

## INTRODUCTION

By the year 1860 California was showing signs of too much mining excitement. The days of '49 were irrevocably gone. For a decade gold mining had passed from one phase to another and disorganized individual enterprise had given way to corporate organization, capital outlay, and engineering skill. Nevertheless, the old gambling spirit persisted, stimulated by occasional rich strikes and partial successes. Moreover, the gold fever had aroused a general interest in minerals, so that there were frequent "excitements" over discoveries of silver, tin, quicksilver, and even coal. Immense resources seemed to lie all about; yet, somehow, they did not materialize with the expected abundance. Under these circumstances it became clear to certain of the more sober minds in the state that definite scientific knowledge was needed to give better direction to the development of resources.

Foremost among those who perceived this need was Stephen J. Field, at that time a justice of the Supreme Court of California, later of the Supreme Court of the United States. He realized that a geological survey of the state, in order to accomplish its purposes, must be not only competent in science, but strictly impartial and unprejudiced. He was determined, therefore, that it should be kept out of politics and that it should be free from local influences. Everything would depend upon the character and qualifications of the man to be placed in charge of the work. Accordingly, before urging the matter in public, Justice Field quietly sought advice of the leading men of science in the East and asked them to recommend a suitable director. The

name that received the preponderance of endorsements was that of Josiah Dwight Whitney, a graduate of Yale, who had been engaged for a number of years in various state surveys and whose book, *The Metallic Wealth of the United States*, had attracted wide attention. Consequently, when the bill came up for consideration in the legislature, Justice Field and his associates, in spite of strong opposition from several locally supported rivals, were able to have Whitney designated in the act itself as State Geologist.

The act of April 21, 1860, in appointing the State Geologist, directed him: "With the aid of such assistants as he may appoint, to make an accurate and complete Geological Survey of the State, and to furnish, in his Report of the same, proper maps and diagrams thereof, with a full and scientific description of its rocks, fossils, soils, and minerals, and of its botanical and zoölogical productions, together with specimens of the same." Whitney accepted the appointment and set about organizing the personnel and equipment for his work.

The first man selected by Whitney for his staff was William H. Brewer. The two had never met, and did not do so until the very eve of departure for California; but so convincing was the recommendation of Professor Brush, of Yale, to whom Whitney had addressed an inquiry, and so entirely suitable were Brewer's qualifications, that the matter was arranged by correspondence. The next four years were to show how extremely fortunate Whitney was in this selection. It was of vast importance that his right-hand man should be of the strongest fiber, of unflagging energy, the soundest judgment, the utmost tact, and of unequivocal honesty and loyalty. Happily, these were the very qualifications that distinguished the character of Brewer.

Brewer's professional attainments were not those of a

geologist. He was educated primarily in the sciences centering about agriculture. But in grounding himself in these he had learned methods applicable to the study of all natural sciences. He was a very keen and careful observer, ever mindful of the importance of accuracy and of order. Moreover, he had a native shrewdness that enabled him to recognize the relative significance of things and to draw sound conclusions from his data. In these qualities he was, in fact, superior to his chief; for Whitney, in spite of his compendious knowledge and high intellectual attainments, was inclined to be dogmatic. There were other respects in which there was a contrast between the two. Whitney was forever quarreling with those with whom he disagreed; Brewer, no matter how pronounced might be his views, was always ready to let good fellowship and good humor prevail. There was a genial quality about him that proved a saving grace for the Survey on more than one occasion. Let it be said of Whitney, however, that with those whom he considered his peers and with the members of his own staff he was on the best of terms.

Notwithstanding the high rank to which he rose in the academic world, Brewer was first and last a farmer, and his life story constantly reflects his closeness to the soil. This is exemplified in his sound common sense, his farmer's handiness with everyday contrivances, his ability to keep the wheels of work going through all kinds of adversities of weather, the zest with which he engaged in hard labor, the sincerity and generosity of his relations with men, the heartiness of his humor, the wholesomeness with which he relished a salty episode, and, finally, in the sound fruition that followed his labors.

