# THE INCREASING DEBT OF HISTORY TO SCIENCE

By Archer B. Hulbert

A generation ago Professor Macy said "The scientist wrecks his high ideal, truth-loving and truth-telling, the instant he enters politics and history, where beliefs and not external phenomena are the dominant factors."

Since those words were uttered the natural sciences have been putting historical theories under the magnifying-glass and in the test tube to a degree that is worthy of remark; from what has been accomplished and is on the eve of accomplishment, it seems plain that on several sides American history is undergoing a scientific clarification that will tend toward an accuracy not hitherto attained. A glance over this field of activity is reassuring and provokes interesting speculation as to the future.

In the generation mentioned we have seen a marked advance in the science of geography and geographical interpretations of history. This phase of activity may well be mentioned first because of the lesson it carries.

The Royal Geographical Society of Great Britain was formed in the middle of the Nineteenth Century as the result of colonial trade expansion and the new problems which that expansion brought forward. At about the same time came the formation of our American Geographical and Statistical Society, of which George Bancroft was elected first president in 1851. The original purpose of these organizations, as indicated, was the study of geography and its application to the development of commerce, the distribution of animal and vegetable productions and of the human race. The first paper read before our

American society was on "The Productions and Trade of Paraguay." The importance of such studies as these from a commercial standpoint was soon recognized, and the societies mentioned became clearing-houses too important in their relationship to national growth to remain the monopoly of scientific bodies. Government departments took up the work and official bulletins and consular reports became the mediums of information. This first service of the geographer was a notable one.

At the beginning of the present century we find geologist and geographer combining to give us geographical interpretations of history, and the appearance of studies on "Geographic Conditions" and "Geographic Influences." The Humes of American history were being enlightened by the Mahaffys. Perhaps these enthusiasts proved too much; in any event the reaction came in academic circles, led informally by Professor Burr, that master of winning and polite, but no less caustic analysis, and resulted in a number of valuable conferences in the American Historical Association. The conference on the relation of geography to history presided over by Professor Turner in 1907 was constructive and of especial clarifying value. Here Professor Burr and Professor George B. Adams pointed out that geography was but one factor in explaining history, and that no more in history than in mathematics can the outcome be inferred from one factor alone. Emphasis was laid on the fact that geographers were using ambiguous and inexact phraseology—as in the word "location," which might denote either an act, or the result of an act. "To impute action or causation, influence or control," Professor Burr was quoted, "to things which are inert is a figure of speech which gives vigor to style but which always involves a fallacy; and when to Nature is imputed what is planned and achieved by man, the sufferer from the fallacy is history." Most of the matters, said Professor Adams, which the geographers

call upon us to include in history are conditions not causes; he warned all and sundry not to be deceived into thinking that it was the waterfall which ground the wheat.

Two results from these discussions may be noted; one, an immediate result, was the common recognition of the lack of cartographical material for the teaching of history and the undertaking on the part of the American Historical Association of the preparation of an historical atlas; the other result, of more fundamental importance, was the recognition of the fact that when dealing in generalities, and embracing too wide a scope, geographical interpretations quite failed to elicit confidence. In illustration may be cited a chapter of a book which treats of a certain river valley as the gateway to the continent. Geologically the thesis is sound; historically it gives a most erroneous impression. Commonwealths beyond the Alleghenies were admitted to the Union almost, if not quite, a decade before the route mentioned began to resemble a thoroughfare of migration, and Lewis and Clark had gone to the Pacific before it became well-known; in the canal and railway era the passage-way rose to first importance and still maintains its prestige; but for the fifty crucial years of expansion into the West (1750-1800) it was, historically, the most effectually barred door in the eastern half of the country.

At the present time we find the study of geographical influences, refined in the fire of criticism, making enormous strides as applied locally to specific problems; types of such studies of great value are represented by such papers as Professor Posey's, "The Influence of Geographic Factors in the Development of Minnesota"[1] and Professor Sioussat's "Memphis as a Gateway to the West."[2] One needs but to scan the bibliography in Vol. III of the Annals of the New York Academy of Sciences to be impressed with the

[1]Minnesota History Bulletin. II. Aug. 1918.

