# Inescapable Ecologies

## A History of Environment, Disease, and Knowledge

Linda Nash

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# 1

# Body and Environment in an Era of Colonization

A knowledge of the *etiology of diseases* can best be attained by studying the affections of different localities in connection with every condition and circumstance calculated to operate prejudicially or otherwise upon the health of the inhabitants. Such philosophical investigation is particularly useful in tracing the modifications diseases may undergo from the agency of causes of a local or special character; and being also calculated to elucidate the relationship of diseases to climate, to the prevailing geological formations—the fauna, the vegetables, the minerals, the waters, which vary with the earth's crust, wherever man can make his abode, commends itself to the pioneer physician of our extended territory.

Dr. Thomas Logan in *Transactions of the American Medical Association,* 1859

It is typical to think of the colonization of western North America as a process in which Europeans and Americans remade the land by reworking natural environments into forms that were both aesthetically pleasing and materially useful. This is surely true, but it is also true that in earlier eras Americans understood colonization as involving bodily transformation as well. The process could work both ways. Places could alter bodies as much as bodies could alter places. Despite the political and cultural rhetoric of conquest, those engaged in colonizing western North America recognized that the effort often brought substantial physical risks. Western immigration was a gamble in physical, as well as economic, terms.

Historians of American expansion have not neglected concerns about health; however, they have overwhelmingly emphasized the disease experience of Native Americans. The story of "virgin soil epidemics"—the

transmission of European diseases to Indian populations with no previous exposure and thus no acquired or inherited resistance—is now quite well known. That the consequences of European disease were horrific for most Indian peoples is certain. But Indians were not the only people who suffered extensively from illness in the eighteenth and nineteenth centuries. The processes and exchanges brought about by the colonial endeavor of that period created what one scholar has labeled a "global epidemiological crisis." Everyone was more vulnerable to illness, even those who stayed put. Diseases that were already familiar to white colonists were not necessarily less debilitating or frightening on that account. Accordingly, concerns about disease and disability permeated much of nineteenth-century European and American culture.[1]

The focus on the disease experience of Native Americans is justified by the unprecedented scope of Indian depopulation and the role that illnesses played in that catastrophe. But to ignore the disease experience of white immigrants is problematic. Such a selective focus can in some cases serve to retrospectively naturalize Euro-American colonization. What was historically contingent—European dominance in North America—can come to seem biologically predestined, and the centuries-long struggle between native peoples and Euro-Americans, which was marked by incredible violence, can too easily be rewritten as a passive and unavoidable conquest. The historical "forgetting" of disease, other than the diseases of Indians, may itself be part of a centuries-long process of normalizing white colonization in the western United States.[2] Moreover, by failing to acknowledge the perceived vulnerability of white as well as nonwhite bodies in earlier periods, we run the risk of reading those periods through the lens of later demographic transitions. By contrast, those engaged in colonization were often far less certain of its ultimate outcome, particularly as they waged their own struggles with Native Americans, unfamiliar landscapes, and a host of lethal diseases: cholera, malaria, dysentery, typhus, yellow fever, tuberculosis.

Understanding the health concerns of nineteenth-century settlers in western North America requires that we put aside more recent understandings of both the human body and the environment. The one-sided focus on the disease history of Indian peoples can have the effect of rewriting white bodies in contrasting and somewhat ahistorical terms—as clearly bounded, always resilient, and unproblematically cosmopolitan. But this modern understanding of the body cannot be found in early- or even mid-nineteenth-century sources. In fact, the very idea of a distinct and bounded body, clearly separate from its environment, and able to move unproblem-

atically from one location to another, is a relatively recent historical development. Nineteenth-century bodies, white and nonwhite, were malleable and porous entities that were in constant interaction with the surrounding environment, an environment that retained a complex agency of its own. Disease in the nineteenth century, even when acknowledged to be contagious, was not reducible to specific pathogenic agents or person-to-person contact. Contemporaries understood the causes of disease as spread widely across both bodies and landscapes. Consequently, prospective settlers approached new environments with caution, recognizing that the land itself could be either a font of health or a source of illness.

For those who moved west, human bodies were the most sensitive and reliable indicators of place.[3] The presence or absence of certain illnesses, rates of birth and death, and the course of epidemics—all these were important clues to the qualities of an unfamiliar landscape. Settlers and travelers alike were typically attuned to the reactions of their bodies and to the appearances of those they met. Their physical reactions—the onset of fever, a new sense of vigor, a persistent cough, the timing of menstrual cycles—became important means to understand new places. As settlers set about to alter the landscape, they recognized that the landscape, in turn, might also alter them. Settlers' bodies were thus instruments of colonialism in a double sense—in that they both facilitated the colonial project and registered that project's physical effects. Nineteenth-century American medicine eagerly addressed itself to this project, assessing both bodies and landscapes with an eye toward preserving health and whiteness in new locations.

## COLONIZATION AND HEALTH

Today California is commonly, even prosaically, associated with health. In our own health-obsessed time, California stands out as an especially health-obsessed place. But the rhetorical association of California and health was largely a creation of mid-nineteenth-century western boosters. Firsthand accounts of the period offer a much more equivocal and sometimes negative picture. Until the late nineteenth century, California, in European and American minds, was a distant frontier about which little was known, a "terra incognita" as more than one source referred to it. Although California may not have raised the same level of fears among Euro-Americans that southern Africa or the Caribbean did, we should not then assume that early migrants to the Far West understood their relocation in trivial terms.

In the Spanish and Mexican colonial periods, Alta California's colonizers and explorers did not consider it a particularly healthful place. There is no obvious reason why they should have. The existence of disease among Indians in California is indicated in part by their extensive knowledge of therapies, which early European observers simultaneously derided and recorded. Among those native remedies that Americans adopted were *Eriodictyon californicum* (yerba santa), a treatment for bronchitis; *Rhamnus purshiana* (cascara sagrada), a well-known cathartic; and *Grindelia robusta,* used for both lung and skin diseases. By the eighteenth century, Indian peoples were also dealing with an onslaught of new diseases. Scholars have typically assumed that European diseases emerged in California only after the establishment of the first Spanish mission in 1769, but some diseases may have preceded colonization. There is no question, however, that disease arrived anew with the Spanish. Contemporary scholars concur that venereal diseases (both syphilis and gonorrhea) were rampant among the Spanish and the mission Indians and had spread to the tribes of central California by 1814.[4]

Venereal diseases were the most prevalent but hardly the only old-world illnesses in colonial California. In the early nineteenth century Franciscan missionaries reported the presence of consumption, dysentery, and various fevers. A devastating measles epidemic swept the missions in 1806 and may also have spread beyond. Smallpox probably arrived in 1828. In 1837 a smallpox epidemic broke out at Fort Ross on the northern California coast and moved south, killing more than 2,000 individuals mainly among the Pomo, Wappo, and Wintun. Another epidemic began in 1844 among settlers in the Central Valley town of Stockton; it subsequently spread through the valley and foothill regions, affecting mostly the Miwok. In addition to smallpox and measles, pneumonia, diphtheria, scarlet fever, and tuberculosis were recorded in California prior to the 1840s. Disease undoubtedly played a critical role in the decline of the California Indians. The demographer Sherburne Cook estimated that Indian numbers dropped by 21 percent between 1770 and 1830, from more than 300,000 individuals to approximately 65,000. Declines were far higher in the missions than elsewhere, a reflection of both a more concentrated population and the oppressive and often violent nature of mission life.[5]

The few medical men who attempted to assess the health of California in the Spanish and Mexican periods were circumspect. In 1786 the physician Henry Rollin accompanied a French expedition to California and published an account of the voyage in Paris eleven years later. Rollin

cataloged the various diseases suffered by California Indians, which he attributed largely to the "great changes in temperature" during the year. He listed several diseases as prevalent in the region, including "ephemeral and intermittent fevers," "digestive disturbances," "putrid fever," "petechial fever," "bilious fevers," and dysentery, neuritis, rheumatic "affections," scabies, opthalmias, pox, and epilepsy. Rollin laid special emphasis on the "high fevers" and "bilious fevers," which he noted were widely feared and frequently fatal.[6]