William Henry Brewer was born at Poughkeepsie, New York, September 14, 1828. The family soon afterward re-

moved to Enfield, near Ithaca, where he grew up accustomed to the duties of a boy on a small farm. A Dutch ancestor, Adam Brouwer Berkhoven, had come to New Amsterdam in 1642, but as generations passed in the New World the name Berkhoven was dropped and *Brouwer* became *Brower*. Not until after the American Revolution did the further transition to *Brewer* occur. Ancestry on the mother's side also extended to Colonial times; the DuBois family, Huguenots, came to New York in 1662. William Henry Brewer had one brother, Edgar, three and a half years younger, who lived for most of his life on the family farm at Enfield. William Henry attended district school and then spent four winters at Ithaca Academy.

Such was his simple background when, in 1848, he secured his father's permission to study agricultural chemistry for a year at Yale under Professor Benjamin Silliman, Jr., and Professor John Pitkin Norton. When Brewer set out for New Haven in October, 1848, he traveled for the first time on a public conveyance. This journey was the beginning of an unfoldment that soon led to farther horizons than he had visioned on the farm. His year at Yale was extended to two. He applied himself eagerly to his studies and formed lasting friendships. He was one of the first members taken into Berzelius Society after its formation.

At the end of two years Brewer returned to Enfield and began his career as a teacher, first at Ithaca Academy, then at an agricultural school. In the summer of 1852 he was summoned to New Haven to be examined for the degree of Bachelor of Philosophy, which was to be conferred upon those who had studied in the "School of Applied Chemistry." On July 29, 1852, with George J. Brush, William P. Blake, and three others, he received the degree. This was the

first class to be graduated from what is now the Sheffield Scientific School.

For the next three years he taught at Ovid Academy, Ovid, New York, constantly strengthening his conviction that the future development of agriculture lay in the study and application of the natural sciences. With this conviction, he resolved to go to the fountainhead of scientific teaching, and in September, 1855, he sailed for Hamburg on the bark *Ericsson*. Going directly to Heidelberg, he entered the analytical laboratory of Professor Bunsen, and a year later moved on to Munich, where he studied under Liebig. In the summer of 1856 Brewer took to the open, walking six hundred miles through Switzerland. While the study of botany was his principal motive, he did not fail to be impressed with the splendors of the mountain scenery. This journey, and a shorter one in the Tyrol the following spring, afforded experience in mountain travel that was to assist him immeasurably in California a few years later. Before returning to Ovid in the fall of 1857, he attended lectures on chemistry by Chevreul in Paris, went on a brief botanical expedition to the south of France, and saw a little of England. It is typical of his weighing of values that in order to enjoy these added travels he chose to come home "steerage" on the steamer from Liverpool.

A year after his return from Europe, Brewer was called to a professorship of chemistry at Washington College (now Washington and Jefferson College), Pennsylvania. Meanwhile, in August, 1858, he had married Angelina Jameson. His new position and his family life were, however, of brief duration, for in the summer of 1860, shortly after the birth of a son, his wife died, and a few weeks later the child followed. It was at this sad moment that the offer came from Whitney to go to California, and Brewer welcomed the op-

portunity of leaving the melancholy associations that a continuance at Washington College would have entailed.

The journey to California, the commencement of the field work, the day-by-day progress, the growth of a comprehensive view of the physical structure of the state of California, are described so thoroughly and so clearly in Brewer's letters that there is no need for amplification or for summary. The four years of Brewer's service with the Survey cover a distinct period, in which a very large part of its important results was accomplished. In the following years the life of the Survey became extremely precarious. At one time there was a complete shutdown because of lack of funds, and finally, in 1873, after a brief revival, it was discontinued entirely.

It can hardly be said that the original purposes of the California State Geological Survey were fulfilled. Much was indeed learned about the mining regions and the nature of the auriferous gravels; here and there a slight curb was put upon speculation; the topography of the state was fairly well mapped; and great progress was made toward an understanding of the geological history of the country. Save for the maps, however, it is doubtful whether any immediate economic advantages can be traced to Whitney's work. Certainly no new mineral fields were discovered and no direction was given to the mining industry. Whitney's excuse was that he could not produce economic results except upon a basis of scientific knowledge, and that the field was so large and so difficult that a much larger sum of money was needed than had been placed at his disposal. There is a great deal of truth in Whitney's contention; but, on the other hand, it is equally true that Whitney's own character had much to do with the diversion of the Survey from its original purposes and its consequent incomplete-

ness. Whitney was bent upon conducting a perfect survey. He was uncompromising and unyielding in the face of practical situations that required diplomatic handling. Before trying to convince a state legislature that the study of fossils—"shells and old bones"—had a direct bearing upon the discovery of gold mines, he should have offered simpler and more comprehensible examples of the value of geological science. This he might readily have done from the multifarious material developed during the first few years of the work. He scorned such expedients, however, and refused to deviate from his nobly conceived, but extremely ambitious, plans.