[2]Tennessee Historical Magazine, III. Mar., June 1917.

value to historians of the work being done by such men as Brigham, Tarr, Tower, and others. From this brief review of the influence of the study of physiographic factors on the teaching and understanding of history we see clearly the debt we owe to scientists who adhere closely to the fine art of truth-loving and truth-telling; their factors are of genuine importance so long as they are treated as factors; the conditions they present greatly enrich our understanding until they are confounded with causes. Historians of the Parkman type, who can command the insight of the geologist and topographer, may rewrite many sections of American history; the study of the relationship of the navigability of our rivers with reference to the inland advance of agriculture; the relationship of such barriers as the Berkshires to New England expansion; the rivalry of Memphis, St. Louis and Chicago as trans-continental railway termini, suggest types of study of local conditions which are being made on truly scientific lines. It is only when the historian turns tyro topographist, climatologist, botanist or hydrographer and becomes "possessed with the devil of one idea," as Professor Parks of Andover once said of the abolitionists, that we are in danger of believing that the multiplicand, by some sudden art of necromancy, has become the product.

In the triple alliance of the climatologist, botanist, and geologist we have a combination that will go far in clarifying our understanding of American expansion and the distribution of population. The stock example of settling a long-disputed historical problem with a magnifying-glass is, perhaps, too well known to bear repetition. Its value as a type of scientific checking of historical interpretation is too great, however, to be overlooked here. Dr. Fernald of the Gray Herbarium was too ardent a lover of truth-loving and truth-telling to swallow the story, perpetuated by a long line of historians, of Norsemen filling their ships with grapes on the New England

coast in springtime. Unawed by the array of Norse "towers" and other monuments, this scientist took back to Iceland the words of the Norse sagas and found that "vinber" meant mountain cranberries, not grapes; that "hveiti" meant strand wheat, not Indian corn; and that "mosurr" meant canoe-birch, not maple.[3] In such a way was Bancroft's ancient contempt and James P. Dexter's earnest groping in his etymological laboratory made honourable by a scientist who located "Wineland the Good" between Labrador and the lower St. Lawrence. It is interesting to note, as a matter of professional gossip, that Dr. Fernald, so far from becoming "possessed with the devil of one idea" and continuing the ravages of his historical research, has rather made light of his valuable contribution to history and refused election to a very prominent historical society on the plea that he was a scientist and not in the least an historian.

The fact remains, however, that climatic conditions, plant life and agriculture are being taken into account today as never before, and to these we may well look, if not for such brilliant checking as was afforded by Dr. Fernald, at least for many fresh and reliable explanations for the distribution of pioneer populations.

The work of Ellsworth Huntington has commanded wide attention despite the criticism which it has attracted. In his *Civilization and Climate* he shows, for instance, how the advancement of the American Indians was checked by the fact that the regions which were otherwise best for them were also best for grass. This seemingly slight climatic coincidence, joined with the fact that the Indians had no tools of iron and no beasts of burden, prevented the growth of a stable civilization in the northern United States. Another set of climatic conditions, which today, strangely enough, are far from the most favorable, caused the vegetation of regions farther south to be much more

[3]M. L. Fernald, "Notes on the Plants of Wineland the Good." Rhodora, XII (Feb. 1910) 17-38.

tractable, for no tough sod could grow. Hence agriculture was possible in southern regions, and our forerunners in America were able to have a much more noteworthy flowering of civilization in the southern United States than in the northern, and a still greater in Mexico.

In the same author's *Civilization and Climate* and *The Red Man's Continent* he shows how the Indians reached their highest pitch of advancement in three highly diverse ways corresponding to three equally diverse types of environment. The first was the irrigation civilization of the Southwest and Mexico. The second found its chief exponent in the Haidas of the Pacific coast near Vancouver Islands, where there grew up a type of culture dependent upon an abundant supply of fish for food and the easy lines of communication furnished by safe and easy waterways among the islands. The third was the cruel, but highly vigorous culture of the Iroquois, centering in a region which stimulates intense activity, but which at the same time had the great handicap of having a climate which made permanent agriculture almost impossible for the Indians because the growth of grass in their fields compelled them to move at frequent intervals.

