PRELUDE
MEDICAL
HISTORY

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This book is dedicated with gratitude and in friendship:

To the medical students of the New York Medical College, Flower and Fifth Avenue Hospitals, who attended these lectures in their original version and gave me their thoughtful and kind encouragement and recognition.

To the distinguished members of the Faculty, the President, and the President Emeritus of the New York Medical College, who gave their kind support to the courses on the History of Medicine.
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**Foreword:**

**ON THE SPOKEN WORD**

I am a lover of the spoken word. No violin rendition, no piano recital, no symphonic concert can transport me as does a well-turned lecture. The written word endures longer than any other work of art, for even after the books containing it have disappeared, the word itself is remembered forever if it has sufficient karats of spiritual value. Long after the Taj Mahal and the Sphinx, the Escorial and the Christ of the Andes, shall have succumbed to the ravages of time, and as long as mankind shall survive, men will still remember the Sermon on the Mount, the lusty lines of Shakespeare, the wise sayings of Don Quixote, the humane words of Lincoln, and will recount them with feeling and fervor.

Of all the forms of the spoken word, I prefer the public lecture. The political harangue is a lash to whip up the emotions of the crowd; the religious sermon is a voice that whispers subtly and directly to the listener's soul; the funeral oration is a mantle of faded roses decking a rigid corpse, which remains warm only in our memory; the forensic pleading is a military formation of facts and laws defending a principle; the scientific communication, like a greyhound, possesses only the lithe bones of
proved facts and figures; the academic lecture is a skilled exposition full of deliberate repetition and purely didactic in purpose. But, the public lecture combines all the beauties of every other form of oratory and enhances them with certain distinctive features of its own. If an article on a specific theme is like a miniature that can be viewed by only one person at a time, the public lecture is like a mural that can be admired by many people from a distance and at the same time. To achieve this purpose, such a lecture must be architectonic in structure, symphonic in technique, and broad in horizons, like a great painting in a museum; it must be musical in rhythm like a rhapsody in words, pregnant with meaning, and clear-cut in purpose. It must leave the listener not only better informed on the subject discussed, but also with the happy feeling that he has without effort assimilated what otherwise would have cost him many hours of reading and concentrated thought.

Although scientific subjects, like chemistry, geometry, physics, botany, can be taught only by means of lessons—that is to say, by the clear, measured, succinct, unvarnished exposition of the subject, reinforced by the constant repetition of all relevant data for better understanding and proper learning—there are other subjects which, I believe, cannot be taught thusly but require instead the fullness of treatment conferred by the public lecture. There is only one way to teach the laws of thermodynamics, the elements of Euclidean geometry, the properties of carbon, mamalian classification, or the structure of the Solanaceae. But there is an infinity of ways for presenting historic reality.

History, including the history of medicine, may be described, interpreted, or narrated. History can be described in the oral lesson, and it can be interpreted in the historical discourse. But to narrate history, that is, to describe what happened, where and when it happened, and to interpret why and how it happened can be done only in the form of a lecture. Such a lecture must not be a dry exposition of facts, dates, and events, bound together by the always fragile thread of chronology. It must be, instead, a presentation of historic reality romantic in form and realistic in content, if one's desire is to turn history into that "enthusiastic attempt at resurrection" spoken of by Ortega y Gasset. For if history is not narrated as if it were romance, then it is nothing.
I believe one of the reasons the history of medicine has remained stagnant for so long lies in the austere, unimaginative manner of teaching it. That explains perfectly why, in the last century, the students of Berlin, encouraged by Rudolph Virchow’s strangely anti-historic attitude, decided they no longer wanted to undergo the tortures of examinations in the history of medicine. I myself, who have attended many deadly dull and dry lessons in the history of medicine, have always admired the contrasting mental attitude of men like Henry Sigerist, who made their courses and lectures on this subject so dynamic and interesting and, above all, so amusing and pleasant.

History has no need for the “clenched fist and stern brow” which a now fortunately forgotten “strong man” of Italy declared was characteristic of the ill-omened political system he invented. That, unfortunately, has been and still is the attitude of many writers, who consider science an enemy of humor and imagination and are shocked at the mere idea of inserting a playful phrase, a humorous comment, or a literary pleasantry of any kind in their writings and lectures. The result is that as soon as they start to speak, the attention of their audience takes off like crows at the approach of a farmer with his shotgun.

A lecture, I believe, must be prepared in meticulous detail, after many weeks of reading and annotation, and with the perspective obtained through years of previous study and reflection, but it should be delivered with a certain pleasant casualness and with that well-meditated improvisation that takes years of preparation, as against that other type of calculated improvisation employed by the political tub thumper, who boldly losesses on his audience a flood of inflammatory oratory to open the gates of their emotions and close those of their intellect.

I can speak from experience on this question of impromptu speechmaking. In Spain, my native land, for many years and especially during the three years of the misnamed “Civil War,” I had to sandwich my medical and journalistic work with speechmaking. In that period I gave over a thousand lectures, talks, discourses, and speeches, often improvised and always—in the true Spanish oratorical tradition—without the aid of a single written note. I always spoke at length, sometimes for as long as four hours to more than sixty thousand people in bull
rings. It must be borne in mind that oratory in Spain—a land of born orators—demands a style that is scholarly, flowery, lyric, architectonic, symphonic, emotional, humorous, ideological, inspired, and fiery. Audiences there, brought up in this tradition of high oratory, demand all of this from the speaker. But only the other speakers there and I knew the endless weeks, the restless nights of reading, writing, and reflection that each "impromptu" speech cost me.

The properly prepared lecture should not be read, for the "curtain of paper" isolates the speaker from his audience; nor should it be reeled off parrot fashion, for then warmth and spontaneity promptly vanish. It must be minutely prepared as far as what is to be said and how it is to be said are concerned, but omitting the actual words to be used. The ideas and the technique of delivery must be carefully studied, prepared, and polished; but the words must flow spontaneously, clothing the speaker's thoughts in full view of the audience. That is the only way to turn a lecture into a genuinely creative act, in which the audience itself dynamically participates by witnessing the lecturer's noble effort to offer each listener that magic moment of creation when his ideas, emerging naked and shivering from his mind, gracefully and rhythmically don right before their eyes the rich, warm, kaleidoscopic robes of words ringing with light and music.

Such a lecture is a work of art that transcends anything else that man can produce, for it can be developed with nothing more than one's knowledge of the subject, the voice issuing from one's throat, and the expression in one's hands—knowledge, words, and gestures that alone can paint, chisel, mold, compose, and direct the swift ballet of words that brings the drama of ideas to life on the enchanted stage of oratory.

For all these reasons, I have sought to apply my devotion to the art of the spoken word to my courses on the history of medicine. In the courses that I had the honor of giving at the New York Medical College, Flower and Fifth Avenue Hospitals, to young people filled with affection and wonder for their profession, I resolved right from the start to give not lessons but lectures, however modest these might be. Abundant iconography was interpolated as a dynamic element, since nothing can be so effective as actually seeing for oneself the bony lesions in a mummy, a
contemporary Siberian shaman practicing medicine today in exactly the same fashion as his forefathers did ten thousand years ago, the face of Nefertete, the beautiful spouse of that bold Pharaoh who made heliot-therapy the official creed of ancient Egypt, Rembrandt’s “Anatomy Lesson,” prints of Padua as it was in Harvey’s student days there, the Acropolis at Athens as Aristotle must have seen it, Vesalius’ countenance as he performed a dissection, or the consulting room where Freud conducted his psychoanalytic investigations. These lectures were delivered with the help of no more than a dozen lines of notes to remind me of the main headings and the order of development of the concepts. A tape recorder took down the lectures as I was speaking, which enabled me to have them transcribed later and then I worked on them intensively in preparing them as a manuscript for this book, thus giving my work a more permanent form.

The lectures contained in this book combine the material employed in two distinct courses, plus here and there certain data and events which lack of time did not allow me to present originally. I have eliminated the jokes and quips and a few repetitions but have retained others, since repetition is the key to instruction. All this I now offer to the reader as a prelude to the history of medicine.

If I were to tell of the hours spent in preparing each lecture and now in revising and correcting the manuscripts, the reader might well be surprised that so much time should have produced so modest a result. I believe, all the same, that those who lecture on the history of medicine or teach any subject in a university will appreciate what I say. To condense into minutes what takes years to study, to make simple what is difficult and complex, to make forceful what is static, to enliven what is serious, to give life to what is dead, to revivify scenes, peoples, situations, and ideas that are buried beneath the dust of centuries, is a difficult task.