Although the Whitney Survey was a disappointment to the people of California, it was, nevertheless, extremely valuable in many respects. It produced a wealth of information which was utilized by other agencies and which ultimately found its reflection in the welfare of the state. Perhaps its greatest value was in the far-reaching influence it had on the conduct of subsequent surveys throughout the United States. Out of its ranks came Clarence King, Charles F. Hoffmann, and James T. Gardiner. King proceeded to form his own Survey of the Fortieth Parallel and later developed the idea of a consolidation of all government surveys. Others were working for the same end, and presently there was a bitter struggle for control. That the United States Geological Survey, as eventually established in 1879 with Clarence King as its first Director, was a civilian rather than a military agency is directly traceable to ideas formulated in the Whitney Survey of California. Many of the methods employed by the United States Geological Survey may be traced to the same source. Hoffmann, for instance, may well be called the progenitor of modern American topography. Guided by Whitney, he taught the art to King

and Gardiner, who, in turn, developed it in the Survey of the Fortieth Parallel. He also taught Henry Gannett, who, with Gardiner, introduced the art to the Hayden Survey. When the consolidation took place, the topographic work was, therefore, almost entirely in the hands of men trained in this school. In 1900 Brewer, in a letter to Hoffmann, reviewed this course of events and made this statement:

ALL these years I have taken pains, whenever opportunity occurred, to keep it in mind that you introduced into America this system of field topographical survey, which now, improved greatly, but fundamentally the same, and tho' modified and much more widely extended, is the method employed by the general Government, and which, as I understand, has since been introduced into other countries where similar conditions occur. For this, Whitney and you should have credit, and the fact should have a more prominent record than the mere recollections of men.

Professor Brewer's title in the Geological Survey of California was "Principal Assistant, in charge of Botanical Department." It will be observed from the contents of his journal that the botanical duties were subordinated to, and at times practically extinguished by, the responsibilities placed upon him as leader of the field parties. Nevertheless, he was able to do a considerable amount of collecting without much extra effort. With his customary precision he numbered his specimens in serial order, an aid to identification frequently neglected by collectors of his time. Classification and description was perforce left to a future occasion, so Brewer came to the close of his work in California with very little beyond his collections to show for his labors in the province of botany. For a time, after leaving the Survey, he worked on his botanical report at the Herbarium of Harvard University, where he had the benefit of the counsel of



Professor Asa Gray. In a memorandum written many years later he states:

I RECEIVED no pay whatever after the closing of my connection with the Survey in California—neither for the time nor expense in working up results. I spent an aggregate of about two years time—a little more rather than less—and over two thousand dollars in cash, besides deducting another one thousand dollars from my salary from college because of time taken out for my work—that is, absence during term time at work on my plants at the Cambridge Herbarium. After Gilman went to California as president of the State University he induced a few wealthy citizens there to subscribe money for the finishing of the botanical work and getting it printed. I got the printing started, and then employed Watson, handed over all my notes to him and the rest of my manuscript, and he finished it.

The first volume of the botanical report did not appear until 1876; the second, in which Brewer had practically no part, not until 1880.<sup>1</sup>

Toward the close of his fourth year with the Survey, Brewer received word of his appointment to the Chair of Agriculture in the Sheffield Scientific School at Yale. His acceptance marked the end of his roving and brought him into the full tide of his career. From the spring of 1865, when he entered upon his duties at New Haven, until his retirement in 1903 as professor emeritus, he took a prominent part in the development of the school. His influence extended far beyond its walls, however, for he was not content with academic teaching, but must needs bring the virtues of science to the farms, the villages, and the cities of his state. He promoted the establishment of agricultural experiment stations; he helped to organize the Connecticut State Board of Health and served on it for thirty-one years; he

<sup>1</sup> W. H. Brewer and Sereno Watson, "Polypetalae"; Asa Gray, "Gramopetalae," *Botany* (Cambridge, 1876), I, xx + 628 pp.; Sereno Watson, *Botany* (Cambridge, 1880), II, xv + 559 pp.

also served for a long time on the Board of Health of the city of New Haven. His services were also in demand in wider fields. As a special agent for the census of 1880 he reported on the production of cereals in the United States; he was a member of the United States Forestry Commission appointed in 1896 to investigate the forest resources of the country; he was chairman of the committee appointed by the National Academy of Sciences in 1903 to make recommendations for a scientific survey of the Philippine Islands; he was offered the position of Assistant Secretary of Agriculture in the Cleveland administration, but declined.