Among the Spanish, the only professional physician in Alta California was the surgeon general stationed at the provincial capital of Monterey, a position that was evidently difficult to fill. Of the eight men who occupied this position between 1769 and 1824, few left significant records. However, in 1804, at the behest of his superiors, who were concerned by the exceedingly high mortality among mission Indians, Dr. José Benites wrote a lengthy report summarizing the medical condition of the province. He reported that syphilis, scrofula, and tuberculosis were common illnesses. He also made reference to the region's unfavorable climate: the humidity, heavy fogs, and great cold, all of which he believed were contributing to the prevalence of disease. Authorities in Mexico City had little interest in supporting Benites's principal request—that they establish a hospital at Monterey. Instead the Royal Medical Board noted somewhat fatalistically that disease in Alta California was unavoidable because of "the extreme cold, the lack of shelter, the bad water, lack of vegetables, and badly prepared meats," as well as the "voluntary indiscretions" of the inhabitants. Impressions recorded at about the same time by George Heinrich von Langsdorff, a surgeon accompanying a Russian expedition to California, were more favorable. While Langsdorff found the west coast of Mexico unhealthy in the extreme, he reported that the climate of Alta California was "better and more salubrious." But he was hardly enthusiastic on that point, noting that the local Indians were often afflicted with fevers, measles, venereal diseases, and a mysterious palpitation of the heart.[7]

As these sources indicate, disease was a constant presence in the region by the early 1800s, if not before. Several epidemics swept through California in these decades, including at least three severe outbreaks of smallpox.[8] Yet, by all accounts, a different and especially devastating illness appeared in the California interior in the 1830s. Indian tribes throughout central California were catastrophically affected, as were the few white settlers and travelers in the region. John Work, an Irish immigrant who had settled in Canada and the leader of a Hudson's Bay trap-

ping expedition to central California, was one of those who fell ill in the summer of 1833; Work's journal offers a firsthand account of the disease among both local Indians and members of his party.

> WEDNESDAY 31 [JULY 1833]
>
> Several of our people have been for some days unwell and some symptoms of the fever breaking out among them.—Indeed for a length of time back, the weather has been very unfavorable for health. The heat, except for a few days back excessive during the day and a heavy chilly dew in the night, so that our blankets would be completely wet in the morning as we slept in the open air. Besides we often had very bad water.
>
> TUESDAY 6 [AUGUST 1833]
>
> Some sickness prevails among the Indians on feather river. The villages which were so populous and swarming with inhabitants when we passed that way in Jany or Febry last seem now almost deserted & have a desolate appearance. The few wretched Indians who remain seem wretched they are lying apparently scarcely able to move. . . . We are unable to learn the malady or its cause.
>
> TUESDAY 20 [AUGUST 1833]
>
> Our sick people get no better, nine more have fallen ill within these two days, making in all 61 that are ill, a good many of them attacked with trembling fits. . . . Our condition is really deplorable, so many of the people taken ill and no medicines, fortunately not many of the men are yet ill, but is is to be apprehended they soon will fall and that we will soon become so weak that we will not be able to raise camp, and I am afraid to stop lest we die like the Indians the most of the people completely disheartened, and indeed well they may.—I endeavour to keep up their spirits as well as I can but it is become now of little effect.[9]

Four days later Work reported that seventy-two persons were ill out of a party of one hundred, and over the next two and a half months, several died. "Our whole party is now become exceedingly helpless," Work wrote on September 7. At the same time, the death toll among resident Indians was almost incomprehensibly high. Of the Indians in the northern Sacramento Valley, the Wintun, Work noted that "the villags *[sic]* seem almost wholly depopulated." Later accounts confirmed the magnitude of the epidemic. An American trapper, J. J. Warner, recalled of the once densely populated region that every native village along the rivers had been abandoned and his party saw "but one living Indian." A member of the Yokuts tribe told the ethnographer Stephen Powers in 1872

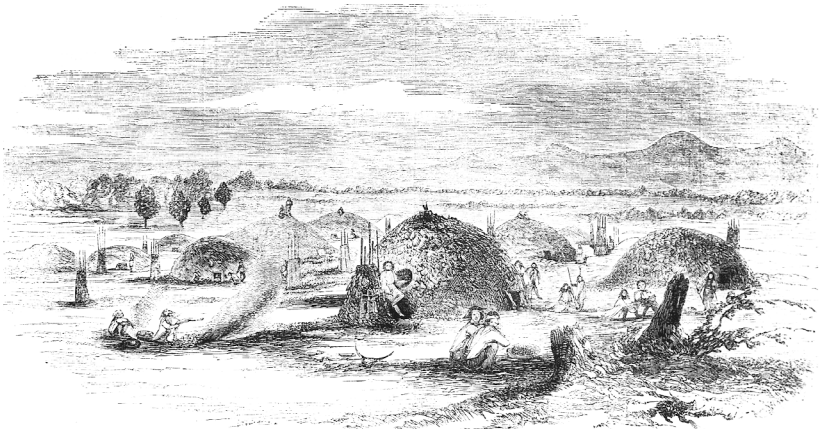

Figure 1. A rancheria near Yuba City, in the area where the 1833 malaria epidemic devastated Native American populations. From *Gleason's Pictorial* 13 (27 March 1852): 96. Courtesy California Historical Society, FN-4341.

that a plague had raged throughout the San Joaquin Valley several years earlier, destroying "thousands of lives." On October 31, 1833, Work finally made it back to Fort Vancouver. As he described his condition some years later, "I was so much exhausted by this debilitating disease that I was reduced to a perfect skeleton and could scarcely walk."[10]

Modern scholars interpret this event as an epidemic outbreak of malaria and typically trace the origins of the disease in central California to Work's own party, though malaria may have appeared in conjunction with influenza, which could explain the dramatically high death rates. While malaria is not generally believed to have been endemic to California before the nineteenth century, at least four species of anopheles mosquitoes were. Once what we now understand as the plasmodium parasite was introduced into California, it could spread through those regions that supported large numbers of anopheles. Moreover, the temperate climate and long, hot summers of California were conducive to an epidemic outbreak, as they fostered multiple cycles of mosquito reproduction. The disease, or diseases, that reached California in 1832 were the southern extension of an epidemic, most likely of vivax malaria, that had begun on the lower Columbia River in 1830, at Fort Vancouver. The epidemic had a devastating impact on the Chinook and Kalapuyan peoples in the Pacific Northwest, prompting one contemporary scholar to label it "the single most important epidemiological event" in the

recorded history of the region. By the time Work's party left Vancouver, malaria had apparently infected most of the white population in the Northwest, and, in fact, Work reported that several of his party became sick with "intermittent fever" en route to California. Disease then traveled south from the Columbia in the bodies of the trappers and their families. Its overall effect on the Indians of California was as terrible as it had been on the Indians of the Northwest. In 1955 Cook estimated Native American mortality in California at 20,000; however, he later revised that number upward to 50,000, or what he estimated to be one-half the entire Native American population in central California. Though the numbers cannot be determined with any accuracy, it is clear from contemporary accounts that the epidemic radically disorganized California Indian societies, leaving Indian peoples ill prepared to resist or adapt to the dramatic invasion of their territory that came a decade and a half later with the discovery of gold.[11]

But the impact of the epidemic on Indians should not obscure the fact that whites themselves were highly vulnerable to malaria and often incapacitated by it—as the fate of Work's expedition attests—though they were typically less likely to die.[12] Malaria, which remains a significant global problem, was the preeminent disease of the nineteenth-century frontier. Fear of the intermittent and remittent fevers were shared by all western colonists, as well as by those who were long settled in the southern states. Even where death rates from malaria alone were not high, it often debilitated much of the population and complicated other, more fatal illnesses. The disease spread rapidly in mosquito-ridden areas such as central California and could easily infect an entire community.[13]

Such contemporary diagnoses were, of course, unavailable to either the Indians or John Work. Mosquitoes were an ongoing nuisance to Indians and whites in California, but no one had reason to think them a source of illness. Indians generally interpreted disease as a foreign or hostile object that had entered the body, the result of an offended or malignant spirit. To cure the ill, these disease objects or "pains" had to be extracted from the body. For most Indian groups in California, the preferred cure was a bloodletting ceremony performed by a shaman, often in combination with specific medicines.[14] Work, on the other hand, drew on Euro-American frameworks of disease. He believed his party suffered from two diseases—a mysterious fever that caused violent headaches and intense pain in the bones and the more familiar "ague," or intermittent fever. European cures for fever and ague were similar to those of many Indian tribes and included both bloodletting and quinine.