In my case, the very fact that my audience consisted of students starting on their careers in medicine only accentuated my feeling of responsibility. My purpose was not to produce medical historians but to help and stimulate a group of young men and women to become better physicians. The history of medicine is not merely history, it is above all medicine. My goal was to imbue my students right from the beginning with the
enthusiasm and joy of being physicians, to help them appreciate that they were entering the finest and most glorious career open to man, and to offer them the history of their profession as a means for understanding better such a profession and at the same time for understanding their own selves.

Two things have impelled me to publish these lectures, the fruit of so many hours of willing sacrifice: the insistence of colleagues and friends who were unable to attend the original lectures and the wish that others may share with me the fruits of my efforts. I trust that those who read these lectures will have the pleasure, if not of learning something new, at least of refreshing their acquaintance with the ever-fascinating history of medicine.

Our society is still in dynamic evolution, and the physician has not yet found his true role in it. Only history can help us to understand what his part is to be as a pillar of future society. Viewed thusly, the history of medicine becomes a powerful philosophic tool for shaping the physician’s fate in the society of times to come.

I am very fond of reading lectures written by physicians, writers, historians, artists, politicians, and travelers on their favorite subjects. A lecture helps one to synthesize in a few moments what has taken its author years to analyze and to learn without tears the best part of what that author knows.

But there is something in a lecture that cannot be put down in black and white, and that is the magic of the spoken word, the music of the human voice, the artistic efficacy of the speaker’s gestures, the drama of sonorous stillness in the audience’s reactions, the tense and exciting atmosphere of a lecture hall.

That is why I have here discarded nearly all the humorous comments and anecdotes, which have a certain charm when heard but seem forced and artificial in print. I have also cut down the inevitable repetitions, which sound natural when speaking but are boresome when read, as well as many side remarks referring to the illustrative slides. At each lecture I showed from thirty to forty-five slides, many in color, all of which have here been eliminated, since if the word does not have sufficient expository power in itself, it is of no use as a factor in education.
All said and done, I repeat that this little book, simple and unpretentious though it is, required many months of labor. May it find a place in some physician’s or student’s readings. Meantime I entrust myself to the goodwill of all its readers. For in a short course such as this, there are inevitably omissions of names, places, events, facts, and data that will astonish some readers, but that are unavoidable in lectures. The drama of the lecture is that it raises a conflict between space and time, between the vastness of the subject to be covered and the short time available for surveying it on the unruly charger of speech.

My modest labors in the history of medicine are now crystallizing into a view of this subject from different levels and angles. In the book Centaur: Essays on the History of Medical Ideas and my forthcoming work Ariel, I have sought to present a literary view of the history of medicine in the form of essays. In my conception and direction of the series of illustrated articles appearing in MD, the Medical Newsmagazine, under the title “The Epic of Medicine,” and in the twelve editorials I wrote on that theme in the same magazine, I have tried to present a poetic view of the history of medicine by relating it to the history of civilization. “The History of Medicine,” the essay I wrote for the Encyclopedia Americana, is a chronological, yet interpretative, view of the subject. In The Fabric of Medicine, a book I am now writing, and in a future one, On the Nature and Philosophy of Medical History, this view will be developed as a symphony of medical history against the background of the history of civilization.

The present A Prelude to Medical History is just a notebook of medical history, an outline of the history of medicine seen through the enthusiastic wonder-filled eyes of a restless world-wandering physician in love with History; a physician whose heart, as he marches on to his rendezvous with History, beats as happily and eagerly as the heart of a medical student on his way to a rendezvous with his sweetheart.

Felix Martí-Ibáñez, M.D.

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Writing of history is a creative process. It is art.

Like every artistic creation a book of history has a strong personal note. It is my experience that I am passing on, my interpretation of history, what I as a result of my labors have come to consider the truth. . . .

Aristotle is perfectly correct when he says of history: ἔχει τι ποιητικόν, there is something creative, poetical in it.

Henry E. Sigerist, M.D.

from "The History of Medical History"
I: THE FABRIC OF MEDICINE

Concept, Methods and Scope of
the History of Medicine—Medical
Geography—Paleopathology

MY FRIENDS, ever since the day you first said the
magic words, "I want to be a doctor," you have been wrapped in the rich
fabric of History—History, without which nothing in life has any real
meaning. For only the delicate tool of History can help man to under-
stand his past, to cope with his present, and to improve his future. These
lectures should make you acutely aware of this, for everything that will
be said here will be inspired by the ideals, the wisdom, and the deeds of
your glorious predecessors in the History of Medicine.

You—the young princes of the medical kingdom—are now embarking
on the most dynamic of careers. In a few years you will become physi-
cians, and you will then come to face many difficult and complicated
problems, though none so vast and complex as medicine itself.

Before that day comes, however, you will be pounded, day after day,
with a vast amount of knowledge, ranging from the most elemental
anatomy to highly complex medical specialties. Soon you will realize that no human mind can possibly lodge so much knowledge, that the fabric of medicine is far too varied and heavy for any one mind to follow all the multiple patterns traced by its scientific threads. You will then come to understand that the only way to master such vast knowledge is by integrating it into a simple though gigantic frame of reference—the History of Medicine.

I hope that we shall become well acquainted at these lectures. We are going to travel together across time and space. I should therefore like to introduce myself to you. I am a physician and psychiatrist who has dedicated his life to medical history, medical journalism, and medical education. During the forthcoming lectures I shall be imposing on your kindness and patience with my too often surrealistic English grammar and my Spanish accent. How much medical history you will learn at these lectures I do not know, but I dare say you will probably end up speaking English with a Spanish accent.

It is strange about languages. Some of you may one day be teaching medicine in a foreign country, perhaps Spain or France or Italy. You will then realize what a tremendous effort it is to translate thoughts, words, and images from one’s mother tongue into another language. This reminds me of Rodríguez, a friend I had in Mexico, a musician who was fond of concocting his own arrangements of Beethoven on his clarinet. One day he said to me, “Doctor, I don’t know what’s wrong. What I blow into the clarinet is Beethoven, but what comes out is only Rodríguez.”

However, the main thing in life, especially in a physician’s life, is to have something to say, not how you say it, and to do great things. Above all, you must realize that “to be a doctor” in the true sense of the word is to be not only a learned man, but also a good man, a kind man—to have a clear and learned mind and a kind and stout heart. “To be a doctor,” in other words, is to be a complete man, a man who can function at once in science as a professional of skill and integrity, in life as a human being with a stout heart and shining ideals, and in society as a citizen with a constructive goal. These ideals I hope will be instilled in you by this course.
THE SPIRIT OF THE REGALERO

I approach these lectures, and you, with the same simple spirit of the *regalero*, as they used to call the little old man who, about a century and a half ago, in the Madrid immortalized by Goya's luminous paintings, delivered the gifts sent by the beautiful Duchess of Alba to her friends. In a basket of golden straw the *regalero* often carried luscious oranges from Valencia, garnet-red carnations from Andalusia, pale yellow roses from Castile, sweet-smelling herbs from Aragon, and many other much-prized gifts. One day, after the *regalero* had finished his deliveries, a friend asked him, "How does it feel to give away so many wonderful things when you have nothing yourself?" "Ah," replied he, "but I have the best of all. I am the bearer of the gifts." This attitude of the *regalero*, the gift bearer, shall be my attitude throughout this course. I shall do my modest but earnest best to bring you the best the History of Medicine has to offer: ideals, ideas, and deeds.

As I said before, Medicine is one of the most dynamic of all professions, because it is based strictly on a series of events that happened in history, and that were, are, and will always be the result of man's *thinking*. History is made by man, and the physician is the greatest history-maker of them all.

Medicine is also one of the most complete professions, because throughout history it has been closely linked to man's other fields of endeavor. This means that the history of medicine encompasses the story of the arts, religion, and philosophy, of political changes and economic conditions—in brief, of anything that may affect mankind, thereby affecting the phenomena of health and disease. It means that the history of medicine is but one of the many sides carved out of the gigantic quarry of civilization.

