

*Biol.
Thesis
1927.*



AN INTRODUCTION TO THE HISTORY OF CLIMATE AND
TUBERCULOSIS

A Contribution to the History
of
Public Health and Medical Climatology

Robert Bruce Watson

✓

|

A Thesis

Submitted To

The Department of Biology and Public Health

of the

Massachusetts Institute of Technology

in

Partial Fulfillment

of the

Requirements

for

THE CERTIFICATE IN PUBLIC HEALTH

June first

1 9 2 7

TABLE OF CONTENTS

Preface.....		1-8
1. Background.....	1	
2. Purpose.....	3	
3. Sources of General Bibliography.....	3	
4. Sources of Thesis Bibliography.....	5	
5. Method of Thesis	6	
6. Concluding Remarks.....	7	
 Chapter I INTRODUCTION.....		 9-17
1. Definitions.....	10	
2. Climate and Civilization.....	11	
3. Climate and Religion.....	13	
4. Climate and Health.....	14	
5. Summary and Plan of Thesis.....	15	
 Chapter II -OUTLINE OF HISTORY.....		 18-27
1. Brief Sketch of History of Medicine...	18	
2. Summary of Periods given by K.Sudhoff.	20	
3. Outline of History of Climate and Tuberculosis.....	26	
 Chapter III PERIOD PRIOR TO HIPPOCRATES.....		 28-42
1. Edwin Smith papyrus of Egypt.....	30	
2. Susrata and Caraka of India.....	32	
3. Classical Period of Antiquity.....	37	
4. Conclusions.....	42	
 Chapter IV HIPPOCRATES TO GALEN.....		 43-64
1. Brief Sketch of life of Hippocrates...	43	
2. Hippocratic Collection.....	44	
3. Hippocrates on Tuberculosis.....	47	
4. Hippocrates on Climate.....	50	
5. Conclusions.....	59	
6. Later Writers of Period on Tuberculosis	60	
7. Medical Developments of Period.....	62	
8. Summary of the Periods Contribution to Climate.....	63	

Chapter V	SOME FACTORS IN THE ORIGIN AND DEVELOPMENT OF CLIMATE THERAPEUTICS -- A discussion of the economic background of the development of climate treatment.....	65-77
1.	Medical Profession of Greece and Rome..	67
2.	Colonization.....	69
3.	Commerce.....	70
4.	Travel.....	71
5.	Pleasure boats.....	73
6.	Conclusion.....	76
Chapter VI	GALEN TO THE RENAISSANCE.....	78-85
1.	Contributions on Climate.....	78
2.	Summary of Contributions.....	81
3.	Factors in the Development of the period.....	82
4.	Note on Sir Thomas Young.....	83
5.	Summary of the Period.....	84
Chapter VII	1600 to 1882.....	86-116
1.	Seventeenth Century.....	87
2.	Eighteenth Century.....	92
3.	1800 - 1882	99
Chapter VIII	EARLY DEVELOPMENT OF THE OPEN AIR TREATMENT AND THE SANATORIUM MOVEMENT.....	117-130
1.	Pre-cursors of the Modern Treatment..	117
2.	Development of Sanatoria.....	124
	H. Brehmer.....	124
	P. Dettweiler.....	127
	E. L. Trudeau.....	128
Chapter IX	1882 - 1927.....	131-170
A.	1882 - 1890	134-149
B.	1901 - 1908	149-163
C.	1908 - 1927	164-170
Chapter X	A CRITICAL REVIEW OF SOME EVIDENCE IN SUPPORT OF THE HYPOTHESIS THAT CERTAIN FACTORS OF CLIMATE HAVE A RELATION TO PULMONARY TUBERCULOSIS....	171-198
Chapter XI	CONCLUSIONS.....	199-201
	Thesis Bibliography.....	202-212

PREFACE

On first thought, apology must needs be forthcoming from the writer for presuming to add another contribution to the already over-burdened and very extensive literature of Medical Climatology. Though "a change of climate" has been a well-recognized therapeutic measure throughout the history of civilization, it did not reach its peak of popularity until the nineteenth century. And from that time onward, there has been a veritable flood of writing, pertaining not only to aspects of meteorology and climate, but the relation of climate to disease in general, and tuberculosis in particular. A search through the catalogues and the various indexes to this stream of thought, which has come to us as the heritage of the ages, has resulted in the collection of approximately four thousand (4000) distinct and individual references; including books, lectures, pamphlets, magazine articles, theses, and other printed material. And the writer is convinced that this list is by no means complete.

1. Background of Present Study

About four years ago, during the course of some routine work while a member of the staff of the National Tuberculosis Association, the writer was impressed with the noticeable differences in the death rates of certain states in the Middle West and especially those states which lie to the east of the Rocky Mountains and to the west of the Mississippi River. Thus, Kansas and Nebraska had very low rates, while Colorado, Oklahoma, Missouri, Arkansas and other states in the immediate

vicinity had higher rates, which in one or two instances were substantially higher. All the usual explanation; such as, location of health resorts, intensity or lack of intensity of the tuberculosis programs in these states and other similar in character, did not seem to suffice. Something more fundamental was apparently at work. Thus the reason for this anomaly intrigued speculation which later developed into investigation, on the assumption that climate was the answer.

It was very soon learned that statistics were not available—either meteorological or mortality—for a sufficient length of time in either Kansas or Nebraska to make the results worth while. Consultation with several statisticians revealed that even if the foregoing data were available, it would be of far greater value to study the problem where the following conditions were obtainable: First, the largest possible percentage of the population subject to identical weather conditions; Second, highest accuracy of data; Third, longest series of observations. The answer to the conditions was New York City. Consequently statistics were gathered and plotted, and the analysis had started when the work was interrupted by the writer's continuance of training at the Massachusetts Institute of Technology.

The present study is an outgrowth of the original investigation. In the meantime it was felt that before the work should be continued an attempt should be made to ascertain whether the relation of climate to tuberculosis had ever been proven, controversy notwithstanding. It was also recognized

that the proper approach to any field of investigation was via the literature.

2. Purpose of Thesis

The purpose of the present investigation is therefore three-fold:-

1. To sketch the development of the subject, "Climate in Relation to Tuberculosis" from early times to the present, with an attempt to locate the origin of the idea.

2. To ascertain, on the basis of the evidence produced, whether any elements have been common to the various periods of the development of the subject.

3. To discover whether the relation of climate to the cure of Tuberculosis has ever been scientifically or conclusively proven.

3. Sources of Bibliography

From the very beginning, emphasis has been placed on the necessity for a complete bibliography. Such a bibliography would then serve not only as a supply of source material for the present essay but also as handy and complete reference guide for future work. A brief survey of available material had revealed that such a guide was not available, beyond the brief list of about fifty references compiled by Miss Towner, the librarian for the National Tuberculosis Association on the staff of the Library of the National Health Council in New York City. As a consequence a major share of the time allotted for the present study was devoted to the collection of the Bibliography.

The references were obtained from the following indexes and catalogues:-

1. Poole's Index to Periodical Literature(1802-1901)
2. Reader's Guide to Periodical Literature(1900-)
3. U.S.Public Information Service (1915 -)
4. Index Medicus (1879 -)
5. Index Catalogue to the Library of the Surgeon-General's office (1880 -)
6. Selected List of references on Climate and Tuberculosis in Library of National Health Council
7. Card Catalogue of the Boston Medical Library
8. Bibliographies suggested by various text-books and authorities on Tuberculosis
9. Cumulative Index to Current Medical Literature

A brief note on these catalogues may not be out of place.

The Index Medicus is the principal guide to current medical literature of the world. It is an attempt to classify all medical literature of importance, books lecture, pamphlets etc. as it appears from month to month. It has had many vicissitudes since its inception in the seventies but it is invaluable as it contains foreign as well as American literature.

The Index Catalogue to the Library of the Surgeon-General's office is a huge compilation containing the sources in that library, which by many is claimed to be the most complete medical library in the world.

The Boston Medical Library is one of the most complete of

the private medical libraries and is replete in source material. It has the advantage also of satisfactory borrowing privileges with the Surgeon-General's Library as well as other libraries.

The better part of a year was devoted to the work of compiling the bibliography, and the literature of nearly every civilized nation has contributed to the final result which is made up of a card index, classified according to the periodicals and authors of books, including about 4000 titles.

4. Thesis Bibliography

It was manifestly impossible, with the time at the writer's disposal, to investigate the entire bibliography. Some judicious selection was necessary in order to furnish reliable sources without at the same time vitiating the purposes of the study. This was accomplished by consulting some of the standard histories of medicine (mentioned in the Bibliography attached to the thesis) authoritative text-books on tuberculosis and the writer's general though limited acquaintance with the field. Additional selections were made from certain titles in the bibliography which seemed likely to furnish promising material. And finally, during the process of reading and abstracting books and articles, the authors often mentioned authorities on the various phases of the subject under discussion at the time. These were noted and consulted. In this manner the bibliography grew and developed as the work progressed. It has been flexible, expanding or contracting with every "scent" or change in point of view. It must be emphasized further however that the bibliography attached hereto is not the complete and final one.

5. Method of Thesis

As far as it was possible, recourse has been had of Original Sources. But this ideal has not been met in many instances, for several reasons. First, availability. The subject of the thesis includes the development through-out history. References have been obtained to ancient literatures. Many references exist in but one or two places in the world, - not in the U.S. It was obviously impossible to obtain them, and if they were obtained there would be the question of value to the subject at hand. Again, many references were to the literature of the sixteenth, seventeenth and eighteenth century and in English. Many of these books are becoming rare and are deposited in very few libraries. Even when mentioned in the Library of the Surgeon-General's Office, and request was made for the book, the slips would be returned "Not loanable", the inference being that either the book was rare or that a date has been set, earlier than which no book is loanable from the Surgeon General's Library. Third, Translation. Many of the early medical writings, or, rather, most of them were written in Latin. Where translations were obtainable, they were used. If translations were not available, the reference was not included. Fourth, Criticisms. Many authors in summing up their subject or in introducing it, quoted paragraphs from the original or author or would criticize in such a way as to make the criticism as valuable as the original. These were used whenever it was thought advisable.

7

Whenever secondary material has been used, due credit for authority has been made, and care has been taken on the whole to use such material only from recognized authorities. Such authorities were prone to summarize whole periods of the past in a terse or concise way, or by their criticisms threw light upon otherwise obscure points. The writer has drawn freely upon these authors in order to obtain a picture of the periods studies and, whenever possible, he has given credit for so doing.

The method used in the thesis is thus intensive and extensive : intensive, by the use of original source material and extensive by the inclusion of other opinions and views.

In conclusion the writer wishes to extend his sincere appreciation to the many agencies and to his many friends who have aided him in the preparation of this essay, without whose assistance he could scarcely have completed the work. In particular he wishes to thank the several members of the staff and Board of Directors of the National Tuberculosis who have made it possible by their encouragement and generosity to continue his training at the Institute; Dr. S.C.Prescott, Head of the Department of Biology and Public Health at the Institute, who suggested the undertaking of the enterprise and who by his wise counsel and kindly criticism has rendered valuable aid; Dr. E.O.Otis, " dean of the tuberculosis experts of the United States" who early manifested interest in the writer's endeavor and who gave valuable suggestions;

and those individuals who aided in the search for the apparently lost evidence on the ownership of ancient private sailing vessels; and the staff of the Boston Medical Library for their courteous and efficient assistance in the collection of the Bibliography and obtaining many valuable sources. And finally the writer is deeply appreciative of the inspiration and sacrifices given by his wife who has thereby had not a little to do with the successful completion of the work.

CHAPTER I

INTRODUCTION

Climate and weather never fail to arouse the interest of the general public. They are subjects of conversation on the street corner, in the office, the club, the Pullman smoking room, the home, among strangers or friends; indeed, wherever people congregate the state of the weather seems to be as important as the state of one's health. And a summer temperature in April or a frost in August commands " front-page space" along with the latest murder, divorce or uprising in China.

These subjects have beyond doubt always interested mankind. Modern psychologists claim that human nature has not changed perceptibly in the last four or five thousand years or at least since man reached the civilized state. Thus we can imagine men of the early ages of recorded history and with their cronies discussing weather probabilities for the morrow, the weather which accompanied them on the last week's hunt, or per chance the climate on the other side of the mountain range.

Later as man gradually reached his intellectual maturity these matters developed from the realm of mere idle speculation into the more difficult one of investigation, and still more recently¹ into the discovery of those laws which have become

¹Ramsay, A " Bibliography, Guide and Index to Climate" 1884

basis of scientific prognostication. Thus at the present time, climatology and meteorology, the sciences of climate and weather, are "members in good standing" in that select group of subjects known as Modern Science.

1. Definitions

Before proceeding further into the discussion it may be well to define the following terms which will be used throughout the thesis: weather, climate, meteorology, climatology. There are as nearly many definitions of these terms as there are treatises on the subjects, all varying to a greater or less degree from extreme simplicity to great complexity. And the definitions have changed from era to era in the course of evolution to our present knowledge of the subjects included under the terms. As the following essay is historical in nature and not a scientific discussion of physical principles or laws, it would seem to be beyond the scope of the work to include all or even many of these definitions which are used at present or which have been used in the past. All that is needed is a general distinction between the terms.

One of the best of the modern discussions of the terms, for the purposes of the essay, is that of Otis¹: The climate of any locality is its average weather conditions, and by weather we mean all those atmospheric elements which are noticed by sight, feeling or instruments, and these include temperature, humidity, wind, condition of the sky, as to

¹ Otis, E.O. "Pulmonary Tuberculosis, 1920 Chapter III

basis of scientific prognostication. Thus at the present time, climatology and meteorology, the sciences of climate and weather, are "members in good standing" in that select group of subjects known as Modern Science.

1. Definitions

Before proceeding further into the discussion it may be well to define the following terms which will be used throughout the thesis: weather, climate, meteorology, climatology. There are as nearly many definitions of these terms as there are treatises on the subjects, all varying to a greater or less degree from extreme simplicity to great complexity. And the definitions have changed from era to era in the course of evolution to our present knowledge of the subjects included under the terms. As the following essay is historical in nature and not a scientific discussion of physical principles or laws, it would seem to be beyond the scope of the work to include all or even many of these definitions which are used at present or which have been used in the past. All that is needed is a general distinction between the terms.

One of the best of the modern discussions of the terms, for the purposes of the essay, is that of Otis¹: The climate of any locality is its average weather conditions, and by weather we mean all those atmospheric elements which are noticed by sight, feeling or instruments, and these include temperature, humidity, wind, condition of the sky, as to

¹ Otis, E.O. " Pulmonary Tuberculosis, 1920 Chapter XIII

cloudiness or sunshine, and the occurrence of precipitation, as rain or snow. By the term weather we mean these conditions as observed at a particular time or during a short period while by climate, we mean, the aggregate of weather conditions extending over a longer period. Huntington¹ mentions the distinction between climate and weather as stated by the small boy of Mark Twain's acquaintance, "'Climate lasts all the time and weather only a few days'" which, according to Huntington, was about right.

Meteorology may be termed the science of weather or the science of measuring such factors of weather as, barometric pressure, relative humidity, absolute humidity, temperature, etc.- all those elements which make up the atmospheric air.

Climatology may be termed the science of climate, though in order to measure climate, one must necessarily compute the average meteorological elements for a region. Climatology is the broader term of the two.

2. Climate and Civilization

The atmospheric air is after all one of the essential features of Environment. And when the subject of man in his relation to the environment is under discussion, there is an implication that one of these relationships is the atmospheric air or climate.

The important rôle which environment has held in the

¹ Huntington, E. " Civilization and Climate" p. 110

evolution of man from " a state of nature" to " a state of civilization" need no elaboration of further emphasis here. It is one of the cherished doctrines of many branches of modern science, including Sociology, Biology, Anthropology and History. The discovery of this principle, leading as it did to many ramifications and manifold interpretations has engaged and is still engaging the research of many of the world's best thinkers. Thus, the economic interpretation of history, to mention but one of the many similar devises, emphasizes the importance of economic factors in shaping man's destiny; such as, food, water, crops, geographical barriers, natural resources, etc.

Only recently, however, have scientific data been produced to support the theory of the influence of climate in the development of civilization. Huntington in his " Civilization and Climate" has very clearly demonstrated this influence and he has developed an interesting hypothesis¹: "To-day a certain peculiar type of climate prevails wherever civilization is high. In the past the same type seems to have prevailed wherever a great civilization arose. Therefore, such a climate seems to be a condition of progress. It is not the cause of civilization, for that lies infinitely deeper. Nor is it the only or most important condition". And in partial support of this hypothesis he explains in detail the rôle of climate in the development of Grecian and Egyptian civilization and assigns as an important cause for their decline in virility a change

¹ Hungtinton, E. " Civilization and Climate" p. 9 and Chapt. XIII

in the type of prevailing climate.

With many bits of evidence he supports the theory of Pulsating Climate - or the theory of changing climates throughout the world's history. And to illustrate the fact that climate has been responsible for changing suddenly the course of history he mentions the study which Kropotkin¹ made to show that " a gradual dessication of Asia would drive into Europe the hordes of barbarians whose invasions were so important a feature of the Dark Ages."

Whether one believes that Huntington and other climatic geographers have conclusively proven their hypothesis or not, one cannot scientifically question the general influence of climate on civilization. Certainly there is strong presumptive evidence if not confirmatory.

3. Climate and Religion

Though it has been mentioned before (p 9) that man has undoubtedly shown at least a passing interest in climate or the weather, there are evidences that at least a few of the elements which enter into the sum total of atmospheric environment were held more or less in awe. Anthropologists and sociologists, in their investigations of primitive man as he once lived and as he lives today in what is known as " the barbaric state", have long noted his tendency to worship natural objects. Thus the sun, rain, thunder, lightning,

¹ Reference given by E.Huntington

cyclones and many other elements have been believed to possess supernatural powers. And the worship of these elements of natural led to the appellation of appropriate " Spirit" or " Gods". And thence to a definite established religion, with ceremonials, rituals and what not. Legendary literature is replete with the tales of Sun Gods, gods of lightning and thunder etc., as, Ra, Apollo, Thor etc.

4. Climate and Health

Among the many interesting features of Huntington's book, " Civilization and Climate" may be found his discussion of vitality of peoples, Chapt. IX. In this chapter he has two maps¹; one showing " the climatic energy" of the United States, and attempt to graphically portray the climatic elements in the various parts of the country; and another showing the death rates. A comparison of the two maps indicates a remarkable correspondence. Where climatic factors are favorable the mortality is low and vice versa. According to Huntington², " This is probably due in part to the direct effects of climate, and in part to its indirect effects upon sanitation and other methods for the promotion of health. The two conditions almost inevitably go together, for where people's energy is great, they are quick to adopt new means for the prevention of disease and the improvement of health. Moreover, in dry, and still more in warm, regions it is easy to tolerate unsanitary methods of disposing of sewage which thus pollutes the water supply."

¹ page 184

² page 188

One of the most useful tools of the modern epidemiologist in his chart showing the seasonal variation of general mortality in the community and the seasonal variation among particular diseases. Thus, with the knowledge so obtained the epidemiologist is in a position to predict, on the basis of the past experience what is the normal mortality and to watch for any indications of a sudden increase over the normal expectation. Thus, it has long been recognized that deaths from respiratory diseases decline in the summer months, while deaths from typhoid fever are likely to reach a peak in the summer and fall. There is a normal rise and fall in these and other diseases which must be understood before one can understand what is actually taking place in any particular locality.

The foregoing illustrations are tributes to the present-day knowledge of the relation of climate and health. On every hand we see the tremendous force of climate at work, taking a prominent place in the ever present struggle for existence and natural selection of man.

5. Summary, and Plan of Thesis

In conclusion there has been indicated the influence of climate upon civilization, religion and health. No attempt has been made, to show conclusive proof. All that has been intended is the illustration or indication of the likelihood that climate as an essential part of environment can not be overlooked in the discussion of man in his relation to environment.

In view of the foregoing it is not strange that man should have looked to his environment for the relief or cure of his several afflictions of the flesh or spirit.

If the protecting spirits in his immediate neighborhood waxed in wrath at some imagined crime, and in consequence sent thunder and lightning; droughts; a long, rainy season, they may have been appeased temporarily by the appropriate incantation. But if loss of food, and lack of game were extended over a considerable period, primitive man undoubtedly looked with some elation at the green fields and plentiful game in some not far distant spot. Later when modes of transportation were perfected with the growing complexity of economic goods and increase in wealth; and when wars, from being mere family feuds or tribal raids and confined to one locality developed to an Alexandrian Conquest, knowledge of different climates was more readily obtained and more easily sought.

There is abundant evidence that one of the most pressing reasons for man's changing his environment was the relief of his diseases. And one of the most prevalent of his diseases was tuberculosis. Throughout the ages man has sought a new clime for the cure of this disease. And he is still "chasing the cure". The far famed expression, "Go west, young man" may still be paraphrased, "Go west, T.B." With many authorities still differing as to whether climate has any relation at all to the cure of pulmonary tuberculosis; with millions of dollars being appropriated annually for the erection of sanatoria in

every part of the world, regardless of favorable or unfavorable climates; with many people suffering from this truly "White Plague", who still seek relief in the west, though little able to afford it, there is still urgent necessity for further investigation of the problem. It was with these vital interests in mind that the writer undertook the original investigation of the weather conditions in relation to the tuberculosis death rate in New York City. And it was at the instance of the same impulsion that he has ventured to present the following historical study.

The thesis has divided itself very naturally into Chapters dealing with the various periods in the history of the subject. The history of "Climate and Tuberculosis" has been found to parallel rather closely that of the broader field of medicine. It has therefore been thought advisable to consider the broad outlines of the historical development of medicine in a separate chapter. Then follow in succession the chapters on "Climate and Tuberculosis" from the earliest times up to the present. The thesis closes with a summary of the historical evidence and the final conclusions.

CHAPTER II

OUTLINE OF HISTORY

L. Brief Sketch of History of Medicine

It is not the intention of the writer in this chapter to delve very deep into the long and vast history of medicine. There are many excellent reviews and compendia on the subject- notably those of Baas, - Handerson, Garrison, Neuberger, Buck and Sudhoff. In addition there are countless investigations of particular periods or special branches of medicine. All that the writer could hope to do with this imposing array of literature would be to copy the texts, adding nothing new. The popularity of the field of research into medical history, especially into origins has increased of late. There is every reason to believe that such research now being conducted in various countries¹ will undoubtedly clear up many questions which have been long under dispute or reveal new facts long hidden from even painstaking scrutiny. This will necessitate a revision of many contemporary conceptions. But since the subject matter of the present paper deals very largely with the subject of medical history- especially is this true of that part touching upon the periods prior to Modern Medicine- and since the outline of historical periods follows closely that of the larger field of medicine it has been thought advisable to sketch the broad outlines of this field.

¹ Especially at the Leipzig Institute, whose first director was K. Sudhoff

2. University of Vienna

3. New chair at Johns Hopkins University held by Dr. W.H. Welch

It will facilitate the understanding if medical history is divided into periods. Professor Buck, in his "Growth of Medicine," after comparing the various attempts of other writers to sketch the periods in the development of medicine, presents a list of such periods which seems to be simple and logical¹:-

First Epoch - Primitive Medicine

Second Epoch - Medicine of the East

Third Epoch - Medicine of the Classical Period of Antiquity

Fourth Epoch - Medicine of Hippocratic Writings

Fifth Epoch - Medicine of Alexandria

Sixth Epoch - Medicine of Galen

Seventh Epoch - Medicine of the Middle Ages

Eighth Epoch - Medicine of the Renaissance (fifteenth
and sixteenth centuries)

Ninth Epoch - Modern Medicine

The above list has the distinctive feature of simplicity.

It also possesses the merit of emphasizing the work of Hippocrates and Galen, rather than a more formal period of history such as Greece and Rome. The modern method of interpreting history in the light of development or growth possesses the great difficulty of separating one period from another. There is constant overlapping as one era merges into another. Social institutions do not change over-night; they are conservative forces.

¹ - Buck, A.H. "Growth of Medicine, 1917, p. 5

Even such an abrupt change as the Industrial Revolution took years for the completion of its total effect upon civilization, and the final chapter has not yet been written. This point must be emphasized when viewing medical history as well.

No attempt will be made to point out the characteristics or chief events of each period. Only those characteristics or points which have a definite relation to the subject at hand will be considered in any event. A detailed description would take up too much space and would not serve to put the subject at hand in bold relief but, like the creeping vine, would tend to obscure the whole picture.

2. Summary by Karl Sudhoff

In order to emphasize, however, the importance of certain periods and to obtain a more complete bird's eye view of the whole sweep of this subject, the following excellent summary of Sudhoff¹ is given:

The beginnings of medical knowledge " go back to the days of man's earliest development, even, indeed into the defensive reactions of the animal world and their mutual interactions. The motives were necessity and the altruistic impulses and the feeling of tribal solidarity." In these early days as the result of " the combats of the chase and the battlefield", observance of life and death in many vicissitudes, empirical attempts to counter-act disease, the whole course gradually centered in the Medicine Man. " Coursely, empirical emanistic views were resolved into animistic, demonic ideas,

1. Sudhoff, K : "Essays in the History of Medicine" 1926, transl. by Garrison, essay entitled " Periods in Development of Medical Science", pp 77-95

to dominate all humanity. Magic spells, verbal, manual and objective incantations became factors of healing. The whole developed into a corporate collection of impersonal, professional knowledge of the priesthood who made notations of it, combined it from many sources of observation, codified it and twisted it to the purpose of a cult.

" As a divinely appointed investigator of the causes of things, the priest, through his very office, answers, with surety and full competence humanity's eternal questionings as to the origin and existence of pain, disease and death. Divine punishment, obsession and possession by evil powers, special demons for particular diseases are merely isolated examples of the countless possibilities of a pseudo-scientific professional consideration of healing.... by means of atonement, catharsis, transplantation, propitiation by way of sacrifice, apotropiac rites or counter-magic with the aid of stones, plants, animals, or of rituals, incantations, charms, sound and rhythm. Such was the accomplishment of the priestly cult in its highest development." "The most refined and consequential phases originated in Mesopotania, upon basis of the ancient Oriental scheme of the Universe, supported by contemporaneous empirical therapeutics, pharmacology and dietetics... That cult of priestly magic has, in some inferior aspect or other, well-nigh over-shadowed the popular medicine of primitive peoples of the whole world to this day, and from its coils, not even Egypt and Babylon were ever able to free themselves entirely."

520
K. 112

" But along with this transcendental process into the open there was an ever closely parallel trend of original observation;..." These observations started with excretions of the orifices of the body- tears, sputum, urine, feces etc.; nocturnal emissions and menstruation. " Furthermore all such bodily secretions and excretions may be sometimes activated by kneading and pressure or may be postponed or held in check by a tight bandage". Therapeutic effects were obtained by venesection. " In this way the mind was almost inevitably drawn to the humoral theories, as they reveal themselves in different cultural periods; in varying aspects". Evidences for " the humoral pathology" are found in Babylon and Egypt- But later the medical magic assumed the greater popularity.

He turns to China. " Before the middle of the ninth century Chinese chronology is by no means reliable ascertained." Pien-tsi is the first medical personality in China. In first period of Chinese medicine the influence of priesthood was not noticed. Yet later disease demonology was about the only medicine the Chinese had. There was a remarkable parallelism with Egypt and Babylon in some of their beliefs. Chinese medicine passed to Japan, thence by the Aleutian Islands to America. There is some similarity between Aztec culture and Babylonian. In ancient America, everywhere the knowledge was in the hands of the priesthood.

Summing up this first period , Sudhoff says" we find the same developments over the whole world, at least in the

stages accessible to us, viz: simple empiricism (emanism); foreign body and worm theories: demons of disease with exorcism, along with collection of observed data (in favored localities) .. and finally a gradually recognizable effort to effect release from animism,..."

" Babylonian medicine was transmitted to the Assyrians, then to the Hittites, was spread thence over Asia Minor to the Aegean,..." Ancient Babylonian doctrine spread also thru Syria up to Northern Palestine, where the interchange of ideas between Babylonina and Egyptian medicine was finally effected. The ancient Assyro-Babylonian medicine extended its spheres of influence eastward also and left definite and recognizable traces on Persia before the Persian Conquest.

The Aryan Hindus were far superior to Iranians. He discusses the Vedas and points out the medical writings among them. In One, the Magic Veda there is " a collection of healing and prophylactic doctrine and of magical superstitions that is almost without parallel."

Later, however, in the Atreya and Sasruta there is " encountered a highly organized system of medicine as a tangible product of Aryan intellect, comparable only with Greek medicine in fifth century B.C. It is similar to it in development and in traces of actual physicians." What the Hindus achieved in medicine and surgery is the first great attempt at a systematization of scientific medicine according to the humoral principles, the second thing of the kind being that of Hellenic medical science, which, however was destined to go

beyond the earlier humoral scheme by leaps and bounds."

Sudhoff says the place of China, India and the influences of Egypt and Babylon are rather indefinite at present. The he adduces evidence to like Egypt, Babylon and China and India, Greece. He says " the stages of Egypt-Babylon-China and India-Greece comprise the total medical achievement of the world, in a scientific and historic sense. The notion of China as a totally independent culture must be checked with a large question mark."

Greek medicine grew up independently out of the Babylonian remains on the coast of Asia Minor and is based upon the collective observational material of Mesopotamia. " Greek medicine", however, " even to its roots is a specifically Greek growth" mothered by Ionic natural philosophy.

Humoral pathology came from Babylon- Hippocrates reviewed it and restored by Galen it dominated thought for 1500 years.

Two schools of medicine- Cos and Cnidas developed in Greece. Hippocrates was a member of the Coan school. There was great rivalry between the two schools. Establishment of actual science by Hippocrates and the later schools of Empiricists, Methodists, Pneumatics, Eclectics.

Summary Second period- Foundation of actual science, surgery in India and Greece.

Third and most recent phase

Greek medicine went to Alexandria and thence to Rome. The

The concept Hellenism includes: ancient Egyptian, Babylonian, traces of Indian elements, all coalescing with native Greek strain. This whole complex declined soon after Hippocrates and with the fall of Rome it disappeared completely except for Byzantium which later disappeared.

