls.

[Practical Exercises in Physical Geography.] [In Japanese.] n.p. pp. [17]. Ils. and atlas of 43 pp. (English edition, 1908.)
Preparation of Scientific Articles. Science 72: 131-4.
Rock floors in Arid and in Humid Climates. J. G. 38: no. 1, 1-27; no. 2, 136-58, 7 figs.

1931

Clear Lake, California. (Abst.) Science n.s. 74: 572-3.
(With Putnam, William Clement, and Richards, George Lambert, Jr.) Elevated Shore Lines of Santa Monica Mountains. (Absts.) Pan-Am. Geol. 54, no. 2: 154; G. Soc. Am. Bull. 42, no. 1: 309-10.
Nature of Geological Proof, Or How Do You Know You Are Right? (Abst.) Pan-Am. Geol. 55, no. 55: 357-8.
(With Killingsworth, Cecil.) Origin of Caverns. (Abst.) G. Soc. Am. Bull. 42, no. 1: 308-9.
The Origin of Limestone Caverns. Science 73: 327-31.
The Peacock Range, Arizona. G. Soc. Am. Bull. 41, no. 2: 293-313, 7 figs.; (Absts.) Pan-Am. Geol. 53, no. 4: 313; 54, no. 2, 152; G. Soc. Am. Bull. 42, no. 1: 308.
Remarks on Arid Pediments. (Abst.) Pan-Am. Geol. 56, no. 3: 236.
The Santa Cataline Mountains, Arizona. Am. J. Sci. (5), 22: 289-317, 6 figs.; (Absts.) Pan-Am. Geol. 55, no. 5: 372-3; G. Soc. Am. Bull. 43, no. 1: 235, 1932.
Shore Lines of the Santa Monica Mountains, California. (Absts.) G. Soc. Am. Bull. 43, no. 1: 227; Pan-Am. Geol. 55, no. 5: 362-3.
Undertow and Rip Tides. Science n.s. 73: 526-7.

1932

Basin Range Types. Science n.s. 76: 241-5.
Glacial Epochs of the Santa Monica Mountains, California. Nat. Acad. Sci. Pr. 18, no. 11: 659-665, 8 figs.
Piedmont Bench Lands and Primärrümpfe. G. Soc. Am. Bull. 43, no. 2: 399-440, 10 figs.; (Absts.) Pan-Am. Geol. 58, no. 1: 68; G. Soc. Am. Bull. 44, pt. 1: 154.
A Retrospect of Geography. Assn. Am. Geog. An. 22: 211-30.

1933

Geomorphogeny of the Desert. (Abst.) Pan-Am. Geol. 5: 374-5.
Glacial Epochs of the Santa Monica Mountains, California. (Absts.) G. Soc. Am. Bull. 44, no. 5: 1041-1133, 26 figs., 16 pls.; G. Soc. Am. Pr. 304-5; Pan-Am. Geol. 59, no. 4: 306-7.
Granite Domes of the Mojave Desert, California. San Diego Soc. Nat. Hist. Tr., 7, no. 20: 211-58, 34 figs., 4 pls.
The Lakes of California. Calif. J. Mines and Geol. 29. nos. 1, 2: 175-236, 29 figs. 1 pl., map.

Submarine Mock Valleys. Am. Geophys. Tr., 14th Ann. Mtg.: 231-4; Nat. Research Council, June; (Absts.) Pan-Am. Geol. 59; no. 4: 307-8.
Work of Sheetfloods. (Abst.) G. Soc. Am. Bull. 44, pt. 1: 83.

1934

The Faith of Reverent Science. Sci. Mo. 38: 395-421.
Gardiner on "Coral Reefs and Atolls." (A discussion.) J. G. 42, no. 2: 200-17.
The Long Beach Earthquake. Geog. Rev. 24, no. 1: 1-11, 6 figs.
Submarine Mock Valleys. Geog. Rev. 24, no. 2: 297-308; G. Soc. Am. Pr. 306.

1935

(With Maxson, John Haviland.) Valleys of the Panamint Mountains, California. (Abst.) G. Soc. Am. Pr. 1934: 339.

1936

Geomorphology of Mountainous Deserts. 16th In. Geol. Cong. 1933, Rept. vol. 2: 703-14.

1938

Sheetfloods and Streamfloods. G. Soc. Am. Bull. 49, no. 9: 1337-1416, 15 pls., 33 figs.