PHILOSOPHY AND MEDICINE

Take philosophy, for instance. Philosophy has exerted a great influence on medicine and is of vital importance to it. The original meaning of the word "philosophy" was love of wisdom, and medical history has always been nothing more than a search for wisdom. You may ask,
“What does wisdom mean in relation to medicine?” From Spinoza to Will Durant, wisdom has been considered as total perspective: viewing things, events, and persons in view of the whole and in view of eternity. That exactly has been and is the goal of medicine.

All this may sound to you so alien to medicine, so remote from dissections, laboratory tests, statistical charts, in fact, from the cold world of facts you face every day. It is not so, really. Even the words describing our profession have a philosophical meaning. So vital has philosophy been to medicine that without the pre-Socratic philosophers there would have been no Hippocrates, and without the Renaissance philosophers there would have been no Vesalius. Philosophers are forever dreaming up theories that, in the beginning, may sound abstract, but that often result in great medical discoveries.

ART AND MEDICINE

Art also is equally important in the history of medicine. As in biology, in history things proceed from the less differentiated to the more differentiated. In biology, elementary organisms become the complex organisms that constitute man. The same happens in art. The artist works using mostly his intuition of reality, and in this respect is a less differentiated person—from a biological point of view—than a scientist. That is why the artist has always been a precursor of the man of science. Later you will see that, throughout history, nearly every great medical discovery was anticipated in the dreams of the artist, whether he was a poet, a painter, or a genius, like Leonardo. In other words, the artist’s intuition, his perceptive vision of nature, always preceded the reasoning and experimental vision of nature of the scientist. Therein lies the greatness and immortality of the work of art, whether it is the Taj Mahal, El Escorial, Hamlet, Don Quixote, or Rembrandt’s “The Night Watch.” Whereas the work of science is transitory, the work of art is immortal.

Therefore, we cannot speak of progress in art. Modern art is no better or worse than classical art. It is only different. Modern medicine, however, is definitely better than classical medicine. Why is this true with medicine and not with art? Because in every period of history the artist has been like a Robinson Crusoe alone on his island. The artist starts
from scratch to create his own art. He seldom avails himself of the wealth of experience accumulated in the centuries behind him. He creates his own world and lives alone in it. This is not true of the man of science. He carefully collects the facts, experiences, and thoughts of previous generations and then converts them into new experience. That is why there is discontinuity in art and continuity in science.

For that reason, anything the man of science creates has a short or limited life. A painting by Van Gogh, Cézanne, or Seurat may be invaluable to posterity. A paper written today by an investigator, whether on antibiotics, surgery, internal medicine, or psychiatry, may be completely outdated by tomorrow, except from a historical point of view. We must always remember this contrast between art and science and learn humility from it, for today's truth in science may be tomorrow's fallacy.

MEDICINE AND WORDS

Another concept of importance in the history of medicine is the value of ideas and of words. The history of medicine is not so much a journey through space and time as a journey through man's brain. In these lectures we shall have the opportunity of "traveling" through the brain of an Egyptian priest, a Roman medical slave, a medieval clergyman, and a Renaissance artist. We shall then realize that what we call historical events are really actions expressing thoughts through words.

Nothing will be of greater value to you in your profession than to be as accurate as possible in the meaning of your words. Nature offers many wonderful things—flowers, birds, shells, stars—but nothing as wonderful as words. Not the words that pour from banal lips, but the words from the gifted lips of the men of conscience, the thinkers, the words of wisdom that express thoughts crystallized into words. Prehistory turned into history the moment man said to his fellow man, "How are you?" These three little words, these three little vibrations in the air produced by the mere contraction of certain muscles, made it possible for man to call himself "I" and the other man "you," thus establishing the process of communication and initiating the history of civilization.

Man, it has been said, is an animal with the ability to make tools. It has been further said that man is superior to all other animals because
he is the only one who uses tools to make other tools. Only man has this unique capacity. And of all the tools man can make, the most precious, the most valuable, are words. In these lectures you will see how the words—and the ideas behind them—of great physicians have woven, in a continuous and dynamic endeavor, the fabric of medicine.

PHYSICIAN, MEDICUS, DOCTOR

Let us first delve into the original meaning of the three words that describe members of our profession: physician, medic, and doctor. The word “physician” derives from the Greek physis, meaning nature. That is to say, to understand the nature of things is at the root of the word “physician.” Medicus comes from medēri, meaning to heal, while the root med means to meditate, to think. To think and to heal, then, are the roots of the word “medicus.” The word “doctor” originally meant teacher, that is, he who imparts knowledge to others. Observe therefore that semantically our profession entails learning and teaching, acquiring wisdom and sharing it with others, while practically it means applying that knowledge to the noblest task man can undertake: to help his fellow men recover their health and—what is equally as important—their proper place in society.

WHAT IS MEDICINE?

And now let us define “medicine.” We could say simply that medicine is what the physician does, but that would not be the truth. Many and great things have been done in medicine by people who were not physicians, ranging from shamans and witch doctors to Paré, da Vinci, and Pasteur. We must also consider that forgotten man in medical history: the patient. It would be more proper to define medicine as the art and science whose goal encompasses four main objectives defined by the World Health Organization as: restoration of health, rehabilitation of the patient, prevention of disease, and promotion of health.

A physician of bygone centuries would wonder at these four objectives of medicine, for in his time his work was only to cure or at least alleviate disease. Not until modern times did medicine establish other objectives. Today it is as important to rehabilitate the patient and prepare him to
return to society and continue fulfilling his duties as it is to cure him. Tomorrow there will probably be other objectives, with even more emphasis than today on preventing disease—yes, preventive medicine is the medicine of tomorrow—and promoting health.

You may query, "What has health to do with medicine?" Well, my friends, the physician today must know the healthy man well if he is to help the sick man. I would even say that unless you have a complete knowledge of the healthy man, physically and mentally, you cannot possibly get to know the sick man. I strongly believe that medicine should be—it is becoming more so every day—medical anthropology, that is to say, the study of man in health and in disease, and that it should also be medical history, namely, the story of how, where, and by whom our present medical knowledge of man was obtained throughout the course of history.

HEALTH AND DISEASE

How does one acquire knowledge about the healthy man? There are many ways. The simplest one is to study the history of medicine. It is also an excellent way to give substance and meaning to our daily work. Open your eyes wide to the whole world around you, past, present, and future. Study the people of all ages. Observe the faces of health and disease, not only in the mirror of classical literature, but also in that of current newspapers. They will always tell you the same story: that the main social cause of disease has always been and still is poverty, which prevents human beings from living as human beings should live. This was so in ancient societies—in Egypt, in Mesopotamia—and is still so today. You need only look at *The New York Times*' “One Hundred Neediest Cases” during the Christmas season. Yes, poverty is still the main social cause of disease. That is why today medicine is considered a social science that uses the methods of the natural sciences.

Disease therefore must be studied not only as a medical problem, but also as a social and a historical problem. Disease reflects the social conditions of a people or society, and it also reflects historical situations. In the Middle Ages, when people crowded together into small, confined towns, and living conditions consequently were extremely unhealthy,
"collective" diseases were rampant. Leprosy, plague, the terrible Black Death, the dancing mania took a heavy toll in the Middle Ages. With the advent of the Renaissance, people began to live closer to nature, they developed an urge for physical culture, they lost their fear of dissecting dead bodies. And instead of "collective" diseases they began to suffer "individual" diseases, the best example of which was syphilis, perhaps the most fearful disease of the Renaissance.

It is not a coincidence that the work of Freud started at a time when people in Vienna lived by two opposite principles: the principle of pleasure in a rather unpressed way in private life, and strict discipline and puritanism in public life.

WHAT IS HISTORY OF MEDICINE?

We have defined medicine. Let us now see what is meant by "history of medicine" and what methods are available to us for studying this subject.

The history of medicine is a study not only of man's health and diseases throughout history, including the geographic, economic, and other conditions in time and space that may have affected health and caused disease, as well as what the physician and society at any given time in history did to fight disease or prevent its spread, but also of the history of all human activities connected directly or indirectly with the pursuits of medicine.