Then came the period of migrating peoples " from the Indus to the Pillars of Hercules". The East was overrun by the Arabic warriors who invaded Syria, Mesopotamia, Irania, Nile Delta and Alexandria. Everything was translated into Arabic, both from Greek and Persian. This led to the renaissance of Greek medicine under the guise of Arabic.

In Western Europe, there was a terrain of desolation with no cultural centre. Gradually cloistral or monastic schools developed which one by one began the re-discovery and re-translation of Greek medicine.

After the ninth century the school at Salerno was dominating. At Salerno there was great activity in translations from Arabic. This was stopped in the twelfth century when a second wave of Moslem literature started from Toledo. In this Aristotle, Galen and Hippocrates were presented to the West. They dominated Western medicine for several centuries.

Gradually in the various monasteries and schools, translations appeared on natural science and medicine from Greek to Latin and from Arabic to Latin. In this way the whole body of ancient medical literature as we possess it today was made accessible to the West, dominated by Galen.

Gradually a few scholastics like Roger Bacon and Arnold of Villanova led an attack on the Greek knowledge of natural history and medicine. As new medical literature was re-discovered other than that of Galen and which differed from Galen's precepts, doubts arose. Paracelsus "with the hammer of individual experience, shattered the ornate columns of the Galenic temple, declaring the four cardinal humors which had fooled the medical world for 2000 years, to be flights of unreality". He turned to Hippocrates and gradually on observation and experience he built a structure "on which we are at work today".

The third period set in with Paracelsus, Vesalius, Paré and Harvey and extended its influence with Borelli, Sylvius, Sydenham, Stahl, Haller, Morgagni, Bichat and Johannes Müller. "To such a simple formula can the general development of medicine during the three periods be reduced..."

2 Outline of the History of Climate and Tuberculosis

Turning now to the subject of thesis, and with the list of Epochs, earlier presented the following periods are listed:-

1. Period prior to Hippocrates
2. Hippocrates to Galen
3. Galen to the Renaissance
4. Seventeenth Century to 1840
5. 1840 - 1882
6. 1882 - 1908
7. 1908 -

The previous list has been condensed, as the history of

climate and tuberculosis is apparently a shorter one, from the evidence which has thus far been found. Further in the early periods of development only brief sketches and statements have been found, so that whole periods merge the more readily into one another; and therefore it has been found more feasible to discuss the subject in this manner.

The succeeding chapters will pursue the above outline in chronological order, starting with " The Period prior to Hippocrates"

CHAPTER III

THE PERIOD PRIOR TO HIPPOCRATES

" In all branches of science, the need for cultivating the study of their historical development is beyond question."

K. Sudhoff.

The epoch under discussion reaches back countless millenia into the dim beginnings of man's life on the earth, and extends to that point in recorded history which is marked by the first definite establishment of medicine on a scientific basis— in the era which has been characterized as the " Golden Age of Man". As to the length of this period, there is no definite conclusion, other than scientific opinion. But for the purposes of this study it includes the first three Epochs of the list on p. 19, and the first period discussed by Sudhoff in Chapter II.

Up to the Classical Period of Greek medicine, immediately prior to the Age of the Hippocratic Writings, there has been so far produced no direct evidence that climate or a change of climate was used for the cure of tuberculosis. This whole period may be summarily dismissed, therefore, with this statement.

However, it was noted in Chapter II that during this whole period there were apparently two streams of development taking place: one, which is characterized by Sudhoff as " the transcendental process" and the other " the parallel trend of observation." Each had its peculiar characteristics and each had profound effect upon human thought and institutions, though the

former had probably the greater currency.

The trend of observation holds for us the greater interest and it may be well to consider this development for the brief space with the purpose of searching for bits of indirect evidence on the problem. If the search is fruitful, then in spite of the lack of direct evidence, a reasonable assumption may be developed.

Before investigating this interesting problem however, the author wishes to present some recent work which has been contributed by Sudhoff to the history of tuberculosis. In an Essay entitled: "Palaeopathological Problems and Tuberculosis in Pre-Historic Times"¹ he throws some light on the prevalence of tuberculosis in the early ages. He mentions the discovery of a skeleton of the late Neolithic age, unearthed near Heidelberg. "Here a series of vertebrae had been destroyed in a typical manner and the spinal column was consequently ante-flexed. This finding shows how the tubercle bacillus performed its murderous work on the body, even more than a thousand years ago". Excavations made by Jones and Smith in Egypt have conclusively shown "that even during the Pre-dynastic period, tuberculosis of the bones, and probably also of the lungs was fairly common on the shores of the Nile. Of decisive importance was especially the close examination of a three-thousand year old mummy, the results of which swept away all doubt".

1. Sudhoff, K. "Essays in History of Medicine" 1917, pp183-189

" For another important finding we are indebted to the excavations made (Nov. and Dec. 1909) in an old burial place near Dakka on the Nile, in the ancient districts of Dselchis. Of ten excavated prehistoric skeletons, four showed pathologic changes in the spinal column". Between the hypothesis of an epidemic of tuberculosis in a family and the location of a health resort at the place, Sudhoff chooses the former. It has thus been conclusively shown that tuberculosis was a scourge before the Dawn of History. Many writers on tuberculosis have assumed that the disease must have been known in primitive times but the evidence is definite. Whether tuberculosis of the lungs was prevalent may never be known unless a well-preserved mummy should happen to afford the evidence. And the method of cure, if any, may likewise remain a mystery due to the lack of written evidence. Medicine in primitive times was largely demonic in character¹ and it is very unlikely that any rational methods were used. But as Sudhoff says, " Pre-history, the sister of history, is still in her teens". What further research may bring forth to alter this conclusion, is of course unknown.

1. Edwin Smith Papyrus

Turning now to the investigation of the indirect evidence the first has to do with a recent " find " by Prof.

1. Buck, A.H. Growth of Medicine. pp. 6-10
- Sudhoff, K. Essays in Medicine. p.161-167; 171-180

J.H. Breasted¹ of the University of Chicago, who has succeeded in translating a part of the Edwin Smith Papyrus, "An Egyptian Medical treatise of the seventeenth century B.C.", "the oldest scientific book in America and the oldest nucleus of really scientific knowledge in the world". The papyrus is a roll with a length of 184 $\frac{1}{2}$ inches. Its original length was about 196 inches. It is written on both sides with 17 columns on the front and five columns on the back. There are thus preserved 22 columns. The writing is what is known as Hieratic.

The papyrus consists of three parts, from three different sources. The first part is the most interesting as it contains a copy from an evidently older Book of Medicine, 17 columns on the front- an extraordinary book of surgery and external medicine. This treatise stops abruptly and is finished in part 2 and 3 which are entirely different from the first, being entirely magical in character. Breasted concludes that this older part is from a Book of Surgery and Medicine antedating the papyrus itself. It contains 49 case histories showing a detailed and correct anatomical knowledge and a considerable knowledge of disease.

" These cases of organs and tissues injured by intelligible physical agencies form a realm quite uninvaded by magic powers- a realm in which the Egyptian physician gathered the observable facts of anatomy, physiology, surgery and therapeutics, quite

• Breasted, J.H. Bull. Soc. Med. Hist. of Chicago, III
58-78; 1923-1925

unbiased by his inherited traditions regarding the demoniacal causes of 'disease..."

" We have here, then, a group of the earliest recorded observations in natural science made by man. The current view that in all cases Egyptian medical practice invariably employed magic devices, a view in which I formerly shared, is quite evidently wrong."

" I have intentionally given little or no attention in the foregoing brief discussion to the scanty therapeutic, a matter in which the treatise is on the whole not strong. In the healing of wounds and bruises the ancient physician's favorite application was fresh meat, followed after the first day by ointment of honey and as astringent herb. The complete materia medica of the document would make a surprisingly brief and simple list. The attitude of the physician is distinctly that of cooperation with nature¹. Repeatedly he directs the practitioner to undertake no treatment but to put the patient on a normal diet and await results. This is an extraordinarily sane point of view in such an age."

2. Susruta and Caraka of the Ancient Hindus

The second piece of information has recently been furnished by Petersen². He opens his contribution, " We, the inheritors of the Graeco-Roman-Saracen system of medicine, are in the habit of going back to Hippocrates as the founder of that school, in whose works tuberculosis is treated clearly enough,

1. Underscoring my own

2. Petersen, W.F. " Ancient Hindus Knowledge of Tuberculosis"
Am. Rev. of Tuberculosis, III: 500-507; 1919-1920

and a therapeutic regimen is outlined that leaves little room for improvement..."

" Possibly of equal interest, though certainly less known than the Greek and Egyptian systems are the ancient Hindoo views of medicine. Whether the fair Aryan conquerors of India preceded in point of time or were contemporaneous with the stock that spread over the Greek and Italian peninsulas is undetermined. And just how intimate the contact between the early Cretan and Greek and Egyptian cultures was with that of the Babylonians and the Hindoos is equally uncertain. Certain it is that in India a system of medical knowledge obtained at the remotest time; that at least a thousand years before our present era a degree of culture flourished there, which in the traditions of its people was no longer recent and that the written records that are available to us give us a fairly clear picture of Vedic medicine that must antedate all other medical records except those of the Babylonians and Egyptians".

" Of the four Vedas that were revered in Ancient India, the Āyurveda is supposed to have formed an integral part. The Āyurveda (law or knowledge of health) is said to have consisted of one hundred thousand verses arranged in a thousand chapters..." They include the following subjects: major and minor surgery; medicine; demonology; pediatrics; toxicology; and pharmacology; elixirs and aphrodisiacs".

But " two Hindoo compends have come down to us which give the basis of our information to us. These are : Susruta, dating

from the sixth century, B.C. and Caraka and compiled in the first century A.D. Both merely codify the knowledge of former ages. In all the texts, the disease entity phthisis- the important disease- is classified as a distinct illness and the symptomatology described in a manner that leaves no doubt that the ancient physician knew what he was dealing with".

Without going into the long list of causes enumerated by Petersen which include, by the by, sexual excesses, grief, fasting and ulcers among others, we will turn to his discussion of treatment as given in these sources.

Treatment was dietetic. Purgatives and emetics are directly warned against." When the appetite is good nourishing food was recommended, as, flesh of asses, mules and horses, camels and elephants, wildcats, mongoose, rats and birds. These to be boiled with oil, salt and peas. Even wine is allowed and garlic is mentioned. All in all it was a perfectly rational point of view."

" The evidence seems convincing that in ancient India tuberculosis was in evidence from the dawn of history; and that the physician by careful observation had come to know the different symptoms and had developed a therapeutic regimen which must have had some measure of success, obvious from 'the fact that he was willing to assume the care of the incipient case, but refused to undertake the cure of those who were in the advanced stage"¹

What do these recent contributions furnish to the present

1 - Underscoring my own

study? Admittedly they furnish what is convenient to call, "indirect evidence". First, they furnish confirmation to the conclusion that in this period there was a trend of observation which was paralleling the transcendental trend as noted by Sudhoff; second, the Susruta and Caraka discussion furnishes evidence that tuberculosis was definitely recognized by the early physician; third, in two places, isolated from each other there is evidence of a rational medicine, corresponding very closely to the modern sense of the term. This last observation seems quite important. The fact that, midst the transcendental trend with its priesthood-medicine, demonology and all its "trappings" physicians were advising patients in essence "to let nature take its course"; and were exercising dietetic regimen for a disease which must have been to them very complicated and difficult to handle; and to do all this with some degree of success is indeed, amazing.

With such evidence is one justified in assuming that one step further was taken, and "climate" or "change of residence" or "change of air" was ever advised? Before answering this question let us pause a moment longer.

Buck¹ while admitting that the Egyptian therapeutics consisted largely of drugs and elaborate pharmacopoeia, shows that the Eberspapyrus confirms the knowledge of diseases and surgery as shown by the Smith papyrus, mentioned before. Furthermore, "the ancient Egyptians displayed a most intelligent respect for every measure that tended to promote the general health of the

¹Buck, Growth of Medicine, p. 30 ff

community. They took care, for example, to prevent the entrance of decomposing materials into the soil and the ground water; priests skilled in work of this character made careful inspections of all meats that were to be used for food; stress was laid upon the importance of keeping dwellings clean; the people were taught the value of bathing the body frequently, cultivating gymnastics, of clothing themselves suitably and employing the right sort of diet", Still later they were even drinking only filtered or boiled water!

And Baas' says , " In addition the Egyptians maintained a simple mode of life and practised a careful system of nurture and hardening from childhood."

Buck² again says while considering Indian medicine that " all the measures enumerated above (hygienic measures) were subject to modification according to changes in the season, the locality, the weather and various other circumstances."

Thus these other writers indicate an extensive knowledge of personal and community hygiene for these peoples. Which makes the temptation to answer the query in the affirmative all the more inviting. Yet the writer hesitates to do so on the basis of the above evidence. Yielding to historical accuracy the answer must be in the negative. The argument for Egypt's taking the step of prescribing climate for disease and tuberculosis in particular is the stronger of the two, especially when in addition to the evidence already mentioned, one recalls that the Nile was always

1 Baas, History of Medicine, p. 18

2. Buck, p. 23

a tremendous factor in Egyptian history as affording transportation, fertilization for crops and in other ways. Withal, the writer hesitates. The answer must be in the negative until further research brings to light additional evidence so strong as to make the conclusion a compelling one. The above evidence does not seem to meet the test.

Leaving this inviting field of historical speculation let us turn to the close of the period we are discussing where the evidence seems to be more conclusive- the Classical Period of Antiquity.

3. The Classical Period of Antiquity

The extent of the Classical Period in medicine is a bit uncertain but probably refers to most of the period prior to the age of Hippocrates. It is quite beyond the scope of this study to go into detail concerning the first origins of Greek Medicine or even to trace its development to any great extent prior to Hippocrates. In the words of Singer¹ " The material is scanty and the conclusions somewhat doubtful and perhaps premature,..." but " more extended investigation may yield further information as to the sources and nature of the earliest Greek medical writings." This seems to be an accurate judgment as the investigation of some of the standard histories of medicine who go into some detail on this matter has revealed nothing beyond some fragmentary descriptions from the general literature; such as Homer and similar writings. But apparently he also

1. Singer, C : Essay on Medicine in " Legacy of Greece" edited by Livingstone, 1922: 205

is correct when he says earlier in the essay, " But the overwhelming mass of earlier Greek medical literature sets forth for us a pure scientific effort to observe and classify disease, to make generalizations from carefully collected data, to explain the origin of disease on rational grounds and to apply remedies when possible on a reasoned basis" While at the same time " there is ample evidence that the Greeks inherited, in common with many other peoples of the Mediterranean and Asiatic origin a whole system of magical or at least non-rational pharmacy and medicine from a remoter ancestry," all of which is evidence that the two trends which have been already mentioned as working thru this period were extant in Greece.

From another point of view, however, this period holds intense interest. During this period were developed the two great schools of medicine for which Greece has become famous: Cos and Cnidus. Since Hippocrates was a member of the Coan school, and since the methods used in the schools of the period before Hippocrates are extremely suggestive as to a possible origin of the use of climate in medicine, it may be well to briefly trace some of the outstanding points in the history of these schools.

The following outline has been well substantiated¹. Aesculapius has been often considered as the " God of Medicine" but recent research² has made it apparently certain that he was an

1. Singer and Buck

2. Buck p. 50

historical individual who was later deified and the Greeks erected temples in his honor, because of his supposed power of cure and nobility of character. These temples were not mere places of worship but "veritable sanatoria- termed Asclepieia- where the extraordinary healing powers... might be perpetuated to succeeding generations!"¹

The first of these Asclepieia were established in Thessaly; at Cnidas, on the coast of Asia Minor opposite Cos; at Epidaurus in Argolis, Greece; at Cyrene on the northern coast of Libia; at Crotona, on coast of Italy, and finally at Athens. In all about 80 have been verified. The date of the Asclepieion- at Cos is about the sixth century B.C. and that of Cnidus about the seventh century. Originally they were managed by men who were descendants of Asculapius and were priests and physicians. Later, others were added as it became necessary. The secrets of the temple were carefully guarded and were handed down only from father to son.

These Asclepieia have been subjected to recent excavation and the details of their structure etc. have been added to the accumulating knowledge of this period.² These details will not detain us long. But at Cos, Buch says "the climate, the existence of a pure water supply, the character of the building, etc. all contributed to make the temple at Cos one of the greatest sanatoria of ancient times."

1. Ibid p. 50

2. Singer, Essay on Medicine in Legacy of Greece, see note, p.

There was a huge building at Cos, closed on three sides and open on the side facing south which was used for therapeutic purposes with a supply of running water in every part of the building. The source of the water was the Burinna spring high on the mountain in the background beyond all possible source of contamination.

" The means chiefly employed at first for the restoration of health were such simple agents as sunlight, pure air, pure drinking water, dietetic measures, massage, physical exercise etc. and yet, when the patients condition seemed to require their use, there was no hesitation in resorting to the rational employment of drugs and even surgical operations were performed."

All with this rational system was a curious temple worship conducted by the priest or priests described by Buck in detail, based primarily on the prayers to Aesculapius to interfere in the patient's behalf. He also compares this regime to other similar semi-religious movements of more recent times.

Further, Singer¹ points out that " we have actual records that the teachers of Cnidus were accustomed to collect systematically the phenomena of disease..." and that the emphasis of the school of Cnidus was on diagnosis and elaborate treatment while the school at Cos laid great emphasis of prognosis.

Later on he says,- " There is another side of these Asclepieian temples. They gradually developed along the lines of our health resorts and developed many qualities—lovely and un-

1. Singer, Essay on Medicine in Legacy of Greece, see note p.

lovely—that we associate with certain continental watering places. On the good side they formed a great refuge among beautiful and interesting surroundings where the sick, exhausted and convalescent might gain the benefits that accrue from pure air, fine scenery and a regular mode of life. It is more than probable too that the open air and manner of living benefited many cases of incipient phthisis."

While Singer is undoubtedly referring to the times later than the Classical Period, Buck gives a similar description as heretofore noted for the period under discussion.

Here, then, seems to lie the kernel of the origin of the use of climate in tuberculosis. Whereas it is not yet possible to definitely connect the two, we do know that (1) a rational system of therapeutics was developing and had developed to an apparently high level, (2) that these Asclepieia were not only temples of worship but were sanatoria for health; (3) that they were immensely popular; (4) that Hippocrates (as will be shown later) was so familiar with phthisis that he could give an accurate description of the disease, which could only come from long association with and observation of the disease (5) that these resorts or sanatoria were nearly all located distant from the main body of the population (6) and finally the very system of therapeutics itself implies some knowledge of climate and its benefits.

The conclusion that we compelled to make on the above evidence that somewhere (the place not definite but probably at Cos) and at sometime during this period the idea of

climatic cure developed. This conclusion will be supported further by the evidence contained in the next chapter.

4. Conclusions

1. The idea of climate in relation to tuberculosis or disease in general probably did not originate prior to the Classical Age of Antiquity. There is some interesting "indirect evidence" from India and Egypt, recently brought to light but the evidence is still not conclusive.

2. There is strong probability that the relation of climate to the cure of tuberculosis may have been considered in the Classical Period. The evidence is strongly presumptive—much more so than for the prior period.

CHAPTER IV
HIPPOCRATES TO GALEN

Hippocrates, " the Father of Medicine," was born in the Golden Age of Greece. His contemporaries were Pericles, the statesman; the poets Aeschylus, Sophocles, Euripides, Aristophanes and Pindax; the philosophers Socrates, Plato and Xenophon; the historians Herodotus and Thucydides; the sculptor Phidias and his pupils¹. All of this group, which contributed so greatly to the glory of Greece and the Ages undoubtedly had great influence upon Hippocrates. Certain it is that he came in personal contact with not a few of these luminaries.

1. Brief Sketch of Life of Hippocrates

Few of the actual details of the life of Hippocrates are certain² but several facts have been generally agreed upon which may be presented briefly. He was born during the first year of the eightieth Olympiad, or about 460 B.C. according to the modern system of reckoning. Adams³ suggests that on good authority it may even be placed earlier. Apparently he was directly descended from Aesculapius⁴, and his father was a physician at Cos. He thus inherited the traditions of this already famous Asclepicon. Here he undoubtedly received his first glimpse into the treasures of medicine which had been accumulating for a long time and here

1 Adams, F " Genuine Works of Hippocrates, 1886. p. 9 4 Chapt.III

Neuberger, History of Medicine, 1910, Vol.1, p.126-127

2 Adams, Vol. 1 : 8

3 Ibid.

he received his instruction, though Buck¹ states that it is quite probable that he may have also received training at the Cnidian School.

After entering upon practise he left his native home and spent many years in travel. In fact from this period onward he is known to have spent most of his time as an itinerant physician. He visited Thessaly, Thrace, Island of Thasos, Dalos, Scythia, many countries bordering on the Black Sea and Northern Egypt, and, of course Athens. As he became recognized as the leading physician of the age there were naturally many traditions connected with him which are considered of doubtful historical accuracy by most historians, as, for example his curing of a Thracian king of love-sickness, his control of the plague at Athens and elsewhere. Though Adams is inclined to believe that it is quite likely that he was connected with some of the plagues which infested Athens, especially after achieving great renown and also from the fact that he wrote at length on Epidemic Diseases. He died at an age upon which authorities differ, but probably nearly 90 - about 370 B.C. These are practically all the known and certain facts of his life.

2. Hippocratic Collection

Much more is known, however, concerning his life work and his medical contributions. It has been due to this

1 Adams Vol.1 p. 81

knowledge that he has been universally accorded the title of "Father of Medicine." The writings of Hippocrates and his school or followers have come down to us in the form of a group of MSS. known as the Hippocratic Collection. As discussed by Littre', Adams and Jones¹ and others it has been exceedingly difficult to decide and it is by no means certain as yet which of the works are by Hippocrates himself and which are by other writers. Many in the collection are known or at least generally considered to be spurious. Many attempts have been made throughout history to settle the question, the first being that of a commission appointed by Pliny, working in the Alexandrian Library. They more or less complicated matters by inefficiency and general lack of ability. But all are agreed that most of the Collection bears the influence of Hippocrates. His spirit is to be seen in most of them. As a result of the investigations by many minds, the works which have been generally credited with being definitely written by Hippocrates himself have been brought together into two collections in English. The first is that of Francis Adams who presented the work in 1886 to the Sydenham Society of England and the second, by W.H.S. Jones of the University of Cambridge in 1923. In regard to two or three MSS, the authors have differed as to authenticity but out of the 70 or 80 in the original Collection, there are about sixteen which have been agreed upon.

1 Adams Vol. 1; 20 ff
Vol. 1, 1923

Jones, W.H.S. "Hippocrates"

The list includes:-

- On Ancient Medicine
- On Airs, Waters and Places
- On the Prognostics
- On Regimen in Acute Diseases
- On Epidemics, Books I and III
- On the Injuries of the Head
- On Things Relating to Surgery
- On Fractures
- On Articulations
- Mohlicus
- Aphorisms
- The Oath
- The Law
- On the Sacred Disease

The Collection is to be considered, then, as reflecting the opinions and portraying the observations of men other than those of Hippocrates. Considering the fame of Hippocrates; the long period before any attempt was made to ascertain authenticity; and the difficulties attending the weighing of the mass of internal and external evidence it is not to be wondered that the question of genuineness is not yet settled. But for the purpose of the present study, the two collections of "Genuine Works" may be considered as those of Hippocrates himself.

No attempt will be made to emphasize the features of these essays or works. This has been done many times and those who

interested are referred to the detailed comments of Adams and Jones in their works and to writers on medicine. However it is well to note a few of the points upon which their fame rest:

1. The system of Medicine as outlined by Hippocrates rests upon clinical observation- observation of the patient.
2. Medical practice was rational
3. The language is concise and brief.
4. Several case histories are included that are models of brevity and accuracy.
5. Treatment was on the whole, rational. It consisted largely of diet, rest exercise and medicine.
6. There was an extremely high ethical code- evidenced especially by the famous Oath.

On these points especially, the fame of Hippocrates rests. The influence of this collection has lasted even to the present time and many authorities have commented not only on the accuracy of description but on the failure of modern medicine to improve upon some of the methods of Hippocrates.

3. Hippocrates on Tuberculosis

It would be presumptuous on the part of a layman to attempt to criticize the passages in the Collection on phthisis and respiratory diseases. But the purpose of this study is not to describe accurately the medical characteristics of the disease; or to compare the present knowledge with that of Hippocrates. Hippocrates, however, was familiar with the disease entity of phthisis. All authorities are agreed on

the point. Throughout the whole collection, phthisis is frequently mentioned; and many authorities have been astonished at the accuracy of his descriptions.

In order to better indicate his knowledge of tuberculosis, the writer has included a few quotations:-

I From " Aphorisms"¹ one of the most famous of the works:- Sec. III

10. Autumn is a bad season for persons in consumption. Sec.V

9. Phthisis most commonly occurs between the ages of eighteen and thirty-five years.

11. In persons affected with phthisis, if the sputa which they cough up have a heavy smell when poured on coals, and if the hairs of the head fall off, the case will prove fatal.

13. In persons who cough up blood, the discharge of it comes from the lungs.

Sec. VII

16. From spitting of pus arise phthisis and flux; and when the sputa are stopped they die.

II From " On Prognostics"²

17. "Empyema " may be recognized in all cases by the following symptoms; In the first place, the fever does not go off, but is slight during the day, and increases at night, and copious sweats supervene, there is a desire to cough, and the patients expectorate nothing worth mentioning, the eyes be-

1. Adams, Vol.2: 192 ff

2. Ibid. Vol. 2: 194 ff

come hollow, the cheeks have red spots on them, the nails of the fingers are bent, the fingers are hot especially their extremities... These symptoms attend chronic empyemata".

"15. When the pains in these regions (the lungs) do not cease, either with the discharge of sputa, nor with alvine evacuations, nor from venesection, purging with medicine, nor a suitable regimen, it is to be held that they will terminate in suppuration of empyemata such as are spit up while the sputum is still bilious, are very fatal... but more especially if the empyema begin to advance after this sputum on the seventh day of the disease."

In regard to empyema which is mentioned throughout the Collection, in a note, Adams says that most of the cases of pneumonia terminating in empyema were undoubtedly acute phthisis . He confirms this with the judgment of Louis on Phthisis II, and Paulus Aegineta B.III, 32. The ancients often confused the two.

Further quotations might be added but they would be superfluous. There seems to be no question as to the fact that Hippocrates and the physicians of his time were well acquainted with phthisis. Summing up the work of Hippocrates on phthisis, Symes- Thompson¹ said," Hippocrates defined phthisis as supperation and ulceration of the lung, and included empyema, bronchiectasis, abseess of the lung, and gangrene

1. Symes-Thompson, " History of Tuberculosis" Practitioner, Vol.106,p. 426-434,1921

under the same head". And Vaughan, in his Epidemiology of the Respiratory Diseases, p. 411 says, "Hippocrates shows an interesting acquaintance with pulmonary tuberculosis. He believed that this disease might be due to (a) imperfect resolution of pneumonia (b) to homoptysis (c) purulent pleurisy. The many positive references to consumption found in Greek and Roman writings both medical and non-medical establish beyond doubt their full acquaintance with this malady. The contagious aspect of consumption does not seem to have been touched upon by Hippocrates."

4. Hippocrates on Climate

But it is not the fact that Hippocrates accurately recognized phthisis which most concerns us at present. Was any sort of climatic treatment used for this disease? Many authorities have claimed that Hippocrates was not only acquainted with pulmonary tuberculosis but had actually recommended a change of climate for its treatment in addition to the usual regimen which was prescribed in his day. Many others have claimed that climatic treatment originated with the Greeks.

Thus, a few of these statements are here presented from several hundred which might have been chosen:-

1. Kretzschmar, P.H.¹ "Of all the manifold ways which have been employed to relieve pulmonary consumption of its

1. Kretzschmar, P.H. "Public health resorts vs Institutions for the treatment of Bacillary Phthisis" Trans. Am. Climat. Assn. V: 69-83

terrible effects upon the human race, none is as old, and none has had more earnest supporters than climatotherapy. Hippocrates already considered change of residence as beneficial."

2. Flick, F.L.¹, "Hippocrates, five hundred years before Christ taught that consumption was a w^eather disease. Wet seasons damp winds and sudden changes in temperature were blamed. Hippocrates reflected the views of the ages before him."

3. Fishberg, M. "Climatic treatment of tuberculosis is probably older than any other method which has survived the recent advent of scientific medicine. The ancient Greek and Roman, as well as the mediaeval Arabic physicians were great believers in the efficacy of certain climates in the control and treatment of phthisis".

4. Simons, M.³ "the pine forests of which are described by Hippocrates as being dry and arid, yet refreshing to invalids."

5. Barlow,⁴ W.J. discusses phthisis as a either disease in the days of Hippocrates.

6. Barnard, and Loir⁵ "Hippocrates summed up the effects of climate on man as 'The ensemble of usual atmospheric conditions characterizing a geographic situation in its relation

1. Flick, F.L. "Consumption a Curable and Preventable Disease", 1903, Chapt. XV
2. Fishberg, M. Pulmonary Tuberculosis" 1922, Chapt. 38
3. Simmons, M. Climate in Relation to Consumption". Am. J Med. Sc. 1872, n.s. 63: 82-96
4. Klebs, "Tuberculosis" 1909, p. 680
5. Bernard & Loir: La mer et les tuberculeux. Presse méd 57:597
Also Abstr. of Tuberculosis. Am. Rev. of Tub., II:45,1925

to the inhabiting organisms".

With a view to checking up the statements of these authors and also for the purpose of ascertaining exactly the views of Hippocrates on the subject of climate, the writer turned to the original treatises as contained in the two volumes already noted. It is perfectly clear that it is necessary to obtain his exact views on the subject: if climatic treatment was used at that time, it is the first definite record we have of its use.