Although after leaving California Brewer never again found time for extended exploration, he by no means lost interest in such things. On three occasions he took part in shorter trips of an unusual character. The first of these was a summer trip to the Rocky Mountains of Colorado in 1869.<sup>2</sup> During an interim in the California Survey Whitney was teaching at Harvard and desired to bring some of his students into contact with actual field conditions. He persuaded Brewer and Hoffmann to assist him in conducting the expedition and in teaching the science of geology and the art of topography. It is noteworthy that of the four students two subsequently achieved great distinction in these fields: William Morris Davis becoming Professor of Geology at Harvard, and Henry Gannett becoming Chief Geographer of the United States Geological Survey. It was many years before Brewer made another expedition, this time to Greenland, in 1894. As a result of this trip he joined with others in forming the Arctic Club, of which he was for many years the president. In 1899 he was a member of the Harriman Alaska Expedition.

<sup>2</sup> Professor Brewer wrote a series of letters to his wife describing this trip. These letters have recently been published in pamphlet form by the Colorado Mountain Club, Denver, Colorado.

In 1868 he married Georgiana Robinson at Exeter, New Hampshire. To their home in New Haven four children were born: Nora (1870), now Mrs. Clifford Standish Griswold; Henry (1872); Arthur (1875); and Carl (1882).

As time went on, Professor Brewer received his share of academic distinctions. He was a member of the National Academy of Sciences and served a term as its president. In 1903 he was twice awarded the honorary degree of Doctor of Laws—by Wesleyan University and by Yale. A highly appropriate recognition came to him in 1910, when the same honorary degree was conferred upon him by the University of California. Thus, in the final year of his life, he again became associated with the state in which he had spent four of his most active years, years in which were laid down strong foundations for his vigorous and useful career.

Throughout his life Brewer was a voluminous letter writer and diarist. He recorded in his notebooks with minute punctiliousness everything he saw. His pages are filled with weather statistics, with estimates of distances, with measurements. These notebooks were for his own use, and well did he use them, again and again. But when he came to write out his impressions for the benefit of others, he clothed the bare bones of his statistics and created something pulsing with life. Yet he never altered his facts to make an impression. The statistics in his letters agree with those in his notebooks; and, if one were to go back to the scene today and remeasure with the same instruments and the same resources, one would in all probability find the facts to be much the same as Brewer said they were. If the altitudes that he gives for mountains are not quite the same as those shown on our latest maps, it is only because his means were inadequate, not because he failed to observe accurately. It is this accuracy of observation, coupled with his devotion to truth, that

gives to his letters unusual historical value. Moreover, in all his writings he rarely goes beyond the limits of his own experience—there is very little “hearsay” in Brewer’s journals.

During his four years in California he exercised his recording faculties to the fullest extent. In the midst of a most prodigious activity he found time to keep several distinct sets of notebooks, to prepare elaborate scientific reports, to engage in a miscellaneous correspondence, and to write the vigorous and comprehensive letters that constitute his personal journal. These letters are the more remarkable in that they were sometimes written late at night by firelight or candlelight, sometimes in the blistering heat of a summer noon, sometimes in a leaky tent with cold rain and wind outside. Numbered serially, they were sent to his brother, Edgar, with urgent instructions that after they had been passed around among family and friends they should be held for him until his return. Happily, only two or three numbers, all of lesser importance, failed of delivery.