Yet having neither medicine nor a doctor in his party, Work sought a change of climate and location. He urged his exhausted and discouraged companions to continue, believing that once they reached the mountains they "would experience a difference of climate which would most likely effect a change for the better."[15]

Work was clearly desperate to save himself and his party, and in seeking a "difference of climate," his response was consistent with the medical advice of his day. In the nineteenth-century world, bodies were understood differently than they would be in the next century. Professional and popular beliefs about health derived from humoralism—a system of medicine that held health was the outcome of balance among the essential bodily fluids, or "humors." Though the idea of humoralism may seem bizarre to most contemporary Americans, in slightly different forms humoralism was the basis for Western medicine from the time of ancient Greece until nearly the end of the nineteenth century. In contrast, the history of "modern" Western medicine and the corresponding "modern" body is far more brief. These ideas would come only with the bacteriological discoveries of the late nineteenth century and their institutionalization in the twentieth.[16]

Before the late nineteenth century, a healthy body was a body in equilibrium, and disease signified that balance needed to be restored. Composed of flows and fluxes—of blood, mucus, saliva, feces, perspiration—the body could easily be either over- or understimulated. The result was imbalance, and the likely outcome was illness. An improper diet, poor habits, a shock to the system, mental anguish—any of these might push a body out of kilter. But especially important were changes in the external environment. Changes in temperature, winds, humidity, or simply an unfavorable landscape could alter the body's normal functioning and leave it prone to a variety of ailments. Work connected the onset of disease among his party with weather that was "very unfavorable for health." Similarly, an army surgeon reporting on the health of the U.S. troops stationed in the California desert in the 1850s wrote that the "unusual mortality" witnessed at his post was "attributable to but one cause, viz.: their transfer from a comparatively cold climate to one so much warmer and more debilitating."[17]

For nineteenth-century Americans, the body itself was not a clearly bounded entity, separate and distinct from its surroundings; rather, it was porous and permeable. The skin did not close off an individual, separating him or her from the larger world. The body flowed into the environment, and the environment seeped into an individual body—through

the air one breathed, the food one ate, the water one drank. These interactions were not only unavoidable; they were critical to health as well as illness. External surroundings could shape the body in both subtle and profound ways. A given environment inevitably left its mark in a body's shape, color, and strength, while radical changes in a person's environment could effect wondrous cures or induce sudden illness. The prevailing winds, the onset of floods, a local earthquake, a distant volcanic eruption—these might all be factors affecting an individual's condition. Local surroundings might be managed for better health, but they could never be kept at bay—nor would one want to do so. Health was not the product of successfully closing a body off from external influences but of intelligently managing the relationship between an individual and his or her surroundings.[18]

This ongoing concern with the environment does not mean that nineteenth-century individuals were oblivious to the process of contagion. Quite the contrary. By the end of the eighteenth century, Spanish measures to prevent the spread of smallpox included isolation, quarantine, and inoculation—which may well have stemmed the spread of several epidemics known to have ravaged Mexico and the Southwest.[19] Moreover, throughout most of the nineteenth century, a heated and sometimes vitriolic debate raged between those physicians who advocated "contagionism" and those who held to the doctrine of "anticontagionism." And though it is easy to interpret this debate through the lens of later scientific developments—and thus to read the "contagionist" position as a forerunner of germ theory—such a reading erases an earlier context. The very ideas of contagion and infection held different meanings than they would in the following century, and they were not necessarily incompatible. Part of what makes eighteenth- and nineteenth-century sources so opaque to a modern reader is that the categories that are so meaningful to us—contagious versus noncontagious, infectious versus chronic—were neither crucial nor discrete distinctions in earlier eras. Even when these words were employed, their meanings differed from contemporary usage. Although the most extreme anticontagionists, such as the well-known Philadelphia physician Benjamin Rush, suggested that there were but two opposed ways of understanding any given disease, most medical men embraced a more complex position. For instance, a Spanish directive on smallpox issued to the governor of California in 1786 emphasized the need for quarantine. But while acknowledging that most professional men believed the disease was transmitted by "contact with the victims or the houses in which they are

treated," the writer nonetheless insisted that victims should be quarantined "in a healthy location [that] shall be situated so that the prevailing winds in the region cannot communicate the contagion to the villages and farms of the vicinity."[20]

A report on disease in California published in the 1860s reveals the slipperiness of medical categories. The writer divided epidemic disease into three classes: "contagious" (which included smallpox, scarlet fever, and measles), "meteoratious" (diseases that were contagious to a limited degree), and "infectious" (diseases "assumed to possess the property of propagating . . . by means of a vitiated or poisoned atmosphere emanating from and surrounding the diseased person, without contact of the body or clothing"). Moreover, he elaborated the difference between contagious and meteoratious epidemics in the following way: "The great majority of cases [of contagious disease] spring immediately from specific poisons, generated in primary or atmospheric cases, and communicable from one individual to another. Whereas in meteoratious epidemics, excepting in one or two of them, every case is of atmospheric *origin;* and, in the exceptionable instances, as in the cholera (and to which may be added diphtheria), which is believed to possess the contagious attribute, the great *majority* of cases manifestly arise, not from the diffusion of its contagious virus, but from the existing meteoratious influence." Implicit in this description was an acknowledgment that the distinctions between these categories were anything but firm. Certain diseases, notably smallpox and syphilis, were widely held to be transmitted from person to person. Even so, contagious diseases might have an atmospheric origin, while meteoratious epidemics might have contagious "attributes." Contagious disease shaded into environmental disease and vice versa.[21]

Despite the recognition of contagion, the local environment was always regarded as critical to health or illness. In the words of the historian Charles Rosenberg, "Disease entities played a relatively small role in a scheme that emphasized the body's unending transactions with its environment."[22] On the other end of the spectrum from smallpox were various fevers, nearly all of which were understood to originate from local places and were thus labeled "endemic." Yet epidemics were also understood to have local causes, for that offered the most logical explanation for why so many people in one place became ill at the same time. Still other diseases such as diphtheria and yellow fever were believed to emanate from environmental causes but were liable to become contagious, depending on the circumstances. And most physicians concurred that even "contagious" diseases, such as smallpox and plague, had

important "climatological relations." When smallpox broke out in California in 1868, leading California physicians readily acknowledged its contagious character and argued for vaccination, but nonetheless they believed that both local and global climatic conditions were relevant to the course of the epidemic. As Thomas Logan put it, "There is some peculiar, but as yet inscrutable condition of the climate which favors its development." Another California physician, Frederick Hatch, offered the hypothesis that climatic conditions, "having brought about such modifications in the constitutions of our people as to renew a susceptibility to the agent," might explain the failure of vaccination to protect against smallpox that year.[23] These and other writings reveal understandings of causality that are multiple; environmental explanations easily overlap with theories of contagion. Disease always had many potential sources, both human and nonhuman.

## MAPPING THE DISEASE ENVIRONMENT: MEDICAL GEOGRAPHY

Nineteenth-century writings about disease offer a window into earlier conceptions of the body. Perhaps less obviously, these same writings speak to earlier conceptions of the environment. Different conceptions of illness point to differences in how people have understood the nonhuman world. When viewed from the perspective of health, the nineteenth-century environment was neither passive nor necessarily benign in its natural state. To the contrary, the "natural" environment, especially those environments least touched by the processes of civilization, acted on settlers' bodies in sometimes aggressive and unpredictable ways. Consequently, untested landscapes were always physically threatening. This fear of distant and unfamiliar places generated reams of popular advice for would-be settlers and travelers. At the same time, existing medical and scientific practices brought the environmental sources of disease into focus.