METHODS AND SOURCES OF MEDICAL HISTORY

What methods are followed in the study of the history of medicine? First, one selects an object—a medical document or instrument, a painting, a monument, a scrap of cloth, an anatomical specimen, anything at all pertaining to a given civilization in history—and it is studied with a historicomedical eye. Suppose a piece of stone has been chosen. What does the history of medicine have to do with it? First, as in any other scientific discipline, it is described—its shape, its consistency, all its characteristics. Second, it is identified—to assign to it a date, to place it in time. Third, it is interpreted—the stone is related to the people and the place from which it came. Once it has been established that the stone is a tablet of baked clay, that it belongs to the Mesopotamian civilization,
and that the cuneiform markings inscribed on it describe a disease—once all that has been established—medical history has been made. This is the manner in which the history of medicine operates. Facts, documents, iconographies, tools, persons, places, things, and events related to medicine are described, identified, and interpreted. Thus the scattered pieces of the great mosaic of the history of medicine are put together to recreate the brilliant design and image of the art of healing throughout the ages.

As for the sources available for the study of the history of medicine, there are anatomical specimens, such as mummies, fossils, and bones; there are the remains of all forms of art, for instance, ancient structures, monuments, coins, sculptures, drawings, stained-glass windows, portraits, and, later, photographs, as well as general literature; there are the philosophical doctrines, systems, and methods that prevailed in different epochs; there are medical traditions, medical lore (myths, legends, fairy tales), and medical literature (books, clinical case histories, necropsy protocols, maps, iconographies). Above all, there is the history of civilization unfolding in time and space in succeeding cultural and social patterns, directly or indirectly related to, or affecting in one way or another, the physician, the patient, and disease.

MEDICAL GEOGRAPHY

Also of extreme importance to medical history is the study of medical geography. Medical geography is to history what anatomy is to medicine. Medical geography is medical history in space, just as medical history is medical geography in time. It studies landscapes, climates, soils, plants, animals, and human societies; it comprises the geography of disease, geographico-historical medicine, and medicohistorical geography.

The main lesson medical history teaches us is that disease is "that alteration of the living tissues that jeopardizes survival in their environment." This definition by Dr. Jacques May has the advantage of encompassing both the medical (alteration of the living tissues) and the sociological (jeopardization of survival) factors. Disease, according to medical geography, is induced by three factors: genetic factors (the enzymatic system of the individual), governed by race and geography;
acquired factors (organic repair and defense formations of the host, or man, and associated reflexes that develop organic "scars"), governed by environmental and mental aggression, emotional stress, infections, allergies; and environmental factors, governed by inorganic, organic, and sociocultural stimuli (climate, food, air, disease agents, cultural situations). Man, throughout the ages, has created cultural devices to combat disease (we call them medical systems) that have always been closely related to the culture of each period.

A KALEIDOSCOPE OF HISTORY

What shall we explore during these lectures? There are so many fascinating things that we could explore, numerous documents and paintings and sculptures, miniatures, coins, tablets, and many others. Every one of them has lent color and variety to the colossal mural that is the history of medicine.

For instance, we could look at the notes describing for the first time in history the circulation of the blood. Written in 1616 by the English physician, William Harvey, they constitute one of the most extraordinary scientific records in the history of the human mind. Harvey wrote these notes just before he gave his famous Lumleian lecture, at which he announced that the blood moves and that it does so in a circle. There is a little triangle in his manuscript, the Greek sign for delta, sort of a shorthand symbol meaning to demonstrate. The next words assert that the blood is in perpetual motion in a circle. Those three words, "in a circle," contain the principle—one of the most important in the history of medicine—that is now the basis of modern physiology.

We could also look at the photograph of a contemporary primitive medicine man, the living counterpart of your medical predecessor, the witch doctor or shaman. He still carries with him the same healing tools as his ancestors thousands of years ago—a piece of bone, a few amulets and talismans, with which he still performs the same ancient weird magical healing rituals. His nakedness would give you an idea of where he lives. It certainly is not New York in the winter.

Of interest are the saints who have been accepted as great healers throughout the ages, like St. Cosmas, one of the patron saints of medicine.
He believed in miraculous healing, but he also used surgical instruments. He and his brother, St. Damian, were Christian-Arabian physicians during the early times of the Byzantine Empire.

Another was St. Sebastian, patron saint against the plague in the Middle Ages, who was depicted with his body transfixed by arrows. There is a fascinating story about him. In earlier pictures, St. Sebastian, a Christian martyr killed in Rome and buried in the catacombs, was portrayed without arrows. Then in the fourth century, during a plague epidemic, his remains were dug out by accident, and because the decline of the plague coincided with the uncovering of the saint's bones, it was concluded that St. Sebastian had protective powers against the plague. Since Greek legend had it that Apollo could shoot arrows that caused the plague (the arrows were probably an unconscious symbol for microbes), the saint was thereafter depicted with arrows piercing his body, meaning symbolically that he was immune to the arrows of the plague. The arrows, amazingly enough, are placed in the same spots where plague buboes or tumors usually appear, plus one arrow piercing his heart, signifying, as Sigerist said, the sudden death that befell the plague victim.

Most interesting also are the classical pictures of the sixteenth-century Italian physicians gazing pensively at a flask of golden liquid, which a servant has brought in a straw basket. Today we serve good old wines in the same type of straw basket. Often the person who brought the urine to the doctor was not the patient himself. It was enough to send the flask with a messenger, who would bring back the diagnosis and the treatment. Throughout medical history, urine has been one of the most important and mysterious body fluids, and its examination with the naked eye, called uroscopy, was for several centuries a favorite diagnostic method. Uroscopy lore is as rich as it is colorful, and it was especially important during the Middle Ages.

There are also pictures of the Italian physician of the same period wearing what was known as the "long coat." The long coat differentiated full-fledged physicians, graduated from a university, from the barbers, butchers, bathkeepers, and other self-appointed practitioners of the art of healing, who wore short coats. Thus the patient was able to tell what kind of doctor was treating him.
We may also examine the "Great Four" of Johns Hopkins as painted by Sargent: Osler, Welch, Halsted, and Kelly. They exemplify the modern physician at his best, and you should make them your ideal, your inspiration. Every one of these men combined in his person the three personalities of the physician: clinician, researcher, and teacher. Not only were they all three things, but they were also what Sigerist called "The Great Doctors."

A fascinating topic to study is the historical evolution of dissection as depicted in old pictures. A fourteenth-century drawing was considered until recently to be the oldest representation of an anatomical dissection. The physician performing the dissection was shown holding the liver, which, because it was large and full of blood, was believed for a long time to be the seat of the soul. Priests were shown reprimanding the physician for practicing dissection, which was then condemned by the Church.

A fourth-century painting, discovered in Rome in 1956, is the earliest known picture of a physician with his pupils. In this picture the physician-teacher appears glorified and dramatized, looking very much like Hippocrates or Aesculapius. There is still some controversy as to whether the scene is a planned necropsy and anatomical dissection or just an impromptu class, which, it seems, was a common occurrence in the past. You see, physicians in those days were not allowed to dissect the human body, but if someone was ripped open in an accident, he was immediately taken to a physician, who promptly got together a class and tried to learn more about anatomy.

The most famous representation in medical history of a dissection depicts the greatest figure in the history of anatomy and one of the greatest in medicine—the Belgian, Andreas Vesalius. It is the famous title page of his great book, De humani corporis fabrica, published in Basel in 1543, a book that was the true prelude to modern science. Incidentally, I do not recommend that you cram your head with dates in medical history. Some of them will stick in your mind—this one, for instance, because it is the beginning of modern science; the others you will find in books whenever you need them. In the afore-mentioned picture, Vesalius is performing a dissection. He was then just a young man, about
28 years old. He was also a very brave young man, for he was one of
the first physicians to perform multiple dissections with his own hands,
in defiance not only of the authorities but also of centuries-old prejudices
and medical traditions. Milling around Vesalius are students, teachers,
artists, noblemen, and other people, as well as various animals. The whole
vibrant scene exudes a feeling of tension and even repressed violence,
which seems to have prevailed in many sessions of dissection in the Ren-
naissance.

It would also be worthwhile to look at the anatomical theatre in Padua,
where your predecessors of the the sixteenth century learned anatomy. I
was there not long ago. The theatre is small and confined, like a wooden
cylindrical cubicle. The students were not comfortably seated but had to
stand for hours. Often the teacher was late and, since students, regardless
of the time or the place, are always restless and impatient, musicians were
provided to entertain them until the teacher arrived. The dissection was
performed by candlelight, and therefore heated arguments among the
students occurred because they were unable to see clearly which organ
or muscle the teacher was severing from the corpse. Since the students
of Padua were a very mixed and international crowd, the dissection was
sometimes interrupted by heated quarrels in various tongues, which
turned the dissection class into a class of languages, or even into an
international rough and tumble brawl.

