Chapter 1

INTRODUCTION
THE STATE OF MEDICAL SCIENCE IN 1884

No one could have prophesied in 1884, when the American Climatological Association was born, that the next century would be a period of medical progress beyond measure, and that American medicine would contribute the most to the advance. But in retrospect, one can see that many of the principal elements initiating and sustaining the forward movement were already visible:

1) Prominent educators had recognized the deplorable state of medical education and were beginning to do something about it. Their efforts would soon be strengthened by the benefactions of several wealthy philanthropists, including John D. Rockefeller, and by the return to American medical schools of young men who were then being trained in the foremost clinics of Europe. Representatives of 22 medical schools met in 1876 to form a provisional association of American medical colleges, which would, in time, play a leading role in raising the standards of medical education.

2) A start had been made in providing facilities and personnel for basic medical research. The first university-based medical research laboratories had been founded: the laboratory of physiology under Henry P. Bowditch at Harvard (1871) and the laboratory of physiological chemistry under Russell H. Chittenden at Yale (1874).

3) Drinking water contaminated by human excreta had been implicated in the spread of at least two epidemic diseases, cholera and typhoid fever. The knowledge that certain diseases were potentially preventable gave impetus to the formation of state and municipal Boards of Health and to the appointment of public health officers. The American Public Health Association was founded in 1872 and in 1879 Congress established the National Board of Health.

4) Hospitals were beginning to assume a new role in the provision of health services and in the clinical instruction of medical students. Hospital architects were paying more attention to functional design and to the need to prevent the spread of intramural infections. That the hospital was no longer to be merely a haven for sick paupers was indicated by the inclusion in newer establishments of rooms for paying patients. Of greater importance for medical education was the establishment in the 1870s of the first two hospitals to operate under the control of university medical schools: The University of Pennsylvania Hospital (1874) and The University of Michigan Hospital (1877). At about the same time, Johns Hopkins provided in his will funds to found a hospital and medical school

and directed that these institutions work together for the advancement of medical education and medical science.

5) Laboratory methods had begun to play a more significant role in clinical diagnosis.

6) The principles and practices introduced by Lister were providing the basis for a great forward surge in the field of operative surgery.

7) Professional nurses with special education and training had begun to replace the uneducated, underpaid women who had previously cared for the sick.

8) The concept of the relationship between microorganisms and human disease was gaining credence. In 1876, Robert Koch was performing his classic experiments on the anthrax bacillus. Bancroft was demonstrating that filariae were the cause of elephantiasis. Manson was conducting experiments that would provide the first scientific indication that a mosquito may serve as the intermediate host in the transmission of disease. However, it was first thought that the mosquito discharged the microfilariae of elephantiasis into water and that people acquired the disease by drinking the water. It remained for Theobald Smith to demonstrate clearly the insect transmission of disease in his studies of cattle fever in the United States.

9) What was to become the science of genetics had its experimental origin in the 1860s in the work of an Austrian monk, Gregor Johann Mendel, who demonstrated how certain characteristics were inherited by peas planted in the monastery garden. In a related field, the basic details of the manner in which cells divide to reproduce themselves were first worked out by Walter Flemming in Germany in 1876.

10) In Washington, D.C., John Shaw Billings was organizing medical literature in a systematic fashion that would make it more accessible to research workers and clinicians, and state governments were beginning to show serious interest in medical licensure.

The practice of medicine during the nation's second century would be profoundly influenced not only by the advances in medical science and other intramedical developments, but also by a number of nonmedical discoveries and inventions in the latter part of the 19th century: the telephone, electric lighting, petroleum products, the internal combustion engine, and the typewriter. Medical practice would also be affected by the various procedures that had been introduced to protect or enhance the health of the individual: better water supply, better disposal of waste; refrigeration in the home and in the transportation of food; more abundant and better-quality milk in the cities; more abundant protein foods, derived chiefly from western cattle; and year-round availability of seasonal foods made possible by the canning industry.