Interest in the medical effects of certain environments has a very long history, dating at least to the Greek physician Hippocrates and his treatise *Airs, Waters, and Places,* written in the fifth century B.C. Theories of environmental causation gained particular prominence in seventeenth- and eighteenth-century Europe. In that period several European intellectuals drew on Hippocratic ideas to articulate a discourse that denigrated warm places and their inhabitants. Among the most influential was Montesquieu, who, in *The Spirit of Laws* (1747), famously argued that hot climates produced sloth, excessive sexuality, and despotic forms of

government. This view would be widely held in Europe for at least the next century. Only in the 1900s, however, would the professions of medicine and geography scientize these beliefs. For both Europeans and Americans, the project of colonial expansion fostered the new disciplines of medical geography—which studied the large-scale distribution of diseases across continents—and medical topography—which cataloged the physical factors that affected health in certain localities.[24]

What motivated these inquiries was the desire to explore and colonize new environments. Medical geography implicitly and often explicitly served the needs of European colonialism. Many of the earliest medical topographies emerged from various militaries out of the concern for troop mortality in distant regions, and, not surprisingly, it was British physicians who did the most to systematize the geographic approach to disease. The British colonial project had generated an obsessive interest in the "tropics" as a zone of overabundant nature that was inherently inhospitable to European "civilization," and these emerging ideas about "tropical" environments owed much to European fears of disease. The canonical English texts on environmental medicine in the nineteenth century were James Lind's *Diseases Incidental to Europeans in Hot Climates,* published in 1768, and James Johnson's *The Influence of Tropical Climates on European Constitutions.* Johnson's volume chronicled the diseases experienced by Europeans in so-called tropical lands: India, Asia, Batavia, southern Europe, western Africa, and the West Indies. First published in 1812, the book had reached its sixth edition by 1841, a testament to its influence. It would remain the principal reference on the subject for two more decades as it was expanded and edited by another British colonial physician, James Ranald Martin.[25]

Though their work on climate and disease was separated by more than seventy years, Lind and Martin occupied a similar intellectual milieu. For both authors, health was the result of humoral balance in the body, and warm climates were likely to overstimulate the temperate European constitution. Excessive heat, especially temperatures that exceeded that of the body, predisposed an individual to all kinds of diseases. Prevailing medical opinion held that the greatest effect was felt on the liver, which produced irregular secretions until, exhausted, it ceased to function adequately. The texts themselves were both diagnostic and prescriptive, offering not only a chronicle of disease and its symptoms but also suggestions on how Europeans might lessen the impacts of hot climates on their selves (through rigid temperance and prophylactic measures). The message was that European bodies were highly sensitive

to relocation and required careful observation and intensive self-management in unfamiliar and inherently hostile places. In the case of serious illness, however, the best and often the only hope lay in returning to a more temperate climate. As Johnson wrote, a change of locality was frequently "tantamount to a transition from almost hopeless disease to rapid recovery."[26]

German and French physicians also contributed to the development of a global geography of disease. Especially important to the continental versions of medical geography was the work of Alexander von Humboldt, who is considered the founder of scientific geography. Humboldt sought to understand the natural world by collecting quantitative information about various landscapes and then seeking mathematical correlations among the variables he had measured. His most significant contribution to physical geography was the isothermal map—a cartographic representation that linked regions by their average temperatures. Humboldt noted that these lines of average temperature, along with altitude, set limits on the occurrence of certain plants, and he produced numerous maps of the world that charted distributions of flora. He also suggested that, like plants, certain diseases were produced under specific conditions of temperature, humidity, and altitude. It was this observation that medical geographers, Germans in particular, took as their starting point. They sought to map the spatial distribution of disease in the same way that Humboldt had mapped the distribution of plants. Like their mentor, medical geographers looked for correlations between the occurrence of disease and measured characteristics of the landscape. Practitioners held out the hope that with the collection of enough data—temperature, barometric pressure, rainfall, and so on—they would be able to predict the response of human bodies to diverse environmental conditions.[27]

At root, the primary concern of nineteenth-century medical geography lay in preserving the health of the white race in unfamiliar lands. Behind the desire to uncover the relationship between bodies and landscape lay the belief that the success of Europeans had always hinged, to some undetermined extent, on climate and, moreover, that climate might ultimately set limits on their continuing colonial ambitions. Nineteenth-century Europeans and Americans understood race in multiple and contradictory ways—as variously a sign of biology, nationality, and culture. A concept anchored in incoherence, race necessarily eluded precise definition. Yet it was quite clear to contemporaries that race was associated in some way with place. Whites came from Europe,

blacks from Africa. The yellow race originated in Asia, the red in America. Race always had a geographic component, and thus it is hardly surprising that ideas of race played a central role in nineteenth-century medical geography. After all, the question that most interested European medical geographers was whether those of northern European descent (i.e., whites) could survive and prosper in climates that they associated with "other" races. While there was general agreement that strange environments had negative effects on European bodies, contemporaries debated the extent to which those same bodies might adapt and acclimatize to their new surroundings.[28]

Proponents of acclimatization believed that human bodies could, over time, adjust to new surroundings. As Europeans had succeeded in introducing plants and animals to unfamiliar regions, they argued, the same would be true for transplanted peoples. But theories of human acclimatization had many opponents. For most who argued against acclimatization, the central issue was racial malleability. If European bodies could in fact physically change to survive in a new climate, would they still be European? More to the point, would they still be white? As James Johnson put the question in his medical treatise of 1820, "Will it be said, that the fair complexion of Europeans, may, in two or three generations, acquire the sable tinct of the inter-tropical natives, by exchanging situations?"[29] By answering with an unequivocal "no," Johnson adhered to a belief in racial stability; whites would remain white no matter where they resided. But Johnson's was hardly the last word on the issue. The question would continue to preoccupy European and American intellectuals for the rest of the century.

The concern with whiteness and its potential malleability was paramount in European settler societies. The "frontier," whether in Africa or North America, was never a zone that separated empty from populated lands; it was, however, a zone that separated lands dominated by those identified as "white" from those whom they deemed nonwhite. By definition, frontiers posed challenges to racial identities; their miscegenated populations only underscored the problem. In a period in which place helped to produce ideas of race and bodies were perceived as porous and5permeable, migration always threatened racial identity as well as health.[30]

Even the suitability of North America for European immigrants had been an issue of long-standing debate. In the seventeenth century, British settlement in America was accompanied by considerable fears over health, especially in the southern colonies but also, to a lesser extent, in

New England.[31] In the late eighteenth century European and American elites intensely debated theories of climate and civilization. Among the most influential authors on this point was Georges-Louis Leclerc, Comte de Buffon, who argued that the cold, humid climate of North America could not support plants and animals of the same size and quality as those in Europe. Pointing to the absence of large native mammals—such as the giraffe, the hippopotamus, and the lion—and to the degeneration of European livestock in the new world, Buffon argued that North America produced neither the same quality of person nor the high level of civilization that existed in Europe. The evidence for this lay in Buffon's description of the physical inferiority of Native Americans—their lesser strength, their low fertility, their "lack of ardour." Though transplanted Europeans might survive in North America, they would not flourish. So influential was this thinking among elites that Thomas Jefferson felt compelled to mount a detailed defense of the North American climate and its plant and animal species in his only book, *Notes on the State of Virginia*. For Jefferson, establishing the existence of the mammoth—a beast larger than any found in Europe—and defending both American livestock and the sexual prowess of Native Americans were crucial to predicting a healthy and fertile white population in America. His vision of a republican civilization ultimately depended on the natural environment's ability to support properly European bodies.[32] Like the mammoth, the native body was a "production" of nature and a testament to the New World's inherent virility.

Discussions of the North American climate's effect on both health and fertility would continue. However, by the nineteenth century whites had proven themselves capable of prospering in both New England and the South. Colonists' bodily fears had gradually been replaced by a sense of their physical fitness for the eastern regions of North America.[33] But at midcentury, as Americans embarked on the effort to colonize the western half of the continent, western climates remained something of a wild card for white settlers. The regions west of the Mississippi were unfamiliar and relatively untested. Much of the landscape of the West was treeless and arid, in contrast to the humid and well-forested lands of the East. The initial American settlement experience in the Mississippi Valley had not been encouraging for whites, who had sickened and died in large numbers. "It is to be suspected," wrote the English physician John McCulloch in 1829, "that no changes and no cultivation will ever bring it into a state of salubrity." Moreover, these regions were still filled with nonwhite populations. The different climate and environment in the

West were subjects of constant commentary, although contemporaries acknowledged their lack of information. "The arid climates of the interior and the cool Pacific coast have been occupied so recently, and so little observed, that is difficult to trace the climatological geography of disease there," wrote J. W. Blodgett in a massive work on the American climate.[34] While most American elites espoused confidence that white Americans would eventually populate western North America, the region's suitability for white bodies and Euro-American civilization was a subject of ongoing debate. Like their European counterparts, Americans feared that the environmental characteristics of new lands might frustrate their desire for expansion.