In Rembrandt's famous painting "The Anatomy Lesson of Dr. Tulp"
one can study many fine faces, some of them of famous people in gorge-
ous clothes. In fact, the picture was probably done to show not only
how anatomy was taught in those times, but also that noted people were
interested in dissection. Obviously they did not expect to participate in
the dissection other than as spectators.

Medicine, especially psychiatry today, has always been a target for
all sorts of puns, jokes, and satires. Rowlandson, the famous British
cartoonist, satirically portrayed many operations in his time. You would
enjoy the one showing the poor victim lying down with his whole inside
plucked out, while a ravenous dog cleans up the mess scattered around.

A picture of a spectacle-maker can illustrate for us the correlation
between medicine and art. It is possible to determine the age of a paint-
ing depicting someone wearing glasses, since true reading spectacles were
not invented until the thirteenth century, in Italy, although pieces of
magnifying glass were used long before in China and in ancient India.
In this case, medicine helps art in identifying the age of a picture.

There are also many captivating things to study from the Orient, for
instance, a Chinese “doctor’s lady,” which has been used for many
centuries down to the present time. When a wealthy woman called on
her physician, instead of undressing she pulled out a small ivory figurine
and pointed to the spot where she felt pain or discomfort. Thus modesty
was saved and everyone was happy.

Medical art often re-created the medical atmosphere of the past. A
painting of a Flemish apothecary shop by a pupil of Teniers’ school is a
faithful reproduction of such an establishment in those days, with straw-
stuffed animals—which were so much in vogue then—scattered about,
and a number of things happening at the same time, for an apothecary
shop then was the scene of many different activities connected with
dispensing drugs and giving advice to patients.

Another example of how art can shed light upon the psychology of a
given historical period is the sculpted head of one of the most beautiful
women that ever lived, Queen Nefertete. The bust of the Sun Queen, as
she was called, now preserved at the Dahlem Museum in Berlin, was
made in Egypt around 1350 B.C. One of her rock-crystal eyes is missing.
Nefertete was the wife of an extraordinary man, the young Pharaoh
Akhenaton, who, opposing Egyptian polytheism, tried to establish the
worship of one god only: the sun disk. Sunshine being, today as yesterday,
perhaps the most important thing to mankind, the Pharaoh, who probably
suffered from rachitism and consequently was biologically sun-starved,
felt that that was the highest tribute he could possibly pay to the basic
source of life. I have seen in Cairo the art of Akhenaton’s period and
found it exquisite and inspiring.

One other remarkable manifestation of art that has had interesting
repercussions in medicine is the Moses of Michelangelo, at the Church of
San Pietro di Vincoli, in Rome. I myself stood in awe in front of this
grandiose example of anatomical sculpture, which opened the way for
anatomical representation in that period. Sigmund Freud wrote a most
interesting psychoanalysis of this masterpiece. The statue seems to be on the verge of springing into action. It makes one feel that it is about to rise and engage in frenetic activity. It proves that, in art, stillness can convey far more power than motion. Vitality repressed through immobility can be infinitely more powerful artistically than the vitality of actual motion.

There are also pictures showing the origin and evolution of the enema. A stork giving itself an enema with its beak shows how man sometimes copied animals in therapy. In the Middle Ages the administration of an enema was an elaborate ritual, almost a festivity. An audience was almost a requisite, and the spectators would praise or criticize, mock or admire the technique, all amidst the most absurd pomp. Several centuries later, the cartoonists succeeded, as they often do, in laughing the ludicrous scenes out of existence. An eighteenth-century satirical cartoon on the enema depicts a wealthy French couple giving themselves an enema while indulging in literary chitchat. It was a weird way of passing the evening, but, then, they had no television in those days.

Pieter Brueghel painted a fine representation of a “collective” disease, the “dancing mania.” People would suddenly start singing and dancing wildly together and, forming interminable lines, would go from town to town, recruiting new victims, until, exhausted, they finally dropped to the ground. This form of mass hysteria, of religious origin, was for many years a source of great worry to sane citizens and to the Church, for the victims drove themselves into a frightening frenzy. This happened in the Middle Ages, but you can still see a replica of this mania at the Paramount Theatre, when Elvis Presley, or his latest counterpart, plays rock 'n' roll.

A famous drawing on sexual intercourse was done by the multi-faceted Italian genius, Leonardo da Vinci. It is inaccurate anatomically, but it is beautifully done, and it shows the extraordinary artistic insight the artist possessed. It also gives a sample of his handwriting. As you know, he used to write from right to left in sort of a mirror-type writing.

Another famous drawing of interest to medicine is that of the German painter, Albrecht Dürer, depicting the artist himself pointing to his own yellow-colored spleen. He sent the drawing to his physician, to let him
know where he was having trouble. Probably a victim of malaria, he showed an enlarged malarial spleen.

Hogarth’s famous picture, “Bedlam,” vividly tells us what a mental institution was like in eighteenth-century England. The conditions in which patients were kept were appalling, and visitors are shown holding vinegar-soaked sponges to their nostrils, so unbearable was the stench in the place. Some of the patients are shown practicing a rudimentary musical therapy. Such is the origin of the word “bedlam,” meaning a place or scene resembling a madhouse.

A magnificent example of how art can perpetuate for posterity the great moments in the history of medicine is the stained-glass window in the Mayo brothers’ house in Rochester, Minnesota, depicting the evolution of the history of medicine in its triple aspect of research, clinical practice, and teaching. Should you ever visit the Mayo Clinic, be sure to go to the Mayo brothers’ house to see this inspiring monument to medicine.

THREE STAGES IN THE HISTORY OF MAN

You have by now realized that the sources for the study of the history of medicine are unlimited. The history of medicine is the history of civilization. It is the history of man, and the early history of man can be summed up in three different stages: first, when man began to conform to nature instead of fighting it; second, when man learned to live in society and the first communities were created in Mesopotamia and Egypt; and third—the greatest stage—when man in classical Greece for the first time became conscious of his dignity. Man then learned something that we should never forget: that he could choose his own destiny. In being able to choose his destiny, regardless of how right or wrong it may turn out to be, lies the greatness of the human being.

PHYSICIAN, PATIENT, AND DISEASE THROUGHOUT THE AGES

Of great importance is the historical relationship between physician and patient throughout the ages.

The role of the physician in every age has been determined by the attitude of society. In primitive societies, he was a magician and healer;
in Mesopotamia and Egypt, he was physician-priest, magician, and artist; in classical Greece, an artisan or a priest; in Imperial Rome, a slave or a freed physician; in the early Middle Ages, a clergyman; in the Arabian Empire, an alchemist; in the high Middle Ages, a monastic scholar; and in the Renaissance, an artist and investigator. In the Modern Age, he is a practitioner, a teacher, or a research worker.

The *role of the patient* was also determined in each historical period by the attitude of society. In primitive societies he was considered as possessed by devils; in Mesopotamia and Egypt he was a sinner; in Greece and Rome, an inferior being; in early Christianity, a potential saint; in the Renaissance, an invalid; in the Modern Age he has at last become a patient.

The *nature of disease* was determined by the medical philosophy of each historical age. Thus, primitive peoples considered disease as possession by demons; in Mesopotamia and Egypt, disease was a sin; in Greece and Rome, a sign of inferiority; in early Christianity, a way to saintliness; and in the Renaissance, a physical ailment. Today we consider it a deviation from normality.

The nature of the therapy was determined by a combination of the afore-mentioned factors. In prehistoric times, it was practically limited to the isolation and destruction of the patient; in primitive societies, it was based on magic and empirical remedies; in Greece and Rome, on faith healing and the natural restoration of physical balance; in the Middle Ages, on dogma, superstition, and medical folklore; in the Renaissance, on empirical remedies; and in modern times, on scientific and empirical medication and on various forms of faith healing.

The relationship between physician and patient has been: in magic medicine, impersonal and practiced if necessary from afar, based on the *whom* (personality of the healer), the *when* (favorable time for healing), and the *where* (sacred places); in scientific medicine, immediate and direct, based on the *what* (medical, surgical, or psychological therapy), the *how* (dialogue, medication, manual or instrumental manipulation), and the *why* (etiological purpose).