The following evidence is therefore presented regarding the views of Hippocrates on the subject of climate in its relation to tuberculosis and disease in general:

I From the treatise, "Airs, Waters and Places,"¹

"1. Whoever wishes to investigate medicine properly, should proceed thus: in the first place to consider the seasons of the year, and what effects each of them produces (for they are not all alike but differ much from themselves in regard to their changes). Then the winds, the hot and the cold, especially such as are common to all countries, and then such as are peculiar to each locality. We must also consider the qualities of the waters, for as they differ from one another in taste and weight, so also do they differ much in their qualities. In the same manner, when one comes into a city to which he is a stranger he ought to consider its situation, how it lies to the winds and

. Adams, Vol. i, p. 156ff

the rising of the sun, for its influence is not the same whether it lies to the north or the south, to the rising or to the setting sun. These things one ought to consider most attentively, and concerning the waters the inhabitants use, whether they be marshy and soft and hard, and running from elevated and rocky situations, and then if saltish and unfit for cooking; and the ground, whether it be naked and deficient in water, or wooded and well watered, and whether it lies in a hollow, confined situation, or is elevated and cold;..."

"2. For if one knows all things well, or at least the greater part of them he cannot miss knowing, when he comes into a strange city, either the diseases peculiar to the place, or the particular nature of the common diseases, so that he will not be in doubt as to the treatment of the diseases,..." And in particular, as the season and the year advances, he can tell what epidemic diseases will attack the city, either in summer or in winter, and what each individual will be in danger of experiencing from the change of regimen. Having made these investigations and knowing beforehand the seasons, such a one must be acquainted with each particular, and must succeed in the preservation of health, and be by no means unsuccessful in the practice of his art. And if it shall be thought that these things belong rather to meteorology, it will be admitted, on second thoughts, that astronomy contributes not a little, but a very great deal, indeed, to medicine. For with the seasons the digestive organs of man undergo a change."

"3. A city that is exposed to hot winds(these are be-

tween the wintry rising and the wintry setting of the sun) and to which these are peculiar, but which is sheltered from the north winds; in such a city the waters will be plenteous and saltish, and as they run from an elevated source, they are necessarily hot in summer and cold in winter;..." He then mentions some of the diseases likely to occur in such places, among them " chronic fevers in winter."

"4. But the following is the condition of cities which have the opposite exposure, namely, to cold winds, between the summer settings and the summer risings of the sun, and to which these winds are peculiar, and which are sheltered from the south and the hot breezes." After enumerating a few general effects of the climate: " The diseases which prevail epidemically are pleurisies, and those which are called acute diseases. Phthisis frequently supervenes after childbirth for the efforts of it frequently bring on ruptures and strains."

"5. Cities that are exposed to winds between the summer and the winter risings of the sun, and those opposite to them have the following characters: Those which lie to the rising of the sun are all likely to be more healthy than such as are turned to the North, or those exposed to the hot winds,..." He then proceeds to discuss at length the reasons therefor and his observations.

"6. But such cities as lie to the west, and which are sheltered from winds blowing from the east, and which the hot winds and the cold winds of the north scarcely touch must necessarily be in a very unhealthy situation:..." He discusses

this at length. " So it is with regard to the winds that are conducive to health, or the contrary."

In section 7,8 and 9 he discusses fully the effects of good and bad water upon the health and marshy and dry soil.

" 10. And respecting the seasons, one may judge whether the year will prove sickly or healthy from the following observations; He then lists many observations and notes the prevalence of certain diseases with the seasons. He discusses the frequency of catarrh, pleurisy, pneumonias etc. at certain seasons. " But if the summer is parched and northerly, but the autumn rainy and southerly, headache and-- are likely to occur... and in some cases, consumption."

For the rest of the treatise he discusses the effects of climate upon the various races of Europe and Asia as he found them in a remarkably clear and concise manner. The nature of this discussion may be indicated by the following brief quotation from his concluding paragraph: " Such as inhabit a country which is mountainous, rugged, elevated and well watered and where the changes of the seasons are very great are likely to have great variety of shapes among them. and to be naturally of an enterprising and war-like disposition..; but such as dwell in places which are low-lying, abounding meadows and ill ventilated and who have a larger proportion of hot than cold winds and who make use of warm waters- these are not likely to be of large stature nor well proportioned, but are of a broad make, fleshy and have black hair..; courage and laborious enterprise are not naturally in them.."

II From Book I- Of Epidemics¹

Sec. I- Constitution First

He discusses some epidemic diseases in Thasus after discussing in detail its climate.

" 2. Early in the beginning of spring, and through the summer and towards the winter, many of those who had been long gradually declining, took to bed with symptoms of phthisis; in many cases formerly of a doubtful character the disease then became confirmed; in these the constitution inclined to the phthisical. Many and in fact the most of them died..." Consumption was the most considerable of the diseases which then prevailed, and the only one which proved fatal to many persons" He then discusses the symptoms- and finally " of all those which are described under this constitution, the phthisical diseases alone were of a fatal character; for in all the others the patients bore up well, and did not die of the other fevers."

Sec. II, Constitution the Second

" During the autumn, and at the commencement of winter, there were phthisical complaints, continual fevers" etc.

III From Book III- Epidemics

In this work he frequently mentions phthisis much in the same manner as heretofore:-

Sec. III, Constitution 2

13. The greatest and most dangerous disease and the one

1. Adams, Vol. 1, p. 293 ff

2. Vol. 2, p. 211

that proved fatal to the greatest number was the consumption. With many persons it commenced during the winter, and of these some were confined to bed, and others bore up on foot; the most of those died early in spring who were confined to bed; of the others the cough left not a single person,..."

IV. From "Aphorisms"

" Sec. III

" 1. The changes of the seasons mostly engender diseases, and in the seasons great changes either of heat or of cold, and the rest agreeably to the same rule"

" 2 Of natures, some are well-or ill adapted for summer and some for winter.

" 8. In seasons which are regular, and furnish the production of the season at the seasonable time, the diseases are regular and come regularly to the crisis; but in inconstant seasons, the diseases are irregular and come to a crisis with difficulty.

"9. In autumn diseases are most acute and most mortal on the whole. The spring is most healthy and least mortal."

And so he continues throughout the section.

V. From "Breaths"¹

"3. Now bodies, of men and of animals generally are nourish-

1. Jones, Vol 2, p. 219 ff
"Breaths" is not considered to be a part of the original work of Hippocrates. It is representative of the collection, however.

ed by three kinds of nourishment, and the names thereof are solid food, drink and wind. Wind in bodies is called breath, outside the bodies it is called air." He then discusses the power and qualities of air.

" 4. How air, then, is strong in the case of wholes has been said, and for mortals too this is the cause of life and the cause of disease in the sick".

" 5. Now I have said that all animals participate largely in air. So after this I must say that it is likely that maladies occur from this source and from no other.

6. Herein he mentions that epidemic and sporadic fever are both caused by air. " Now epidemic fever has this characteristic because all men inhale the same wind; when a similar wind has mingled with all bodies in a similar way, the fevers too prove similar. So whenever the air has been infected with such pollutions as are hostile to the human race, then men fall sick but when the air has become ill- adapted to some other species of animals then these fall sick."

From here on he discusses the relation of air to several diseases, including dropsy, fevers, chest hemorrhages, epilepsy, apoplexy.

He concludes:-

"15. So breaths are seen to be the most active agents during all diseases; all other things are but secondary and subordinate causes. If indeed I were to speak of all maladies, my discourse, while being longer, would not be in the least

more true or more convincing".

VI. From "Precepts"

The last sentence of the treatise reads." A wooded district benefits"

Though the list of quotations might be extended, the writer feels that those sentences of the most representative works of Hippocratic Collection which bear most directly upon the problem have been included.

5. Conclusions

1. It seems apparent that Hippocrates and the other writers of the Collection recognized a relation between some of the meteorological elements and the course of certain diseases.

E.g. Wind, sunlight, moisture.

2. It also seems apparent that the seasonal influence of the weather upon certain diseases was recognized.

3. In particular, phthisis was observed as being most prevalent in autumn.

4. Phthisis mortality was observed as being higher in certain seasons of the year, particularly in the spring.

5. The epidemic character of certain diseases was related to seasons.

6. Wooded districts were considered to be beneficial in the treatment of disease.

7. The atmospheric air was considered as one of the causes

1. Jones, Vol. 1, p. 313 ff
Precepts was also probably not the handiwork of Hippocrates. It is a representative work, however

of disease.

3. No definite reference was found to the effect that a change of residence, or a change of climate was advised in the cure of phthisis.

6. Later Writers of the Period on Tuberculosis

1. Aristotle (384-322 B.C.)

¹
Young says: " In the works of Aristotle , who flourished about a half century later than Hippocrates, we find the earliest traces of the opinion, that consumption is an infectious disease. In the eighth section of Problems he inquires ' Why are consumptions, psora, and op^hthalmia, communicated to those who approach near to the person affected by them white dropsy, fevers and apoplexy are not communicated in the same manner... and because consumption makes the breath corrupt and offensive; but those diseases are most easily communicated in which the breath is so vitiated,.as for example, in the pestilence; and those who approach the diseased person, breathe the air thus affected, and acquire the same disease which has vitiated it, as if it had been vitiated by their own respiration."

2. Celsus² (27 B.C.014 A.D.)

" In genuine consumption, a long voyage, with a change of climate, is advisable if the strength allows it; and Alexandria is generally preferred; a shorter voyage may be tried if the strength is much reduced; or the motion of a coach or chair."

1. Young, T." A Practical and Historical Treatise on Consumptive Diseases" 1815 London p. 121
2. Young, p. 126

Young says of Celsus: "Diet, carriage exercise, sailing and gruel were the principal remedies." Barlow¹ has given a translation of the passage, "' But if the distemper is more violent, and there is true phthisis, it is not easily overcome. If the patient's condition allow, he must take a long sea voyage, change his climate, taking care to remove to a grosser one than that he leaves, and therefore from Italy to Alexandria is a very agreeable change... If the weakness will not admit of that, it is very proper to sail in a ship, but not too far; but if any circumstances render the sailing unfit, the body must be removed to a litter or some other way."

3. Pliny, the Elder² (1st century A.D.)

" The elder Pliny enumerates a variety of specifics for consumption, with an almost superstitious credulity...he observes that ' woods affording an abundance of resinous effluvia are very beneficial to the consumptive, even more so than a voyage to Egypt, or a course of milk in the mountains³".

4. Aretaeus(probably first or second century A.D.)

Young³: " We have no means of judging of the date of Aretaeus' writings; but there is something in the stile, which inclines us to place him within a moderate interval after Hippocrates." But Buck⁴ places him in second century A.D.

In regard to the views of Aretaeus on the treatment of consumption: " For the cure of consumption sea voyages are

1. Klebs, " Tuberculosis" 1909, p. 681

2. Young, p.128

3. ibd, p. 122

4. Buck, p. 144

much recommended; the saline particles appearing to dry up the ulcers; and afterwards the liberal use of ointments; Milk is to be taken as largely as the stomach will bear it; this fluid is agreeable to the taste, and congenial to our habits from infancy; it is pleasing to the eye, and demulcent to the trachea; it expands the bronchiae, raises the phlegm, facilitates respiration and glides easily downward... and is every way more friendly than any other food, serving at once for nourishment and medicine... Fresh eggs boiled soft are also a good article in the diet of the consumptive."

Up to the time of Galen, we have enumerated four writers on tuberculosis who either recommended a change of climate specifically or at least were familiar with such a regime; and one who very definitely recognized the infectious character of the disease and who from the nature of his writings would not discuss the treatment of the disease. Aristotle, however, very probably connected climate and disease, as he writes at considerable length on meteorology¹

7. Medical Developmentsof Period

After the death of Hippocrates, physicians became divided into groups, Medicine lost the unity which it had during the Age of Hippocrates, and various theories took predominance. The center of medical interest changed to Alexandria where two famous anatomists Erasistratus and Herophilus and

1. Loves, "Aristotle's Researches in Natural Science", Chapt.III

and practitioners laid the foundations for schools which flourished for a time. Alexandria's leadership lasted from 305 B.C. to about 117 B.C., when Ptolemy Euergetes drove the physicians from the city and closed the schools. Then under the leadership of Asclepiades, a Greek philosopher and physician the center of medicine went to Rome- about 90 B.C. A new sect was established with his entrance to Rome, his method of treatment consisting largely of " abstinence of meat, use of wine under certain well- defined circumstances; massage and frictions; baths of various kinds; walking; driving and being carried about in the open air in a litter or in a boat on a quiet river or in the protected harbor." He did this to open the pores. The History of Medicine at Rome in the early Christian era was the history of sects. Aretaeus was a member of Pneumatists; but Celsus and Pliny do not seem to have attached themselves to any particular school. New facts, beyond those mentioned by Hippocrates were constantly being added to the existing body. Such was the situation at the close of this period when Galen appeared to exercise an influence upon the course of medicine nearly equal to Hippocrates himself.

8 Summary of the Period's Contribution

1. Hippocrates recognized the influence of climate upon the course of disease and the mortality from disease; and especially so as regards phthisis.

2. Aristotle recognized the infectious character of phthisis.

3. Celsus is the father of the idea of recommending sea voyages for phthisis.

4. Pliny the Elder probably shares with some unknown writer of the Hippocratic Collection the fame for discovery of the beneficial influence of forests.

5. Aretaeus was a disciple of Celsus in his treatment of phthisis.

CHAPTER V
SOME FACTORS IN THE ORIGIN AND DEVELOPMENT OF CLIMATE
THERAPEUTICS

With the end of the first century of the Christian era the Early Period in the history of Climate in Relation to Tuberculosis was brought to a close. It was a period characterized by meagre evidence and slow development. But from this point on through the remaining periods the evidence accumulated rapidly and became more complex, particularly in the era of Modern Medicine. Hence, before continuing with the historical outline it has been thought advisable to consider the problem of Climate and Disease in the light of factors which entered into its development. In so doing the accomplishments of not only this Early Period but those of succeeding eras will be more readily understood.

The following facts were established in Chapter III and IV:

1. The establishment of Asclepieia and their later development into institutions similar in character to our modern health resorts (Classical Period)
2. The recognition of the influences of climate and season upon the prevalence of and mortality from certain disease especially phthisis(Hippocratic Collection)
3. The actual recommendation of a " change of climate" and sea voyages in the treatment of phthisis (Celsus)

The importance of these contributions to the therapeutics and the control of certain diseases, especially those of in-

fectious character is emphasized when it is recalled that all three have continued even to the present time, though with varying degree of popularity, understanding and emphasis on the part of the medical profession and laity alike.

But upon further study of the above list two questions naturally arise: First are the facts related to each other? In other words was there a gradual evolution from the first stage to the third? Second, Is there any significance in the fact that according to the evidence now at hand the sea voyage was the first method to be used in the climatic treatment of phthisis? The answers to both questions can be made with assurance and satisfaction only when we turn to the consideration of the broad development of the periods under discussion, giving special attention to the economics factors.

It has already been noted, (p) that by the fifth or fourth century B.C. the Asclepieia had become very popular but Gulick¹ has also mentioned this fact: " Hence, both in Athens and elsewhere..., the precinct of Asclepius became a kind of sanatorium, thronged with patients who devoutly lay at night in or near the temple waiting for the dream that should give the directions required. The temples of Asclepius usually stood in healthful regions, sometimes near mineral springs; and though the cure was always² regarded as the miraculous intervention of the ' kindly ' god it was doubtless furthered by

1. Gulick, " Life of Ancient Greeks" Chapt. XXI
2. In view of the discussion of this point by Buck the statement probably should not be so strong.

wise prescriptions given by the priest in regard to diet, fresh air, exercise and legitimate amusements."

In order to explain this popularity along with the questions already noted, the following facts are presented.

1. Medical Profession of Greece and Rome

A. Greece

Baas¹: " It should be remarked at the outset that the medical profession among the Greeks, as among the Orientals was always held in great respect. Moreover both before and during the age of Hippocrates the practice and social position of physicians were in many respects very similar to those which exist among us. There were also medical professors and students though the former limited their activity to private teaching. Moreover there were physicians appointed by the state... These might be called State physicians. Besides these there were physicians chosen and paid by certain communities for the special purpose of taking care of the poor free of expense, There were often court physicians who practised, often with high salaries at the court of foreign tyrants or kings. Finally there were army and navy surgeons."

Neuberger²: " From Homer's time and onwards, poets and historians make mention of lay physicians who freely exercised their profession untrammelled by temple medicine. In very early times the custom arose for communities to appoint offi-

1. Baas, "History of Medicine", p. 94

2. Neuberger "History of Medicine," p. 97

cial positions whose duty it was, for a fixed salary, to attend the poor gratis, to make the necessary sanitary arrangements in presence of epidemics... Three types of physicians were distinguished:- 1. Simple practitioner (2) The Master (3) Dilettante amateur."

The picture which is obtained in these discussions is that the medical men of those days were more or less professionalized. It should be especially noted that a distinction between the rich and poor was evidently made.

Hippocratic Collection : ¹ " I urge you not to be too unkind but to consider carefully your patients superabundance or means. Sometimes give your services for nothing, calling to mind a previous benefaction or present satisfaction." Even in Hippocrates' time the private physician was called upon for charitable work and to exercise discretion in regard to fees. The essential point is that there was a community and professional regard for one's ability to pay.

2. Colonization.

It has already been stated that the Asclepieia were apparently located in favorable localities with respect to climate, water and other advantages and that there were a great number established several authorities giving estimates as high as a hundred². That the factor of colonization entered into this development may be judged from the following citations:-

1. Jones, Vol. 1, p. 319

2. Whibley, " Companion to Greek Studies, p. 559

Zimmern¹: " We have seen that the growing Greek states were faced in the eighth and seventh centuries with the problem of over-population in its acutest form... In the course of these two centuries the Mediterranean, from Spain to Crimea was girdled with a ring of cities sent out from Greece and Asia Minor.

A Greek colonizing expedition was not a private venture of individuals or groups of individuals but embodied a carefully organized scheme of State-promoted emigration. A Greek colony was not primarily a trading centre. The basis of its economy was agricultural,... It was only through the chances of later development that some of them like some of their parent cities attained commercial importance.

Whibley²: " The first beginnings of Greek colonization may be fairly traced to the migrations... This expansion was followed, throughout the Greek world by a period of internal development, political and economic; until there ensued by a natural reaction, a second age of expansion, which lasted from the middle of the eighth to the middle of the sixth century and resulted in the foundation of some 250 colonies... The Colonies of the second epoch were the results partly of necessity, partly of enterprise. Sometimes colonization became necessary for political or economic considerations, as a relief from foreign or domestic tyranny, from deadlock between parties, from over-population, debt and slavery."

1. Zimmern, A.E. " Greek Commonwealth", Chapt. VI

2. Barker, E. in Legacy of Rome, C.Bailey editor, 1924, p.56

And further, Whibley observed," The colonial life had its short-comings; successful trade led to money-worship and an acuter antagonism between rich and poor, while luxury wrought frequent disintegration."

The following points should be emphasized:- first, the period of colonization in Greece coincided with the development of Asclepieia; second, the colonization was extensive; third one of the great effects of this expansion was to increase the wealth of Greece and to emphasize further the difference between the rich and poor.

3. Commerce.

Whibley¹: " But it was obvious that the Greeks, with their natural affinity for the sea, their geographical advantages and their imitative propensities could not long remain merely passive partners in these rough and ready transactions" (barter in days of early navigation)" He then states that with the internal development of Greece and with her 250-colonies around the Mediterranean, there was a rapid expansion of commerce until in the fifth century B.C. Greek commerce was flourishing.

Zimmern:² - "It was not easy, however, to do much trading by land. The country was too rough and the roads too bad. For in the Greek area at any rate the sea is the natural medium of travel". He then proceeds to outline the typical trading operations of the period: " With these difficulties in view let us watch our merchant at his work. He will set sail

1. Whibley, p. 427
2. Zimmern, Chapt. XI

from Athens or Corinth when the winter storms are safely over, on a 'round' ship of his own or one placed at his disposal by a body of friends or subscribers manned by a small crew of twenty citizens or resident aliens who welcome the outing for a change and for a chance of rowing and steering practice... His first destination is a line of ports and landing places in Italy or Syria. But he has no fixed orders or programme, still less a time table and he is quite free to change his course as the wind or a whim or some opposition leader among the crew or a piece of news from a passing boat may chance to direct. So he will move about on the familiar roads of the Mediterranean as a distributor or public carrier."

Barker¹ states in regard to the Roman commerce-

" By a process of commercial expansion, which gave her trading citizens the monopoly of Mediterranean trade at the expense of Carthage in the West, and of Corinth and other centers in the East, she had become virtual mistress of the Mediterranean littoral in the middle of the second century"(B.C.)

The points to be especially noted in the discussion on Commerce are: first, the association of commerce with colonization and the expansion of Greece; second, the slow, desultory method of conducting commercial enterprises; that the commerce of Rome had dominated the Mediterranean after the second century B.C.

4. Travel and Modes of Travel

Gulick¹ states that " with the increase in trade and

1. Gulick, Chapt. XIX

numerous military and colonial enterprises undertaken across the Aegean in the fifth century, there grew a desire for travel and exploration such as had never before existed in the heart of the Greek. If the traveller purposed to take a sea voyage he must wait until he heard of some vessel going to the port nearest his destination, since there was no regular packet service. The traveller went to the skipper, got his consent to travel on board and arranged with him how much he was to pay his fare..."

¹ Whibley observes that the travel routes commonly used were: a northern route from Aegina, Corinth and Athens to the Black Sea; a northeastern route to Phocaea and other places; an eastward route to Miletus and Ephesus; and a westward route to Italy.

² Stevenson has written a few remarks on sea travel in the Roman period: " Ancient ships were indeed very much at the mercy of winds and waves. The Mediterranean was practically closed to navigation between November and March and it was only between the end of May and the middle of September that sailing was considered safe. Rapid travel by sea from Italy to Alexandria was only possible in the height of summer,... The best authorities think that the average duration of the voyage from Alexandria to Putioli was fifty days even in summer." And elsewhere in the same chapter, " Under the Roman rule the world was only economically but politically one. No barriers of race or language prevented free intercourse."

1. Whibley, p. 428

2. Bailey " Legacy of Rome", p. 163, 4

5. Pleasure-Boats. In regard to the ownership and use of pleasure-boats by the Greeks, the writer was not successful in establishing the fact. Since there was apparently a development of economic wealth among the citizens of Greece as the result of her economic expansion, it would only be natural that some of the surplus would be devoted to luxuries. And such was the case, but pleasure-boats, on the basis of present evidence, were not developed to a great extent, at least to the point where records were made of the fact. It was established very certainly by Torr¹ that there were numerous small vessels during this period, some of which were merchant- vessels and others whose use is not mentioned. Several prominent authorities of Greek civilization were consulted on the matter, but they were equally unable to furnish any evidence. The nearest approach to the establishment of the fact was found in the opening statement to A.H.Clark's treatise "History of Yachting":-

"Pleasure-craft, or what we know as yacht, have existed among maritime nations from the most remote period; but the records of these gorgeous vessels of antiquity have perished, except in fragments to be scattered here and there among the writings of ancient authors. Later on he says that Chapter XXVII of the book of Ezekiel" is one of the most ancient records of the most ancient records of shipping bequeathed to us, and bears testimony to the great antiquity of pleasure craft."

1. Torr, Ancient Ships, Appendix

In regard to the Roman pleasure-craft, it is general knowledge that during the Empire period the ownership of private pleasure-craft was common among the upper classes and Torr (see note on previous page) points out that even passenger boats were run to various parts of the Medeterranean beginning with the first century B.C.

The Economic Factor in Climate Treatment of Phthisis

On the basis of the foregoing evidence an attempt will be made to answer the questions raised at the beginning of the discussion; namely, was there an evolution from the period of the development of Asclepieia into health resorts and Second: Is there any significance in the fact the sea voyage was the first method to be used in the climatic treatment of phthisis?

The growth of Asclepieia into health resorts coincided with the economic expansion of the Greek civilization. This economic expansion was based largely on colonization and commerce. It was noted that both developed very rapidly and very extensively. The effects of this expansion were to increase the knowledge of the people in regard to the several localities on the Aegean and the Mediterranean; to develop the means of transportation and to increase the wealth of the community. It was inevitable that people sought other climes, whether ill or well. As to the classes of people which went these ancient sanatoria, evidence is not clear. Apparently the poor went as well as the rich, for it is

known that the resorts were popular and the writer in the Hippocratic Collection recognized a distinction between rich and poor patients. Assuming that the writer was an associate of Hippocrates and that he was attached to his school and Asclepieion at Cos there is justification that both classes sought relief there. But the evidence for this is scanty.

The observations made by Hippocrates on the seasonal and climatic influence on disease were the result of his extensive travels. A comparison of the places visited by Hippocrates with the list of important sea routes of shipping indicates a very close relationship. This fact is a confirmation of the fact that travel took place along the planes of shipping in those days and also that the economic development of Greece was largely responsible for this particular contribution. Without the means of travelling, it is very unlikely that his observations would ever have been made. It should also be noted that he visited Egypt during the course of his travels.

With the transfer of the supremacy over the Mediterranean from Greece to Rome there was a still greater expansion of commerce and colonization. The Roman Empire was more extensive and the demands were greater. The basis of Roman commerce was the Greek shipping and merchants. Until the Christian era most of the commerce of Roman was conducted by Greek merchants. It is especially significant that Roman colonization and commerce developed first in the Eastern Mediterranean. The sea was made safer and intercourse was

made freer by Roman genius and military powers.

Thus, with the development of the means of transportation to the point where passenger vessels regularly plied around the Mediterranean; with the increase in wealth as the result of colonization and commerce; with the increase in the knowledge of the various parts of the world, it is not strange that the sea voyage was recommended in the treatment of disease or that a change of residence to Egypt was advised as well. If, in addition to these developments there is considered also the fact Hippocrates mentioned Egypt and then later Celsus, a well-versed of the Hippocratic Collection and traveller with even wider experience than Hippocrates, recommended Egypt there seems to have been a direct personal relationship between the two periods by way of the literary heritage.

The conclusion to which we are forced, on the strength of existing evidence is that in accordance with the economic development of Greece and Rome the stage was set, so to speak not only for the origin of the Climatic Treatment of disease but for its continuance after it was once started. There was a gradual evolution from one stage of its development to the succeeding stage, culminating in the recommendation of the sea voyage for the treatment of phthisis.

After the writer had come to the conclusion just stated he changed upon the following observation made in 1892 by

1
W.E.Ford : " In the early history of every country the conditions are such, as to the distribution of wealth, the need of universal industry and also the absence of ready means of communication, as to preclude anything like climatic treatment of diseases. As communities become older and more wealthy the proportion of those who are able to seek health in new climates rapidly increases;... In the process of the development of the country those who suffer from lung trouble are probably the first talked of as patients for climatic treatment... "

In conclusion, if a change of climate presupposes a knowledge of climates, ready means of transportation and the ability to pay for the same, the economic development in this Early Period in the History of Climate Treatment furnished these necessary requirements.

1. Ford. W.E. " The Element of Change, Per Se. In the Climatic Treatment of Disease. Trans. Am. Climat. Asso. 9:89-96 - 1892.

CHAPTER VI

GALEN TO THE RENAISSANCE

Claudius Galen was the last of the brilliant figures of medical writers who made such valuable contributions during the Graeco-Roman civilizations. It would have been logical to include him in the Age of Hippocrates, more especially as he made elaborate commentaries on the works of Hippocratic Collection and other works of the earlier periods. Yet the influence of Galen, attested by the tremendous popularity of his collection of MSS, was of such a dominating character in the field of medicine during the latter part of the Middle Ages and just prior to the Renaissance that it has seemed advisable to place him at the beginning of the era.

1. Contributions on Climate

The following comments were made on the subject of climate and tuberculosis during this period:-

1. Claudius Galen (131-201 A.D.)

Young¹: " The Treatment of pulmonary consumption is fully considered in the fifth book of the *Method of Healing*" He then proceeds to describe an actual case. " He was directed to lie on his back, and hold a styptic medicine in his mouth, and he was sensible of its effect, acting either directly or by transmission, but he thought he perceived that the action was direct. After a short time he sailed down the Tiber, and in four days more he arrived at Stabiae, and used the milk of

1. Young, T. *History of Consumptive Diseases*: p. 140

that place, which is not unjustly celebrated. The air of Stabiae is dry, the pastures healthy, the hill is of moderate height, three miles from the bay of Naples, sloping gently to the west. It is near Vesuvius, which makes the air still drier, by means of its volcanic heat, and defends it from the northerly or rather north westerly winds. Such a hill might be chosen in any other country, not facing north, providing such vegetables as afford a good and astringent milk..” At Stabiae cows’ asses’ and goats’ milk as well as woman’s milk was used in the cure.”

Later writers- Kretzschmar, Jex-Blake, Barlow, Symes-Thompson and Simons- whose papers have been included in the bibliography at the end of the thesis all refer to the recommendation of Galen for dry, mountainous air and milk diet.

2. Caelius Aurelianus¹ (4th and 5th century A.D.)

Young²: Sailing, especially to a distant climate, and reading aloud are good exercises. He observes that some of the Methodists call it a disease of stricture, others of solution but the most approved authors think it a mixture of both. Where stricture seems to prevail, he enjoys abstinence for three days, rest and warm clothing and a residence in a light situation and mild climate; where solution, a dark and cold place is preferred, and as the cure advances a change of residence especially to the sea-side.”

1. Ibid. p. 148

2. Ibid p. 153

3. Avicenna¹ 980-1037 A.D

In commenting upon the works of writers after Galen, both Greek and Arabians, they " consist principally of abridgments and extracts from the voluminous writings of that author."

"Avicenna observes with respect to pulmonary ulcers that they are always dangerous... that consumption is most common in cold countries: he recommends a dry air and milk diet for its cure; but in general he adheres closely to Galen."

Dinguizle² examined the writings of the great Arabian physician and came across an interesting account of tuberculosis and its treatment. Avicenna regarded tuberculosis as a general consumptive disease capable of producing ulcerous eruptions in different parts of the body, which, if localized in the respiratory organs, constituted pulmonary tuberculosis, or pulmonary phthisis. Concerning treatment, he extolled direct action upon the ulcers by injections of liquids and a milk cure, consisting of asses' or goats' milk, uncontaminated, and as pure as possible. He also insisted upon the influence of open air treatment and upon psychic care.