Consequently, knowledge of the relationship between climate and disease became as important as geologic or agricultural assessments to furthering the colonization of western North America, and the period saw several important American contributions to medical geography. In 1842 the army surgeon Samuel Forry used data collected by the military to compose the first complete medical geography of the United States. Forry emphasized the need to move from anecdotal accounts of climate and disease to the quantification of climatic features, and his work was widely lauded as an original and important contribution to medical science.[35] Like most American physicians, Forry drew heavily on Humboldt, whose mapping of isothermal lines had disrupted an older reliance on latitude alone as the principal factor determining climate. When latitude was considered in isolation, the more southerly location of North America relative to northern Europe was cause for concern. Humboldt's isothermal maps, on the other hand, helped to draw attention away from differences between the old and new worlds over which Jefferson and Buffon had argued. He reassuringly linked North America with Europe by redefining the United States as an unambiguously "temperate" region.

The publication of Daniel Drake's massive work, *A Systematic Treatise on the . . . Principal Diseases of the Interior of the Valley of North America as They Appear in the Caucasian, African, Indian, and Esquimaux Varieties of Its Population* (1850–54), drew international attention to the medical geography of North America. In many ways, Drake was an unlikely person to make such a contribution. He was raised on the Kentucky frontier at the turn of the century, far from the centers of medical knowledge. His medical training consisted of an apprenticeship with the most prominent of Cincinnati's four physicians. After establishing his own practice, Drake published a pamphlet describing the climate,

topography, and diseases of his town. The work was well received, and that publishing success inspired him to undertake an exceedingly ambitious effort to chronicle the diseases of the entire West. Drake embraced as his region of study the area between the Allegheny Mountains in the east and the Rockies in the west and running from the Gulf of Mexico to the Polar Sea. He was explicitly Humboldtian in his approach, emphasizing the primary importance of latitude and altitude to disease and the local character of both symptoms and cures and insisting that the watershed was the proper unit of medical analysis. All told, Drake spent more than ten years collecting firsthand information and traveled more than thirty thousand miles. When published, his book ran to more than 1,800 pages. It immediately became a seminal publication in American medicine and inspired much more work along the same lines. That growing interest in medical geography also helped drive an interest in meteorology among American intellectuals, doctors in particular. In 1848 the newly formed Smithsonian Institution enlisted physicians across the country to assist in the systematic collection of national weather data. Lorin Blodget, a former employee of the Smithsonian, would publish much of that work in his 500-page *Climatology of the United States* (1857), which American physicians embraced as a critical reference.[36]

Nineteenth-century medical geography was an elite, scientific, and transnational discourse, but it emerged at a time when even scientific knowledge was acknowledged to be profoundly local. The goal of medical geographers was not to erase local particularity but to quantify and systematize it. Thus the most valuable work in the field could, and often did, emerge from the periphery—as in the case of Drake's *Systematic Treatise*. It was on the periphery where new and unusual relationships might be uncovered and where existing theories could be tested against new circumstances. Medical geography was a science, but it was a science of local experience.

## EVALUATING THE ENVIRONMENT OF CALIFORNIA

As Americans set their sights on colonizing the Pacific Coast, discussions of the far western environment and its effects on health appeared in a variety of places: newspaper articles, medical periodicals, emigrant guides, almanacs, personal letters, and government reports. The region of California generated no shortage of medicoenvironmental commentary, and among the most prolific writers were those who most enthusiastically and uncritically advocated settlement: western boosters.

Booster literature on California proliferated along with the push for American expansion in the 1840s. Despite the profusion of writers, the tracts themselves have a formulaic quality. Boosters routinely discussed those details that had some bearing on settlers' economic prospects: land availability, soil fertility, the length of the growing season, the size and character of towns, and the availability of transportation. These same writers also almost invariably addressed the region's effect on health.[37] And despite the devastating experience of illness in the 1830s, California boosters made much of the region's "salubrity" in the following decade. Perhaps this is not surprising. Like modern tabloids, booster literature is notoriously unreliable. History and environments alike can too easily be rewritten to further social and political goals, and booster accounts of California were motivated at least as much by desires for American colonization as by empirical observation. Those inspired to write about the region in the 1840s typically sought white settlement in the Far West, America's "manifest destiny," regardless of any potential costs in human suffering. And though what they wrote was not necessarily or even likely to be true, they tell us something about prevailing cultural vocabularies: what boosters wrote about presumably held some meaning for their intended readers. Thus while the repeated, almost obligatory, insistence on the region's healthfulness might say little about the actual prevalence of disease, it suggests that perceptions of health were important, even critical, to understanding a foreign place. Nineteenth-century boosters did not invent the connection between climate and health; they did, however, wield that connection freely, often with considerable flair.

Richard Henry Dana, one of the most widely read popularizers of California in the 1840s, claimed that the region was "blessed with a climate, than which there can be no better in the world; free from all manner of disease, whether epidemic or endemic." John Marsh, who settled in California in the 1830s and offered his services as a physician (although he, like many other physicians in this period, had no formal medical training), wrote, "It is much the most healthy country I have ever seen, or have any knowledge of. There is no disease whatever than can be attributed to the influence of the climate." Yet Marsh himself maintained a thriving medical practice, treating both Indians and whites for fever and ague and other diseases. The author of a popular emigrant guide published in the mid-1840s made a point of denying that the virulent "fevers" known to have killed thousands of Indians in the previous decade were attributable to any "local" causes but instead blamed the mortality on the habits of the Indians themselves. He went on to claim

that "there is no country in the known world, possessing so fertile a climate, of such mildness and uniform salubrity."[38] Victor Jean Fourgeaud, a physician with connections to the expansionist politicians Thomas Hart Benton and William Gilpin, went considerably further in his account of the region's effect on health. In a piece intended for eastern audiences and potential immigrants, Fourgeaud asserted that "the general salubrity of California has justly become a proverb. The surgeons of California have remarked that wounds heal here with astonishing rapidity, owing, it is supposed, in a great measure, to the extreme purity of the atmosphere." For those who sought American colonization of California, it was critical to establish the region's healthfulness, and among this set Fourgeaud's claim for the wound-healing properties of the atmosphere would be frequently repeated.[39]

What boosterism alone could not accomplish the discovery of gold did. In 1849 a massive migration to California began that decisively shifted the region's racial and ethnic demographics. Perhaps as many as 90,000 immigrants arrived in California in a single year, and between 1848 and 1860 the population rose by almost 300,000.[40] With so many people suddenly in the region under such extraordinary circumstances, accounts of the local environment proliferated. Those who traveled to California during the gold rush were not of one mind regarding the region's healthfulness, however. Individuals evaluated the environment's effects through both their personal experience and their hopes. Some, such as the physician John Baker who came to California from New Hampshire in 1853, managed to stay relatively healthy and attributed their vigor and success in part to the positive effects of the local climate. But many more wrote of illness and disease. Sickness seemingly surrounded and enveloped miners and travelers in the early 1850s. The journalist Bayard Taylor visited the interior of California in 1849 and claimed that "three-fourths of the people who settle in Sacramento City are visited by agues, diarrhoeas, and other reducing complaints." The experience of most miners confirmed this claim. As the miner George Kent confided to his journal, "Almost all of us had severe attacks of the diarrhoea or dysentery either before or after our arrival at this place." "Never had I been so ill before," wrote Thomas Kerr after he came down with "the ague" at Sacramento. Still another miner, John Gunnell, wrote, "[I] had not been in good health since I bin in Calaforn" and on that account advised others not to make the journey. "Gold was not a sufficient recompense," another physician and failed miner wrote, "for disease and broken constitution."[41]