The action of the physician upon the patient is of three kinds: *empirical*, based on what the physician *sees*, that is, on his observation of reality
in order to acquire diagnostic and curative experience; rational, based on what the physician thinks and knows, or on his rational knowledge as a man qualified to teach; or mystical, based on what the physician believes and on what the patient, in turn, believes.

The physician’s contribution to mankind has developed throughout history in three different capacities: as a professional, as a member of society, and as a human being. In these three capacities you will function when you become physicians, and your spheres of life will be: as professionals, your medical circles; as members of society, your country and your times; and as human beings, mankind and the world.

Of course, there have been throughout history physicians who, though they concentrated specifically on one area, happily integrated the three capacities mentioned and could move with equal ease in all three spheres of life. They were “the great doctors” in medical history, as Sigerist called them, great practitioners who conceived medicine as a service, like Hippocrates, Ambroise Paré, and Thomas Sydenham; great teachers, who conceived medicine as instruction, like Galen, Boerhaave, and Osler; and great scientists, who conceived medicine as research, like Vesalius, Harvey, and Fleming.

THE FOUR PERSONALITIES OF THE PHYSICIAN

There are also four personalities of the physician: he is the man who heals; he is the man who knows; he is the man who prevents; and he is the man who organizes.

We all know that the physician is a healer, who avails himself of all the resources at his disposal to cure or at least alleviate disease. Throughout history there have been three main ways of healing: magic healing, faith healing, empirical or scientific healing.

The first, practiced by shamans and witch doctors, is based exclusively on magic elements, and centers chiefly on who, where, and when, as previously mentioned. The second is a medicine of suggestion based mostly on the patient’s faith in the curative powers of the healer or in the agents or methods used—for example, the medieval ointments with which “witches” made people fly. Today, we know that such ointments
contained aconite and belladonna, which cause cardiac irregularities and hallucinations that produce the sensation of flying.

The third way of healing is based on empirical or rational means, relying mostly on the what (the drug used or manipulation); the why (etiological approach); and the how (techniques used). In Imperial Rome, electric eels were tied around the head of the Emperor Commodus by his physician to cure his migraine. Unknowingly, they were practicing a rudimentary electroshock. In the seventeenth century, poultices made of mold taken from human graves were used, which probably contained germ-killing penicillin and other antibiotics. Although they did not know about the antibiotics, they were aware of their healing effects. Ambroise Paré used onion plasters on wounds because he had discovered they had a healing effect, but he did not know the reason. During World War II the germicidal effects of some of the chemical substances in onions were proved. All these are empirical means, which include all agents with remedial properties but whose mechanism is unknown. Even penicillin, which was discovered by accident, belongs to this category. Rational means, on the other hand, include all agents or methods based on established scientific principles, on what the physician thinks, and on experimentation. These means are the basis of modern medicine.

We also know that the physician is a man who knows, a learned man whose knowledge may help him to develop a new drug or, even more important, a new principle, a new concept. The physician throughout history has made priceless contributions to the biological knowledge of man with such concepts as the circulation of the blood, or the concept of the neuron, which today is the basis of all the knowledge we have on the nervous system. Above all, the physician knows the human being, physically and mentally, which is perhaps the most important knowledge man can acquire.

The physician as a man of knowledge has discovered new drugs, such as digitalis (Withering), salvarsan (Ehrlich), or penicillin (Fleming); new methods, such as the humane treatment of wounds (Paré), the antisepic dressing of wounds (Lister), the psychoanalytic treatment of neuroses (Freud); new instruments, such as the clinical thermometer
(Sanctorius); or new principles, such as the circulation of the blood (Harvey), and the concept of the neuron (Ramón y Cajal).

The physician is also a man who prevents disease and therefore preserves life. He can do this in many ways, but the best-known methods are vaccination and other forms of immunization, and the preventive use of vitamins, mineral salts, and antibiotics. History records that the physician, to preserve life, has also used propitiatory spells, as the shaman did, or emotional catharsis, as the Greek itinerant physicians did; reshaped the sewage system of a city, as did Pettenkofer in Vienna; or cleansed his hands in antiseptics, as Semmelweis did in the obstetric wards in Vienna.

As an organizer, the physician has fought diseases that varied according to the times. Disease is an historical event, a process that moves in time, both for the individual as for society. Thus, the Middle Ages had "collective" diseases, like the plague, St. Vitus' dance, ergotism, and the dancing mania; and the Renaissance had "individual" diseases, such as syphilis. Disease is a social factor and society reacts against it. The physician has always guided and implemented society's opinions of the sick man and disease. Arnold of Villanova exemplifies this in the Middle Ages, Fracastoro in the Renaissance, Virchow in the nineteenth century. The physician has contributed to the health of man and his enjoyment of life by being a medical statesman, a public counselor, and a world health organizer.

Healing, knowing, preventing, and organizing—in any one or in all of these capacities you will function when you become physicians. Now, to study the history of medicine is the best way to integrate in your mind the accumulated ideals and wisdom of medicine, which in turn will enable you to function with dignity in whatever capacity you choose. Wrap your practical medical work in the fabric of history, and you will turn history—which is remembrance—into a dynamic instrument—which is hope—with which to conquer the future.

Do you begin to see now, my friends, what it means "to be a doctor"? Do you realize now that to be a doctor is much more than being a medical carpenter, than patching and mending torn flesh and broken souls? To be a physician is to be a keystone of modern society. And I would add, with Paracelsus, it is to be an intermediary between God and man.
THE FABRIC OF MEDICINE

THE PAGEANTRY OF MEDICAL HISTORY

Our vision, then, of the history of medicine will be a series of living tapestries portraying the joys and miseries of physicians throughout history, resurrecting men, ideas, events, and places of memorable import in the story of medicine, lighting up with words and pictures all the dark corners of the healing art, and conjuring a festival of the medical spirit in the multiplendored garden of history.

We shall attend the first awakening of medical consciousness in the magic-ruled shamans of the primitive world; the fight between sorcerer-physicians and the demons of disease in Mesopotamia and Egypt; the ceaseless spinning of subtle philosophies by philosopher-physicians amidst the harmonious geometry of white marbles in ancient Greece; the practice of medicine by slave-physicians in bureaucratic, militaristic Imperial Rome; the compilation of monumental medical works by physicians in walled-in Byzantium, who thus sought to escape their cloistered world, just as the Byzantine artists sought escape through the magic windows of their multicolored mosaics; the achievements in alchemy and hygiene of the Arabian hakims in the Baghdad-to-Cordova empire created by Islam at the point of scimitars; the birth in the so-called “Dark Ages” of the first hospitals and universities, the Gothic cathedrals, and The Divine Comedy, which makes this an era not of darkness but of blazing spendor; the exploration of the human body by artist-physicians in the Renaissance, which paralleled the exploration by navigators of the new world beyond the Atlantic waters; the discovery of the circulation of the blood and the beginning of scientific research in the Baroque, a period characterized by motion and emotion in art; the endeavors of the experimenters and visionaries of the Enlightenment and the Romantic periods, who heralded the transition to the nineteenth century’s naturalistic positivism, the transition from the old medicine, based on qualitative impressions, to present-day medicine, based on quantitative measurements, which led to psychiatry, antibiotics, ataraxics, and space medicine, and is now leading to a biochemical, physical, and—once again!—philosophical medicine, and to the submission of man and the universe to an objective evaluation and a subjective integration.

The History of Medicine is not only History, but also Medicine. Our
medical activities—prescribing an antibiotic, making a psychoanalysis, performing a laparotomy—acquire meaning only when we interpret them in reverse, like a film shown backward. Only then can we find the historical meaning in everything we do in our profession. Our medical work—preparing a clinical case history, making a diagnosis, applying treatment—would be far more efficient if we knew the why of what we are doing and if we could anticipate its future course. This is possible only by making living history of all medical work, and by doing this with love and imagination, so as to set free once again the many-hued butterflies pinned between the pages of the huge book of History.

THE TALE OF THE THREE BARS OF GOLD

I started this lecture with a story about the Spanish regalero in the Madrid of Goya, and I shall end it with a story about one of the greatest Spanish-Arabian physicians of the Middle Ages, Averroës.