Brewer probably never intended these letters for publication. At least, he never edited them or took any steps in that direction. Nor would they, perhaps, have attracted much attention if they had been published in the years immediately succeeding the events described. They were not “literature”; they were not written in the style of certain superficial travelers of the day whose animated accounts of what they saw and what they didn’t see in California still cumber our shelves. Clarence King, Brewer’s young *protégé*, could write “literature,” however, and did, with a brilliancy that marked his course in many fields. His *Mountaineering in the Sierra Nevada*, published in 1872, after appearing in part in the *Atlantic Monthly*, was the only publication resulting from the California State Geological Survey outside of the

official reports and Whitney's scientific by-products. In King's delightful book there is glamor and entertainment; in Whitney's reports, voluminous information ably presented. But in the ripeness of time Brewer's letters will come to fill a place quite as important as either Whitney's reports or King's essays. They are an unabridged, undecorated record of the times, as replete with significant facts as the reports, often as vivid in descriptions as the essays, yet devoid of the obsolete deductions of the former and the occasional exaggerations of the latter.

In preparing these letters for the press, the editor has taken certain liberties with the text which he believes Professor Brewer would have cordially sanctioned were he alive. It would be unfair to a scholar of high standing to perpetuate errors of spelling, hastily contrived sentence structure, unwitting repetition, and other trivialities, resulting from the trying conditions under which the writing was done. Moreover, there are portions of the letters in which considerable condensation has been possible without the sacrifice of anything of permanent value. Better balance and facility in reading has been brought about by abandoning the original letter lengths and substituting chapters. There seems to be not the slightest advantage in reproducing here a precise facsimile. Should any question arise upon which the exact text is desired for comparison, reference can be readily made to the original manuscript which has been deposited in the Yale University Library. There is also a carefully compared typed copy in the files of the California Historical Society in San Francisco. The editor confidently believes, however, that in no instance has he altered Brewer's meaning or impaired his accuracy and that no matter of importance has been omitted.

For readers who may desire to pursue farther the subject

matter of these letters, references to other publications will be found here and there in the footnotes. Foremost among these is the *Geology* volume of the Whitney Survey.<sup>3</sup> A reading of Brewer's letters makes it clear that a considerable portion of this work was written by him, or at least composed substantially from his reports. Part of the material contained in the *Geology* is also to be found in the several editions of *The Yosemite Guide-Book*.<sup>4</sup> These are by no means all of the publications of the Survey, but they are the ones most likely to interest the non-scientific reader. Of Brewer's associates on the Survey, Whitney and King have been the subjects of biographical volumes.<sup>5</sup>

In the many years since the field party of the California State Geological Survey set out with its mules and wagons over dusty roads and incredibly steep grades, enormous changes have come upon some portions of the scene. Where these changes have obliterated all traces of earlier conditions, Brewer's vivid descriptions will serve to summon a vision of the past with all its picturesqueness and romance. But there are some spots, a little off the main highways,

<sup>3</sup> J. D. Whitney, State Geologist, Geological Survey of California, *Geology*, Vol. I. "Report of Progress and Synopsis of the Field Work from 1860 to 1864" (1865, xxvii + 498 pp., woodcuts). [Vol. II, dealing with later work, was published in 1882.]

<sup>4</sup> (a) *The Yosemite Book* (1868, 116 pp., 28 photographs, maps). [A handsome gift book, limited to 250 copies, containing photographic prints of Yosemite and the Tuolumne Meadows.]

(b) *The Yosemite Guide-Book* (1869, 155 pp., woodcuts, maps). [Many copies bear the date 1870.]

(c) *The Yosemite Guide-Book* (pocket edition, 1871, 133 pp., maps).

(d) *The Yosemite Guide-Book* (new pocket edition, revised and corrected, 1874, 186 pp., maps).

<sup>5</sup> (a) Edwin Tenney Brewster, *Life and Letters of Josiah Dwight Whitney* (Boston and New York: Houghton Mifflin Company, 1909, xiii + 411 pp., illustrations).

(b) *Clarence King Memoirs—The Helmet of Mambrino*, published for the King Memorial Committee, Century Association (New York and London: G. P. Putnam's Sons, 1904, vii + 429 pp., portraits).

(c) Thurman Wilkins, *Clarence King. A Biography* (New York: The Macmillan Company, 1958, ix + 441).

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where, even today, the reader of these letters will have little difficulty in identifying the landmarks and where he may, if he chooses, tread in the very footsteps of Brewer, Whitney, Hoffmann, Gardiner, King, Averill, and the other bearded and sunburned men whose story is told in these pages. Historian, traveler, and general reader alike, will, I am sure, thank Professor Brewer for his pains in writing so faithfully of what he saw as he traveled up and down California during those four years, 1860 to 1864.

F. P. F.

*San Francisco,  
March, 1930.*