4. Paulus Aegineta³ seventh century A.D.)

Barlow says that Aegineta wrote in seventh century of the present era and laid special emphasis on pure air and the fact that the different qualities, such as heat, cold, dryness, or humidity have not the same effect on all, that it

1. Ibid p. 153

2. Dinguizle, " An point d'histoire medicale. les conceptions d' Avicenne sur la tuberculose et son traitement" Abstr. of Tub. 7: 9-10, 1923

3 Kleb, Tuberculosis p.981

is a matter of temperament with regard to the benefit derived."

Young, however, in his discussion of Aegineta does not mention such definite characteristics in his (P.A.) method of treatment. It corresponded more closely to Galen or the other Arab physicians.

5. Fifteenth-~~S~~ixteenth Centuries

Young¹ makes the following remarks on the writers at the close of the period: "The medical authors of the fifteenth and of the first half of the sixteenth century, seldom ventured to deviate very materially from the doctrines and practice of the ancients; although many of them faithfully registered the facts which they observed and contributed in this manner to the improvements which were made by their successors." This judgment is apparently sound, and is verified by the discussion of Buck and Baas on the medical history of the Middle Ages.

2. Summary of Contributions

1. Galen, instead of recommending the long sea voyages as was done by Celsus apparently advised his patients to take short trips on the Tiber or to near-by watering-places or to a dry climate in the country where milk was to be obtained.

2. Aurelianus recommended the long sea voyage and a residence at the sea-side.

3. The Arab physicians and the physicians at the close of the period followed the doctrines of Galen very closely,

though Avicenna one of the leading physicians of the "Arab renaissance" event so far as to emphasize the purity of air.

3. Factors in the Development of the Period

The fact that Galen did not recommend the long sea voyage calls for some attention and it can be explained in the light of Galen's experience and some economic factors of the period. Galen according to Buck¹ was born in Rome, travelled extensively throughout the Mediterranean during the early years of his manhood but later became the leading physician of Rome, becoming physician to Emperor Marcus Aurelius and enjoying a wide practice among the noble and upper classes of society. He was of the intellectual elite of Roman Society and undoubtedly his patients were for the most part of the same group.

Furthermore, Fowler on page 248 of his "Social Life at Rome" says: "Every man had to provide his own 'health resort' in those days: there was nothing to correspond to the Modern hotel. Even at the great luxurious watering-places on the Campanian coast, Baiae and Bauli, so far as we know, were all private residences". And on the next page, "There being no hotels... he would buy a site for a villa first in one place, then in another or purchase one ready built or transform an old farm house of his own into a residence with 'modern requirements'".

Thus the patients under his care were of the class who

1. Buck, Growth of Medicine, Chapt. 5

had villas in the country and could take advantage of the country air. Added to this was the fact that at that time there were many pleasure craft on the Tiber and along the Italian coast which were used by the upper strata of society for their amusement. It is not strange then that Galen did not recommend the long sea voyage.

Aurelianus was a Greek physician and a follower of Hippocrates and Celsus. His social, medical and literary heritage gave him the background, as already pointed out, for his employment of sea voyages.

The contribution of Galen has continued popular even to the present time. That there is a beneficial result to a sojourn in the country no one seriously questions to-day.

Note on Sir Thomas Young

The authority for many of the statements made during the present and previous chapter has been that of Sir Thomas Young whose valuable historical essay entitled: "A Practical and Historical Treatise on Consumptive Diseases" was published in 1815. It was an attempt to survey the literature of the ancient periods on tuberculosis and to indicate the development of the subject down to 1800. The use of this work has greatly facilitated the investigations of these early periods. A question may be raised as to the advisability of using this guide. The author, it must be confessed, was somewhat doubtful on the point until the following note on Young was observed in the Am. Review of Tuberculosis

by Dr. Allen K. Krause¹, himself an authority on tuberculosis.

" It is quite likely that few of us ever open Thomas Young's book on Consumptive Diseases. That the author's name is associated with tuberculosis should be a source of pride to all who take an active interest in the subject. The same man gave his name to 'Young's Modulus and the Young-Helmholtz theory of color perception. He discovered the mechanism of the crystalline lens and formulated the best theory of tides. The universality of his genius is attested by authoritative investigations on " shipbuilding, gas lighting, standardization of the seconds pendulum and the imperial gallon, longitude and life-insurance.' He was a famous Egyptologist and the decipherer of the Rosetta Stone. Garrison characterizes him as ' the most highly educated physician of his time, ' probably the handsomest of all the great physicians, and one of the greatest men of science of all time.'"

Summary of the Period 100 - 1600 A.D.

The following factors should be kept in mind while reviewing the contributions made by this period to the history of Climate and Tuberculosis:-

1. The period was one of stagnation in intellectual progress from about the fifth century to the Renaissance.
2. There were repeated migrations of races and wars to upset the normal political and social development of the era.
4. Economic development was sporadic and weak.

The general characteristics of the Middle Ages are familiar to all students of history so that they will not be further emphasized at this point. Sufficient has been set forth to indicate the reason for the paucity of data on our subject in spite of the great length of the period- over thirteen centuries.

CHAPTER VII

1600 to 1882

With the dawn of the Modern era in medicine, ushered in by the discovery of the circulation of the blood by Harvey in 1628, the establishment of anatomy upon the secure foundation of science, and the increasing number of discoveries in allied fields, the literature on all medical subjects rapidly expanded. Even today the historian interested in the developments which took place in the seventeenth and eighteenth centuries is nearly overwhelmed by the mass of material written during that period. It was a period of ceaseless activity.

In common with this widespread development, the literature on the subject of climate in relation to tuberculosis increased, both in rate and extent. Because of this fact the writer has divided the period into three subdivisions in order that the main outline may be more readily traced: seventeenth century, eighteenth century and 1800-1882. Furthermore it has been felt advisable to condense a considerable portion of the work of this period, except that of acknowledged authorities whose contributions and opinions had marked effect upon the prevailing ideas as well as upon later writers. In most instances the work of an author is summarized in a sentence or two or short paragraph and quotations are used when certain points seem to call for emphasis. By this means it has been possible to avoid carrying the essay to undue length,

and at the same time present a description of the main developments. The period came to a natural close with the discovery of the tubercle bacillus as the etiological agent of tuberculosis by Robert Koch.

The open-air treatment of tuberculosis, which had its inception during the eighteenth century and which has continued in popularity up to the present time, has been reserved for a separate chapter, lest this development be confused with the main thread of the estimate, per se, in its relation to tuberculosis. In this separation of parallel developments there are obvious disadvantages, but the advantages of clarity and simplicity have been deemed to have greater importance to the purposes of this essay.

A. Seventeenth Century

1. C. Bennet¹ (1654-6)

Young says, "Our countryman, Bennet, though his style is obscure and inelegant, may be considered as the earliest writer that can now be quoted, with perfect confidence on the subject of consumption."

He noticed that expectoration was more difficult in moist weather than in dry, with skin changes as well. At Bristol he saw several persons die. Bristol being elevated. A moist or dry air is considered advisable depending on the nature of the disease. Milk preferable to meat.

2. T. Bartholin² 1654

1. Young, p. 168ff

2. Ibid. p. 177

Stated that " a sitting room may be made, by proper effuvia, to serve instead of a voyage to Egypt."

3. T. Willis¹ 1675

Noticed that turf fires seem to exempt some parts both of England and Holland from consumption on account of the sulphurous smell.

Believed warm air and warm bathing beneficial in incipient consumption. One of his cases benefited by the open air with daily horseback exercise or in a carriage.

In an article in 1921 on Thomas Willis, William Snow Miller¹ gives the exact translation of this case history.

4. T. Sydenham² 1682

Sydenham discussed consumption in only a few passages of his works, according to Young. But Sydenham's relation to tuberculosis is forever secure as a result of a letter to a friend, G. Cole, who had written the famous physician regarding some difficulties in his (Cole's) practise. In this letter, Sydenham says: " Horse exercise is no less useful to the consumptive than to the hypochondriac: in several instances some of my ~~own~~ relations have been resotred to health by taking very long journeys on horseback, at my recommendation, when medicine had been of no avail: and not in slight cases only, but where night sweats and diarrhea had supervened, as usually happens in the last stage. In short, notwithstanding the acknowledged fatality of this disease,

.1 Am. Rev. of Tuberc. 5: 934-9 49,1921
2. Young p. 186

which carries off two-thirds of those who die of chronic affections, I do not hesitate solemnly to affirm, that neither mercury in syphilis nor bark in intermittents is more effectual than riding in consumption provided that the patient take care to have his linen well aired, and to continue his journey long enough, the longer as he is more advanced in life: and this I have learned by multiplied experience, which I have scarcely every found to fail, nor is carriage exercise by any means to be dispised, though not equal to riding."

5. Gideon Harvey¹ 1689

After riding rough shod over the prevailing treatment he believes that " change of air is a condition indispensable to the recovery of health."

6. R.Morton² 1637

Advocated " open fresh kindly air and such as is free from the smoke of coals."

7. E. Ettmuller³

Recommended milk, raw eggs and change of air.

Summary

The following points should be especially noted in the above contributions:

1. A few writers recommend merely " change of air" or diet of milk
2. The use of horse-back riding
3. Lack of the use of long sea journeys by either English-

1 Young p.190
3. Young p. 204

2. Klebs, Tuberculosis p.682

men or continental writers.

4. When "change of air" was recommended, "warm, dry or moist air" was preferred.

In regard to the first point, many of the physicians were evidently led to prescribe this as the result of the influence of the early writers which have already been noted- Celsus, Galen, and the Arabians. These works had been in vogue some time and were still the prevailing text-books of medicine.

Willis and Sydenham both share the honors of being the father of horseback riding in the treatment of tuberculosis, though Sydenham has the **greater claim** because of his firm belief in its beneficial effects and his general use of it. Horse back riding was widely used during the eighteenth and early part of the nineteenth century largely because of Sydenham's association with it. It also apparently is a link in the chain of early development of "open air" to be mentioned in Chapter VIII

Economic and Political Background .

A complete discription of seventeenth century Europe is unnecessary to throw further light on the climatic treatment of that era. But points 2 and 3 in the above list call for a brief statement in explanation.

It is to be remembered this century was characterized by frequent wars, religious strife and especially the Civil War in England in the reign of Charles II. Though trade increased considerably during the Elizabethan period it was not until the latter part of the century that wealth was materially increased as a result of foreign trade. Manufac-

ing flourished, but roads and conditions of travel were in wretched shape¹ and travel was still limited at the end of the century largely to post horses.

According to A.H.Clark, yachting or ownership of private pleasure boats started in 1600 in Holland and became increasingly popular in England from 1604 onward.

The period was one of unrest and economic instability. Though a few isolated watering-places were popular in England in latter part of the century they were used only by the upper classes and there is very little evidence of the use of Mediterranean resorts as yet. Conditions were still such that travel was inconvenient and in most instances impossible.

Conclusion

It is apparent that sea voyages would not be popular in such a period, but that people would be inclined to take a change of air if necessary via change to the country or in the use of horse-back riding.

In view of the social conditions of the time and also the known fact that Sydenham and Willis were popular with the upper strata of society it is quite likely that only the upper classes was treated in this manner. Finally, it should be borne in mind that climatic treatment in any form was a radical measure during this period. The use of medicines as prescribed by Galen; the treatment of conditions by means of combinations derived from minerals of all kinds and prescrip-

↓ Cross , History of England, p. 593

2. Clark, " History of Yachting, Chapt. 2

tions of concoctions of herbs, insects and what not were prevalent during the greater part of the seventeenth century. If such a method as change of air or residence were used, it was largely the result of accident or chance. In any case it was used only after the other methods were unavailing. This was true even of those writers whose contributions have been included in the foregoing discussion.

B Eighteenth Century

At the very beginning of the century, riding and various forms of exercise were popular prescriptions for phthisical patients. Starting with F.Fuller¹, who in 1705 agreed with Sydenham " that where consumption is without fever or ulcer riding is almost the only specific; but the patient must become a Tartar and live on his horse." riding was frequently employed throughout the remainder of the century. Without going into details, the following physicians are mentioned in Young² as supporting the method inaugurated by Sydenham:- F.Hoffman (1740); Barry (1726); Desault (1733); J:Juncker (1734); J.Wainwright (1737); R.Mead (1751) T. Marryat (1758) D.Monro (1764); van Sureten in 1770 said that, riding is very beneficial, where it can be afforded."D.MacBride (1772) L.Chalmers 1776; May (1788); B.Rush 1793 advocated its use in the closing years of the century.

There was only one dissenting voice on this regime:

1. Young, p. 210

2. Ibid pp 210-371

that of Capper in 1737 who related two cases wherein the employment of riding was totally unsuccessful. This was partially confirmed by the experience of Buechner. So that there was not a unanimous opinion in regard to this method of treatment.

It must be stated however that most physicians advocated other methods along with riding; such as diet, air, exercise of many kinds etc.

J.Huxham¹ (1752) advocated removal of the patient " into the country in the spring for a change of air."

Starting with R.Mead in 1751 there developed considerable discussion as to the utility of change of climate. There was decided difference of opinion among the physicians. The following writers advocated " a change":-

1. R.Mead² (1751)- " a change of climate, voyage to Lisbon or Naples."

2. E.Gilchrist³ (1757) mentioned nineteen case histories of patients who had used voyages. Most of them were cured or relieved. " The spray of the sea, suspended in the air, the author thinks the best application for diseased lungs."

3. Mac Bride⁴ (1772) besides advocating riding advised milk diet " and especially sailing."

4. Linne' and Ullholm⁵ (1772) praised the effects of the climates of Athens, St. Helena and the Bermudas.

1. Young, p. 227
3. Ibid. p. 233
5. Ibid p 270

2. Ibid. p. 230
4. Ibid. p. 268

5. Fothergill¹ (1776) sometimes recommended the South of Europe and Madeira, though he says the most popular places were Nice, Marseilles, Naples, Lisbon and Cintra. Of all remedies the most important are: early abstinence, milk and vegetable diet, country air, quiet of mind, good hours, moderate exercise and frequent change of scene."

From the foregoing it seems that in some respects at least he was considerably ahead of his time.

6. Alexander Wilson published a work entitled, "Some Observations relative to the Influence of Climate on Vegetables and Animal Bodies" in 1780 which had some vogue and which several writers mention. Wilson, in chapt. 38 states that consumption is to be "considered as a chronic disease of the putrid kind." He mentions a curious experiment undertaken by a Dr. Alexander who decided that "a piece of meat putrified sooner that has been breathed upon by a person with diseased lungs and a bad breath than another... that has been breathed upon by a sound person." He further claimed that warm climates were favorable to phthisis as they possessed a septic tendency, and the heat increased the accumulation of putrescent matter.

In Chapt 40 he treats of the cure of consumption wherein he advocates, "warm clothing, gentle exercise riding on horse-back vegetable and milk diet," and if then prove futile, "a copious discharge by issues is often of the greatest service."

1. Young p. 274

And when all these remedies fail, " a sea voyage to the southward frequently proves a cure if the disease was not too far advanced before this remedy is attempted. In going to the southward, the pores of the body are opened, and the de-purated state of the sea air enables the lungs to fling off the phlogiston with which they are over-charged.. " He advises against going too far south into the torrid zone " as the too warm impregnated state of the tropical atmospheres is exceedingly unfavorable to these complaints." "The most favorable situations for the residence of persons afflicted with these complaints are near the sea, in a dry and warm climate, situated between the latitude of 36° to 45°:..."

7. J.Borsieri¹ (1782-5) : " In one instance where many complicated remedies had failed the patient recovered by means of simple milk diet and change of air. The best climates in Italy for the winter appear to be those of Naples and Pica."

8. B.Moseley² (1787) Whereas he thinks the climate of England is the best in the world and affords " change enough for an invalid." he says that under some circumstances a voyage to Madeira may be advantageous to incipient cases or Montpellier. The benefit from sea voyages according to this author is in the air and the motion of the boat.

9. Edinburgh³ (1794) The medical professors of Edinburgh recommended the climates of Madeira and Bermudas: Nice was thought to be too liable to cold winds.

1. Young p. 299
3. Ibid. p. 360

Ibid p. 327

10. Frank¹ 1794 Advocated a mild climate.
11. T. Beddoes² (1899) Did not recommend Lisbon, Hierer, Madeira or Holland. Preferred Spain or Aix ea Chappelle

In contrast to those who advocated a change of climate, were the following who opposed the idea, some with vehemence and others with considerable reasons.

1. L. Chalmers, who published in 1776 "An account of the Weather and Diseases of S. Carolina." He was a resident physician of the colony who took considerable interest in meteorology. In Vol. II, p. 126 ff he says:-

"After all, when patients are reduced to the desperate condition we mentioned, what avails it to deprive them so much sooner of the little strength they still enjoy, by recommending their undertaking voyages by sea, or journeys by land, under a pretense of changing their climate? For though it be certain that in some degrees of this distemper, as well as in others such alterations of air may have their good effects when a right choice is made, I would ask those who would prescribe such perigrinations whether they can seriously expect patients of this sort should receive any advantage from such travels on whom the harbingers of death had already taken possession. I have seen people in this condition, arrive here to pass the summer, which proved quickly fatal to them; and therefore my opinion truly is that on those occasions, such counsel may with truth be accounted- splendide mendax. For it would be better

1. Young p. 360

2. Ibid -. 362

to suffer them to die inquiet with their relations than to hasten their deaths amongst strangers, by making them undergo fatigues which they in no wise are able to sustain." He then proceeds to outline fairly rational treatment one of the features of which is riding on horseback.

2. S.F. Simmons¹ (1780*)

" In the last stage, change of climate is useless, and it must be remembered that the progress of the disease is commonly more rapid in warm climates, its diviation in Italy seldom exceeding three or four months."

3. T.Reid² (1782) " the author does not place much dependence on change of climate". Strange to say he though the benefit of sea voyage was the sea sickness. Lisbon and Madeira had disadvantages.

4. J.C.Smyth (1787) Does not think sea air is best for consumptives. Montpellier has disadvantages because of nearness to sea and northerly winds Madiera as well is improper for the patient.

Summary

From the foregoing evidence the following is apparent.

1. Riding and exercise were frequently prescribed, though one writer mentions two cases wherein the treatment proved unsuccessful. And one pointed out that it was beneficial " if it could be afforded."

2. Diet and open air were recognized as beneficial by

-1. Young p. 290

2. Ibid p. 294

2. Diet and open air were recognized as beneficial by a few physicians.

3. Sea voyages were popular but there was some doubt as to the actual benefit therefrom

4. Warm climates and warm air were considered favorable climates for phthisical patients.

5. Authorities differed as to the benefits derived from the popular resorts to which patients were being sent.

6. Two writers recognized the failure of climate in advanced stages.

Factors in the Development of the
Climate in this period.

While the exact relation between the economic factors and the use of the methods of riding, and "change of climate," especially sea voyages cannot be determined without exhaustive research into this period, there were a few developments which must have exerted an influence upon the methods.

First, and probably the foremost development was the Industrial Revolution which took place during the latter half of the century. The rise of modern industrialism and capitalism revolutionized the social and economic life of England and continental Europe, the effect of which has remained to the present date. The evidences of this great upheaval were already noticeable at the close of the century under discussion in the cotton, pottery, and iron industries; with the increase in wealth, expansion of commerce; the growing labor and factory owning classes.

Second, Roadbuilding developed rapidly during the eighteenth century. Travel was no longer the burden that it had been heretofore and in consequence outlying districts were becoming popular places of rendezvous and recreation.

Third, Colonization. Throughout the preceding two centuries most of the larger nations had expended effort and money on colonies, which resulted in commercial expansion, development of knowledge concerning far-places and a desire to travel.

Fourth, Maritime enterprises were extensively inaugurated and carried through. Exploration was a popular pastime as well as business enterprise.

Fifth, Development of science. Whereas there were no startling discoveries there was a growing enlightenment, diffusion of knowledge and research in all branches of science then extant including meteorology.

All the above elements in the economic and intellectual life of England and Europe were co-incidental with the development of the climatic methods in the treatment of pulmonary tuberculosis. There was furnished the knowledge, the means and ability necessary for the use of climate.

C. 1800 - 1882

1. W. Heberden, Jr.¹ 1801

In warm climates mortality from phthisis is greatest in winter and cold rather than wet weather generally makes a season unhealthy.

1. Young p. 385

2. T. Beddoes² 1801, 1806

Discussed the advantages to patients in being confined to rooms with temperature 60° to 65°. They were less liable to colds by being frequently in heated rooms. "Change of climate is generally recommended when the practitioner feels that nothing more remains to be done by art."

3. G. Heberden² 1802

"A sea voyage has sometimes been a palliative and appears to be always safe. A small island without hills would be the best situation for the winter months.

4. T. Trotter³ 1804

Advocated change of climate for scrofulous tumors and ulcers, and residence in warm climate until middle age.

5. W. Woolcombe⁴ 1808

Noticed the influence of seasons on mortality.

6. B. Parr⁵ 1809

Advocated residence at sea side in the winter.

7. A. Portal⁶ 1809

A French physician who observed the effects of climate on Englishmen and Northerners who went to the south of France. He considers, as a result, that climate in phthisis is of little importance.

8. G.L. Bayle⁷ 1810

"Tubercular consumption may possibly be prevented by

1. Young pp 387, 411
 3. Ibid. p. 399
 5. Ibid p. 411
 7. Ibid p 447

2. Ibid p. 391
 4. Ibid p. 419
 6. ibid p2 432

by travelling and declaiming." in incipient state it may be checked by sea voyage. Recorded 54 case histories and only one was relieved by change and sea air. He seemed to be doubtful, on the whole, as to effect of climate.

9. A.Duncan¹ 1813

He observed no benefit from sea voyages on cases of well marked consumption. " He thinks indeed that a change of climate has little or no power to promote a radical cure."

10 Wells² 1812

Compared statistics of intermittent fever with those of consumption and came to following conclusions: a) In Vienna, Petersburg, Minorca, Egypt and Bengal, intermittent fever was prevalent and consumption rare; b) In London and Scotland as intermittent fever decreased, consumption increased; c) Consumption was rarely occurrent in Jamaica and S. Carolina but frequent in Bermuda, Azores, and Barbadoes. " Dr. Wells imagines that the causes of intermittents induce a state of constitution which is a protection from consumption without actually producing fever." On above evidence he does not advocate Lisbon, Nice, Naples or Madiera but does advocate Jamaica, Alentijo or Egypt for phthisis patients. The disease he points out is more frequent in marshy countries.

11. H.H.Southey 1814

Discusses the frequency of consumption in various parts of world. It is rare in Russia, Denmark, Egypt, Bengal, Persia,

Greenland, Canada, South Carolina, Jamaica and West Indies, occasionally found in Holland, Madiera and Azores; and frequent in Germany, England, Vienna, Italy, Philadelphia, Barbadoes and Bermuda. "Removal to a warm climate is often extremely proper in incipient consumption: Valencia seems the most eligible part of Spain, Hieres of France; Lisbon is cold in winter; in Madiera the accommodations are bad, in Egypt we meet the plague and ophthalmia; and in W. Indies the yellow fever." Advocates riding, sailing and sea voyages.

With the contribution of Southey the treatise of Young closes. The book has been an extremely valuable guide for the periods already covered and the writer wishes again to acknowledge the debt he owes to this reference work. The substance obtained from it has necessarily been condensed into a very brief form. In the original work, the discussion was ample and the research exhaustive.

For the remainder of this period, the works of several authorities will be subjected to analysis. For the most part these contributions exerted considerable influence upon the opinions of the medical profession at the time and were frequently referred to in the literature. They will serve to indicate the opinions prevailing at that time.

James Clark in a volume entitled, "The Influence of Climate in the Prevention and Cure of Chronic Diseases, etc." published in 1830 summarized the problem of climate and disease. This book commands our attention not only from the fact that it influenced to a considerable degree the course of the

history of the subject but it very evidently reflected the ideas of the times.

On page one, the author states " Although the power of different climates to produce as well as to alleviate and cure diseases, is well established as a matter of fact, yet, perhaps there is nothing in general science more unsatisfactory than the manner in which we are able to explain this influence.." Later on¹, " To the inclemency of our seasons we are justified in attributing some of our most dangerous diseases; and many others, of great frequency, if they do not derive their origin immediately from our climate, are at least greatly aggravated by it. Among this number may be ranked pulmonary consumption,.."

" Change of climate and change of air have been considered by physicians as remedial agents of great efficacy from a very early period, and the correctness of the opinion is supported both by reason and experience." As an illustration he considers change of residence from city to country or from cold to warm climate is reasonable and is justified by experience.

He then criticizes the methods of prescribing climate for consumptive patients in vogue in his day on the following grounds:

1. Climate resorted to as a forlorn hope in hopeless cases
2. Climate is applied in many cases.
3. Patients sent abroad without proper directions as to

1. Clark, Jas. "The influence of Climate in the Prevention and Cure of Chronic Diseases" 2nd Ed. Lond. 1830

suitable climate or regime.

In view of these facts " need not excite our surprise-- that the result should have been such as to bring the remedy in- to discredit." the fault being in the manner of prescribing the treatment.

Nevertheless," we possess in change of climate and even in the more limited measure of change of air in the same climate one of our most powerful remedial agents; and one, too, for which in many cases we have no adequate substitute." He throws a flood of light on the whole problem when he makes the follow- ing significant statement:- " When the extent of the benefits which may be derived from this remedy, both on the physical and moral constitution, is duly estimated, no person whose cir- cumstances permit him to avail himself of it, will fail to do so."

He emphasizes the importance of selecting the proper cli- mate for winter residence among the several of nearly equal value by stating that the subject has been neglected due to " the opinion which has generally prevailed in this country that climate is chiefly useful in consumptive diseases which he says is far from being the truth.

" And I here beg to caution the invalid who goes abroad for the recovery of his health not to expect too much from the mere change of climate. The air or climate is often regard - ed by patients as possessing some specific power by virtue of which it directly cures this disease. This is a very erroneous view of the matter,..." On the other hand he indicates the

following advantages of a change of climate: 1) open air
 2) exercise 3) peace of mind. In order to reap the full
 benefit he must "adher strictly to such a mode of living as
 his case requires; and he must exercise both courage and patience
 in prosecuting this to a successful issue."

From the above discussion he says that change of climate
 is not "totally different from other remedies."

In Part II, On Diseases, he emphasizes again his position
 on change of climate: "Too much is generally expected from the
 simple change of climate... The physician "generally advises
 all medicines to be laid aside except such as are requisite
 to keep the bowels regular and with this counsel he consigns
 the patient to his fate..." And later on. "In the first
 place I would strongly advise every person who goes abroad for
 the recovery of his health, whatever may be his disease or to
 whatever climate he may go to consider the change as merely
 placing him in a situation the most favorable for the removal
 of his disease;..." He then cautions the patient against errors
 in regimen, exposure to cold, fatigue, excitement, crowded and
 over heated rooms, late hours etc.

In regard to Consumption," There is no disease in which
 change of climate is considered in this country of so much im-
 portance as consumption; and yet it must be admitted that there
 is no one in which the hopes founded in such a change are more
 constantly disappointed. Occasional examples of its beneficial
 effects are certainly observed; and they bear so trifling a
 proportion to the cases in which it produces no benefit.. it

still remains the chief source of hope and confidence in the treatment of consumption both to the profession and to the public.

" Respecting the treatment of consumption we must admit the humiliating truth, that there is no reason to believe the physicians of the present day more successful than their predecessors were ten, nay twenty centuries ago."

He recognized three stages of the diseases and in stages I and II climate was beneficial under limitations where there was no benefit from climate in stage III.

" Which is the best climate? The truth is, no one climate or situation is the best in all cases. He favors Rome or Pisa for the winter and Nice for another class of patients, but the best suited to consumptive patients is Madiera. He considered that consumption was more frequent on the sea coast than inland, and felt that sea voyages were beneficial in the early stages, mentioning several cases so benefited.

Summary

The vogue and influence of Clark's work was not a little due to the fact that it contained accounts of personal observations of the various climates. In Part I of the book he classifies most of the climates which were popular with invalids and classification was the result of personal experience.

Because of the importance of the foregoing contribution to our subject it is well to summarize briefly the essential points:-

1. At the time he wrote the power of climate to influence

the course of diseases was generally recognized.

2. Climate was likewise considered as a factor in the etiology of diseases, especially pulmonary consumption.

3. The efficacious power was demonstrated on the basis of reason and experience.

4. His criticism of the prevailing methods of recommending climates should be especially noted. It is the first attempt thus far noted, to scientifically explain the reasons for the failure of climate to benefit pulmonary invalids. In the main his criticism would be true even to very recent times.

5. He definitely recognized the economic factor in this treatment. It is apparently one of the first instances recorded wherein the ability to pay is considered a factor.

6. Clark was one of the first if not the first writers to call attention to the fact that climate is not a specific in any disease, particularly in consumption.

7. He recognized the importance of regime.

8. He frankly admitted the failure of climate to benefit the large majority of pulmonary invalids, yet it remained the chief hope of the professions.

9. He recommended warm climates.

10. He preferred the inland climate to the seacoast.

That Clark's exerted considerable influence long after the period in which it was written is attested by J.R. Leaming in 1887 who said that " it was not until 1820 when Sir James Clark published his tours to famous resorts that the profession began to collect statistics of temperature, moisture and their

comparative sanitary effects for the scientific guidance of the sick.

Henry Hunt¹ observed that the Sea Coast in all countries is most liable to this destructive disease... and we feel perfectly satisfied that this cause arises from a mixture of land and sea air." He quoted numerous statistics all tending to show that mortality from pulmonary consumption along the sea coast was considerably higher than that observed at inland cities. He thus confirmed the opinion of Clark but went further by trying to explain the fact. He advised horseback riding; mild diet, avoidance of high mountains and low marshy places.