Averroës once set forth on a trip across Spain in search of gold. On his white Arabian mare, he crossed plains blazing under the sun, and climbed high sierras carpeted with the ermine of snow, until he finally reached the coast, where sparkling white foam necklaced the bronzed shores of the Mediterranean. But nowhere did Averroës find the gold of Spain. Finally, tired and disappointed, he wondered if the only gold in Spain might be the gold in her sun, whereupon, using his magic arts, he seized three rays of sunshine and buried them deep in the sacred black earth of a mosque, where they have remained buried to this day. The legend is that should a physician search for the place where the rays are buried and discover it, he will find three bars of gold.

I can tell you this much: if you take from medical history its three rays of sunshine—knowledge, ideals, and humaneness—and you bury them deep in your mind and your heart, the day you become physicians you shall see them turn into wisdom of mind, greatness of soul, and simplicity of heart—the three bars of gold that can be the reward to those magic words, I want to be a doctor.
II: PRELUDE OF MIST

Witch Doctors, Shamans, and Medicine Men
(Primitive Medicine—Magic Medicine)

THE ANTIQUITY OF DISEASE

Disease is a dynamic process. Because of its dynamic nature, there is no way, except perhaps in a motion picture, to represent accurately, wholly, and dynamically the process of disease. Anatomy is static; pathology is always dynamic—in fact, it is anatomy in motion. The dynamic process of disease moves not only through space—the body of the patient—but, above all, through time—the life span of the patient. It is logical therefore that we begin our cavalcade through medical history by studying disease in time.

Disease is older than man. It is as old as life itself. The events that led to the genesis of the primeval nebulae billions of years ago are still uncertain, but there are probably more than a hundred thousand planetary systems like ours in the Milky Way, and more than a billion in the telescopically visible areas of the universe. On many of these systems there may be forms of life still unknown to us. Our planet was created some
three and a half billion years ago. The most elementary forms of life appeared about a billion years ago. Man, as far as we know, emerged from the mists of time between six hundred thousand and one million years ago. Fossil forms of Australopithecus indicate that half a million years ago there already existed a creature, intermediate between the great apes and man, that used tools. This strange, lonely humanoid being roamed the vast lands, deserts, and jungles of the earth under the most cruel conditions imaginable, impelled by fear, hunger, and cold. This was prehistoric man.

Prehistory, as we all know, is that period before writing was invented. No written records therefore exist of that period, but there are other sources that bear testimony to the existence of man and of his diseases. Such sources—the testimony of the stone dug by the spade—are the basis of the science called paleomedicine, which covers a period extending from the mists of time until about 100,000 B.C. From then until about 10,000 B.C. is the province of prehistoric medicine, which in turn is followed by primitive medicine. About 4000 B.C., archaic medicine began, when the first recorded forms of medicine appeared in Mesopotamia and Egypt.

THE BIRTH OF PALEOMEDICINE

Paleomedicine, the study of prehistoric disease, was originated by an American, Dr. Roy L. Moody, a professor of anatomy from Chicago, in the year 1923, on the occasion of a camping trip in Wyoming with a friend, an anthropologist. One night, while icy winds howled outside their tent and a kettle of water for tea quietly boiled on the fire, Dr. Moody listened fascinated as his friend talked about the origins of mankind. Little did he know that his destiny was right then and there being decided. For, while listening to his friend, it occurred to Dr. Moody that medicine would never be a real science until its whole history, as far back as prehistory, was known. And the only way to acquire such knowledge, he realized, was to study from a medical viewpoint all the things mentioned by his friend: stones, fossil bones, prehistoric tools, anything and everything related to man before history was recorded. Thus the science of paleomedicine was born. Soon thereafter Roy L. Moody began
the first scientific studies on paleomedicine. Since then, further explorations and studies have greatly increased our records of the diseases of prehistoric man.

The aforesaid is important, because the history of medicine is becoming, more and more every day, medical anthropology, or the study of the human being in health and disease, not only as a biological entity but also as a social and historical entity, related to other human beings in time and space.

Despite his gorilla-like appearance, prehistoric man was not a healthy or even a strong creature. Exposed as he was to either extreme cold or extreme heat, humidity, suffering from lack of food, inadequate shelter, little or no clothing, and all kinds of danger, ranging from earthquakes to prehistoric monsters, he must have been indeed a sickly and unhappy creature. He had bad teeth and he suffered from all sorts of bone diseases. Worst of all were the dangers from within, the consuming stresses, anxieties, and fear of the unknown, the uncontrollable terror of the things that lurked in the dark.

THE SOURCES OF PALEOMEDICINE: BONES, TEETH, MUMMIES, ART

Paleomedicine studies the diseases of prehistoric man through four basic sources of information. The first two sources are the only two hard tissues of the human body that survive time: bones and teeth. Everything else disintegrates, for even the loveliest woman is biochemically just four buckets of water and one bucket of salts. The third source is the soft tissues preserved in mummies, Egyptian or South American. For example, an Egyptian mummy of an old priest of Amon is the earliest known case of tuberculosis of the spine. The fourth source is provided by artistic carvings and paintings in rocks and stones, by tools, weapons, and similar objects left by prehistoric man. An example is a prehistoric painting of what could be either a hunter disguised as a deer or a medicine man chasing the demons away. If the latter, it would then be the earliest representation of a psychoanalyst at work.

Another famous example of prehistoric art is the so-called Venus of Willendorf, one of the oldest artistic representations of a woman. The original, a little limestone statuette, was found in Willendorf, Germany,
and is reputed to be 25,000 years old. It represents, with a peculiar charm and even dignity, the steatopygic type of beauty that prevailed in those times. The arms are strangely thin in comparison with the monstrously obese body, with its colossal breasts and buttocks. It is a perfect example of the disastrous effects of a steady diet of fat and bone marrow. To us the Venus of Willendorf may look monstrous, but a charming African proverb says, "To the mother-crocodile, each of her offspring is a gazelle." To her contemporaries, the Venus of Willendorf may have looked as shapely as Brigitte Bardot looks to us today.

Even more famous are the beautiful prehistoric drawings of the Altamira caves in Asturias in Northern Spain. Dubbed the Sistine Chapel of prehistoric art, the caves bear witness to the creative and artistic impulse of prehistoric man. The caves were discovered by a Spanish nobleman while out hunting with his twelve-year-old daughter. Stumbling upon the entrance to the caves, father and child walked in, the light of their acetylene torch flickering on damp walls, chasing away the centuries-old shadows. Suddenly the child cried: "Daddy, daddy, there are lions here!"

And lions there were, and bison and boars and deer, all painted in red, brown, and other earth pigments on the walls and ceilings of the caves. Their perfection of design and gracefulness of line have excited the envy of many a modern artist. Yet the paintings were done nearly in darkness, with the artists lying on their backs on the cold, damp floors. Thus the strange creatures tried not only to embellish their caves, but to practice a little magic. They felt that by surrounding themselves with the animals in effigy, they guaranteed success in hunting. The drawings are stunning and great examples of prehistoric "modern" art. One of them, a charging bison, conveys the feeling of motion as vividly as if a stroboscopic camera had taken the picture. In fact, all the Altamira animals convey a strong feeling of motion that has earned the unknown artists great world admiration.

THE JAVA MAN

The development of paleomedicine, based on archeological records, is a fascinating tale. In 1891, a Dutch physician, Eugène Dubois, unearthed in Java a small piece of bone that he recognized as a fragment
from the top of the dome of a skull. Because of the depth of the earth where he found the bone, Dubois deduced that it was about half a million years old. Later, when he made a cast of the bone, he observed with intense excitement that the inner surface bore the same indentations made by cerebral convolutions on the human skull. The bone, he concluded, had held a functioning brain under it. But what kind of a brain? An ape's?

Dubois immediately proceeded to calculate the volume of the entire skull and reached the figure of approximately 1000 cc. Now, since the brain of an ape is never more than 600 to 800 cc. in volume, and that of man is from 1250 to 1500 cc. (the female, poor creature, has a smaller brain, although that has no bearing on her intelligence; in fact, the brain of the famous writer Anatole France was only 900 cc., hardly more than that of a gorilla!), the half-a-million-year-old skull bone was perforce that of a man. But what kind of a man?