The second instance to which he refers is in *World Power and Evolution* where he shows the remarkable agreement between the curve of climatic pulsations as worked out in Asia, the Mediterranean regions, and California on the one hand, and the rise and fall of prosperity and activity in Rome on the other. In his opinion this parallelism is one of the most interesting features of the investigation of climatic changes.

Another coincidence of this same kind is that the Mohammedan outburst, as Professor Huntington has shown in "Palestine and its Transformation," came just at the driest time known to history, while the out pouring from Central Asia under Ghengis Khan came at another extremely dry time. Doubtless other causes would have led to a stirring of the nations under

the impulse of Mohammed and Ghengis, but the extreme dryness and consequent hunger seem to have played an important part in making these particular outbursts from the desert so much more serious than any other.

Enthusiasms, such as shown by Professor Huntington, must be excused because they are explorations into new fields and hold a modicum of plausibility. It is easy to say that he builds too great an edifice on a small array of foundation facts. But many of his leads are valuable, and from them we may come to profit to a degree unguessed by those who minimize the net results to date.

While too much attention should not be given to the atmospheric pressure in the halls of political conventions, not even the Constitutional Convention of 1787, climatic and soil conditions which favored the growth of certain trees, plants, and grasses will give us clearer explanations of westward American migration than we now have. When the Watauga Region in the Southern Alleghenies was found to be a second New York State as a butter and cream region, but removed so far southward that cattle would winter unharmed in the open, it became a magnet of migration; the strong argument in building the Ohio canals (which benefited all the Great Lake States equally with Ohio) was that they gave a northward outlet for grains which frequently turned sour in the long voyage to semi-tropic New Orleans; the position of the most northerly ice-free port on the Mississippi River was a dominant factor in railway building in the Middle West in much the way Port Arthur dominated Russian advance upon Manchuria.

Professor Turner, a generation ago, called attention to the limestone pathways leading southward from the old granary of America, Pennsylvania, to the limestone oases of Tennessee and Kentucky. The plant life of these limestone districts exerted far-reaching influences. In the wheat-fields of Pennsylvania the

English hunter was crossed with the "dog-horses" (as one of General Braddock's officers described them) of Virginia, giving us first the sturdy packhorse of the Indian traders and then the strong wagon-and-coach-horse. These animals arose from out these wheat fields as naturally as did the McCormick reaper. Here, too, was first seen that lumbering vehicle of American migration, the Conestoga wagon, as different from the Concord coach as the civilizations which lay back of them. The place of this limestone zone in the history of American transportation is worthy of emphasis; here was built the first American canal; here plied Fitch's first steamboat; here was built the first steam engine to run on a highway; here was built the first American stone road.

Migration westward followed unconciously vegetative zones, soils producing nut-bearing trees and mast, the pea-vine valleys and blue grass meadows and balds; the Shenandoah Valley in turn became the granary of Virginia and the pathway of migration on its centripetal route by Cumberland Gap to the Kentucky blue grass zone. When this movement reached Staunton and the blue grass regions of the New and Greenbriar valleys it would naturally have struck straight to its evident goal the Ohio Valley. But the coal measures of the Great Kanawha and Big Sandy blocked the road, sending the movement on the line of greatest vegetative attraction across both the James and New rivers to the five limestone valley tributaries of the Tennessee and thus to Nashville and Boonesboro. Kephart has cited the razorback hog as a pilot of this migrating army which made possible the timely occupation of Kentucky on the eve of the Revolution. He gives good proof that you could not drive that dogmatic, four-legged Calvinist out of his vegetative zone of least resistance and emphasizes that his flesh was the mainstay of the migratory horde.

In proof of the domination of these influences of plant life one needs only to turn to the formal and

informal propaganda of promoters and land companies of the era of expansion into the trans-Allegheny wilderness. Weather conditions, length of seasons, soils, and kinds and dimensions of shrubs and trees were uniformly cited in proof of the excellence of one region over another. Washington's measurement of the giant sycamore on the Ohio in 1770 (done at the risk of his reputation for truth-telling) was intended to indicate merely that such was the fertility of the soil (which he desired to rent for 999 years at a good rental) that it could produce trees forty-five feet in circumference.