Chas. Higgins² on the basis of six years' residence in southern France wrote a severe diatribe against the popular French resorts as health resorts for English invalids. Typical of the tenor of his work is the following: the popularity of the French climate " is largely due to the ignorance of the French who extol their own climate because they have never seen any other country; consequently their own country is Elysium" He never saw a single English invalid suffering from phthisis who was benefited by the climate.

P.C.A. Louis³ was an eminent authority on tuberculosis in Paris. His work long remained one of the standard volumes for practitioners. His opinion therefore carried great weight.

1. Hunt " Observations on a Change of Climate in Pulmonary Consumption" 1834
2. Higgins. C " Observations on Climate, Diet, Medical Treatment in France and England 1835
3. Louis, P.C.A. Recherches on Phthisis, tranl. 1846 Chapt.V

In regard to climate he said, "Climate, and more especially temperature, have been, until lately, regarded as conditions possessed of the greatest power in either exciting or warding off the development of tubercles in such a manner that warm countries, those generally of high temperature- the south of Europe in particular- were generally considered to be exempt from phthisis. Unfortunately this is not the truth; modern observers have shown by statistical evidence that phthisis is prevalent in all countries, the hottest as coldest... At the present day the entire or very nearly the entire profession is agreed upon the matter." He further states that in consequence constancy of temperature must protect people from tuberculosis but he states that this is also a delusion. "It follows then, from the evidence now brought forward(he quotes statistics of troops of the British Government) that the prevailing opinion respecting the influence of climate on the development of phthisis is if not completely erroneous, at least of most doubtful accuracy..."

He admits however that a change of climate does have some advantages, however in affording a complete change of habits and exercise. Due to these facts a change of climate may be beneficial. Removal from cold to warm climate in winter produces same advantages, including "exercise in the open air." "We should not then hesitate to recommend such change to persons who can afford it."

Results of sending away patients have been variable. He

discusses advantages of Nice, Pisa, Rome, Hieres, Pau. For incipient cases these places exert beneficial influence. In later stages there is little or no advantage.

What he has said on warm climate applies to sea voyages the influence of which " has not been demonstrated, and that the question of its reality is one still open for the decision of accurate experience."

Louis has thus attacked the influence of climate from a different standpoint, showing 1) that phthisis is prevalent in all countries and 2) that the advantage of climate lies in the difference of habits in the invalid and 3) he mentioned that errors of diagnosis play an important role in the judgment of the efficacy of climate 4) sea voyages have never been demonstrated as having an influence on consumption, 5) equability of climate has no influence.

That the medical profession was not at all unanimous as to the beneficial action of climate on phthisis is indicated by the essay of J.C. Atkinson¹. Therein he attacks the problem from a still different angle, by stating that people are sent to the sea-side, parts of England, South of France, Italy, Spain, Portugal, Madiera, W. Indies in all of which places phthisis is extremely prevalent. In the majority of cases those sent to the above resorts die. He speaks with some feeling when he says that " it would not be easy to mark

1. Atkinson, J.C. " Change of Air: Fallacies Regarding It"

down the various kinds of Drops, Elixirs and Waters that have been trumpeted forth to the world. Magnetism, Mesmerism, Hydropathy, Homoeopathy, all these have done serious evils in their day... The last and most universal of all these panaceas is 'Change of Air'" He continues somewhat in the same vein throughout the essay, winding up with a plea for medicinal treatment of various kinds.

J.E.Pollock¹ after stating that phthisis is universally prevalent in all countries, criticizes the value of climate in the treatment of tuberculous except under limited conditions; namely, bronchial irritation; chronic cases with slight fever, moderate pulse. In these instances a mild sedative air may be beneficial. But in most instances the very places to which the patient is sent are hotbeds of consumption.

J.H.Bennet² was in favor of a cool, dry, stimulating climate; not a warm moist one. When tuberculosis was considered formerly as an inflammatory disease it was natural to prescribe the latter climate. But his experience of 30 years practice has convinced him that many places of England and in Southern France which are stimulating produce the best results. He himself was cured of consumption in Southern France near Cannes. He compares this locality with warm climates.

J.C.Thorowgood³, an eminent authority on the Climatic Treatment in the middle of the nineteenth century, called attention

-1. Lancet, Lond. 2: 213 1856

2. Bennet, J.H. On Treatment of Pulmonary Consumption by Hygiene, Climate etc. 1866

to one reason why the change of climate did not always work to the benefit of the patient; failure to observe the invalid more closely. He felt there was too much reliance on tables of temperature, rainfall, direction of winds etc; " no work of climate seems to be thought in any way complete unless it abounds with a mass of carefully recorded meteorological observations.."

He presented statistics tending to show that cold northern regions were from the prevalence of phthisis, as well as those districts of considerable elevation, and compared these with statistics indicating the prevalence of phthisis in warm countries.

Among other things he showed there was a higher mortality in the city as against country; and that those cases which should be sent to mild climates were : laryngeal phthisis, bronchitis, pneumonia and young children. He considers the warm mild climates to be over-rated and believed that " climates that are dry and bracing, with more or less stimulant character in the air" were the best for consumptive patients.

He enumerated places which had these characteristics:

1. Southern France

Provence Riviera district

2. Malaga

3. Malta

4. Algiers

5. Egypt

6. Australia

7. Several English resorts

M. Simons 1 after reviewing the literature on the subject came to the following conclusions:-

1. Phthisis occurs in every zone
2. The disease is not more frequent in cold regions
3. Same is true of heat
4. Moisture, combined with heat has greatest influence on favoring the disease
5. Variability of heat, cold, moisture are greatly injurious.
6. Extreme altitudes are inimical to its development
7. Consumption is more frequent on seashore than elsewhere

Herman Weber 2 another eminent authority on the subject stated that Dr. Archibald Smith in his article, "Practical Observations on disease of Peru", Edinb. Med. -Surg. J. 1840 was the first to point out the scarcity of phthisis at high altitudes. Later Lombard, Mühry and Hirsch confirmed this as well as Jourdanet for Mexico; Fuchs for Germany and Schnepf for the Pyrenees.

But elevation is not the only factor in the problem and he mentions: Motion of atmosphere; locality; topography, sunshine; exposure (N.E. S.W.) ; dryness and dampness of the soil; number of clear days; humidity; precipitation.

The prevailing objections to elevation are : low temperature, harshness of the climate on delicate patients; rare-

1. Am. J. of Med. Sci. 1872. Vol. 63: 82-96
 2. Brit. M.J. 1867, 2: 41-42, 58

fied air increases haemoptysis; difficulty of obtaining quarters. But Weber did not find these objections insurmountable. He mentioned several cases which were benefited by the Alpine climate; the experience of Spengler and Unger at Davos whose treatment consisted of milk, light food, moderate amount of wine; graduated exercise; and cold douches.

The physiological benefits of mountain air are; rarefied air, pure air; exhilaration, all affecting the digestion, appetite and the blood.

C.T. Williams ¹ whose opinion greatly influenced the medical profession during the latter part of the century read a paper before the International Medical Congress on the Curability of Phthisis at High Altitudes. He confirmed the ideas expressed by Weber that altitude exerted a direct physiological effect on the human body, particularly of phthisical patients and showed experimental data indicating that altitude increased the size of the chest wall and changed the lung tissue by the absorption of pneumatic consolidations, shrinkage of tuberculosis masses and hypertrophy of healthy tissue. He mentioned also the antiseptic quality of mountain atmosphere.

Conclusion

Many other opinions might have been added almost ad infinitum but it is quite likely that these additions, with their numerous repetitions would become ad nauseam. The literature was very extensive on the subject of the Climatic

2. Brit. M.J. 1881, 2: 975-6

Treatment of Tuberculosis toward the end of the nineteenth century and among the outstanding characteristics of the output were: repetition of ideas; presentation of further clinical evidence as to the effect of this, that and the other factor of meteorology on tuberculosis; descriptions of the countless health resorts. The evidence which has been presented in this paper, however, has been so chosen with regard to authority, and substance as to indicate the main developments or trends of the subject.

The following points in regard to the developments of the nineteenth century are worthy of attention:-

1. The evidence both pro and con concerning the influence of climate per se or its various factors consisted almost entirely of personal observation on the part of physicians of various health resorts or clinical records of cases.

2. Warm climates of a sedative character were popular during the first two or three decades.

3. The concept of the specific action of climate upon tuberculosis was exploded about 1820 on the ground of universal prevalence of the disease.

4. Climate was considered an etiological factor in the disease throughout the entire period.

5. The sea coast was generally considered bad for phthisis patients.

6. The efficacy of sea voyages was very definitely questioned.

7. After the specific effect of climate was exploded,

attention was directed to the regimen of the patient and later, to the physiological effects of certain meteorological factors upon the diseased tissues

8. Toward the end of the period there was a very decided drift from the use of warm climates to cold climates, at least to the climates of a stimulating character.

9. Finally, the popularity of altitude, per se, which has continued to the present moment.

The entire period was characterized by a tendency on the part of all authorities to question the various methods and principles which had been bequeathed to them by preceding generations. This scientific attitude, starting with some hesitation and later accelerating into full swing was the chief distinction of this period of the history of climate and tuberculosis in contrast with the previous eras.

CHAPTER VIII

THE EARLY DEVELOPMENT OF THE OPEN AIR TREATMENT AND
THE SANATORIUM REGIME

In an earlier chapter the origin and growth of the Greek Asclepieia was traced. Out of the dim beginnings of temple worship for the praise of Asclepius, "the God of Medicine" there developed numerous institutions throughout the Greek world. They became the meccas for invalids and the seats of schools for training physicians. Later, during the seventeenth and eighteenth century, watering-places, spas, and so-called "open" health resorts became popular throughout France, the Atlantic Islands and the Mediterranean basin. Indeed there was hardly a portion of the earth's surface possessing a mild and somewhat equable climate which was not the site of a resort or the goal of those patients who could afford to avail themselves of the climatic change. There remains to be considered the evolution of the modern treatment of tuberculosis in the closed institution- a place solely for tuberculosis patients- with a regime of open-air, diet, regulated exercise and rest.

A Pre-cursors of the Modern Treatment

Though Hermann Brehmer, as a result of his successful establishment of a sanatorium in 1859, is rightly acclaimed as the Father of the sanatorium idea, recent research has brought to light interesting bits of evidence regarding an earlier development of the open-air method, which culminated with the institution founded by Brehmer. A brief survey of

of this evidence will therefore be presented as an introduction to the Sanatorium development.

1. It has already been noted in a previous chapter, that Avicenna (980-1038 B.C.) an Arabic physician and commentator "insisted upon the value of the open-air treatment" as well as a carefully regulated diet. The evidence on this point does not go further and it is not known therefore, the extent to which his doctrine was put into actual practice. But it is important to remember that he at least observed this influence.

2. Sydenham inaugurated the long-used treatment of horseback riding. Even as late as 1872¹, Dr. E.L. Trudeau was advised to go to Aiken, S.C., in order "to live outdoors and ride on horseback,..." In addition to the long list of physicians who recommended this form of exercise which was recorded in the previous Chapter it is interesting to note that Benjamin Rush, of Revolutionary fame was a strong advocate. Later, Henry I. Bowditch² took a journey in 1808 in company with a friend in an open chaise when he was thirty-five years of age. The trip was 750 miles. Though he had cough, hemoptysis, anorexia, diarrhoea and general malaise at the start he returned with all these symptoms improved. Though it was thought by Sydenham and his later followers that the value of this form of treatment was in the exercise, there is strong probability that being out doors in the fresh air was also a factor.

1. Trudeau, E.L. Autobiograph p. 73

2. Bowditch, V.Y. Trans. Am. Clinat. Asso. 6: 194-205

It seems hardly possible that this feature could have been over-looked, especially as many writers went so far as to advise racking in a chair in a room in order to produce the same effect. It should be further emphasized that in those days the customary treatment was to keep the patient in a tightly closed room, with no ventilation and at a fairly high temperature. In view of these facts, it seems justifiable to include horse-back riding among the fore-runners of the modern treatment

3. Throughout the discussion in the earlier chapters there was rather frequent mention of writers who, like Avicenna saw the value of fresh air. It must be admitted however that these were isolated instances, and in almost all such cases, the recommendation was made only after the customary methods had failed and as a last resort.

4. The first definite evidence of an authoritative character for the use of an open-air regime is that of a "Scotch physician in 1747", mentioned by Arthur Latham 1. It seems that the Scotch gentleman wrote a letter to some London friends in which he asserted " for the first time in clear and unmistakable language , supported by the incontestable evidence of the results he had obtained, that hygiene and diet are the most important factors in the treatment of tuberculosis, and that climate and medicine are only to be consider-

1. Latham, A. " Diagnosis and Modern Treatment of Pulmonary - Consumption", 1907

ed as more or less adjuvant. The practical outcome of his teaching was not encouraging,..." It is indeed unfortunate that Latham, after finding this evidence did not mention the physician's name or even where the letter was found. The writer has been unable to confirm the above statement, finding no mention of a similar letter in any other work on tuberculosis or even of the Scotchman's name. Since Latham himself is dead, the task of checking this evidence will be difficult. In view of the situation the statement is presented on the authority of Latham alone.

5. Edward Barry and J. Fisher, two Irish physicians of the latter part of the Eighteenth century¹ apparently gave directions to their patients in the way of " diet, fresh air, exercise, including horseback riding."

6. In 1905 a MS, endorsed by a Dr. MacKenzie of Glasgow as "Dr. Stewart's Treatment of Phthisis" was found². The MS proved to have been written by one of Dr. Stewart's patients. Dr. Andrew Stewart studied³ in the University of Edinburgh and was licensed a preacher, April 28, 1796. He took a M.D. at Edinburgh in 1802.

In the MS which was found there was a complete description of Stewart's treatment. He apparently disagreed with the prevailing method of treating tuberculosis- a palliative treatment- but he desired to harden the system against repeated attacks of cold by the open air treatment and diet. " The climate can-

1. Kirkpatrick, T.P.C. in Brit. J. of Tuberculosis, 1910, 4: 26-30

2. Finalyson, Jas. Brit. M. J. 1905 1: 960-1

not be brought to suit the constitution, therefore the constitution must be hardened to bear the climate, which can only be done by persevering in a prudent and determined manner in producing a state of coolness and firmness capable of defying the dangerous variations in the weather, and by restoring the frame to its original healthy tone of vigour. It is Dr. Stewart's urgent wish that the patients should be for many hours daily in the open air- cautiously, however, avoiding fatigue- either on horseback or on foot or in an open carriage which last he relies most upon as least likely to tire the patient."

It is apparently evident that there was considerable use of open air, or fresh air in the latter part of the eighteenth century. Along with this regime, diet, hygiene and exercise were recommended. Apparently the only factors missing to complete the elements of the modern treatment were rest, and institutional care.

7. In 1840, George Bodington of Sutton-Coldfield, Warwickshire England published" an Essay on the Treatment and Cure of Pulmonary Consumption on Principles Natural, Rational and Successful". In this essay he stated clearly his theories on consumption. Several authorities have quoted at length from this essay and because Bodington has achieved such an important position in the history of the open air and sanatorium treatment it may be well to include these remarks.

R.J.Cyriax in an article¹ on Bodington: " In condemning

1. Brit. J. Tuberculosis ,1925 Vol. 19: 1, And Abstr. of Tuberculosis 1925 12: 86

certain gases he stated, 'the only gas fit for the lungs is pure atmosphere, freely administered without fear; its privation is the most constant and frequent cause to the progress of the disease. To live in and breathe freely the open air, without being deterred by the wind or weather, is one important and essential remedy in arresting its progress- one about which there appears to have generally prevailed a groundless alarm lest the consumptive patient should take cold'" Windows were to be kept open. Nothing is to be gained at the seaside, inland air is best. The next important item is " nutritive and moderately stimulating diet. Riding or carriage exercise must be taken for several hours a day, as also walking for as great a distance as the patient's strength will permit, the length of the walk being gradually increased. Inclement weather must not interfere with daily walking.

Latham¹ quoted: " ' Cold is never too intense for a consumptive patient, the apartment should be kept well aired, so that it should resemble the pure air of the outside, pure air being used in the treatment as much as possible.'"

Fishberg² says that " he vigorously protested against the close confinement of a consumptives for fear of the evil influences of cold fresh air ' forcing them to breathe over and over again the same foul air contaminated with diseased effluvia of their own persons.'"

1. Latham, Modern Treatment of Tuberculosis, 1907 p.82
2. Fishberg " Pulmonary Tuberculosis" 1922 p. 696

Bodington had the strength of his convictions and attempted to put into practise his teaching by erecting a small institution in Sutton-Coldfield for the reception and treatment of consumptive invalids. The date of opening the institution is uncertain, tho Cyriax states that his writings indicate he was treating phthisis according to his principles in 1833.

The Institution was shortlived. Carlo Ruata¹ in 1901 said, " however resolutely he (Bodlington) maintained his position, however firmly he supported his ideas, disapproval so universal drove patients from his establishment, where, several years previous to the publication of his essay, he had according to his principles and effected many cures. He finished by giving up the curing of consumption and transformed his hospital into a lunatic asylum" And Latham also confirms the fact: " This author met with the most bitter and contemptuous treatment, being regarded as a lunatic; his patients were driven from his institution, which, by the iron of fate, he was compelled to turn into an asylum for the reception of the insane."

However , the facts are clear that Bodington established the first sanatorium for the open air and rational treatment of pulmonary tuberculosis in the world.

8. In 1855 Dr. Henry McCormac of Belfast published a

1. Ruata C. in article by Ed. Cureton, Practitioner, 107*45
1921
2. Latham p. 83

book on lines similar to those of Bodington and as a result " had to bear every kind of persecution to which a man in his position could be subjected"¹

B Development of the Sanatorium Treatment

By 1855 or thereabouts almost everything had been done in establishing the foundation for the Open Air and institutional method of treatment. Books had been written on the subject, a few physicians had successfully used this method, and an institution had actually been started in order to put the principles into practise. The cornerstone had yet to be laid and the superstructure started.

Hermann Brehmer

The writer is indebted to an article¹ by H.M.Kinghorn in the American Review of Tuberculosis for the main facts in the following summary of Brehmer and Dettweiler.

Born in 1826, Brehmer began his career in 1854 and died in 1889. When he started his medical work, the view was generally held that tuberculosis was incurable. As a result of Rokitansky's results showing that 90% of those that had not died of tuberculosis had healed tuberculosis lesions within the normal lung tissue. Brehmer was stimulated to investigate this problem of healed lesions. His thesis for his doctor's degree in 1857. was. " Tuberculosis primis in stadiis semper curabilis" There was considerable

1. Kinghorn, H.M. " Brehmer and Dettweiler: A Review of their Methods of Treatment of Pulmonary Tuberculosis" Am. Rev. of Tuber . 5:950-972, 1921-22

opposition to the tenets held by the youthful author.

Upon graduation he apparently had the intention of putting his theories into actual practise, but with only limited means he was unable to do so. Accidentally he went to "Govbersdorf in Silesia a Prussian province where an elder sister of his first wife had established a small hydropathic institution. The institution was merely struggling along and Brehmer took it over for the demonstration of his theories. " He began with a few patients, with one cow to furnish milk for them and a lean horse to fetch coal from a distant place and patients from the station. The establishment consisted of a modest little cottage." This was in 1859.

After encountering not only the opposition of the medical profession, but financial difficulties he planned and erected a " Kurhaus" of 40 rooms in 1862. In the late eighties a new institution was built.

Hydropathy was a part of his treatment from the first and according to Kinghorn he devised the " Wald-dusche" which consisted of a strong stream of ice cold water falling from a height of five metres, the thickness of a thumb. It lasted 30 seconds and was given to every patient every day.

Also, his equipment from the start included a meteorological observatory and a well equipped laboratory which continuously trained many world renowned technicians-Kohler, Cornet, Petri, among others.

The basic principles of Brehmer's treatment consisted of

1) treatment and observation of pulmonary patients in a sanatorium admitting only lung patients 2) situated in a suitable climate with abundant nourishment, 3) fresh air treatment and hydropathy. When Brehmer started his sanatorium, patients were not taken for the winter but by 1869 he had inaugurated a winter regimen for all patients.

He published his first book in 1857, "Die chronische Lungenschwindsucht und Tuberkulose der Lunge" which was entirely ignored. He brought it out again in 1869 and it was more favorably received. The principles were those mentioned above. A second and the final edition during his life time was produced in 1889. In 1889 his principles included:-

1. Closes sanatorium
2. Proper selection of the place for the institution
 - a) In the mountains, due to physiological effects of the atmosphere
 - b) Immunity from tuberculosis in high altitude.
3. Supervised exercises walks about the forest grounds of the institution, with promenades. By this time he recognized the importance of fatigue and had erected benches at set intervals for the use of the patients.
4. Medical supervision
5. Diet.

Rest was not an essential feature of the Brehmer system.

Though Brehmer's theories were not all correct, yet " he stands out as the great figure in the modern treatment of

this disease. He is the father of the modern treatment"

2 Peter Dettweiler

He was born in 1837, and while a medical student he had his first pulmonary hemorrhage. He was sent to Brehmer at "Görbersdorf where he was first a patient and later an assistant of Brehmer. While he was with Brehmer he became finally convinced of the curability of the disease as the result of his observations and the outcome of his own case. His own experience gradually led him to theories in opposition to those of his teacher and the two men finally separated, though Dettweiler held the opinions of Brehmer in high regard throughout the remainder of his life.

Dettweiler's great contribution to the modern treatment were; the rest cure and the assertion that climate and elevation play no essential part in the treatment of pulmonary tuberculosis. These views led to the rapid extension of the sanatorium treatment and made it possible for the same treatment to be given alike to all classes of invalids, regardless of pocketbook. In the words of Kinghorn, "Rarely has a valuable measure been so quickly accepted by the medical profession, and with so little opposition, as the rest treatment, and particularly the open air-rest treatment. The cause of this lies in its implicity."

Dettweiler was led to his of the rest cure as a result of his own experience in taking the walks through the forest and parks of Brehmer's sanatorium. He finally concluded that "the consumptive is a physical and usually a nervous weakling and needs more rest than one ordinarily takes" He began to

establish his own treatment in 1879-1880.

Kinghorn states, "On a sheltered terrace between two wings of the main building, airy glass pavilions and rotation pavilions were built. In these there were about 90 lounging chairs on which patients with suitable covering passed the entire day except when at meals and walking. All patients lived in the open air in all changes of weather, even in heavy fog, snowstorms and cold at 10° - 12° below 0° . Only those confined to bed by accidents or illness were excepted" Though Dettweiler apparently never went so far as to say that phthisis could be treated equally well in all climates, recognizing the variability of climatological conditions yet he felt that the cure of the disease fundamentally depended on factors other than climate.

Dettweiler's theories were the great stimulant to the popularizing of the great sanatorium movement. His two great contributions furnished the cornerstone and to a very considerable degree the superstructure of the principles of the modern method of treating pulmonary tuberculosis. Kinghorn states that whereas the technique of the treatment has been improved greatly, "yet very little has been added to the fundamental principles as laid down by him." This great and inspiring leader passed away in 1904.

3. E.L. Trudeau

Though Trudeau's sanatorium at Saranac Lake was started after Kach's discovery, this recital of the development of the Modern Treatment would not be complete without the inclusion of the work of this great leader and organizer.

Born in 1848 in New York City of "markedly medical ancestry", Trudeau spent the greater part of his youth with his grandfather in Paris. Returning to this country at about the age of seventeen, he attempted to take up various careers with indifferent success. He finally entered the College of Physicians and Surgeons in New York from which he graduated in 1871. He was married in June of that year and started practice in the fall. The following February during a period of hard work in a hospital he was diagnosed as having consumption by Dr. Janeway, an authority on the subject at the time, and advised to go to Aiken, as mentioned in the previous chapter. Returning in no better health he finally decided to go to the Adirondacks at a camp known as Paul Smith's- a famous hunting resort. Leaving his family in New York he started out with a companion in May 1873. Fishing and hunting all the summer. his health returned in September sufficiently for him to join his family in the city. But his fever soon returned and the doctors advised St. Paul. He became no better and in the following May went to Paul Smith's camp again where he stayed until November 1876 when he went to Saranac Lake. He remained in the Adirondacks for the rest of his life.

In 1882 he read of an account of Brehmer's sanatorium in Silesia in a medical journal as well as Detweiller's. Their success fired his imagination and he determined to test out their theories. He also read of Koch's discovery and the subject led him to make a trip to New York in order to learn the technique of isolating and staining the bacilli. His tale

of the search he made through New York until he finally found an instructor in his old college who was a pupil of Koch makes thrilling reading. For days he diligently learned its technique and started back to Saranac Lake laden with his microscope, tubes etc.

After many labors and as the result of the gifts of friends the first patients arrived at the Adirondack Cottage, Sanatorium at Saranac Lake in the fall of 1884. "The Little Red." the first cottage was opened in 1885. From that time to the present day the Sanatorium has been a leader and pioneer in the tuberculosis movement. Trudeau very early demonstrated the soundness of Brehmer and Dettweiler's theories and then began to evolve and improve upon the technique. He started a laboratory in 1885 which has become world famous in its experimental evidence on various matters pertaining to tuberculin, bacilli and specifics.

The essential facts in the foregoing sketch were obtained from Trudeau's Autobiography (1916).

CHAPTER IX

1882-1927

The publication in 1882 of the report of Robert Koch in which he announced to the scientific world the discovery of the etiological factor in tuberculosis and the experiments in support of his claim opened a new era in the history of tuberculosis. The far-reaching effects of this amazing paper are matters of common knowledge. Theories of disease causation which had persisted from the time of Hippocrates were swept aside; the war on tuberculosis was now to be waged against one enemy instead of many; the science of bacteriology was created almost with one stroke, securely resting upon the foundation of Koch's Postulates and his methods of culture and staining bacteria; infection and prophylaxis were made matters of fact rather than topics of speculation. In short the whole domain of community health was stirred and stimulated by the genius of Robert Koch.

Meteorological conditions, as has been pointed earlier in this essay were considered to have a causal relation to disease before 1882. As a consequence, invalids were sent away from localities where certain diseases were prevalent to places where the climate inhibited the disease. Furthermore the climatic conditions were thought to play a leading role in the actual cure of the disease, first by some specific action and later by their physiological effects on the tissues, organs and their functions. Such was the philosophy of climatic treatment before Koch's announcement. What was the effect of the discovery upon this philosophy and what have been the

developments in the climatic treatment since 1882?

The material on the subject of climate and tuberculosis is tremendously extensive for this period. At least two-thirds of the entire list of 4000 references mentioned in the Preface as having been collected by the writer is concerned with the period after Koch. Even after the process of selecting the bibliography for the thesis was completed, it was found that the greater number of the references was concerned with this period. This was the natural result of the rapid development of sanatoria, the popularity of western and southern health resorts of the United States and the resorts of Europe, the discussion on the value of Home Treatment as opposed to Climatic Treatment and the publication of treatises on all aspects of climatology and tuberculosis. This condition coupled with the increasing popular interest and a widespread community awakening in all matters concerned with health resulted in the extensive literature.

An investigation of this mass of material led the writer to attempt to narrow the subject-matter still further without affecting the purposes of the thesis. It was found that the American Climatological Association was inaugurated in 1884 and its membership consisted of physicians who were interested in medical climatology and especially in the relation of climate to tuberculosis. They were apparently the leaders in this branch of science. When the National Tuberculosis Association was started in 1904, it was further discovered that many of the members of the American Climatological

Association were also members of the latter body. Thus the transactions of both Associations contained an unbroken record of original contributions made by recognized authorities to the subject at hand. With the addition of material from the American Review of Tuberculosis, which contained abstracts of foreign literature as well as American, the British Journal of Tuberculosis, and the leading text-books on tuberculosis, it was thus possible to obtain authoritative evidence on the period sufficient to indicate the outlines of developments without going through the entire literature which consisted to a considerable degree of evidence which confirmed or opposed the ideas as expressed in these Transactions, reprints of articles in these Transactions, opinions of hundreds of physicians on the many developments which were taking place at the time. This literature while valuable in itself did not contribute subject matter for the purposes of this essay.

With these thoughts in mind the period of 1882-1927 has been roughly divided into three sub-divisions: first, 1882-1890. It has been thought advisable to especially study this period for the immediate effects of Koch's discovery on climatic treatment. Second, 1901-1908. In these years, two meetings, one of the American Climatological Association and the other of the National Association for the Study and Prevention of Tuberculosis, contributed papers and reports which summarized the developments up to that time. Third, developments from 1908 up to the present time.

A 1882- 1890

There is evidence that Koch's explanation and experiments indicating that the Bacillus Tuberculosis was not generally accepted in the first few years after the announcement. At the first annual meeting of the American Climatological Association, B.F. Westbrook¹ presented a paper entitled, "On the Etiology of Pulmonary Phthisis," in which he said, " I am not prepared to discuss, on the basis of my own knowledge the latest and most important discovery in the pathology of this disease, viz., that of the Bacillus Tuberculosis. It has, it seems to me, so completely absorbed the attention of the medical world that other and important matters are in danger of being entirely lost sight of. Yet, there are many important factors in the pathology of phthisis besides the Bacillus tuberculosis" Among these factors he emphasized:-

1. Those conditions which are found in the bodies of ordinary healthy people.
2. Abnormalities of anatomical structure
3. Conditions arising from imperfect development of the body
4. Acquired diseases of the lungs, leading to the formation of caseous matter or collections of decomposing pus.
5. Such conditions of life as favor the occurrence of struma and caseous pneumonias.

1. Westbrook, B.F. " On the Etiology of Pulmonary Phthisis"
 Trans. Am. Climat. Asso. Vol. i, 5-21 incl

He continues, " It may be allowed, tho there is no proof of it, that by direct inoculation, a healthy human being may be rendered tuberculous. But I think it fair to assume that, in the vast majority of cases, some or many of the predisposing factors mentioned are in existence prior to the advent of active tuberculization." He further states that his ideas on the pathology of the disease and its general definition were those of the medical profession as a whole and not necessarily his own.

He criticized the available data on the relationships of climate to tuberculosis on the ground that diagnosis might be faulty and that they were collected largely by travellers who merely questioned" those with whom they came into contact". He himself believed that elevation and equability of climate were important.