From the early 1850s on, the incongruence of booster accounts and bodily experience was a common theme in California writings. "I am satisfied," wrote George Kent, "that the ideas we had formed of California before leaving home were very incorrect, and people who come out here must form their opinions of this new state independent of any home notions derived from Fremont, newspaper accounts &c." The writer Alonzo Delano repeatedly maligned the popular account of Edwin Bryant, in particular his claims about the salubrity of the climate and the purity of the atmosphere. Delano wrote, in contrast, "I never saw so much suffering and misery from disease in all my life as I have seen during a five months' residence in California." Immigrant doctors were particularly apt to attack the booster literature of the period for its inaccuracies. Jacob Stillman, a physician from New York, joined the rush to California in 1849 and subsequently wrote, "I was deceived in some respects; the healthfulness and beauty of the country was exaggerated by the early explorers." Dr. Thomas Muldrup Logan, a native of Charleston who arrived in San Francisco in 1850, wrote after four months in the state, "As to the health and climate of California, I now speak from experience when I affirm that we have all been grossly deceived. . . . [Since my arrival] I have not passed one perfectly well or pleasant day." In fact, Logan concluded a particularly gruesome depiction of the ravages of cholera in California with the ironic comment, "[This was] a land where I had been led to expect an Italian clime—an Archipelagian salubrity, and El Dorado harvest!"[42] The early reports of the California State Board of Health, first published in 1871, similarly undercut any consensus on the region's healthfulness; instead the authors went to considerable length to catalog the diseases associated with every region of California and condemned as injudicious the "extravagant" portrayals of the state's healthfulness promulgated by "non-professional travelers." As one leading California physician wrote, "The most erroneous statements have been circulated, either by travelers or by interested residents. It is our imperative duty as medical men to correct such error and to disseminate the truth."[43]

Such cautious and often negative assessments seemed to be borne out by the arrival of cholera in northern California in 1850, smallpox in 1852, and the rapid spread of dysentery and various "malarial fevers" in the ensuing decade—not to mention the high rates of insanity reported among recent immigrants to the state. Disease spread rapidly in the havoc of colonial invasion, though it is difficult if not impossible to assess the material prevalence of disease in contemporary scientific terms. The

only available statistics on death and disease from the period are fragmentary and unreliable by contemporary standards. Moreover, nineteenth-century categories of disease do not correspond neatly to contemporary ones. The most systematic accounts of disease from the period appear in army reports on the health of troops stationed in California; yet even these reveal more about the cultural gulf that separates the nineteenth from the twenty-first century than about disease as we might now understand it. What are we to make of the category "fevers," one of the most common causes of death in early California? The reports do contain death rates for the army, and by themselves these do not suggest that troop mortality was especially high in California—at least as compared with the southern United States or the tropical regions of the world. Yet disease in California was acknowledged to be highly localized. In some regions, rates of illness and death rivaled the most disease-ridden sections of the South. Army surgeons noted that the prevalence of illness, if not death, at certain posts was disturbingly high by any contemporary standard. Camp Far West, located in the Sacramento Valley, was abandoned in 1849 on account of its unhealthfulness, and a second fort, established some distance farther north, was similarly abandoned in 1856.[44] The city of Sacramento, a center of gold rush activity, was known to be especially sickly. Death rates calculated for the city in the 1850s are considerably worse than those for the state as a whole: 39 per 1,000 persons in 1851; 74 per 1,000 in 1852, when cholera was at its height; and 27 per 1,000 in 1855.[45]

Yet physicians routinely commented that death rates alone failed to tell the story of illness adequately. Many diseases were prevalent in early California, and the incidence of disease seemed to be increasing in some regions. Cholera appeared again in 1860, and smallpox struck the state three times in the first two decades of American occupation. Of equal or even greater concern were the various fevers. "Malarious" diseases reached epidemic proportions in central California in 1858, and some physicians regrettably acknowledged that this class of diseases was endemic to their new home. Fifteen years later, the State Board of Health noted with resignation that "throughout the whole of the State there must continue to be more or less of malaria for centuries to come, if not for all time." Aside from malaria, California physicians recorded the presence of scarlet fever, measles, diphtheria, influenza, typhoid, phthisis (consumption), and various forms of dysentery and intestinal disease. Insanity also elicited deep concern. California had a much higher proportion of supposedly insane individuals than other regions of the coun-

try, as high as one in every 490 persons. Insanity had been a local concern since the gold rush, but in the 1870s the State Board of Health noted somewhat anxiously that it might become an epidemic. Explanations focused on the "pace" of life in California, the heterogeneous social climate, and even "nostalgia," but most acknowledged that the local climate was at least partly responsible.[46]

Observers of California often pointed to bad habits and poor social conditions that were exacerbating disease, especially among the miners. Whereas the environment was a critical factor, the characteristics of an individual body were certainly relevant. Even in an unhealthy climate, not everyone succumbed to illness. Disease and death were the result of the "combined influence of the meteorological and physiological conditions modified by temperament."[47] Dr. J. P. Leonard of Rhode Island, who arrived in California in 1849, immediately wrote to the *Boston Medical and Surgical Journal,* noting the region's general healthfulness and downplaying the existing diseases. However, just four months later he was unable to maintain the same sanguine assessment. Writing to the same publication, he now acknowledged a "vast amount of sickness in San Francisco during the past summer," much of it fatal. He listed dysentery, diarrhea, pulmonary disorders, and fevers as the most prevalent diseases. Yet Leonard was reluctant to change his overall assessment of the California environment; instead he, like many others, called attention to the "intemperance, dissipation, disappointment, privations, exposure &c." that complicated recovery.[48]

How one understood disease causation had potentially enormous implications for the future of the region. Americans such as Leonard worried that the environmental characteristics of new lands might frustrate their desire for expansion, and mass outbreaks of disease were particularly disillusioning. While the British in India could resort to rotating new recruits into unhealthy districts, the American project of settlement depended on the ability of settlers' bodies to remain healthy, and reproduce themselves, in their new locations.[49] Only relatively healthy lands could be colonized through settlement in the long run. Thus to the extent that disease was the result of human action (intemperance, poor diet), the health of the community could be restored; accordingly, the prospects for settlement remained good. But to the extent that disease was the outcome of local environmental factors, it was largely outside human control; settlement, in turn, was threatened. By insisting on the role of "intemperance, dissipation, disappointment, privations, exposure &c.," Dr. Leonard and many others asserted some-

what hopefully the ability of immigrants to manage their own well-being in California.

The health concerns of nineteenth-century colonizers were inextricably connected to their obsession with race, and American immigrants to California were no exception. Although white immigrants spoke of health in general terms, the question that actually interested them was whether the region would foster the health of Euro-Americans, specifically those of northern European descent, the "Anglo-Saxon race."[50] The answer varied, but the intensity of the discussion indicates that both doctors and laypeople remained concerned about white racial health in the Far West. White settlers saw themselves as *more* vulnerable to certain diseases because of their race. Conversely, they believed that nonwhites, with the important exception of Native Americans, were less susceptible to the "tropical" diseases encountered in California, such as malarial fever. Writing of malaria, Thomas Logan paid particular attention to its differential effects among the races, noting "the insusceptibility of negroes and of those of mixed blood, born and bred in hot climates." He offered the tentative conclusion that "the susceptibility of the different races of mankind to malarial fevers appears to be in direct ratio to the whiteness of the skin." Others made frequent note of the seeming insusceptibility of Chinese immigrants: "The Chinese seem to be constituted something like the negro; they are not affected by the malaria as the Anglo-Saxons are."[51] Medicine and public health provided a scientific arena in which concepts of race and place were simultaneously constructed. And in an ethnically heterogeneous society such as post–gold rush California, vulnerability to specific diseases such as malaria could itself be a sign of whiteness. Illness could reaffirm one's race in the Far West, even while it raised questions about the suitability of the region for white settlement.

At the same moment, the growing crisis over slavery intensified both popular and medical interest in the debate over races and their proper places. Among Anglo-American intellectuals, racial categories hardened over the course of the 1840s and 1850s, and several leading British and American scientists argued the evidence for "polygenesis"—the belief that different human races had separate origins in different parts of the world and were thus biologically distinct. These ideas cast human migration—including American expansion—in threatening terms. In 1850 the Edinburgh anatomist Robert Knox published his treatise, *The Races of Men: A Philosophical Enquiry into the Influence of Race over the Destinies of Nations*. Knox, a former British army surgeon stationed at

the Cape of Africa, argued that migration from east to west was as dangerous as that from north to south; he held that Europeans in America and Australia had, in fact, degenerated. His outlook on the American future was equally dim: "A *real native* permanent American . . . race of pure Saxon blood, is a dream which can never be realized." The American physician and committed raciologist Josiah Nott concurred, writing that the races of the temperate zones had already "paid dearly for their migratory propensities." At the same moment, America's foremost scientist, Louis Agassiz, drew on Humboldt's geography to articulate his theory of zoological provinces and "natural racial zones." Agassiz argued that the various races of men could maintain and reproduce themselves only in distinct regions of the world.[52] In his view, human migration across these zones was doomed to failure.