Many developments taking place in the last quarter of the 19th century

had a significant, though sometimes indirect, effect upon medicine. The expansion of railroads, the improvement of highways, and the increased speed and volume of waterborne travel by river, canal, and ocean served to break down the relative isolation of many communities and thus to aggravate problems in the control of communicable diseases. The United States had to keep a sharp eye on diseases in foreign lands because of the unremitting flood of immigrants. An additional, but in this case beneficial, effect of improved transportation was the widening of the service area of rural physicians. The progress of organized labor, beginning with the national organization of the Noble Order of the Knights of Labor (1869) as a secret society and with the founding of the American Federation of Labor in 1881, was to have a considerable influence on the health field. Its successful efforts to eliminate children from the labor force, to shorten the hours of work for both men and women, and to eliminate hazards and improve conditions in factories, mines, and other working areas certainly had a beneficial effect upon the nation's health.

The growth of the cities with their congested slums presented problems in housing, sanitation, nutrition, water supply, and the disposal of sewage and other wastes. Some of these problems facing physicians, health officers, and city officials were recognized in the first century of this country, and these men developed means for dealing with a few of them. The technical advances that were so numerous in the 1870s began to bring practical results to the cities in the 1880s, while new and useful inventions continued to multiply.

The Impact of Tuberculosis

Pulmonary tuberculosis–also known as consumption or phthisis–though less alarming than the diseases that came in spectacular epidemics, was unquestionably "the captain of the men of death" in the 19th century. During the first half of the century, in the cities of the United States that kept mortality records, the annual death rate from consumption was about 400 per 100,000 population; in New York City in 1812 it reached 1700 per 100,000. Though the incidence of consumption was high among all classes of people, it was highest in the urban slums, where poorly nourished people were crowded together under abominable hygienic conditions.

In 1830, in the Report of the Sanitary Commission of Massachusetts, Lemuel Shattuck wrote: "The dreadful disease (tuberculosis) is a constant visitor to all parts of our commonwealth, but creates little alarm because it is so constantly present whereas the occasional visit of cholera or other epidemic disease creates alarm and, therefore, precautionary measures are taken."

Edward Delafield summarized the notions on tuberculosis therapy prevalent in America in the early 19th century in a thesis published in 1816: bloodletting, emetics, mercury, opiates, digitalis and Peruvian bark.[1] He pointed out that sea voyages and a mild climate were of benefit and postulated that the nausea of seasickness was the basis for the beneficial effect of sailing.[2,3] He reiterated the views of Robinson and Reid that changes of climate are beneficial in tuberculosis; travel often means sea voyages, passengers on ships frequently become seasick, and therefore the induction of vomiting by use of emetics is beneficial in the treatment of tuberculosis. This cyclical reasoning led to the use of emetics not only in the treatment of tuberculosis but in other diseases as well. In 1834 Samuel Morton published the first American textbook on tuberculosis in which he devoted a major section to a discussion of climate.[4,5] He concluded that "when it becomes advisable to combine a long journey with a change of air the invalid cannot do better than direct his course from our Atlantic cities to the western states across the Alleghenies and travel through Ohio and Kentucky."

The attitudes toward tuberculosis underwent a radical change when Robert Koch discovered the tubercle bacillus. William H. Welch, who was then pathologist at the New York University and Bellevue Hospital Medical College, learned about the discovery from Austin Flint, Sr., who, though 70 years old, relished with boyish enthusiasm every new development in medical science. Flint had shown more interest than most of his American colleagues in the germ theory of disease. On the morning of April 3, 1882, while Welch "lay in bed after a late evening in the dead house, the door of his room burst open and in came the old gentleman [Flint] at a run, waving a newspaper in the air. 'Welch,' he cried, 'I knew it, I knew it!' The young man must have blinked in sleepy surprise, but when Flint explained that a dispatch in the paper told of Koch's great triumph, he jumped out of bed as excited as his master."[6]

During the latter part of the 19th century, health spas had reached their peak in Europe and were attracting a great deal of attention in the United States. Although there were many areas in this country offering similar climatic and geographic features, they were relatively unknown at this time and as a result, many patients were sent to Europe for the cure.