In the opening address of this first meeting. Dr. Knight of Boston gave the reasons for creating a separate organization.

"1. More can be accomplished by a small body of interested men working independently in a limited field."

" 2 Interests of climatology can be better served by its isolation from other fields."

He put in a plea for " well known and indispensable facts about places, and indications for their selection, ways of travel and accommodations. For climate is but an adjuvant."

" I hope that our health resorts may gradually approximate those of Europe in comfort and luxury, so that our patients will no longer look forward to a visit to those of Europe with

pleasure, and to a visit to our own as a kind of banishment to be endured for the sake of health."

The effect of Sea Air upon Disease of the Respiratory Organs was discussed by Boardman Reed¹ at this meeting. " Thus † to briefly summarize it has been shown that sea air contains more ozone, is denser and therefore more invigorating as well as moister and purer than the atmosphere of interior localities; that it is also warmer in winter and cooler in summer; and besides, tha it contains in suspension a very appreciable amount of saline particles, which are alkaline in reaction and possessed of alterative virtues" He presents evidence from his clinical experience and testimony from the literature in support of his thesis. He concluded" nearly every recent author of any note who has made a study of the subject bears testimony to the value of sea air in pulmonary diseases when resorted to in time and mentioned the following:- Madden," Health Resorts of Europe and Africa; J.H.Bennett in Reynolds" System of Medicine; J:Parkin," Climate and Phthisis", and Tanner, " Practice of Medicine."

Dr. A.L.Loomis², who gave the annual address at the second meeting of the American Climatological Association summarized the prevailing opinion on the subject of climate and phthisis.

He mentions the fact that most continental writers advised 2 Longer or shorter periods in this or that health resort

1. Reed B, in Trans. Am. Climatological Assoc. Vol 1: 51-59, 1884
2. Loomis, A.L. ibid Vol. 2 1-14, 1885

or ' take a course at some mineral spring." That recoveries from very many chronic ailments are reached by such sojourn no one will question." In regard to the Etiology of Phthisis, he remarked," For one class of observers pulmonary phthisis is an inflammation of the pulmonary substance, which may or may not be complicated by tubercle. Another class maintain that tubercle is the primary and essential lesion of all phthisis. Still more recent investigators maintain that there is a specific material which may or may not be accompanied by the histological elements of tubercle, but which always has a specific form of bacillus as the sole exciting cause of its development.

Koch's statements that the repeated entrance into healthy lungs of small numbers of the specific bacilli of tuberculosis will cause chronic phthisis, and that simultaneous admission of numerous bacilli will produce acute phthisis stand as yet unproved it remains to be shown how and when, in any individual case the microbes effect their entrance into the system , or why their entrance takes place so readily in one case and not in others."

It must be pointed out that Trudeau in his Autobiography testified that Loomis changed his opinions some years later and even became a consultant and examining physician for the Adirondack Cottage Sanatorium. He remarks are quoted, however, to show how slow was the general acceptance of the bacillary etiology. And this situation and natural, because there had been so many theories in the past, and so many hoaxes had

been perpetuated upon the profession that thoughtful and careful physicians were naturally cautious about their enthusiasm for or even the acceptance of the Koch hypothesis.

Loomis stated further on in his address that in regard to therapeutical indications, " the unqualified reply is by good hygiene, good food and a suitable climate, and those medicinal agents which promote and maintain that normal performance of the digestive and assimilative processes which is essential to healthy nutrition. At the present day I think that the majority of careful and unprejudiced observers are united in the opinion that the most important of these agents is a suitable climate, which acts therapeutically in arresting early phthisical processes in two ways:-

First, by its invigorating effects on the general system and its power of improving defective nutrition.

Second, by its local effects in preventing diseased tissue in the lungs, and in arresting such processes after they are developed."

He does not believe in the specific influence of climate, yet maintains whole-heartedly that certain climates are better than others.

Home Treatment

In spite of Dr. Loomis's statement that the majority of the profession agreed that suitable climate was the most important agent in the regimen of the tuberculosis patient, there were a few men who even at that time were favorably impressed with results obtained at home. There was apparently con-

siderable difference of opinion on the question of Home Treatment vs Climatic Treatment and since the debate continued in importance until very recently it is well to emphasize this development.

E.D.Hudson¹ summarized the opinions of that portion of the profession who were advocating home treatment.

1. He criticized the statistics of that period on the ground that they were collected for localities where phthisis was infrequent or in favorable localities without the presence of social conditions which would make the comparison a fallacy.

2. Best statistics are those of practitioners with a wide range of observations- whose patients at home were numerous and whose patients seeking climatic benefit were equally numerous.

3. He summarized the views of men like Laennec, Clarke, Williams Flint, and Loomis:-

a) Change of out-door life and occupation diminishes danger of contracting the disease.

b) Travel and change to regions having pure air benefit most patients and cure many.

c) Temporary changes from time to time tide many over the critical period, 20 - 30 years.

d) Sea voyage saves many.

4. His views on the indications of climate for phthisis:-

- 1. Trans. Am. Climat. Asso. Vol. 21132 ff 1885

a) Children in a family of tuberculosis history removed to country, or from indoor to out door life.

b) In cases where tubercle has already started nothing retards the progress of disease.

c) In catarrhal phthisis, cases with caseation of catarrhal products, chronic bronchitis, climatic change is beneficial

d) In simple chronic interstitial forms of fibroid forms climate is of little value.

5. In conclusion, " we must emphasize the fact that for each and every form and stage of the disease much of the benefit derived by travel and changed residence results from the suspension of mental and bodily work, and the substitution of invigorating exercise and out-of-door-life..." Looking over my record of phthisis for the past fifteen years while I am sure that a majority of those with incipient phthisis who have changed their occupation and residence or who have travelled for a long period have been most benefited, a greater proportion of advanced cases have been obliged to remain at home and have done well at home, under improved hygiene and a climate artificially obtained, aided by medical guidance and good home care and nursing. Indeed for the poorer classes, the transition from their ill-ventilated and cramped homes, with ill selected food, to a hospital of the better class, with rest, fresh air and correct diet is quite as marked a change as is removal from home with extended travel and modified climate for the rich. My impression is that for the same stages of their disease they do nearly as well."

Dr. Shattuck¹, emphasized the economic factor in the treatment of phthisis,-" There are two classes of consumptives for whom the home treatment is the only treatment- those whose means do not allow a change of climate, whatever the stage or condition of their diseases and those whose condition, whatever their means, is such that they had better stay home and die among their friends, surrounded by the comforts which are to be found in the homes of the well-to-do but which can so rarely be secured, especially in this country, in hotels or boarding houses." He is a supporter of the home treatment for the above cases and has secured good results.

J. T. Leaming² also admitted that the climate cure was for the rich. For the poor he advocated parks, sanatoria, dispensaries, horseback riding. He said in emphasis, " The essential benefit of climatic treatment is reforming and keeping the habit of natural breathing. This can be cultivated in parks if climate cure is impossible.¶

Other Developments

Among the supporters of the climatic treatment there were certain interesting developments taking place.

1. Emphasis on the Beneficial Effects of Colorado, and the Southwest or such resorts as Aiken, Asheville, Florida

In almost all instances, reports favoring the climatic advantages of various resorts were by physicians who were practicing at those places. Throughout this period numerous papers

1. Shattuck, F.C. " Home Treatment of Phthisis". Trans. Am. Climat. Assoc. Vol. 2: 65-76, 1885

were presented at the meetings of the American Climatological Association dealing with the advantages of a sojourn in these resorts. It would not be true to state that all the papers on this subject were from physicians in these localities. There were many physicians like Dr. Knight of Boston, several in New York and Philadelphia and elsewhere who also advocated these resorts. The profession at this time was becoming very rapidly crystallized into two camps; those who advocated a change of climate and those who believed that Home Treatment proved equally successful provided the same regimen was pursued.

Typical of the papers which supported the claims of the Climatic Treatment were the following.

1
S.A. Fisk of Colorado in 1888 presented the following characteristics of the Colorado climate:-

1. Elevation
2. Dry air
3. Large amount of sunshine
4. Warm sun temperature
5. Variable temperature- cool in winter
6. Moderate air motion with occasional high winds
7. Small amount of snow, rain
8. Absence of fogs
9. Pure air(bacteriologically)
- 10 Dry, sandy well drained soil.

S.E. Solly² of Colorado confirmed the above characteristics and emphasized the point that the above list produced physiological effects agreeing with those of H. Weber:-

1. Skin is better nourished, strengthened and is more active.
2. Circulation is better.

1. Trans. Am. Climat. Assoc. Vol. 5 11-22, 1888

3. Lungs Number of respirations temporarily increased and the depth of respiration improved.

4. Lungs The amount of water separated from the lungs is increased and the separation of $H_2C O_3$ is rendered easier

5. Appetite and assimilation improved.

6. Nourishment is better.

7. Nervous- muscular systems- greater energy in both systems

8. Sleep is improved.

He presented case histories to support his contentions.

In regard to what cases do well at Colorado Springs-

1. Very marked benefit" in those whose ancestry or physique or both convey the impression of their being affected with general tuberculosis.

2. Hemorrhagic cases are found to do well.

3. Phthisis consequent upon croupous pneumonia is generally benefited.

4. The presence of a cavity is not, in itself alone a bar to coming and receiving good.

5. Fibroid phthisis is usually improved.

2. Discussion on the importance of certain of the meteorological elements

There was considerable differences of opinion as to which¹ of the climatic factors was the most beneficial. E.T. Bruen pointed out these differences: The following features of climate all had their supporters:-

1. Bruen, E.T. Trans. Am. Climat. Ass. 5: 36043 1888

1. Cool or cold climate
2. Warm or hot climate
3. Altitude or sea level
4. Dry Climate
5. Moist Climate
6. Equability
7. Variability
8. Pine Forests
9. Ozone
- 10 Ocean Voyages.

" It would seem, therefore that the consideration of the etiology of phthisis would indicate that climate is of value to the individual predisposed to phthisis not by a single or a specific quality of air or by any definite combination of meteorological conditions. It is neither more nor less than pure air, uncontaminated by miasm or organic or inorganic substances. The chief purpose of climatic change is to increase cellular restive power. He then advocates the following characteristics of a climate:-

1. Pure air
2. Well drained soil
3. Atmospheric dryness
4. Sunshine
5. Moderate altitude, dismissing entirely the benefits of high altitude.

In conclusion, he states, " The relative advantages of climate should be set against other disadvantages; personal comfort convenience, expense.

Dr. V.Y. Bowditch¹ in 1888 after reviewing the literature on the subject was in favor of:-

1. Dryness of atmosphere and soil
2. Cool air
3. Inland climates
4. He dismissed the value of high altitude, per se.

3. Belief in value of biologically pure air.

It has been noted in several of the previous papers the writer emphasized the importance of pure air. This meant air free from germs. Since by 1890 most of the profession had accepted the Bacillus Tuberculosis as the cause of tuberculosis, it was long natural that in its application to climate they should have insisted upon germ pure air. This particular point was mentioned by many writers of the period.

4. Publication of results obtained in sanatoria

Home treatment had a dual meaning as sanatoria became more extensively used. First, home treatment was applied to that treatment which was conducted actually in the home for those patients who were unable to go away either on account of finances or because the disease was too far advanced. Second home treatment meant treatment of a patients in their home climate in sanatoria as opposed to climatic treatment presumably at some distance, such as Colorado, Arizona or even European resorts.

In regard to the second factor of Home Treatment-Sanatorium Treatment there was interest at this time in the results which were being produced.

V.K.Bowditch¹ presented the following report in 1888:

"The Sharon Sanitorium has these distinctive features, and so far as I know is the only one in this country which combines the following conditions, viz: that it is within easy access of Boston, situated in our New England climate, which is not notoriously unfavorable for consumptives at an altitude of about 400 feet only and is intended for the use of people of very limited means, like teachers, shop-girls etc. not for the wealthier classes and is chiefly supported by public subscriptions." After stating that he did not expect to achieve results equal to those which are produced with patients going to more favorable climates he reviews the existing notions of home treatment ideas: cod liver oil, cough syrups, stay in open air, eat good food, "with the knowledge that in the vast majority of cases it means a slow and steady going down hill of the patient."

Since the opening of the Sanitorium on Feb. 9, 1891 51 patients have been received. 3 patients did not remain long enough for treatment of the remaining 48, 8 proved to have bronchitis and were discharged "well" of the 40 cases of phthisis, 10 were discharged "arrested" 13 were improved 11 not improved, 6 showed slight improvement.

of the 11 not improved! 7 were in advanced stage
 2 had well marked disease
 2 were incipient.

1. Bowditch, V.Y. "Three Years Experience with Sanitarium Treatment of Pulmonary Diseases" Trans. Am. Climat Ass. Vol. 10, 254-274 1893-4

C. T. Williams¹ reported in the British Medical Journal¹ some interesting results on Patients in high altitudes:-

Report on 141 cases in sanatoria at 5000 ft to 9000 ft. elevation in the Alps, Rocky Mts. and South African Highlands:-

Cured-41%

Improved Greatly 29.7%

Improved 11 %

Worse 17%

There was an improve-

ment of 91% of the

cases in the first stage

By this time also the results of Brehmer and Dettweiler were becoming familiar by their publication in the Journals and the books of these pioneers.

5. Open Resorts vs. Closed Institutions

There was another group of physicians who were pointing out the advantages of the sanatoria and the disadvantages of the old type of open resort which received patients with practically no supervision. Kretzschman² summarized these views:-

" Neither climatic influences nor medical or surgical treatment, whether applied directly to the diseased lung tissue or through the general organism, nor increased nutrition nor open-air camping or resting, nor mountain climbing nor systematic use of baths, douches or mineral springs or massage has, as yet, enabled us to lay down any reliable guide for the successful treatment of pulmonary consumption.. " Discarding all specific medication, it should be our endeavor so

1. Brit. M.J. 1888, I: 1009
2. Trans. Am. Climat. Ass. 5: 69-83

to combine all remedial forces at our command as to strengthen and invigorate the great complex of cells- the general organism and thereby to enable the diseased organ to resist the destructive invasion of the tubercle bacillus".

He emphasized the need of the physician controlling everything that might influence the condition of the patient, favorably or otherwise, and stated that this was possible only in sanatoria.

His objections to the open resorts were the result of a personal investigation in Europe and the United States:-

- | | |
|------------------------------|-----------------------|
| 1. Absence of regular habits | 5. No rest treatment |
| 2. Dissipation | 6. Strenuous exercise |
| 3. Drinking | 7. Excitement |
| 4. Late hours | |

Summary

The foregoing were the main developments in the period just after Koch's discovery. The essential points to be noted are:-

1. The slowness of the acceptance of Koch's views by the medical profession.
2. The direction of efforts toward obtaining a bacteriologically pure air, after the acceptance of his discovery.
3. The development of Home Treatment vs. Climatic Treatment.
4. The growing favor of sanatoria not only with the medical profession but the public at large.
5. The diverse views on the subject of climate among the

supporters of the Climatic Treatment.

6. Recognition and emphasis of the economic factor in the Climatic Treatment.

In addition to these feature of the period, the literature was full of discussion on the value of antiseptics against the bacillus. The profession, having discarded the theory of specific climate now turned to the search for a specific agent against the bacillus. And the search is still on. In the words of Dr. E.R. Baldwin¹, " During the later years, among the 'eighties the trend of treatment was toward germicides aimed against the bacillus. Creosote was perhaps the most widely used agent with disinfectant powers." He also mentions $H_2 S$, $H F O_2$ and oils. " Belief in specifics was natural considering that the enemy had been located and the bacillus could be studied with reference to the influence of antiseptics."

It was a period of activity and investigation along many lines. Though the value of open air, rest, diet was indicated by a few writers, the sanatorium treatment and the home Treatment in general was viewed with indifference by the medical profession as a whole.

B 1901-1908

The discussion on Home Treatment vs Climatic Treatment came to a head at the annual meeting of the American Climatological Association in 1901. At that time three papers were presented in support of the Home Treatment; two papers compared

1. Baldwin, E.R. Trans Am. Climat. Ass. 25: 84-91 1908
2. Trans. American Climat. Ass. Vol. 17: 183-228, 1901

the results of Home Treatment and Climatic Treatment; and two papers by physicians from Colorado presented the views of the Health Resort group¹. These contributions summarized the convictions and opinions of the two groups of therapeutists.

The papers which were in support of Home Treatment were by Leonare Weber, ~~I.H.Hance~~ and A.C.Klebs. The points which they emphasized were:-

1. Weber became convinced of the value of Home treatment after investigating personally sanatoria in U.S. and abroad- especially for those patients " as could not or would not be sent away from home."

His Home Treatment consisted of:-

- a) Rest cure at the outset and careful nursing
- b) Patients' room light, airy, easy to ventilate with moderate heat and provision for collection of sputa
- c) Diet and baths regulated
- d) Px for keeping down the temperature
- e) Treatment of hemoptysis
- f) Treatment for cough
- g) On improvement he sent them to the country.

2. Hance pointed out the value of home treatment in nearby country places with the application of approved methods modified so as to fit the patient- fresh air, good food and rest. He quoted the good results obtained by Bowditch at Sharon and the result at the Montefiore Home in New York City. This class of patients (those for Home Treatment) from the nature of their cases do not give roseate statistics, but with the

1- (see Foot-Note p.)

absolute faith in this form of treatment by the physician, there is every reason to believe that results will be forthcoming.

3." History has handed down to us first the climate or region where tuberculosis is cured; then came the natural evolution of sanatorium treatment; now is added the State care of the consumptive; finally comes the individual and it behooves us all now to battle for his interests, so that when he is a victim of tuberculosis he may get the same treatment for tuberculosis and his physician extend to him the value of our scientific knowledge, instead of relegating him to the class of chronics whose fate it is to have all nostrums and new pharmaceutical compounds poured down his stomach ad nauseam."

3. Klebs" when one reads the history of the treatment of tuberculosis, one finds that at one time or other almost any combination of known atmospheric conditions were considered to constitute a climate, which had protective or curative qualities for consumptives." He then summarized these conditions: warm climates, cold climates, even equable climates, sea voyages, "immune zones", high altitudes, deserts. "It cannot be denied that any of these climates, just as any of the drugs recommended can and has a favorable influence on some cases, but we have no fact or statistics at our disposal to prove that there is any one climate or drug that exerts a specific effect on all cases." Since the discovery of the bacillus, "climatological, physical and medicinal methods were chiefly directed against the bacillus" and as a consequence the practitioners were divided into sects of therapeutics: - increase of red

corpuscles at high altitude, effect of Ozone; intense insolation; prolonged exposure to air; overfeeding. The disadvantages of climatic treatment:-

1. Expense of a long journey
2. Discomfort in changing climate
3. Time necessary for acclimatization.
4. Home sickness
5. Choice of an appropriate climate difficult
6. Lack of suitable accommodations for pulmonary invalids
7. Danger of over-exertion
8. Impossibility of returning home for many patients.

He emphasizes his discussion by quoting the fact that 40% of cases of "mixed material" can recover and remain well in adverse climates. "My advocacy of home treatment is based on the conviction that by its judicious application we can do for many of our patients a great deal more than by sending them away, and I do so especially in opposition to the practise of indiscriminately dispatching patients in all stages, with little health and little wealth' without first considering the measure thoroughly and in every direction. 'Tuberculosis, therefore Cresote or Colorado" are much used watchwords which should be condemned wherever there is occasion for it."

E.O.Otis in his paper on "Home Treatment of Tuberculosis vs Climatic Treatment" added a new angle to the discussion:
 "All treatment of pulmonary tuberculosis is in one sense climatic wherever you treat the disease certain climatic essentials are indispensable:- Pure air; freedom from dust and winds; sunshine; equable temperature; Some or all of these essentials

enhance climate treatment per se , but when they have to be obtained by compelling the patient to be acclimated twice over, first to the climate and then again re-acclimated to the old, it is a debatable question whether the additional gain is worth the price paid. The magic of climate as the totality of treatment now no longer holds sway, but any region whose climate permits the patient to continuously remain out-doors in pure air is a favorable one for hygiene-dietetic treatment" He supports this conclusion by the results obtained in sanatoria in England, Germany, and New England.

V.Y.Bowditch on the same subject said: " when any attempts are made to compare the two forms of treatment that one is confronted with vagueness of terms and lack of sufficient evidence," He takes the stand that all the evidence one way or another is not yet complete. On the basis of the existing methods in the West as compared with those of the East, he takes the following position:-

1. He is strongly in favor of the erection of sanatoria wherever the disease prevails
2. The results of sanatorium treatment in favorable or unfavorable climates is not yet complete
3. The results of sanatorium treatment in the West should be better than in the East.

The presentation of evidence in support of Climatic Treatment was made by C.F.Gardiner and S.G.Bonney, both of Colorado.

Gardiner enumerated the effects of the Colorado Climate upon the patient:-

1. Rarefied air gradually expands the chest and more effectively than in lower altitudes.

2. Capillary circulation is promoted
3. Re-infection is limited, the air being sterile
4. Specific gravity of the blood is increased and nutrition stimulated
5. Appetite is increased
6. Solar rays act with power on the skin
7. Sunlight is a powerful germicide
8. Dryness of air and cool nights prevent exhaustion from the heat.

The facts as quoted were gathered by men who have spent a long time actually in the climate. He decries against the spirit of skepticism in regard to the curative value of climate. He feels that this skepticism has been the result of the abuse of climate which " has given the wrong impression. The abuses of climate:-

1. Invalids sent to resorts in the West where food is difficult to obtain and sanitarium methods impossible to establish
2. Patients sent in the last stages of the disease
3. Patients sent in financial stress
4. Comparision of climatic treatment in the West with closed sanatorium treatment in the East is unfair because in the East the invalids are under skilful care of physicians who " weed out unfavorable cases and only leave the favorable cases."

S.G.Bonney was " an earnest advocate of the value of climate in the treatment of consumption" He is a supporter of managing the daily life of the patient but considered the latter as an adjunct of the first. He also felt that the results produced in sanatoria could be obtained by medical advisors without the aid of institution. He asserted that " the undue enthusiasm on the part of those advocating home sanatoria may delay

the acceptance of the more comprehensive principles of management at the expense of a considerable sacrifice of life. Disclaiming any desire to reflect upon the actual worth of such institutions the utility of which, for those unable to seek climatic change, has been accorded, it is nevertheless a matter of record that the heralded satisfactory results are largely due to the fact that only incipient cases are admitted."

" If a suitable regimen without the favorable influence of climate is capable of producing a perceptible improvement of very incipient cases, how much greater and more enduring results and in how much greater number of cases, advanced though they may be, may be obtained by precisely the same manner of life plus the beneficence of climate."

" Have not the consumptives an inviolable right, provided their financial condition will permit, to expect their advisers to place them in the midst of a new environment, with opportunities for recreation and social advantages, facilities for industry and business enterprise and possibilities of advancement and fortune incident to a new country, with its western stir and activity.?"

The discussion of the papers by the members of the Association produced some interesting side-lights.

1. Six physicians from Colorado supported the climatic Treatment though with varying degrees of emphasis. One or two recognized and admitted that the pocketbook was an essential factor yet they all asserted their belief in climate. The group included S.E.Solly, S.A.Fisk, Hart, Edson, Whitney, Campbell.

2. Dr. Knight of Boston was in favor of climate

3. Dr. McGahon of South Carolina was in favor of sanatoria

4. Two physicians from Philadelphia- Curtin and Wilson- supported home treatment.

5. Dr. Minor of Asheville was " sorry to hear Dr. Bonney put climate before life and to have Dr. Solly put climate down as the first essential"

6. Dr. Hance said that invariably if the physicians themselves had tuberculosis they would seek a climatic change.

The reports and discussions indicated a geographical difference of opinion. The men from health resorts, with one or two exceptions were in favor of climate while those who were conducting sanatoria or were actively interested in Home Treatment supported the Home Treatment. There was a middle group represented by Dr. Otis and Dr. Bowditch and others who while admitted the advantages of sanatoria yet considered the climate factor when obtainable an advantage tho not essential or held final decision in obeyance until the evidence was all in. It was further interesting to note that both groups admitted that the economic factors were of importance.

Four years later, at the first annual meeting of the National Association for the Study and Prevention of Tuberculosis there was presented a Report of the Committee on the Influence of Climate in Pulmonary Tuberculosis.¹ The committee consisted of:

Dr. C. L. Minto, Chairman, Asheville; Dr. E. R. Baldwin, Saranac Lake; Dr. Norman Bridge, Los Angeles; Dr. C. F. McGahan,

1. Trans. Nat. Tuberculosis Ass. Vol. 1: 304-315, 1905

Aiken; Dr. Henry Sewall, Denver; Dr. S.E.Solly, Colorado Springs.

All of the above committee were also members of the American Climatological Association and had taken active part in the previous discussions on the subject. The report in substance was as follows:-

" The beneficial influence of wisely selected and properly used climatic influences in the treatment of pulmonary tuberculosis has been one of the accepted facts of therapeutics for centuries, attested by an enormous mass of satisfactory clinical evidence from the days of Hippocrates and Celsus until our own". They reviewed the causes for doubting the value of climate; 1. unskilful use in the past of climate 2) widespread belief in a mysterious specific influence of climate which led to a neglect of hygiene, diet, instruction and detailed supervision 3) " in the effect of the general profession of their recent and all too limited experience with outdoor treatment at home, which has caused them to go from the extreme of an undue hopelessness in the past to that of an equally unwise hopefulness that any case can be cured in any atmosphere by sleeping out on a porch and eating freely."

Errors were pointed out wherein the profession was not managing, supervising and instructing cases. They point out also that most of the evidence for climate consists of clinical experience.

Since the first aim in the treatment of tuberculosis is the raising of the vitality of the patient's system the beneficial action of climate depends on 1) power of vitalizing the system 2) effects on metabolism and 3) awakening of dormant or waning

powers.

They also emphasized that hygiene, diet, teaching and supervision came first.

The beneficial factors of climate:-

1. Abundance, bacteriological and chemical purity of air.
2. Sunshine
3. Coolness
4. Dryness
5. Altitude
6. Wind
7. Equability
8. Soil

" For the submerged tenth climate-theraphy, save as supplied by the municipality or state or philanthropic effort is an impossibility. " The only permanent results among the poor will come from prophylaxis based on teaching them decent modes of life, improvement of bad sanitary conditions and on a change in the impossible hygiene of their lives. For those in modest, or narrow circumstances it is only desirable when they will be able to get at the resort equal or better conditions than they could at home. For those who are comfortably off or for the well-to-do, it seems to your Committee that there cannot be a moment's doubt that any results that they could obtain at home... can be infinitely improved and the percentage of cures or arrest greatly increased by the carrying out of similar treatment under the favorable influences of climate."

Here again the discussion on the report produced some interesting features. After it was moved the report be adopted,

Dr. L.F.Flick, the director of Phills Institute in Philadelphia, declared; " I wish to record myself as holding the opinion that there is absolutely nothing in climate in the treatment of tuberculosis" He elaborates upon this, stating his own personal experiences. Dr. Lyle of Cincinnati spoke in favor of Home Treatment and Dr. Stevens of Des Moines wished the report modified with less emphasis on climate. Dr. Phillips wished the report referred back to the Committee. But Drs. Kinght, Carrington of New Mexico, Bowditch, Rochester of Buffalo, Hinsdale, Cohen Meyer and Pattenger, all prominent authorities on the subject, favored the report. The Report was adopted and approved as read.

Such were the official recorded opinions of the various experts. The opinions of these men were hopelessly divided by 1905 and they ranged from the one extreme as expressed by Dr. Flick to the other extreme as expressed by Drs. Solly and Bonney of Colorado.

Other Developments

While the subject of Home Treatment vs Climatic Treatment was apparently the " topic of the hour" there were other contributions being made to the subject of climate. These discussions will not be reported in detail, as references to them have been included in the bibliography in a special section on the period 1882-1927. But in order to make the history of this period more complete the topics and points are summarized as follows:-

1. Difficulties confronting the climate-therapist in the way of lack of data both as to meteorological conditions and mortality statistics were repeatedly emphasized.

2. Difficulty of making comparisions between sanatorium

results and those of health resorts were re-emphasized.

3. Data of sanatoria, such as those of Dettweiler, Hohenhonnef, Adirondack Cottage, Sanatorium, Asheville, Sharon were brought forth in increasing numbers.

4. Exaggeration of these data was repeatedly warned against.

5. Whether as a result of the discussion, reported in this chapter, which took place at the 1901 meeting of the American Climatological Association or not, there were erected soon after this date several sanatoria in Colorado and the Southwest. The results of these institutions were brought forward.

6. Clinical evidence, as in the past, consisting of personal experiences both of physicians and the laity was repeatedly furnished.

7. Many writers indicated the antiseptic qualities of the air in certain localities- sunlight and bacterial purity.

8. Values of high altitudes, medium altitudes and low altitudes, had their prominent supporters.

9. The question as to whether certain cured or arrested cases could ever return home from high altitudes excited continuous discussion.

10 Ocean climates and sea voyages still had their supporters

11. With the increase in the popularity of the community health problems and the consequent rapid extension of the health department activities, clinics and dispensaries added their experience to the accumulating evidence of the value of the Home Treatment.

12. Such men as Hermann Weber, and C.T. Williams in Europe ably summarize and discussed the physiological effects of

certain climates as high altitude, forests, desert climates, ocean voyages etc. on phthisis. Their opinions, supported as they were by clinical evidence both of the sanatoria and the private practitioner still exerted tremendous influence on the medical profession.

13. Please for the inclusion of medical climatology in the medical courses of Universities were frequent.

14. The crystallizing of medical opinion was evident in the discussions of climate which were presented in the treatises on Tuberculosis. Among several of such works the following were typical:-

Flick, L.F.¹ after showing that climate had the support of medical opinion throughout the ages and that tuberculosis was to be found everywhere said. "Strictly speaking climate has no causal relationship to consumption. It influences the disease only in so far as it affects the micro-organisms which have to do with the disease." His book is a plea for Home Treatment and deals largely with its management and methodology.