For some, these debates over races and their proper places cast American westward migration in ambiguous if not completely negative terms. For Euro-Americans engaged in Western colonization, the concern with the health of white bodies took on particular urgency. In California, Euro-American perceptions of Mexican society only served to intensify the question of degeneration. In a passage quite typical of the period, Lansford Hastings, author of a popular emigrant guide, described the Mexican inhabitants of California as "scarcely a visible grade, in the scale of intelligence, above the barbarous tribes by whom they are surrounded." It was an open question whether the small population and what Hastings saw as the backwardness of Mexican California could be ascribed to the physical and moral inferiority of the inhabitants or whether the climate and landscape were in some way responsible. Common, as well as professional, knowledge held that the numbers and characteristics of the local people were important indicators of the quality of the land. As the Englishman James Martin had written in his medical treatise on the tropics, it was "an axiom of medical topography . . . that a slothful, squalid-looking population invariably characterizes an unhealthy country."[53] Euro-Americans were already convinced that the mild tropical climates of Latin America fostered degeneration and debility among their own kind, and accounts of American forty-niners frequently made anxious reference to the degenerate Europeans and Americans encountered in Panama and Mexico. As one prospective miner wrote of Chagres, the port of disembarkation in Panama, "Idleness and sloth meet you at every turn; you feel that you are in the midst of an inferior race of men, enervated by the climate, whom bountiful nature has made stolid and indolent." In contrast, harsh northern

European climates supposedly bred vigor. But what the relatively mild climate of California would yield was, in 1850, still unknown. Dr. John Baker expressed this mixture of hope and anxiety after he arrived in San Diego in 1853. "The people here were the first specimen of Yankeedom that we had seen since leaving New York," Baker declared, "or at least those who manifested in their appearance the healthy and active life which the Yankee is accustomed to do in our section of country. If we found a man from the States on the Isthmus [of Panama] (where there were many) they had the appearance of sickness and debility about them. But at San Diego they seemed to be healthy."[54]

Early white immigrants like Baker hoped that the environment of California would be more like Europe and eastern North America and less like South America, but that was merely a hope. In 1850, firsthand information about the region was still relatively scarce, and its vast distance from centers of civilization underscored its unknown character. Although the presence of gold made California irresistibly attractive, immigrants had almost no idea what to expect when they arrived. Moreover, in intellectual circles the rise of Humboldtian geography had cast California in an ambiguous light. Though North America existed securely within Humboldt's "temperate" zone, maps of average temperatures revealed local and regional anomalies. Much of California was anomalous in just this way; some localities stood out as exceedingly hot. In fact, at the time the nation's highest recorded temperatures came from Fort Miller in California's Central Valley. As Lorin Blodget noted in his *Climatology,* these summer temperatures "exceed those measures in [the] humid tropical climates," a fact that was not reassuring to prospective immigrants.[55]

California stood apart not only as a result of its summer temperatures but also because of its diverse society. Contemporary observers almost always commented on the state's racial and ethnic heterogeneity, and the need to attract more immigrants of "northern European stock" became a paramount concern of the state's American boosters. At the same time, however, Euro-Americans could not help but wonder whether there might be some underlying relationship between the social diversity that they feared and the regional climate. Many immigrant physicians viewed California as an experiment in racial health, and neither the social conditions nor the overall state of health in gold rush California initially inspired white confidence on this point. The editors of the *California Medical Gazette* noted in 1857 that recent immigrants to California were "peculiarly susceptible of disease," and the *Second Biennial Report* of

the State Board of Health acknowledged the popular sentiment that whites were degenerating in their new home and called for further scientific study.[56]

Among other things, concerns about degeneration prompted the close scrutiny of California's native inhabitants. Implicit in Jefferson's argument with Buffon had been the belief that Native Americans symbolized the quality of the land that whites now sought to colonize. Several decades later Euro-Americans still held Indian bodies as proxies for the natural environment. Whites understood Indian bodies as even more permeable than their own and thus as especially sensitive indicators of the region's healthfulness. As the doctor Frederick Hatch remarked in an early account of California, Indians were "by birth and hereditary impress . . . the peculiar subjects of the climatic influence and serve . . . to illustrate its features." Hatch, much like Thomas Jefferson before him, tried to read Indian bodies as healthy and resistant to disease. Similarly, John Griffin, an army surgeon in California during the war with Mexico, wrote that the Indians in southern California were "fine large, healthy looking fellows—and speak well for the salubrity of the climate." In the 1890s, when California health boosterism was at it height, Dr. Peter Remondino would extol the appearance, longevity, and endurance of the southern California Indians, comparing them to that paragon of physical and moral perfection, the ancient Greeks.[57]

Yet in the early decades of settlement, whites were also anxious to confirm their own biological superiority and their physical, as well as moral, fitness for the land they were appropriating. Indians presented something of a conundrum in this regard. It was necessary to understand Indians as both physically superior and physically inferior. The answer that many would settle on was to assert, as Dr. Logan put it, the remarkable "viability of the native Indian race . . . so long as he is not subject to the habits of civilized life." Native Californians were healthy and long-lived, but they were also ill adapted to progress and civilization. From this perspective, Native Americans were robust indicators of California's natural environment even while they were doomed to extinction.[58]

White women's bodies, like those of Indians, were understood as relatively more permeable than those of white men. Thus women were the most sensitive indicators of the environment's effect on white immigrants. Moreover, avoiding racial degeneration depended on the ability of female immigrants to produce able-bodied and unambiguously white children. Manifest destiny hinged not only on conquest and migration but also on reproduction. The success of colonial settlement hinged on

the ability of whites to outproduce indigenous peoples. Reproduction, in turn, depended on female health. Consequently, the diseases of women drew particular attention because of their potential effects on fertility and childbearing. Though opinions on women's health in California were mixed in the mid-nineteenth century, writers were more likely to declare their anxiety than to express optimism. In a description of California's diseases written in 1852, Dr. James Blake asserted that "there can be no doubt that the climate is conducive to fertility in the female." Yet in that same year the army surgeon at Monterey remarked that the "diseases peculiar to women" were more common than any other malady in that region. James Hittel, in an otherwise promotional account, admitted that women's diseases were common in the state, that fertility was low, and that women began to "wither" at the age of twenty-five. In the late 1850s the state's newly formed medical society splintered over a paper on women's health in California prepared by one of its members. Dr. Beverly Cole had written of the moral and physical degeneration of white women in the state, claiming that "in no place of civilization do the causes [of ill health among women] exist or prevail to the same extent as in California." Several members of the society walked out in protest, claiming that Cole, by his references to immorality, had disgraced California's white women and, not incidentally, had impugned the suitability of the California environment for white immigrants. In response to Cole's paper, a medical colleague argued that children born in the state to immigrant women were remarkably healthy and would constitute "a highly improved variety of the human species."[59]

Despite the harsh reaction to Cole's paper, the debate over women's health in California continued for the next three decades. In its first report the State Board of Health corroborated the popular perception that "females [were] more susceptible to all kinds of disease, especially in California," and a book titled *Female Health and Hygiene on the Pacific Coast,* published in 1876, began by referring to the "unusual prevalence of disorders affecting the reproductive organs among ladies on the Pacific Coast." Others, doctors and boosters alike, continued to argue to the contrary that the local climate fostered both female fertility and healthy children. Dr. Thomas Logan appealed to mortality statistics to demonstrate that the proportionate mortality of women in California was lower than that of men. Charles Nordhoff, in his popular booster tract written at the behest of the Southern Pacific Railroad in 1874, included the obligatory reference to the attractive forms of women and children: "The climate is most kindly to little children, which is perhaps one its best tests.

One cannot travel anywhere in California without noticing that the forms of the women who have lived some years here are more full and robust than [in the East]; while the children are universally chubby and red-cheeked." But the attention devoted to the issue only underscored the anxieties of early white immigrants.[60] The ways in which the California environment might alter their bodies—and those of their children—was, at best, an open question.