After the discovery of the tubercle bacillus, it was hoped that a way would be found to kill the bacillus within the human body, or at least to make the body more resistant to its effects. In 1890 Koch thought he had discovered a cure for tuberculosis. He reported at the International Medical Congress in Berlin that he had made a substance that rendered normal guinea pigs resistant to tuberculosis, and when injected into guinea pigs with advanced tuberculosis, arrested the disease. Three

months later he reported that this work had been extended to human patients with very encouraging results. In neither of his first two reports on this subject did Koch describe the origin or preparation of the substance that he had used to treat the animals and the patients. Known at first as "Koch's lymph," it turned out be tuberculin prepared by boiling, filtering, and concentrating a broth culture of tubercle bacilli. In spite of the cautious and preliminary nature of Koch's reports, tuberculosis patients from all countries flocked to Berlin for treatment. (The treatment was also tried extensively in this country.) Before many months had passed, it became apparent that the tuberculin treatment was not only ineffective, but also dangerous. There were severe, and sometimes fatal, reactions to the tuberculin. Although tuberculin proved to be worthless as a remedy, it came into wide use as a diagnostic agent. The true nature of the tuberculin reaction, however, was not understood until the first decade of the 20th century, when von Pirquet and Schick reported their work on hypersensitivity and allergy. In the second decade of the century, the whole subject of tuberculin sensitivity came under intensive investigation at Trudeau's Saranac laboratory.

Interest in Climatology

The idea that climatic and geographic conditions influence human constitution and predispose to certain diseases goes back to Hippocrates. In the United States, public opinion on the relationship of climate and disease followed that of the physicians. William Curry's historical account of the climates and diseases of the United States, written in 1792, is a summary of the impressions he gained from talking to doctors in his travels around America. There is nothing new in his book and his opinions do not differ from those of Thomas Jefferson or Benjamin Rush. The idea that miasmas, originating in swamps, and noxious substances developed from putrefying vegetable and animal material were causes of disease was a basic tenet of public health at that time. It resulted in efforts to drain swamps and to clean up vegetable and animal remains during epidemics of the colonial period in the United States. Although the theory was then incorrect, these efforts did kill off the mosquito vector in some of the yellow fever and malaria epidemics of the time. Another practical and effective outcome of this theory of noxious substances was the development of the mountain resorts along the Appalachian chain of mountains to which the upper classes of the colonial cities retreated during the summer months, thereby avoiding the malaria and yellow fever of the tide water. At the same time, the therapeutic value of the "waters" came to be appreciated.

Explorations of the Rocky Mountains started with Pike in 1810, who developed the idea that the openness and the air were good for health.

In 1847 George Frederick Ruxton stated: " . . . the air of the mountains has a wonderfully restorative effect upon constitutions enfeebled by pulmonary disease. . . ."[7]

Two papers (in 1867 and 1869) by Hermann Weber[8] (Fig. 1) drew widespread attention to the effect of altitude on tuberculosis.[9,10] Weber quoted the articles of Archibald Smith on the Peruvian Andes that had appeared in the early 1840s, and referred to H.C. Lombard of Geneva and Brehmer of Gorbersdorf.[11–13] Weber called attention particularly to Switzerland and to the resorts at St. Moritz and Davos, which opened in 1865 and were the models of high-altitude tuberculosis resorts.[14] Weber believed that the advantages of high altitude were due to dryness of the soil, diminished humidity of the air, and low temperature. He emphasized the "comparative freeness of the air from foreign admixture, especially of organic nature; and the greater number of clear days."[15]