Francine, A.P.² Reviewed the whole problem indicating that the factor of climate is recognized as being of less importance than formerly yet feeling that there were certain conditions which were amenable to climate. He reviews the popular health resorts and the indications for their use, emphasizing the need for individuality and the study of the requirements

1. Flick L.F. "Consumption A curable and Preventable Disease, Chapt. XV 1903
2. Francine, A.P. "Pulmonary Tuberculosis". Chapt. III 1906

for the particular case. " But the fact remains, I believe that change of climate in suitable cases and in those properly prepared by treatment at home is of distinct advantage provided always that the patient's financial resources are amply adequate

Latham, Arthur¹ was a supporter of the modern sanatorium treatment with its regime of open air, diet and rest. " The question of climate is, however, of importance in the treatment of advanced consumption and when certain conditions such as emphysema complicate the disease; but with these exceptions any climate will do for the treatment of tuberculosis, provided the air is pure and bracing." He then reviews the chief climatic elements.

Bonney, S.G.² Presented an elaborate dissertation on the benefits of the climatic treatment. His views of the subject have already been discussed in connection with discussions at the American Climatological Association. As a practitioner in Colorado who himself went to Colorado in search of his health and who was later cured, he could hardly be otherwise than a supporter of Colorado's climate. There is no doubt that his opinions on climate were those of most of the profession in Colorado and the Southwest.

15. Finally there was some evidence, statistical and experimental, which was intended to prove a relationship between climate and tuberculosis. This evidence has been reserved for

1. Latham, A. "Diagnosis and Modern Treatment of Pulmonary Consumption" 1907
2. Bonney, S.G. "Pulmonary Tuberculosis" in Part VI, 1908

for more thorough summarization and discussion in the next
chapter- Chapter X

1908-1927

In 1908, as the result of an invitation extended by the National Association for the Study and Prevention of Tuberculosis the Sixth International Congress on Tuberculosis held its meeting in Washington, D.C. The invitation had been extended and accepted in 1905 one year after the organization of the National Association. With a budget of \$10,000, the infant organization was struggling along trying to make both ends meet and almost immediately it undertook a task which would require at least \$100,000 to underwrite. However, careful planning and organization resulted in a successful meeting the influence of which could hardly be measured. As Dr. Jacobs of the National Tuberculosis Association has said¹, "It has proved unquestionably to be the most significant milestone in the progress of this great movement in the United States. The educational and organization campaign centering around the preparation for the Congress paved the way for the development of state and local associations throughout the entire country. The individuals interested in the Congress itself such an inspiration that hundreds of them immediately began to develop community effort in their respective towns and cities. The conclusions reached by the Congress, both as evidenced in the resolutions and as brought out in the various discussions, formed the basis for the programs of national state and local tuberculosis association for nearly a decade." Thus the present extensive

1. Knopf, S.A. "A History of the National Tuberculosis Asso.
p. 150 1922

organization of the tuberculosis movement in the United States had its real inception at the Sixth International Congress.

Among the several resolutions which were adopted by the Congress in 1908 was the following:-¹

" Resolved: That we urge upon the public and upon all government (a) the establishment of hospitals for the treatment of advanced cases of tuberculosis (b) the establishment of sanatoriums for curable cases of tuberculosis (c) the establishment of dispensaries, day camps, and night camps for ambulant cases of tuberculosis which cannot enter hospitals or sanatoriums." This resolution and the paper by Sir Arthur Newsholme, " The Causes of the Past Decline in Tuberculosis and the Light Thrown by History on Preventive Measures for the Immediate Future " wherein he ascribed the great value of sanatoria to be in their use for isolation of open, active cases, bore fitting testimony to the results of the open air-dietetic regime which had developed from the contributions of George Bodington, Herman Brehmer, Dettweiler and Trudeau.

With this official recognition of the value of the open air and sanatorium movement by the leading practitioners of the world and the new watchword of prevention rather than cure, it was not surprising that the emphasis placed upon climate became less and less pronounced. In 1909, Dr. Trudeau said²

" The exact value of climate is still a disputed subject, but

1. Knopf, S.A." A History of the National Tub. Ass. 1922 p.149
2. Klebs, A.C. "Tuberculosis" p. 505-1909

it is difficult to understand why climate should be disregarded entirely while all other factors which go to make up a favorable climate for the patient are insisted upon. No doubt good results could be and are obtained without any specially favorable climatic influences, but it seems hardly rational to insist on the value of the minutest details of the patients surroundings and habits of life and deny absolutely any influences of climate as a factor in securing the most favorable environment obtainable for the patient." This statement indicates a conservative point of view and also that the idea of the importance of climate was not immediately abandoned. In the same volume in which Trudeau's statement appeared there is a lengthy chapter dealing with the Physiology of Climate by Henry Sewall and Climatic Therapeutics by W.J.Barlow which represents the views of the climate school of physicians. This discussion does not materially differ from the earlier opinions of this group though it is a bit more temperate in character, recognizing the importance of sanatoria.

Pottenger¹ in 1917 stated, " Neither open air, food, rest exercise pshchotherapy, climatic change, tonics, bacillary vaccines or any other measure alone is a cure for tuberculosis, but the intelligent application of these various measures in proper combination will bring about an arrestment or healing in a very large percentage of cases." And later on in this chapter he calls attention to the fact that most discussions

1. Pottenger, F.M. " Clinical Tuberculosis" Vol II, 254-276
1917

on climate are intentionally or unintentionally partisan. Practitioners draw conclusions from the results obtained in their particular locality. He says, "All are right and all are wrong, They are all right in the one observation that tuberculosis is a curable disease when the patient is intelligently guided... They are equally wrong in drawing the conclusion that the cure which resulted was due alone, or largely, to the presence of favorable climatic elements, or that climate has no influence.. The good or bad influence of climate depends on the degree to which a man can adapt himself to the particular elements present, and maintain a physiological equilibrium."

E.O.Otis, in 1920 admirably summarized the prevailing opinion upon the subject of climate:-

" Since such favorable results have been obtained in any and all climates in the treatment of tuberculosis by the skilful application of the open-air regime, the role of climate does not now occupy the paramount place it once did. Formerly a change to a more favourable climate was considered the most essential factor in the treatment, and when once the patient had reached the climatic El Dorado, he was left to himself to follow his or extraordinary mode of life with but little, if any, medical oversight, A few recovered and more died under this go-as-you-please plan. Experience has demonstrated however, that the open air treatment can be successfully carried out anywhere, even in the crowded city; for more depends upon the method, the careful attention to details skilled medical supervision and the complete fulfillment of the out door life than

upon any special climate. Nevertheless it is obvious that, with an efficient hygienic - dietetic method, favorable climatic conditions are an added advantage."

All the writers were not taking such a stand on climate, however, Many physicians who had spent their lives in such long-heralded climates as Colorado, New Mexico, the Alps afforded could not with complacency accept these newer doctrines in toto.

John W. Flinn¹, E.S. Bullock² and W.C. Klotz³ presented articles in the American Review of Tuberculosis with conclusions and evidence which seemed to show that climate per se had some influence. And foreign observers including Ichok and Flügge⁴ also presented evidence in support of climate. Even as late as 1926, van Canterin⁵ wrote on the relation of tuberculosis to physical agents.

But in spite of the support of climate by many ardent enthusiasts there is abundant evidence that the majority of enlightened physicians take the position as expressed by Otis and Pottenger as well as Fishberg who in his "Pulmonary Tuberculosis" 1922 said, "The treatment of tuberculosis in certain climatic regions... has its indications and contraindications, while home treatment has certain advantages in this regard. It can be applied successfully in the treatment of nearly all cases, in all forms of phthisis, and in all stages; striking results are obtained in patients with limited as well as those

1. American Rev. of Tuberc. Vol. 6; 484-524, 1922-23
2. Ibid, Vol 4 : 300-309 1920-1921
3. Ibid Vol. 1 : 83-98 1917-18
4. Am. Rev. of Tuberc. Abstracts 6: 250-51: 7 ;76
5. Ibid 13: 107

who are well-to-do; in febrile and a-febrile cases; in those or without gastric derangements. In short, in all cases of tuberculosis, in all its forms in all stages of the disease, during any season of the year in almost any climate except the arid."

Summary

In this chapter the emphasis put upon climate and its influence upon tuberculosis underwent a radical change. The discovery of the tubercle bacillus exerted a profound change and destroyed the theory that climate was the etiological agent. The search for pur air, bacteriologically speaking, and the demand for immune zones were the questions of the hour. Later came the discussion on Home Treatment as against Climatic Treatment. This resulted in dividing the profession in two opposing camps with extreme views held by each. After the International Congress in 1908 a middle ground was taken with the emphasis on open air, food, rest and graduated exercise and the consideration of climate as a valuable adjuvant to this regime but not necessarily an essential part. There was finally a definite realization that climatic treatment was a treatment for the rich

This chapter brings to a close the historical outline of the subject; Climate in Relation to Tuberculosis. Up to this point two of the purposes of the thesis have been fulfilled: first to outline the main developments in the history of the subject, and second, to search for any elements which were common to all periods, with an attempt to explain the origin of the climatic treatment. The second purpose has been

more thoroughly considered in the final chapter containing the concluding remarks.

There remains for further consideration, however, the papers which have been published from time to time purporting to offer convincing evidence of the relationship of various meteorological elements to the course and mortality of tuberculosis. An analysis of certain of these papers is to be found in Chapter X,

CHAPTER X

A CRITICAL REVIEW OF SOME EVIDENCE IN SUPPORT OF THE
HYPOTHESIS THAT CERTAIN FACTORS OF CLIMATE
HAVE A RELATION TO TUBERCULOSIS

The foregoing historical study has revealed that the subject of climate in its relation to tuberculosis underwent many vicissitudes in the course of its development from the recommendation of long and short sea voyages or a mere change of residence to the belief that climate was not an essential factor at all. The knowledge upon which all climatic treatment was based was essentially empirical. Thus the personal experience of physicians in their travels or by actually having the disease and then seeking a suitable climate, and the observation of the results obtained upon certain patients were the basic elements. As a natural result of such empirical knowledge there was a continuous change of viewpoint and conflicting opinion. Indeed in no period which has been discussed can there be said to have been entire unanimity of opinion in the medical profession as a whole or even among the recognized authorities.

There were a few attempts however to show a direct relation between certain meteorological elements and the course or mortality of the disease, by statistical methods and scientific experiment. One or two of these papers have exerted considerable influence upon professional opinion and others await confirmation of their conclusions. Whatever may be claimed for these contributions in the way of scientific proof, or however

severely they may be criticized they all deserve credit for being serious efforts to apply scientific principles to a problem which has engaged the attention of observers throughout the ages.

These papers are presented in chronological order. They have been necessarily condensed but emphasis has been placed upon their method of attack and conclusions.

1. Henry I. Bowditch, 1854-1862

Bowditch made a study of soil moisture and the prevalence of consumption in the state of Massachusetts. The original MS of the study reposes in the Boston Medical Library and the writer has been privileged to examine it. From the detailed tables which Bowditch prepared it is evident that he made a personal investigation of most of his cases. He made very elaborate notes on practically all the cases and came to the conclusion that moisture in the soil was an important factor in the prevalence of consumption. Wherever there was considerable moisture in the soil he found considerable numbers of cases.

Criticism

The work of Bowditch was painstaking and done at the expense of a great amount of energy. However, in view of the fact that it has been shown that soil and moisture are not as important etiological factors as the tubercle bacillus, the study did not conclusively prove the point. Bowditch also used his personal judgment as to whether the soil was moist or not. In a column headed, "Conditions of Soil", he noted merely whether

the soil was wet, dry, moist etc. without indicating any standard for such measurement.

Bowditch enjoyed a national and international reputation as a practitioner and clinician. He made many valuable contributions to medicine and naturally his paper on soil and consumption received instant recognition. The paper was quoted frequently in the literature and it was not an insignificant factor in turning the tide of opinion from moist damp climates to dry, equable climates for tuberculosis patients.

2. William Pepper¹, 1886

In a paper, "A contribution to the Climatological Study of Consumption in Pennsylvania," Pepper used the statistical method and questionnaire method in cooperation with Guy Hinsdale who made the maps and diagrams.

The study contained several elaborate maps in which the death rates of consumption in Pennsylvania were plotted by counties as well as the temperature, elevation and average rainfall. The meteorological data were those of the U.S. Weather Bureau and the elevation was obtained from the State Geological Survey. He went into great detail in the topography of Pennsylvania.

In addition Pepper sent out a questionnaire containing 28 questions on the subject of 650 physicians throughout the state. The following were some of the typical questions:-

1. Trans. Am. Climat. Asso. Vol III, 88-163, 1886

Height of your locality above sea level

Location of the town (exposed, sheltered, warm, cold)

Atmosphere generally- cool, warm, dry, damp

Annual amount of rain

Description of the soil

Is consumption prevalent or rare

Do you know of any cases of incipient consumption apparently cured by coming to or by going from your town or district?

Have you any evidence in support of or against the contagious or infectious character of consumption?

He received 120 replies out of the 650 sent out or a return 18.4%

Pepper came to the following conclusions after analyzing his charts, statistics and questionnaires:-

1. There was no relation between the density of population and consumption.
2. There was a relation between high mortality and low elevation.
3. There was a relation between low mortality and high elevation
4. There was no relation between soil moisture and consumption.
5. The answers to most of the questions in the questionnaire were confusing and he admitted the impossibility of drawing conclusions from them.

Criticism

The results obtained by the questionnaire were not surprising. Long after Pepper's study the questionnaire method of obtaining information was subjected to investigation and certain principles were laid down among which were: simplicity, few questions, questions to be answered yes or no or by a number.

The difficulties of the questionnaire are many but by careful planning and in the hands of experts it may be used with success. The study of Pepper's questionnaire reveals its many obvious shortcomings.

But if the questionnaire had yielded better results there would still be the question of whether the problem would have been solved. The answers would still have been a matter of personal opinion. The results so obtained could hardly be admitted as conclusive proof.

Furthermore, the study was limited to a few meteorological factors:- temperature, precipitation, elevation, wind direction. All other factors were disregarded. The advisability of taking just one or two elements of climate and attempting to show a correlation between these, without considering the other elements which are at work at the same time is open to scientific question, as will be considered later.

Pepper's study while painstaking and containing many well constructed maps and charts and tables can not be considered as offering conclusive proof.

3. E.L. Trudeau, 1887-8

While Trudeau did not study, as far as is known, the problem of climate factors in relation to tuberculosis he presented two scientific papers in 1887, and 1888 which contained experiments which he had conducted on the problem of environment as a whole in relation to tuberculosis. These papers have become classics and it has been thought advisable to include them in

the present study in order to make the picture of the whole problem more complete

His first paper on the subject was "Environment in its Relation to the Progress of Bacterial Invasion in Tuberculosis" 1 In this paper he described three experiments which he had performed:-

Experiment I Five rabbits were inoculated with pure culture of bacilli, confined in a dark place, cellar, and were stinted in food.

Experiment II Five rabbits were placed in a box in a hole in the ground which was excessively moist. They had no inoculation of bacilli.

Experiment III Five rabbits were inoculated as in Experiment I and were set free on an Island in a nearby lake and were allowed to roam about at will. The conditions were ideally suited to stimulate vitality.

Results: Experiment I. Four rabbits died in three months. The fifth survived and on autopsy showed typical lesions of tuberculosis.

Experiment II The rabbits were all living at the end of four months.

Experiment III One rabbit died in one month. The other four remained in perfect health and were so active that two could only be captured with the aid of a gun.

1. Trans. Am. Climat. Asso. Vol 4, 131-136, 1887

Conclusions: " The above evidence confirms the view that the production of tuberculosis is a complex problem and one in which many elements besides the bacillus enters.

In estimating, however, the power of environment in rendering these rabbits insusceptible to disease, it must be remembered that in them the tuberculosis was an artificial one, produced in previously sound animals, and not the culmination, as in the spontaneous disease in man and animals, of many debilitating causes, acting often through long periods of time and impairing the resisting power of the system to such a degree as to allow of spontaneous infection.

All measures which tend to increase the vitality of the body cells have been found to be precisely those which are most effectual in combating tuberculosis; one by one, specific methods of treatment, which for a season enjoyed popularity have fallen into disuse, and hygiene, climate and feeding- in other words, a favorable environment- have alone given results which have stood the test of time."

In 1888, Trudeau presented a second paper entitled, " An Environment Experiment Repeated."¹ He stated in his introduction that there were one or two points in his previous experiments which needed confirmation and also further investigation on the following points-² First, quantity of virus; second, permanency of the beneficial influence exercised by favorable surroundings.

1. Trans. Am. Climat Assoc. Vol 5, 91-94 1888

Experiment. Six full grown healthy rabbits were inoculated in the right lung with a double amount of pure culture as used in the previous experiment. They were turned loose on the same island. After four months, three were killed and autopsied, while the remaining trio spent four months in confinement in a sandy pit on a restricted diet, then autopsied and examined.

Results: Lot #1 No lesion in one rabbit.
Extensive lesions in second
Localized lesion of a small cyst in third

Lot #2 Small lesion in one
Everything normal in second
All organs normal except pleura in third.

Conclusions

1. " Amount of virus which enters the body at one time is an important factor.
 2. Influence of favorable environment is emphasized not only by the entire freedom from disease presented by two rabbits, but by a careful study of the arrested lesions of their mates.
 3. The absence of any fresh outbreak of tuberculous disease noted at the autopsies of the animals placed for the last four months in less favorable surroundings is evidence that the conservative reaction of the tissues against the bacilli tended ultimately to bring about complete recovery.
- " The best promise of success in the management of tubercular infections for the present, therefore lies not so much in the search for specific germicidal methods of treatment as in careful study of all those measures which tend to increase

the vital resistance of the infected individual."

Trudeau's experiments had a profound influence upon the modern treatment of the disease. They were simple, direct, and conclusive and they laid the foundation for the principles announced later by the National Tuberculosis Association and other bodies in the movement to eradicate tuberculosis.

4. Henry B. Baker, 1890

Baker's paper, "Relations of Certain Meteorological Conditions to Diseases of the Lungs and Air Passages in Colorado." ¹ was one of the first attempts, if not the first attempt to correlate the tuberculosis mortality with factors of weather and climate. In his introduction the author stated that he had previously analyzed the mortality and weather data of Michigan, Massachusetts, London and India which showed relationship. He now extends his investigations to Colorado.

His methods of gathering data were:- questionnaire to physicians, health officers and officers of public institutions for statements of deaths by months in Colorado; published records of U.S. Census Bureau and Denver Health Department. He admitted that his data were meagre but things they still have some value.

He put his evidence into the form of tables and diagrams showing the deaths from consumption in Colorado by months, and in some manner the temperature, absolute and relative humidity. The mortality data was obtained from the U.S. Census Report

of 1870, Denver, 1889, Colorado Springs, 1875-1889 and Boulder 1881-1889. He obtained an average mortality from consumption for each month for each place. The climate data included averages for each month for these data. After obtaining these average mortality figures for each month and the average figures for the climate factors he plotted these figures on a scale diagram and drew curves between the plotted figures. He thus had a curve for the average mortality from consumption running from Jan. to Dec. He had similar curves for climate factors. These curves appeared in one chart, for comparison. In addition he presented similar graphs for the experience of the other places which he had investigated.

He then stated:- " It takes only a glance at the diagram to show that the mortality from consumption is much influenced directly or indirectly by the temperature of the atmosphere. There is such a general correspondence of the two curves as to indicate some necessary relation between them". He pointed out the long known fact that the least number of deaths occurred in the warmest months. His explanation was that " consumption occurs through exhalations by exposure to inhalation of cold air."

The comparison of the curve of mortality with that of Absolute Humidity showed." that the most mortality occurs when there is the least water vapor in the atmosphere and the least mortality when there is moist water vapor in the air:" Similarly for Relative Humidity, there was more mortality in the months when the atmosphere was " more then usually saturated with vapor and conversely."

The paper naturally provoked discussion and the Colorado adherents criticized the paper roundly. The opinion was general that Colorado climate was beneficial in winter as well as summer.

Criticism

1. The data were too meagre for conclusive results

2. The curves were plotted from averages, for each month. It would have been much better to have used the actual mortality and weather figures. It is doubtful whether an average figure in this sense means anything.

3. A visual comparison of two curves which seem to indicate the same general character is not correlation. A true correlation can only be obtained by refined statistical methods.

4. Here again the author has neglected the other factors of weather. He assumed there was a relationship of temperature, relative and absolute humidity alone. Yet the other factors of climate must have had some influence, unless proven otherwise.

5. The paper was a step in the right direction- the use of mortality figures has been frequent in recent years, and the comparison of mortality statistics with weather data is perfectly legitimate when done under rigid restrictions and with a thorough understanding as to the limitations and interpretations of the results.

5. William Gordon, (1901-1925)

- Gordon, working in England in a series of papers presented from time to time from 1901 to 1925 attempted to show a

a correlation between Wet, Rain bearing Winds and Phthisis. His first paper, " Observations on Wind Exposure and Phthisis" appeared in 1901¹. He said, " when the erection of a sanatorium near Exeter was discussed recently I set to work to acquaint myself with the distribution of the phthisis death-rate in the Exeter neighborhood and in Devonshire generally" In doing so he presented the following data:-

1. He calculated the annual death rates from phthisis in various rural sanitary districts. The rates varied from .67 to 1.47 per 1000- his averages were based on an eight year series.

2. He calculated the general death rates in the same districts which showed a variation from 12.8 to 14.6 per 1000.

3. He compared the phthisis rates with rainfall data and seemed to get an apparent correspondence- the high rates corresponded with largest amount of rainfall, but the correspondence was not close.

4. In regard to soil influence he took the conclusions of Sir Geo. Buchanan in 1867 which " have withstood criticism" to the effect that dry soil shows absence of phthisis.

4. He compared the direction of the prevailing winds and showed a correlation between wet winds and phthisis rates. He concluded that exposure to wind was of more importance than rainfall, soil etc.

In a second paper, " Remarks on the Influence of Wind on

¹. Brit. M.J. 1901, i, 69-75

on Phthisis," 1903¹ he answered the following objections which had been raised against his first paper:-

- ✓ 1. Population of the district was too small- about 50,000
2. Periods of observation were too short
3. Influences of race, occupation, marriage, sanitation and sex not excluded
4. Wind influence only indirect because of closed doors and windows and because it drove the dampness thru the walls.

In regard to the first objection he replied," If it can be shown, in a considerable number of small villages in spite of the tendency of small numbers of population to produce large exceptions to any law of incidence that the law holds with no or almost no exceptions then the conclusion drawn is not that this absence of exception is itself a matter of chance but that the law is so cogent that it overrides chance and compels conformity"

As to the second, ten years seems to him to be a reasonable period.

As to the influence of race, occupation, marriage, sanitation, health officers have assured him that these objections can not be maintained. He quotes female rates which support his hypothesis.

As to the last objection there is no evidence.

His conclusions:-

1. West and southwest winds in Devonshire have a marked influence on phthisis
2. These winds are prevalent strong wet winds.

1. Brit. M.J. 1903 1: 1189-1191

3. These winds will produce similar effects anywhere
4. These winds are chilly and depressing and the bad effects are due to these characteristics.

In a third paper, "Influence of Rainy Winds, Soil, Poverty and General Death Rate on the Phthisis Death Rate in Exeter, 1892-1901", he analyzed the statistics of a recently published sanitary report of Exeter and showed:-

1. Streets whose roadways were swept by prevalent rainy S.W. and W. winds, suffered more from phthisis than those whose roadways were sheltered.
2. The streets built on relatively impervious soil tended to suffer more than those on pervious soil
3. Streets inhabited by the poor suffered more than those where the well-to-do resided.
4. The general death rate does not seem to affect phthisis rate.
5. Exposure to rainy winds exerted a greater influence than soil or poverty.
6. The influence of rainy winds appeared to be direct upon the people exposed to it.

In carrying out his study. Gordon used female rates only. For the purposes of plotting he used a Topographical map of Exeter which showed also the streets and houses. He used the opinions of sanitary inspections in regard to shelter and exposure to the previous mentioned winds.

In later papers¹ he confirmed his results for Exeter by investigations in nearly all areas, observation of ex-sanatorium

1. Brit. M.J. 1905, II; 1165-70 ; 1912, L: 291-294
 1923, I: 555-57 ; 1924, II: 983-85 . Brit. J. Tuberc
 XX: 20-25, 1926

patients and finally mentioned the confirmatory evidence of L. Rogers in India (to be discussed later on).

Criticism

Gordon's method of attack was scientific but his results were not conclusive. In the first place his correlations were apparent rather than exact. This charge has been brought against the work of previous writers and needs re-emphasis. Pearson and others have repeatedly warned against the inadvisability of taking an apparent correspondence of the characteristics of two curves for a proved correlation. At least the correlation coefficient by the Personian method showed he evaluated before discussion of the apparent correspondence can be admitted.

Secondly Gordon in common with other writers already noted neglected other weatherfactors.

Third, His answers to objections as contained in the second paper were not conclusive. It seems evident to the writer that all the objections were valid. His data was too meagre, the period of observation was too short, the data were not analyzed except on the basis of sex.

Fourth In spite of the objections to Gordon's data and methods which were repeatedly made. Gordon maintained throughout a belief in the trustworthiness of his method. He showed an unwillingness to concede that the opposition had a case. At least he made no effort by statistical methods to prove or disprove the claims. The whole case seemed as open to argument at the end of twenty-five years as it had at the start. Argumentation never proves a point. Scientific proofs are required.

8. Leonard Hill, 1913

Hill in a "Lecture on the Physiology of the Open Air Treatment"¹ at the Brompton Hospital in London dispelled the older theories concerning the effects of air as due to chemical State of Air, Organic Poisons and Bad Smells, and presented the modern view of spray or droplet infection, warm air, on nasal mucous membrane, open and confined air on metabolism, and the temperature and moisture of air. By kata-thermometer experiments and other experiments which he performed, he became "convinced that the whole effect of open-air -treatment is due to the movement, temperature and moisture of the air and has nothing to do with the chemical properties."

Criticism

Hill's contribution is valuable in that it indicates what factors among the various meteorological factors may have the greatest influence on the physiology of the patient. It is quite likely that the experiments of L.Hill and Greenwood, Winslow and others which have contributed so greatly to the revolution in the subject of ventilation have also indicated what factors play the greatest role on the phthisis patient. These experiments should be considered if the problem of climate and tuberculosis is ever to be scientifically demonstrated. They may point the way to a legitimate exclusion of certain meteorological factors which can be scientifically shown to have no rela-

1. Lancet. 1913, I: 1285-1290

tion whatsoever to the phthisis patient. .

7. Guy Hinsdale, 1914

Hinsdale in his treatise "Atmospheric Air In Relation to Tuberculosis"¹ reviewed the literature on the subject of climate and tuberculosis and also the experiments which had been performed on the subject of chemical purity of air, the work of Rollier on heliotherapy surgical tuberculosis, open air treatment. His essay won the Hodgkins Prize in 1908 at the time of the International Congress on Tuberculosis in Washington. The prize was shared with Dr. Knopf who also wrote on the subject. Hinsdale was a member of the American Climatological Association and enjoyed a high reputation in the profession.

In his opening paragraph, Hinsdale states, "We are compelled to acknowledge at the outset the difficulty or impossibility of analyzing the relationship of atmospheric air to tuberculosis so as to isolate the influence of all other factors. It would be totally useless and impossible to consider air independent of sunlight, heat, rainfall configuration of the earth's surface : racial characteristics, social environment, including dwellings clothing, food and drink". Later on, "The problem seems incapable of solution," However he surveys the whole field of climate in relation to tuberculosis in a very complete and satisfactory manner. It was probably the most complete survey of the subject up to that time. He came to the following conclusions:-

1. Smithsonian Misc. Coll. Vol. 63, #1, 1914

1. " There is no specific climate for tuberculosis and the long search for such a climate, a search lasting for nearly two thousand years, is apparently at an end.

2. No one can fail to be impressed with the living examples of recovery at Colorado, New Mexico, Arizona etc.

3. Several doctors of standing have been cured in the West.

4. Climate may be utilized as an adjuvant of great value for carrying out the hygienic, dietetic treatment of all forms of tuberculosis and of many other diseases. There are some elements of climate that have a more positive influence in hastening cure than others; abundance of air chemically and bacteriologically pure. sunshine, dry weather. In regard to the other factors they may or may not have influence. As regards altitude it probably has not, per se, any great influence. However, altitude is incidentally associated with mountain life or life on the plains with more sun, less moisture and scattered population."

Criticism

Hinsdale's treatise commands respect both because of the reputation of the author and the auspices under which it was produced. His work ably summarized the situation and both his opening sentences and conclusions are as sound today as they were at the time they were written. While the contribution offered no new evidence on the direct relation of climate and tuberculosis, it furnished testimony to the fact that the relationship had not been scientifically demonstrated up to that time. Whether the relationship can or will be proven is a matter

of the future.

8. N.B. Burns, 1913, 1914

Burns in two articles, "Seasonal Variation of the symptomatology of pulmonary tuberculosis,"¹ attacked the problem from a slightly different angle. He recorded the daily losses and gains in weight of patients in the North Reading State Sanatorium over a considerable period of time. He compared the curves so compiled with those of barometric pressure, relative and absolute humidity and temperature. He concluded that barometric pressure had very little effect, though relative humidity and temperature seemed to show an effect.

Criticism

The recording of data was evidently very carefully done and precautions were taken to insure accuracy. The patients were subject to same regime, food, exercise etc.

The paper is valuable in so far as it indicates a method of scientifically measuring one of the factors in the condition of the patient. Up to the present point the methods have been to use mortality data or number cases. But the author of the paper went one step further and took one of the factors which could be carefully measured. The questions naturally arises; How important is this factor. If a relation between weather and weight of tuberculosis patients is shown does this prove a relation between climate and tuberculosis?

1. Boston M.- S.J. Vol 168: 421-425, 1913
Vol. 170: 568-569 1914

It seems evident that " weight " as an index to the condition of patients may be seriously open to question. Besides weight there is temperature, mental condition, progress of the disease in the particular tissue involved, general metabolism and a host of other factors which make up the general condition of the patient. It may be doubted, then, whether a change in weight caused by weather conditions indicates a change in the general condition of the patients.