The fact that land companies rivalled each other in pointing out the pharmaceutical superiority of the growths on lands offered for sale reminds us that the relationship of migration to disease and choice of settlements has not been scientifically developed. The effects of malaria, miasma, and kindred diseases to settlement making and pioneering is practically an untouched field; the failure of many a prospector and colonizing enterprise, the rise and decay of numerous towns in unhealthy environments, and possibly much of the so-called *wanderlust* of the rovers who led the pioneer advance, might be explained more fully by the student of bacteria than by the historian. These insidious influences had farther reaching effects than have been recognized, influencing mind as well as body, religion as well as diet, politics as well as complexion.

The hysteria, for instance, which accompanied periods of religious excitement along our frontiers was part and parcel with the fanaticism which led the Indian "medicine men" to exert such ghoulish control upon their morbid, distraught proselytes, attaining a terrible success that, in one instance, at least, affected a stolid representative of the white race. The monotony of life in the half-lights of the forests, with its perpetual tendency to provoke the ailments universal to the Indian, pulmonary disorder, together

with the inroads of malarial germs, gave to the pioneer race sallowness of complexion and, together with a limited diet, a gauntness of frame, which characterized them so commonly that the highlander of today in Appalachia feels disgraced by a fat son. The oppressiveness of the monotonous silence of forest life affected mind and, without doubt, body; this was particularly true of women, the mothers of the children of the wilderness, and their sons were the weaker for it; this, perhaps as much as the toil of wilderness existence, may account for the lessened longevity on the part of the pioneer crusaders of our young West.

The lack of zoölogical maps of the west likewise hinders our understanding of the distribution of earliest populations. Maps showing clear lines marking the habitat of the valuable fur-bearing animals will measurably add to our understanding of fur company and international rivalries and the retardations in occupation of zones which did not exert that magnetic influence. Such maps will make much clearer the explanation of the artificial tangents on which numerous migrations struck out and the curiosities of the haphazard occupation of our northwest; the mapping of these zones with reference to the fertile agricultural regions on the one hand, and of the gold and silver areas on the other, will clear up much of the haziness in our understanding of the social movements from the former to the latter.

In the realm of hydrography and aerography the progress made in the past decade is instinct with promise. Those of us who have scripturally believed the winds fitting symbols of fickleness are a little confused to hear them classed among stable and dependable natural phenomena. Certain trade winds we have known are as regular as the seasons, but to be told that the great air currents can be relied upon generally to aid in explaining the seemingly whimsical routes of early explorers and help us to understand

their landfalls and omissions as well as commissions is altogether new.

This work, begun by Professor George Davidson of the University of California, is being continued by Director Alexander McAdie of the Blue Hill Observatory. The work of these men has already made much clearer the facts concerning the discoveries of Vancouver, Drake, and Cooke on the Pacific Coast. By a careful comparison of the original logs kept by these explorers with our present knowledge of air currents, tides, fogs, sea-floor, and coast-lines, these scientists have proven that the "Golden Hinde," for instance, could not have reached the latitude of 48° North as has been uniformly stated and repeated in as late an authority as the last edition of the Britannica. They give us certain proof of scientific accuracy that the farthest point reached was 43° North; that Drake could not have discovered San Francisco Bay but, rather, found his anchorage behind Point Reyes, which region he christened "Nova Albion."[4]

It is not unlikely that many of the voyages of the old explorers will be examined in the light of our growing knowledge of air and ocean currents, tides, fogs, and sea-floor, and that many old-time puzzles, such as Cartier's missing the mouth of the St. Lawrence in his first voyage, will be scientifically explained.

As factors in this recasting of opinions the progress in study of marine life will not be without its value; we know vaguely that forms of life frequenting the Gulf Stream differ entirely from those which are found in the submerged Arctic Current on the one hand or in the Sargasso Sea, on the other. The proof that Columbus and other explorers were dependent, or the reverse, on the Gulf Stream for finding the Caribbeans, lies largely with the biologists and ornithologists as well as with the hydrographers.