Over time, as white dominance became an established reality in the region, California promoters such as Nordhoff, as well as some of the more boosterish doctors, would turn concerns about degeneration around and claim that the mild climate of the Pacific Coast produced an even healthier breed of white Americans. Already in 1869 the author of a popular tract on California, Charles Loring Brace, had acknowledged the effect of climate on the human "type," but he also assured his readers that the result was a sturdier and more attractive breed of Anglo-Saxons: "One sees great numbers of fine manly profiles, with full, ruddy cheeks, and tall, vigorous forms." However, Brace still felt the need to reassure his readers that while climate could improve health and vitality, it could not alter race. As he put it, "Blood is stronger than isothermal lines." But even these remaining reservations about racial malleability would soon disappear. Dr. Peter Remondino, who became one of the foremost boosters of southern California (as well as the owner of a popular health resort in San Diego), would pen several articles on climate and health in the 1880s in which he refuted the widely held idea that humidity was bad for health and only harsh climates bred vigor. Instead, as Remondino put it, California's "moist marine air and equable temperatures produce the most perfect specimens of physical development."[61]

## COLONIAL MEDICINE AS ENVIRONMENTAL SCIENCE

Nineteenth-century immigrant doctors were among those who wrote most prolifically about the environment of California. In contrast, contemporary medicine is not much concerned with the landscape; physicians generally confine themselves to the terrain of the human body, while the natural environment is left to a host of other disciplines. This narrowing of professional perspective and the intellectual parsing of environmental and medical sciences is largely a product of the early twentieth century. Nineteenth-century understandings of health required physicians to pay close attention not only to the sufferer's body but also

to the surrounding landscape. It was only logical that among the early European exploring expeditions, the same person typically served as both doctor and naturalist.[62] And that the issue of health and environment drew the sustained attention of professionals as well as laypersons should caution against reading the large popular literature on the subject as merely the invention of boosters or the writings of medical eccentrics. Rather, nineteenth-century science underwrote and sustained widely held beliefs that melded human health and the natural environment into an inextricable whole. Even while popular and professional writings diverged in their particulars, they reinforced a view of the body as an entity that was both porous and environmentally sensitive.

But for professional medical men who saw themselves as serious scientists, the relationship between health and environment remained frustratingly vague and qualitative. In the national and even transnational intellectual debates over health and environment, several early California physicians saw themselves at the forefront of an empirical effort to answer questions about climate, environment, and racial fitness in a more definitive way. As the reception of Daniel Drake's treatise on the Mississippi Valley attests, professional interest in scientific medical topography was high in the 1850s. Consequently, at the moment of its colonization California formed a rich field for the extension of medicoenvironmental studies, and colonial physicians worked hard to institutionalize and scientize the study of the local environment. Several gold rush–era physicians brought environmental interests with them to California, quite conscious of the fact that they were encountering a new environment to which bodies might react in unforeseen ways. Immediately on their arrival, several physicians committed themselves to the close study of the local environment in their adopted home and to the "patient and laborious accumulation of exact statistics."[63] From the outset, professional medicine in California had a strong environmental cast.

In many ways, the critical figure in early California medicine was Thomas Logan, a devotee of Humboldt who arrived in San Francisco with an established interest in climatology and the environmental basis of disease. Logan was born into a family of physicians in Charleston, South Carolina, in 1808 and was educated at the Medical College of South Carolina in a period in which probably less than half of all physicians actually took a medical degree. He supplemented his formal training with a tour to Europe and wide reading in his field, and he subsequently practiced in Charleston and New Orleans. But the mid-nineteenth century was a difficult time to be a doctor, and there is no

Figure 2. Portrait of Dr. Thomas Muldrup Logan, one of the most prominent and prolific American physicians in nineteenth-century California. Courtesy of the California History Room, California State Library.

evidence that Logan ever established a profitable private practice in the South. In 1850 he left Louisiana and the South for good. He joined the gold-inspired migration to San Francisco and quickly settled in Sacramento where he would practice medicine for the next twenty-five years. Having brought along meteorological instruments on loan from the Smithsonian Institution, Logan immediately commenced recording weather statistics. Eventually he would become one of California's most prominent physicians, a professor at the University of California, and president of the American Medical Association. As a leading figure in the California Medical Society and later as the first secretary of the State Board of Health, Logan lobbied strenuously for more meteorological study, arguing that "every city, village, and settlement should have its meteorologic record."[64]

Logan was joined by several other physicians who shared his professional interests and environmental orientation. Henry Gibbons immigrated to California in 1850, arriving from Philadelphia where he had been a faculty member at the University of Pennsylvania. In San

Francisco, Gibbons supplemented his medical practice with the study of native plants and of meteorology. As the editor of the leading California medical journal, he urged every physician to "train himself as an observer of meteorological phenomena. The thermometer, the hygrometer, the currents of wind and cloud, should be as familiar to him as the stethoscope, the microscope and the speculum." Frederick Hatch, a graduate of New York University's medical school and a successful physician in Wisconsin, immigrated to Sacramento in 1853. Hatch would become a close observer of the California environment and would write several papers on the subject; and, like Logan, he would serve as a meteorologic correspondent for the Smithsonian. His observations on climate and health in his adopted state were included in Blodget's 1857 *Climatology.* Hans Herman Behr, an immigrant from Germany, had trained in medicine at the University of Berlin, where he had been a student of Humboldt and another well-known German geographer, Karl Ritter. In California, Behr combined his interests in climate and health with the close study of native plants and insects.[65]

These and other individuals would succeed in institutionalizing the study of environmental medicine at an early date. In a speech before the newly formed California Medical Society in 1856, Logan insisted that a key aspect of the organization's mission was "to work out the problem of climatic influence on the physical condition of man—to investigate the nature and causes of endemics and epidemics—to show how far man's agency has to do in the matter." At the second meeting of the society, Logan was instrumental in establishing the Committee on Medical Topography, Meteorology, and Endemics and Epidemics. The following year, he chaired the committee and wrote a lengthy report on the subject. When the California State Board of Health was founded in 1871, Henry Gibbons served as its first president and Logan as the first permanent secretary. Under their leadership that organization would make the study of the physical environment and its relationship to health a priority, and medical topographic studies would proliferate in California for two more decades.[66]

This emphasis on the environmental causes of disease may well reflect the fact that until the last decades of the nineteenth century California remained very much a settler society, and settler anxieties about relocation made western physicians especially attentive to their surroundings. Given that nineteenth-century bodies were permeable, new and diverse environments required both wide and meticulous scrutiny. While indigenous bodies were powerful indicators of the land, immigrant bodies

required careful monitoring and care in a new place. Doctors such as Logan and Gibbons saw their studies of environment and health as indispensable to securing the successful colonization of California by white Americans. However, since it was not yet clear what aspects of the environment were critical to health, Logan advised his colleagues to collect as much data as possible—not only temperature and altitude but also dew point, quantity of clouds, timing of frosts, depth of ground frozen, temperature of wells and springs, timing of animal migrations and fish runs, presence of ozone in air, and causal phenomena such as thunderstorms, tornadoes, hailstorms, the aurora borealis, meteors, shooting stars, and earthquakes.[67] Discourses on medicine and health were thus not only discussions of the human body but also important realms of environmental understanding.

The approach of nineteenth-century immigrants to questions of health and disease reveals a world in which the very concept of agency was understood in nuanced ways. Disease was not simply contained within certain pathogens. Discussions of causality, whether carried on by physicians or laypeople, embraced theories of environment and contagion, individual constitution and moral rectitude, personal habits and social progress. In this world, the local environment was sometimes healthful and sometimes threatening—but it was always active, contingent, and relevant to the bodies that resided there. Agency, moreover, was not necessarily confined to human beings, nor were the causes of disease discretely located in certain microorganisms, at least not yet. Rather, disease was only the most obvious sign that humans were part and parcel of a larger whole, a world that, though not completely opaque to scientific methods, often responded in unpredictable ways. Certainly American immigrants who came to California in the mid-nineteenth century did not doubt the virtues of white settlement. But when Logan wrote of the need to study "the modifications diseases may undergo from the agency of causes of a local or special character," he, like many others, acknowledged at the outset that the history of that project would be the outcome of nonhuman as well as human forces.