Furthermore, Huntington has shown that there is a normal variation in psychic, economic and physical characteristics of various groups of the population which corresponds to the variation with season. To what extent then, would this normal variation take place in the condition of tuberculosis patients? It seems that we have not gone far enough as yet in our analysis of the fluctuations which take place in the condition of normal, healthy people in order to interpret the results of variations in the condition of sick persons. Until this is done the experiments such as presented in this section are open to serious doubt before their final acceptance.

Furthermore, the same charge which has been repeatedly made against previous workers can be made here; namely, that the author failed to take into account all weather factors.

9. C.Frimodt, -Moller, 1921

This author performed approximately the same experiments in India ¹ that Burns had done in New England. He concluded

1. Tubercle, II, 385-395 1921

that humidity and temperature were important factors in variations of weight.

10. G. Ichok, 1922

Ichok, in an article, " La mortalité par la tuberculose dans les différentes régions climatériques de la France."¹ using the mortality statistics for tuberculosis, 1906-1913 for the whole of France, computed the mortality for several climatic regions. He divided France into regions or districts, computed the average weather conditions in these areas; temperature, humidity, rainfall, altitude and wind. He also computed the rates for the whole region, urban localities, 5000 or more population and communities of less than 5000 population. He concluded that these factors played an important part in the variations which he discovered.

Criticism

The danger of using averages has already been pointed out. It is maintained that the average conditions in a community while they represent the climate of a country can not be used scientifically to demonstrate relationship between variations in mortality and these same weather conditions. The actual figures must be used.

11. Gardiner, Webb, and Ryder

These authors, in an article, " Tuberculosis Mortality In Relation to Altitude, Humidity and Density of Population,"² on the basis on Ichok's article, attempted to do the same thing for the United States, dividing the United States, mortality

1. Rev. d. 1 Tuberc. Vol 3, 267 1922
2. Am. Rev. of tuberc. Vol VIII: 1923

from phthisis into the various states. They presented tables giving " Approximate Mean Elevation in Feet." " Approximate Mean Relative Humidity," " Population per sq. mile and the Death Rates" by states. They then plotted these data in graphic form and compared the curves. Their conclusion is that " the high inland plateau region of the United States has a remarkable low death rate from tuberculosis, both pulmonary and non-pulmonary. as compared with lower and damper regions; and this appears to be due not only to favorable hygienic , economic and social conditions, but also in considerable part to climatic factors , notably altitude and dryness."

Criticism

The same criticism can be made of this contribution that was made concerning the work of Ichok. Both contributions did not show conclusively a correlation.

12. Leonard Rogers, 1925

Rogers, in an article entitled " Tuberculosis Incidence and Climate in India; Rainfall and Wet Winds." ¹ used the statistics of the jail population for ten consecutive years between 1891 and 1918 and compared the tuberculosis mortality of this population with the rainfall and winds in India, in much the same manner as Gordon from whom he admitted ~~that~~ his inspiration came. He concluded, " The direction, steadiness and strength of the rain-bearing winds appear to be the most important factors in addition to high rainfall and absolute humidity, in influencing the prevalence of pulmonary tuberculosis in Indian jails."

1. Brit. M.J. 1925, I: 256-259

Criticism

The advisability of the use of the population of jails in such a study may be open to question. The charge was brought against Gordan's work that his original study in 1901 was not accurate because of the use of figures for the male population. Though the population in jails can be placed in the same category as the female population in that they remain fixed and subject to the same climate elements at all times, yet it must not be overlooked that the influence of climatic factors on such population is bound to be indirect. These two populations remain indoors for long periods and the climate does not have the opportunity to exert its influence in such direct manner as is obtained by its influence on out-door populations.

The lack of correlation is to be stressed and also the proneness to draw general conclusions.

Standards of Climatic Studies

Within the scope of the present thesis and the foregoing evidence the conclusion must be inevitably drawn that the relationship of climate to tuberculosis mortality or incidence has not been conclusively demonstrated. The strongest bits of evidence which we possess at the present time is first that the mortality of tuberculosis is seasonal in character, obtaining peaks in the spring and winter and reaching low points in summer. Second, there is evidence that the curve of meteorological conditions corresponds to the curve of the loss and gain of weight of tuberculosis patients.

The evidence presented in this chapter has been severely criticized from many angles, The question is naturally raised,

as to what constitutes adequate proof from the statistical point of view. The answer to this question implies the necessity of formulating adequate standards for future studies.

Among the entire range of literature which has been surveyed for the present thesis, there has not been found any discussion of what constitutes scientific proof of the problem. Apparently men all over the world from time immemorial have accepted as a matter of fact the relationship of climate to disease and have thereon built a structure of confirmatory evidence. Each contributor has believed that his treatise or discussion presented prima facie evidence and the question of doubt has not seriously been entertained by any of the long line of students. Yet a casual survey of even the most prominent authorities must have convinced even the most ardent supporters of the climate hypothesis that the evidence was so far contradictory.

It would be very easy in view of the historical survey and the critical review of the evidence presented in this thesis to lapse into a state of pure skepticism on the subject of the influence of climate. Since climate has never been proven to have a relation to tuberculosis and since the present campaign of the tuberculosis movement is based on prevention, and treatment by open air, rest, diet, exercise why bother about the problem at all: And surely this skeptic spirit is justified when the whole problem can now be considered one of purely academic interest.

However, it seems to the writer that these very reasons, offered in the skeptical spirit as a condemnation of the whole

proceedings, are a challenge to the scientific mind. Surely a problem which has engaged the leading medical writers and many of the best students of the past, is not to be easily cast aside. And when it is recalled again that in spite of the development of modern principles of the treatment of tuberculosis by means of sanatoria located everywhere in utter disregard of climate many people still believe in the efficacy of the "climate cure" to the extent of gambling all on this one case of the die, there is further challenge to prove or disprove, scientifically, and conclusively, the relationship of the disease to weather.

In the spirit of optimism, therefore, and with the strong feeling that the problem is not utterly incapable of solution in spite of the overwhelming evidence to the contrary, the writer presents the following standards or tests which he feels should be considered for the future treatment of the problem.

1. There should be a recognition of the fact that the problem may be approached in two ways: the course of the disease in a group of patients or the mortality experience of a group. The influence of climate, if there be such an influence, will be such as to check or accelerate the disease itself or on the other hand will be indicated by its power to hasten the end of those individuals suffering from the disease who are just on the verge of the end. In the latter instance the weather factors whatever, they may be will be the strongest influence of all the factors which are playing upon the individuals concerned. The problem therefore is two-fold and the approach must be suited to the exigencies of the situation.

2/ If the problem of the influence of climate on the course of disease is under consideration the following factors must be considered:-

a) The individual or individuals who undertake the solution of the problem should have broad training in public health and should be thoroughly acquainted with the fields of statistics and tuberculosis.

b) The director of the undertaking should also have the advice of statisticians and tuberculosis experts of long experience. The undertaking should be cooperative in every feature.

c) A plan should be laid before the actual work is started. This plan should be carefully considered and well thought out by the person who is actually to supervise the work and then should be presented to his advisory counsel. Every detail should be considered, discussed, criticized from every conceivable angle.

d) Two possibilities are open for consideration. Either the selection of a group of patients in a recognized sanatorium in each of several climatic regions to be studied or the experience in sanatoria which have kept adequate records both clinical and meteorological may be studied. Of the two plans the former is more advisable. It is more advantageous to start anew with all elements of the situation under actual observation rather than to consider the records of the past.

e) The undertaking should be under laboratory conditions in so far as it is possible to maintain them. Then principles of control, and accurate observation should maintain through-

out the experiment.

f) All individuals subject to observation should have exactly the same conditions even to the minutest detail.

g) The same conditions within the institution should be maintained throughout the various districts chosen.

h) All records should be uniform in all districts

i) All factors of weather should be included.

Other standards or tests may be included but certainly the above standards are the bare minimum. The main points are that laboratory conditions should be maintained throughout and that the experimental part should be done by men who appreciate scientific investigation and its problems and who are acquainted with the demands of scientific observation.

3) If the problem of mortality is undertaken the same standards of expert control should be maintained with the following additions:-

a) As large a group of the population subject to the same climatic changes should be chosen.

b) The data of mortality should be analyzed on the basis of age, sex, social and economic conditions, race, etc.

c) As long a series of observations as is possible should be used, both meteorological and mortality. The longer the better.

d) The data should be plotted by months.

e) The resulting curves should be analyzed for secular trend, seasonal variation, absolute size of items, etc.

f) A correlation coefficient should be obtained.

g) All factors of weather should be included.

4 Before proceeding upon either of the above problems, it is advisable to experiment at length upon the question of the relation of climate to the normal healthy individual. In doing the interpretation of the results obtained in the above experiments will be more sound.

The standards which have been considered are merely indicative of the spirit in which the problem of the relation of climate and tuberculosis should be approached and are by no means exhaustive. The solution if it ever comes, must be the result of the contribution of many minds- not one. The whole problem should be subjected to thorough analysis and discussion by experts. Such counsel and machinery are already in existence. The American Statistical Association, the Committee on Climatology of the American Public Health Association of which body the writer has been advisory member for three years, and various groups of statisticians of the voluntary health agencies.

With the recognition of the failures of the past and their cause, with careful planning for the future in adherence to rigid standards and the labor of many minds in the scientific spirit, the problem which has so persistently eluded solution may yet be conquered. The fate of many patients and the expenditure of public funds demand renewed interest and vigorous attack.

CHAPTER XI

CONCLUSIONS

At the outset of this thesis three purposes were enumerated; namely, to record the development of the subject of climate in relation to tuberculosis from early times to the present; to ascertain whether any factors were common to all the periods in this development and to offer an explanation of the origin of the climatic treatment; to survey some of the various contributions which have appeared in the literature in an attempt to prove this relationship. The summaries which have been placed at the end of the various chapters in the historical outline together with Chapter V on the origin of Climate Therapeutics, Chapter VIII on the Open air treatment and Chapter X dealing with a critical review of the evidence in support of the climate hypothesis do not need further emphasis. But there are some points which should be noted in order to obtain a picture of the whole development.

1. The treatment of tuberculosis by means of a climate change coincided with the economic expansion of the Graceo-Roman civilization. It apparently was the natural evolution from these potent forces in the development of civilization. The ability to pay, the means of transportation and the knowledge of climate could not have developed without economic wealth.

2. These same factors were common to all the later periods in the history of the subject.

Whereas the economic factor was merely an hypothesis up to the Industrial Revolution in Europe and the United States, from that point onward, the literature is replete with evi-

dence that physicians were cognizant of this factor.

3) The history of the relation of climate and tuberculosis paralleled very closely the History of Medicine and Public Health in their broad outlines. With increasing knowledge of medical science, there was a direct influence in the course of the other subject.

4) The evidence on the development of the Open Air Treatment indicates that the question of origin of the air treatment is by no means certain, though there is no question concerning the fact that Bodington was the first to use a closed institution for the treatment of tuberculosis patients.

5) The relation of climate to tuberculosis apparently has never been scientifically demonstrated.

6) Every spot on the globe has been used at some time or another for the cure of tuberculosis.

7) The knowledge of the relation of tuberculosis and climate was largely empirical throughout its entire development.

It is especially to be emphasized that the limitations as to the source material of the History of Medicine are also those of the present subject. The work of Sudhoff and others in recent years has clearly demonstrated that we know, after all, very little of the medical knowledge of the ancients and the peoples of the Middle Ages. Much of it is pure surmise and conjecture at the present time. With further research into these periods there may be brought to light evidence which

will clear up many of the dubious points which baffle the investigator at present.

In final conclusion it is hoped that the present study by bringing together the loose threads in the strands of the development of the subject of the relation of climate to tuberculosis has made it possible to obtain a bird's eye view of the whole field. But retrospective view is of value only in its aid in affording a stimulus for the future. There is much work yet to be done. There must be vigorous search for the "lost records of the history of medicine and science. There must be renewed effort to prove the relationship of climate and tuberculosis. It is to be hoped that in the not far distant future, scholarship and scientific ingenuity will furnish the gaps in our present knowledge of the subject.

THESIS BIBLIOGRAPHY

Bibliography: Periods Before 1882

- Atkinson, J.C. Change of air: Fallacies regarding it.
London 1848, J.Ollivier
- Baas, J.H. Outlines of the history of medicine and the medical profession. Trans. by H.E.Henderson, N.Y. 1889,
J.H.Vail & company
- Bennet, J.Henry On the treatment of pulmonary consumption
by hygiene, climate and medicine. 1866, London, J.
Churchill & sons
- Bernard, L. and Loir, A. La mer et les tuberculeux. Presse
med. July 16, 1924, LVII : 597. Abstr. of tuberc., 1925
XI, 45-
- Bowditch, Henry I. Open air travel as a curer and preventer
of consumption. Trans. Am. Climat. assoc. VI, 194-205
- Breasted, J.H. The Edwin Smith papyrus : An Egyptian medical
treatise of the seventeenth century before Christ.
Bull. soc. med. hist. of Chicago. 1923-25, III, I
58-78
- Buck, A.H. Growth of medicine, from earliest times to about
1800. Yale Univ. press. New Haven, 1917
- Clark, Arthur H. History of yachting, 1600-1815, G.P.Putnam's
sons, N.Y., Lond. 1904
- Clark, James The influence of climate in the prevention
and cure of chronic diseases more particularly of the
chest and digestive organs : etc. 2nd ed. London: 1830
Thomas & Geo. Underwood
- Cureton, Ed. History of tuberculosis. Practitioner, 1921
107-145
- Cyriax, R.T. Geo. Bodington, The pioneer of sanatorium treat-
ment of pulmonary tuberculosis. Brit. J.tuberc.
Jan. 1925, XIX: 1. Abstr. of tuberc. 1925, 12:86
- Dunguizle, Un point d'histoire medicale: les conceptions
d'Avicenne sur la tuberculose et son traitement.
Prog. med. July 15, 1922, #28, p. 333; Abstr. of tuberc.
1923, VII: 9-10
- Fowler, W.A. Social life at Rome. Macmillan 1910,
- Finalyson, Jas. Open air treatment of phthisis in Scotland
100 years ago. Brit. M.J. 1905, I: 960-1
- Gulick, C.B. The life of the ancient Greeks. D.Appleton
and company, N.Y. 1902

- Higgins, Chas. Observations on climate, diet and medical treatment in France and England 1835, Lond. Burgess and Hill
- Hippocrates: Airs, waters, places. trans. by W.H.S. Jones, Lond. N.Y. 1923
- Huntington, Ellsworth Civilization and climate.
- Kirkpatrick, T.P.C. Some Irish writers on tuberculosis in eighteenth century. Brit. J. Tuberc.
- Huntt, Henry Observations on a change of climate in pulmonary consumption. (Read before the Columbian Institute in 1826, published in the Medl and sug. Jour.; addition remarks on Red Sulphur Springs of Va., printed by J.Gideon, Jr. 1834
- Kinghorn, H.M. Brehmer and Dettweiler: A review of their methods of treatment of pulmonary tuberculosis. Am. rev. of tuberc. 1921-22: 950-972
- Krause, A.K. A note on the practice of artificial pneumothorax by the Hippocratic school. Am. rev. of tuberc. 1922-23, VI: 327-330
- Latham, Arthur The diagnosis and modern treatment of pulmonary consumption. N.Y. 1907, Wm. Wood and company. 3rd ed.
- Livingstone, R.W. (editor) The legacy of Greece. 1922, Clarendon press, Oxford
- Louis, P.C.A. Recherches on phthisis, anatomical and therapeutical. Lond. 1846 Sydenham soc.
- Miller, W.S. Thomas Willis, Am. rev. of tuberc. 1921-22, V: 934-949
- Neuberger, Max History of medicine. Trans. by E.Playfair. Lond. 1910 I
- Petersen, Wm. F. Ancient Hindoo knowledge of tuberculosis. Am. rev. of tuberc. 1919-20, III 500-507
- Pollock, J.E. Lectures on the history and constitutional character of phthisis delivered at hospital for consumption and diseases of chest. Lecture II, Lancet, Lond, 1856, II: 213
- Simons, M. Climate in its relations to the production, progress, amelioration and cure of consumption. Am. J.M. Sc. Phila. 1872, No. 8 XIII, 82-96

- Symes-Thompson History of tuberculosis. Practitioner:
1921 106 426-434
- Thorowgood, J.C. Climatic treatment of consumption and
 chronic lung diseases. 3rd ed. Lond. 1868, H.K.Lewis
- Vaughan, V.C. Epidemiology and public health. Vol. I
 Respiratory infections. St. Louis C.V.Mosby company,
 1922
- Weber, Hermann On the influence of the Alpine climates
 on pulmonary consumption. Brit. M.J. 1867, II
 41-42: 58
- Williams, C.T. Curability of phtthisis at high altitudes.
 Brit. M.J. 1881, II: 975-6
- Wilson, Alexander Some observations relative to the influence
 of climate on vegetable and animal bodies. T.Cadell,
 Lond. 1780
- Young, Thomas A practical and historical treatise on con-
 sumptive diseases. 1815, Lond. Underwood, Fleet St.
 and Callow , Crown Court.

BIBLIOGRAPHY ON THE PERIOD 1882 TO 1927

- Anderson, B.P. Intermediate altitude for the consumptive invalid. Trans. Am. clim. ass. 1899, XV: 87-93
- Baldwin, E.R. Progress and changes in the treatment of tuberculosis during the past twenty years. Trans. Am. climat. assoc. 1908, XXV: 84-91
- Bonney, S.G. Climatic treatment of pulmonary tuberculosis vs. home sanatoria. Trans. Am. climat. assoc., XVII: 224-228
- Bonney, S.G. Pulmonary tuberculosis and its complications. 1908, W.B. Sanders company, Philadelphia and London
- Bonney, S.G. When should the consumptive residing in Colorado be permitted to return home? Trans. Am. climat. assoc. 1902, XVIII: 203-208
- Bonney, S.G. Observations upon pulmonary tuberculosis in Colorado. Trans. Am. climat. assoc., 1896, XIII, 153-170
- Bowditch, V.Y. The comparative importance of different climatic attributes in the treatment of pulmonary consumption. Trans. Am. climat. assoc. 1888, V: 44-49
- Bowditch, V.Y. Three years' experience with sanitarium treatment of pulmonary diseases. Trans. Am. climat. assoc. 1893-4, X: 254-274
- Bowditch, V.Y. Home treatment vs climatic treatment of phthisis. Trans. Am. climat. assoc., XVII: 214-223
- Bowditch, V.Y. Subsequent histories of arrested cases of phthisis treated at Sharon sanitarium. Trans. Am. climat. assoc. XV: 53-67
- Bowditch V.Y. Subsequent histories of 79 arrested cases of phthisis treated at Sharon Sanitarium, 1891-1902. Trans. Am. climat. assoc. XVIII: 64-70
- Brannan, J.W. Home treatment of tuberculosis by means of hospital dispensaries. Trans. Am. climat. assoc. 1904, XX: 149-163
- Bruen, E.T. Relative importance of different climatic elements in the treatment of phthisis. Trans. Am. climat. assoc. 1888, V: 36-43

- Bullock, E.S. A contribution to climatic phthisiotherapy. Trans. N.T.A. 1906, II: 479-507
- Bullock, E.S.-Fahlen, F.T. A report of twenty years' work in the treatment of tuberculosis at New Mexico cottage sanatorium. Am. rev. of tuberculosis, 1922-1923, VI: 484-524
- Bushnell, G.E., Major, U.S.A. Sanatorium treatment in an appropriate climate. Trans. N.T.A. 1905, I: 362-370
- Charteris, M. Ocean climate. Trans. Am. climat. assoc. 1890, VII: 278-282
- Climate in pulmonary tuberculosis, report of committee on the influence of- . Trans. N.T.A. 1905, I: 304-315
- Darlington, T. Work of tuberculosis clinic of health department of New York city. Trans. Am. climat. Assoc. 1904, XX: 143-148
- Fishberg, M. Pulmonary tuberculosis. Lea & Febiger, Philadelphia and New York, 1922, 3rd edition, revised and enlarged
- Fisk, S.A. A study of the climate of Colorado as applied to the arrest and cure of pulmonary disease. Trans. Am. climat. assoc. 1888, V: 11-22
- Fisk, S.A. A search for a suitable climate. Trans. Am. climat. assoc. 1907, XXII: 40-52
- Flick, L.F. Relative value of home treatment of tuberculosis Trans. N.T.A. 1906, II: 442-449
- Flick, L.F. Consumption a curable and preventable disease. David McKay, Philadelphia, 1903
- Flinn, J.W. The influence of climate, as distinguished from fresh air in the treatment of pulmonary tuberculosis and its complications. Am. rev. tuber. 1920-1921, IV: 300-309
- Flugge, C. Einige kritische Bemerkungen zu den Klinabebachtungen in Kurorten des Hoch und Mittelgebirges. Zeitschr. F. tuberk. Oct. 1922, XXXVII:1
Abstr. of tub. 1923, 7:76

- Ford, W.E. The element of change, per se in the climatic treatment of disease. Trans. am. climat. assoc. 1892, IX: 89-96
- Forster, A.M. The present attitude toward climate. Trans. N.T.A. 1911, VII; 212-234
- Francine, A.P. Pulmonary tuberculosis. J.B.Lippincott company, Philadelphia and London (1906)
- Gardiner, C.F. The importance of an early and radical climatic change in the cure of pulmonary tuberculosis, Trans. Am. climat. assoc. 1901, XVII: 202-205
- Gray, John Pulmonary tuberculosis. 1923, Oliver & Boyd company, London, Edinburgh
- Gardiner, C.F. Light and air in the treatment of consumption in Colorado. Trans. Am. climat. assoc. XV: 19-29
- Hawes, H.B. 2nd Consumption: what it is and what to do about it. 1915, Small, Maynard company, Boston
- Hance, I.H. Home treatment of tuberculosis. Trans. Amer. climat. assoc. 1901 XVII: 196-200
- Hudson, E.D. Results of the home treatment of phthisis contrasted with those of changed residence and travel. 1885, Trans. am. climat. assoc. II:132
- Ichok, G. La lutte antituberculeuse et la climatologie. Le Prog. Med. Jan., 1922, #1. Abstr. of tub. 1922-23, VI: 250-51
- Ingals, E.F. The antiseptic treatment and the limitation of climatic treatment of pulmonary tuberculosis. Trans. Am. climat. assoc. 1897, XIII:1-21
- Jex-Blake, A.J. Tuberculosis 1915, G.Bell and Sons Ltd. London
- Klebs, A.C. The home treatment of pulmonary tuberculosis. Trans. Am. climat. assoc. 1901, XVII: 206-213
- Klebs, A.C. Tuberculosis. D.Appleton company, New York, London, 1909. Part. V. Treatment; Climatic treatment; Climatic therapeutics, W.J.Barlow, H.Sewall, E.L.Trudeau
- Klotz, W.C. Group studies in tuberculosis under different climatic conditions. A.R.T. 1917-18, I:83-98

- Knight, F.I. Opening address: First annual meeting Am. climat. assoc., Trans Am. climat. assoc. 1884, I:2-5
- Knight, F.I. On return of cured tubercular patients from high altitudes. Trans. Am. climat. assoc. 1890: 189-195
- Knight, F.I. What shall we do with patients having pulmonary tuberculosis? Trans. Am. climat. assoc. 1904, XX:137-142
- Knight, F.I. Climate as a factor in the treatment of tuberculosis. Trans. N.T.A. 1906, II: 437-441
- Kolb, E.P. Climate in relation to treatment of tuberculosis. Long. Isl. M.J. Jan.1921, XV:1. from Abst. of Tub.,Am. rev. of tub. 1921-1922, V: 104-105
- Kretzschmar, P.H. Public health resorts vs institutions for the treatment of bacillary phthisis. Trans. Am. climat. assoc. V: 69-83
- Latham, Arthur The diagnosis and modern treatment of pulmonary consumption. 1907, WmWood and company, New York. 3rd edition.
- Leaming, J.R. Philosophy of climatic treatment of chest diseases. Trans. Am. climat. assoc. 1887, IV: 24-30
- Loomis, A.L. Annual address. Trans. Am. climat. assoc. 1885: II; 1-14
- Newton, R.C. Some personal observations upon effects of change of climate upon men and animals. Trans. Am. climat. assoc. XIII: 51-63
- Otis, E.O. The sanatorium or closed treatment of phthisis. Trans. Am. climat. assoc. XII: 26-45
- Otis, E.O. Pulmonary tuberculosis. Boston 1920.
- Otis, E.O. Home treatment of tuberculosis vs. the climatic treatment. Trans. Am. climat. assoc. XVII: 219-223
- Otis, E.O. Home treatment of tuberculosis either in favorable or unfavorable climates. Trans. N.T.A. 1905, I: 389-398
- Pottenger, F.M. Relative value of high and low altitude in the treatment of tuberculosis. Trans. Am. climat. asso. 1907, XXII: 155-161
- Pottenger, F.M. Clinical tuberculosis. 1917, II. C.V. Mosely company, St. Louis.

- Pratt, J.H. Results obtained by class method of home treatment.
Trans. N.T.A. 1916, XII: 128-132
- Reed, Boardman Effects of sea air upon diseases of the
respiratory organs, including a study of influence upon
health of changes in atmospheric pressure. Trans. Am.
climat. assoc. 1884, I: 51-59
- Robin, A., Weil, M.P. Les tuberculeux pulmonaires a la mer.
Rev. d.l. tuberc. Aug. 1920, I: 209; Abstr. of Tuberc.
1922-23: VI; 48-49
- Schwatt, H. Climate in the treatment of pulmonary tuberculosis.
N.Y. med. J. & med. rec. 1923. CXVII: 32-34
- Sewall, Henry Altitude in fact and fancy. Trans. Am.
climat. assoc. XVIII: 186-195
- Shattuck, F.C. Home treatment of phthisis. Trans. Am.
assoc. 1885, II: 65-76
- Solly, S.E. Invalids suited for treatment at Colorado
Springs. Trans. Am. Climat.assoc. 1888, V: 23-35
- Solly, S.E. Principles of medical climatology. Trans.
Am. climat. assoc. 1895, XI : 1-8
- Solly, S.E. Sanatorium treatment of tuberculosis in Colorado.
Trans. Am. Climat. assoc. 1902, XVIII: 182-184
- Sudhoff, K. Essays on the history of medicine.
- vanCauterin Tuberculose et agents physiques. Rev.
Belge d. l. tuberc. March 1925, III 70. Abstr.
of Tuberc. 1926, XIII: 107
- Walker, J.B. Some of the difficulties of climate therapy.
Trans. Am. climat. assoc. 1896, XII :1-12
- Weber, Hermann Remarks on climate and sea voyages in the
treatment of tuberculosis. Brit. M.J. 1899, I: 1321-
1324. Climate as a factor in the treatment of tuberculosis
Brit. J. Tuberc. 1907, I 46-52
- Weber, Leonard On the home treatment of pulmonary tubercu-
losis. Trans. Am. climat. assoc. 1901, XVII: 183-195
- Westbrook, B.F. On the etiology of pulmonary phthisis.
Trans. Am. climat. assoc. 1884. I: 5-21
- Williams, C.T. Report on Results of treatment of pulmonary
consumption by residence at high altitude. Brit. M.J.
1888, I: 1009

Wilson, J.C. Remarks on the treatment of pulmonary phthisis.
Trans. Am. climat. assoc. VI: 132-138

Yandell, W.M. Preferable attributes of climate for consumption,
as applied to winters in southern N.M., Ariz. and Texas.
Trans. Am. climat. assoc. VII: 81-100

BIBLIOGRAPHY FOR CHAPTER X

- Baker, Henry B. Relations of certain meteorological conditions to diseases of the lungs and air passages in Colorado. Trans. Am. climat. assoc. 1890, VII: 210-230
- Burns, N.B. Seasonal variation of the symptomatology of pulmonary tuberculosis. Boston M.-S.J., 1913, CLXVIII: 421-425; 1914 CLXX: 564-569
- Frimodt-Moller, C. Climate and weight tuberculous patients in South India tubercle, 1921, II; 385-395
- Gordon, Wm. Influence of rainy winds, soil, poverty, and general death rate on phthisis death rate in Exeter, 1892-1901
- Gordon, Wm. Observations on wind exposure and phthisis. Brit. M.J. 1901, I: 69-75
- Gordon, Wm. Remarks on influence of wind on phthisis. Brit. M.J. 1903, I: 1189-1191
- Gordon, Wm. & Harper, J.R. Remarks on influence of rainy winds on phthisis in 23 parishes of N. Devon during years 1860-1904. Brit. M.J. 1906, II: 1165-70
- Gordon, Wm. Influence of strong, prevalent rain bearing winds on the course of phthisis. Brit. M.J. 1912, I: 291-294
- Gordon, Wm. Address on wet winds and early phthisis to S.W. branch of Brit. med. assoc. Brit. M.J. 1924, II: 983-985
- Gordon, Wm. Effects of strong prevalent rain-bearing winds on commonness and course of phthisis. How are they produced? Brit. J. Tuberc. 1926, XX: 20-25
- Hill, Leonard Lecture on Physiology of the open air treatment at Brompton Hospital for consumption and diseases of chest. Mar. 7, 1913; Lancet. 1913, I: 1285-1290
- Hinadale, Guy Atmospheric air in relation to tuberculosis. Hodgkin fund, prize essay:- Smithsonian Miscellaneous collection. Vol. 63 # 1, 1914
- Ichok, G La mortalite par la tuberculose dans les differentes regions climateriques de la France. Rev. d.l. tuberc. 1922 III 267: Abstr. of Tub. 1923, 7:107
- Pepper, Wm. A contribution to the climatological study of consumption in Pennsylvania. Trans. Am. climat. asso 1886, III: 88-163
- Trudeau, E.L. Environment in its relation to the progress of bacterial invasion in tuberculosis. Trans. Am. climat.

assoc. 1887, IV 131-136

Trudeau, E.L. An environment experiment repeated,. Trans.
Am. climat. assoc. 1888, V: 91-94