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[4] "An examination of the Early Voyages . . . 1539 to 1603," U. S. Coast and Geodetic Survey, Appendix No. 7; "Nova Albion—1579," Proceedings of the American Antiquarian Society, v. 28. 1918.

More than a decade ago Professor Bassett showed clearly how the study of the coast of the Carolinas could be made to clarify historical interpretation. Probably it will not be long before the science of hydrography will establish a comparison, for instance, between our two great gulfs, the Gulf of Mexico and the Gulf of St. Lawrence with reference to tides, currents and sea-floor. No history with which I am acquainted compares those two great waterway avenues into the heart of America; we know in general that the ocean tides sweep a thousand miles up one river and only about a dozen miles up the other; that one river flows clear from a rocky archean highland leaving no deposit at its mouth, while the other brings down its alluvial valley four hundred million tons of silt and clay annually to block and metamorphose its innumerable mouths. These vague outstanding facts when scientifically developed by men fitted to speak with accuracy, will make plain why the St. Lawrence became the key to the interior and would have done so had there been no Great Lakes at its head; also why the Mississippi was such an enigma to explorers and was never ascended by Europeans even in small craft until thirty years after the Great Lakes were comparatively well known.

In this connection the soil-carrying power of water has produced sociological results in the way of town and city planting that are worthy of study in numerous instances. The more rapid a stream's current the larger are the soil particles which can be carried in suspension. If the current is moving three inches per second, fine clay and silt will be deposited; at eight inches a second, sand the size of linseed will be deposited. At a rate of sixteen inches a second pebbles an inch in diameter will be transported, while water flowing two feet per second will carry stones the size of a hen's egg.

This study of the relation of soil to velocity of streams explains why alluvial lands have varied

stratified deposits as the currents have varied, and why the richest of soils are likely to be deposited in the backwaters and the coarser near river banks; thus the draining of inland lagoons and swamps discovers exceedingly rich soil. Deltas are usually most productive. If streams at flood tide, bearing much deposit, are blocked from entering other streams to which they are tributary, they become still water and deposit their soil-burden in their channel or upon the surrounding bottom lands. These channel deposits are washed into the main river when the blockade is removed, and, sinking, form bars.

Excellent soils at all deltas had a direct bearing on making such spots choice land for the squatter or prospector. The bars in the main river added to the strategic character of the mouths of streams as sites of settlements and, often, of towns. The bars in the main stream lessened its depth and made fording safer. The main fords were located by the larger game animals at such points, and men, following their well-laid paths, found and used these fords. Frequently high water rendered the ford impassable especially after vehicles came into use. Thus the ferry-boat was needed and the business of ferrying was a profitable one. Ownership of land at such points was, therefore, doubly advantageous, giving the owner a lucrative employment at odd hours. As vehicle travel became common, the ferry was usually moved to a point above the shifting bars where there was a steady depth of water. Railways came later, following streams with monotonous regularity, and bridged streams on the site of the ancient ford. Hundreds of farms in these strategic locations became hamlets in the era of the stage and wagon, and blossomed into cities on the advent of the railways. Behind this interesting evolution we see its secret—the soil-transporting power of water. Studies of this type founded on sound scientific reasoning, give a

basis frequently for the explanation of facts never otherwise understood.

Before closing, the very recent and important development of aerial photography which will be invaluable to the writers of the histories of the late war, should be mentioned. When one considers the endless discussion of the past over positions of lines held and advances made it is not without a feeling of gratitude to these faithful men of daring that we recognize the basis they have laid for correct physiographical studies of the war, sector by sector.

As no one factor explains a result, so no result is understood without the proper recognition of all factors which exert a control over it. The spirit of the day—our admiration for, and devotion to, truth-loving and truth-telling—demands a catholicity of temperament and a loathing of bias on the part of our historical writers. As never before the natural sciences have become the handmaidens of history, and every clarifying influence they exert, or suggestion they offer, must be hailed with attention and gratitude.