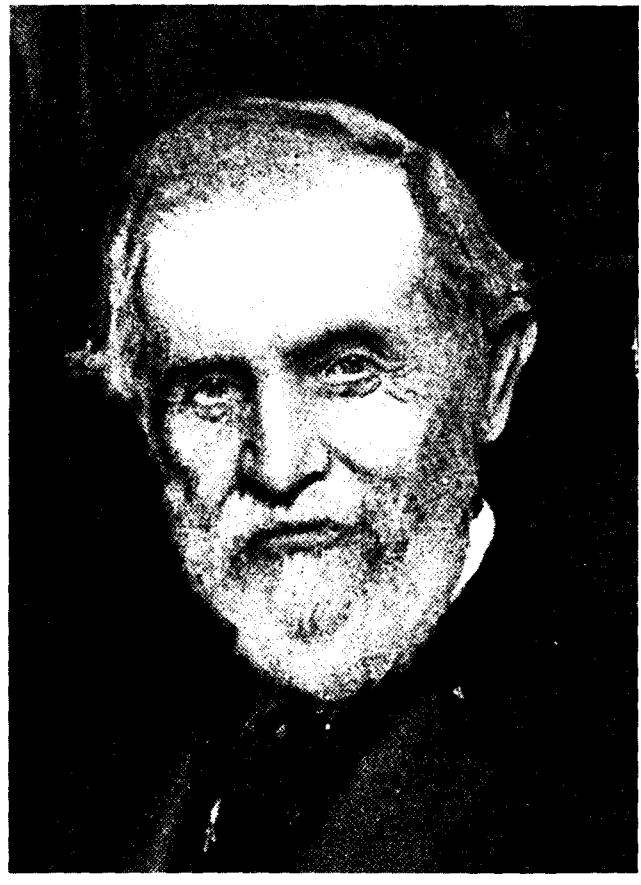

FIG. 1. Sir Hermann Weber

Following the gold strikes of the 1860s and the end of the Civil War, migration to Colorado increased greatly, and when the railroad reached Denver in 1870 the influx of patients with tuberculosis was quite large. It was estimated that by 1880 fully one-third of the population of the state (about 65,000) were consumptive. A Colorado Territorial Medical Society was formed, and at its meeting in 1874 Dr. Thomas E. Massey of Denver was appointed chairman of a Committee on Climatology. In his report a year later, Massey stated that "the peculiarities of a climate that apparently protract the days of a consumptive seem to be precisely those that prematurely age the generally healthy. . . ."[16] The minutes recorded that "it was a characteristic paper and dealt with the climate and claims of Colorado in a trenchant and incisive style which was evidently the result of conviction." The President promptly renamed the committee, calling it the Special Committee on Topography, Climatology, and Epidemics, and he appointed Dr. Charles Denison as its chairman.[17]

Denison had arrived in Denver in 1873 as a victim of tuberculosis. Graduated from the University of Vermont in 1869, he had had pulmonary hemorrhages while practicing in Hartford. More than anyone else, Denison advertised the Colorado climate as a cure for tuberculosis. In 1876 he published two papers, the first of which was read at the American Medical Association (AMA) meeting in Philadelphia in June as part of the program on the Section on Public Hygiene and State Medicine. During the previous year the Section had invited papers on tuberculosis from Colorado, Minnesota, and Florida—and this very selection by geographic area shows the predominant interest in the disease's climatological aspects. Denison's paper was fairly short and properly restrained, as "befitted a man from a Territory."[18] However, between June and September of 1876, Colorado became a state, and when Denison attended the Centennial International Medical Congress it was as a representative of the Colorado State Medical Society. There he read a paper on "The Influence of High Altitudes on the Progress of Phthisis" which occupied 34 printed pages with six tables, and voluminous notes.[19] He concluded that: "Resort to a well-chosen elevated climate should constitute part of the physician's advice to every consumptive. . . . " The discussion was lengthy and typical of those that followed all papers presented in the next two decades on this subject. In 1880, Denison published his book on Rocky Mountain health resorts[20] and later there were several editions of his Pocket Atlas and various climatic maps.[21]

During the 50-year period beginning in 1871, Colorado physicians published about 4700 papers in professional journals. Of these, about 11% concerned tuberculosis and 30% of those were on the effects of altitude on the disease.[22] The principal writers on altitude therapy were Charles Denison (1845–1909), Samuel A. Fisk (1856–1915), Charles Fox Gardiner (1857–1947), S.E. Solly (1845–1906), Henry Sewall (1855–1936)

and Gerald B. Webb (1871–1948). All of these men were at one time or another officers of the American Climatological Association. Although Denison and Solly typified the older breed of climatologist, that a new breed was appearing was evident from the work of such men as Henry Sewall and Gerald Webb.

By 1883 there was widespread interest among physicians in the treatment of tuberculosis. This group was also active in disseminating information about the health spas in this country and in studying the effects of climate on disease. These physicians decided to form a society for "the study of the climatology and diseases of the respiratory organs."

Birth of The American Climatological Association

A small group of these men met in New York City on September 25, 1883 to organize the American Climatological Association. Charles Denison, having conceived "the idea," left it to his close friend J.H. Tyndale to arrange this organizational meeting. The following were selected as officers: President, Alfred L. Loomis of New York; Vice-Presidents, Frederick I. Knight of Boston and William H. Geddings of South Carolina; Secretary and Treasurer, J.B. Walker of Philadelphia. The date set for the first annual meeting, which was to be held in Washington, D.C., was May 3, 1884. Among the other founding members who attended that meeting in New York City in 1883 were William Pepper, Frederick Shattuck, J.H. Tyndale, J.R. Leaming, D.M. Cammann, Paul Kretschmer, John H. Musser, Roland Curtin, Beverley Robinson, J.C. Wilson, and E. Fletcher Ingals.