Dubois had also unearthed in the same spot an upper molar, a femur, and several rough stone tools, which, to refute other investigators who argued that the three bones did not belong to the same man, he demonstrated had the same content of fluorine. Based on these findings, Dubois reconstructed the figure of a man, the so-called Java man, Pithecanthropus erectus, different from all other beasts, including the ape, who knew how to carve stone and make tools and led a life which, though highly primitive, had nothing in common with that of apes. To Dubois also belongs the glory of having discovered the oldest example of human pathology: an osteitis in a six-inch femur of the same Java man, a lesion half a million years old! One can imagine the agony of this lonely pain-crazed wandering beast, and one cannot but feel joined by a strange bond to this remote ancestor who, with no one to alleviate his pain or lend him a helping hand, roamed the land, alone with his tragedy under the prehistoric sky.

THE PEKING MAN

Other investigators followed in the steps of Dubois. One of them, Davidson Black, a Canadian, while browsing in a little apothecary shop in Peking, came upon some bones and teeth that in China were called
“dragon teeth” and “dragon bones,” but that actually were boar and tiger teeth. Among the teeth, Black recognized one tooth as belonging to a prehistoric man, and, basing his deductions on that one tooth and on bones found in the Peking area, he re-created (just as Sherlock Holmes would re-create a person from a footprint or a lost hat) a silhouette of prehistoric man—the so-called Peking man—as he must have been half a million years ago.

Not too long ago, Dr. R. von Koenigswald, in South Africa, also re-created another prehistoric man out of a few prehistoric bones he found.

One fascinating fact that emerged from all these studies was that we are not truly descendants of the apes. If anything, we are their cousins. It now seems that man is either a cousin to the ape or himself a degenerated ape, whereas formerly it was believed that man was the result of the progressive evolution of the ape. It is now contended that, at a certain moment in its evolution, the original branch of primates from which sprang the lemurs, tarsiers, and Old World and New World monkeys split into two branches, and that from one of the new branches sprang the apes, and from the other, man.

Summing up, you see that the existence of several types of prehistoric man has been established, men who lived from half a million to one million years ago and from whom *Homo sapiens* is descended.

**THE GREAT PREHISTORIC DISCOVERIES**

Today we talk proudly of our age of discoveries, but our discoveries mean little to us in comparison with what the discoveries of man in antiquity must have meant to him. What are radio and radar, television and luniks, in comparison with what stones must have meant to primitive man when he realized that with them he could kill the animal that would provide food for him to remain alive, or protect himself from his enemy, or build a shelter to keep himself warm and dry? Thus—with coliths, with man-made “fingernails” of stone to relieve his own forever bleeding fingernails, with the use of pebbles as missiles and hammers—the history of civilization began. Later, a rawhide handle was attached to the stone, and the stone was ground or flaked and polished into sharp-edged tools and weapons, hammers and missiles, and slowly man reduced his primi-
tive helplessness and emancipated himself from some of the pressures of his environment and the cruelties of nature. This man and his diseases are the objects of study of prehistoric medicine.

THE METHODS AND FINDINGS OF PALEOMEDICINE

The methods used by paleomedicine in its investigations are various. The simplest is examination with the naked eye. Next is roentgenography, which has made it possible to see muscular cells in Egyptian mummies eight thousand years old. Then there is the microscope, which has permitted the identification of gram-positive bacteria from Egyptian mummies. And last is the chemical analysis of prehistoric material. For instance, with the help of the new chemical techniques, it has been found that prehistoric shells, 25 million years old, contain the same amino acids—glutamic acid, lysine, alanine, and others—that are found today in the human body.

In studying paleomedicine it has been discovered that many of the diseases found today in any modern city already existed in antiquity, such as hydrocephalus, sinusitis, rickets, caries, pneumonia, pyorrhea, pleurisy, acromegaly, tumors, poliomyelitis, smallpox, osteitis, and atherosclerosis. Disease developed according to mechanisms identical to those that prevail today: alterations in growth and metabolism, tumors, traumas, and infections. It has also been discovered that disease, as well as the organic defense mechanisms, already existed before man appeared on the earth. Note carefully this remarkable fact: disease, as well as the processes of tissue repair and cell growth, and all the other mechanisms with which the human body fights disease, existed even before man. Arthritic lesions and osteosis were found in the vertebrae of a dinosaur that roamed the earth prior to the advent of man.

THE FIRST Homo sapiens

Anthropology and paleomedicine have revealed that one of the main skeletal differences between the ape man, the Neanderthal man, and Homo sapiens lies in the mandible. In the ape the mandible was very powerful. Trees being his normal habitat, he held on to the branches with his teeth, and thus developed strong jaws and a thick supraorbital
ridge that protected his eyes from falls or collisions when swinging from branch to branch. In Neanderthal man, who had already climbed down from the trees and dwelled mostly on the ground, the mandible was beginning to resemble ours; the teeth, no longer used to swing from branches, were already reduced in size, and the supraorbital ridge was not so thick as that of the ape. The abdominal muscles in the ape were also much stronger than those of Neanderthal man. Since the ape walked on four legs, these muscles became almost a steel-like girdle, to keep the abdomen from sagging to the ground. When man began to walk on two legs, his abdominal muscles grew thinner and weaker, and in *Homo sapiens* as he is today they are quite flabby.

**PREHISTORIC MEDICINE**

The first physician was man himself; the first medicine, his own instinctive attempts at selfhealing, such as licking, sucking, and blowing on his lesions. Accidental or battle wounds, carving up animals, and cannibalism gave man some idea of the visceral content of the human body, and when man began to eat animal organs, the principle of opotherapeutic similitude was born.

Weapons began to be used to make incisions and trepanations. Licking and sucking were replaced by bloodletting, scarification, amputation, and surgery with stone tools. Then, the discovery of fire brought with it not only burns, but also cautery. As a powerful sociological agent, fire beckoned these humanoid creatures to gather together in its warm "golden chambers."

Often multiple trepanations were performed on the same patient, yet he managed somehow to survive them all, as is known from the unearthed skulls showing the spontaneous organic repair of bone tissues around the trepanation holes. To prove this further, an intact skull was trepanned after it was found, to show how it would have looked had there been no repair of tissues. One can imagine how terribly painful these trepanations must have been without anesthesia. With sharp pieces of flint a series of holes were bored into the skull until a circle was completed and the disk-shaped piece of skull could be removed to let out the demons lodged in the brain, which were believed to be the cause of headaches or epilepsy.
The trepanations therefore were not done to get into the brain, but to let the possessing demons out of the head.

The study of paleomedicine is of vital importance, for it alone can give us an idea of the antiquity of disease and of the continuity of organic processes in health and disease throughout the centuries. The prehistoric period lasted a long, long time, hundreds of thousands of years. When man realized that it was far better to live in society than all by himself like a beast, roaming the earth alone with his burdens, physical and mental, he then began to gather together with others like himself. Thus the first human communities were established, and this initiated the period of primitive medicine.

**PRIMITIVE MEDICINE**

The sources of information of primitive medicine are many and diversified. There are the tools, weapons, dwellings, tombs, drawings, carvings, and monuments of extinct primitive peoples; there are primitive peoples and races still living in remote isolated places in Africa, Asia, Australasia, and South America, people that are true "islands in time," untouched or unchanged by the progress of centuries; there are ancient myths, folklore, legends, tales, all of which are of great help in the study of the characteristics and customs of primitive peoples; there is psychoanalysis, which deciphers and interprets man's night dreams and neurotic rituals, which spring from man's unconscious, where a vast store of information on his primitive life is hidden; and, last but not least, there is the mind of the child, for the infancy of man is a replica in many respects of the infancy of mankind. Children, like primitive man, live in an unknown, fearsome world, in which they create their own tools and even their own language and their own myths and legends. And myths and legends, whether created by primitive man or by children, are of great importance, because myths are the projection of man's hopes and fears, and legends are history distorted by the imagination.

**THE PRIMITIVE MAN**

Primitive man ("isolated" man would be a better name, particularly for the primitive peoples of today, since they are not retarded but
just isolated from advanced cultures) lived approximately between 10,000 B.C. and 4000 B.C. To this period belongs the eolithic culture, the earliest stage of human culture, represented by the use of crude stone implements and by a type of man who already conformed to the laws of nature. Man at first was a hunter. On foot, patiently and tenaciously, he followed his quarry across great portions of the earth. Today, because of the jet plane and other modern means of locomotion, we speak of having no notion of distances. This is only partly true. Primitive man really had no notion of distances, for he had no standards of comparison. Pick up a map and trace on it the vast distances traversed on foot by primitive man in search of food. You will not believe your eyes. Primitive man, with no idea of what lay beyond the horizon and no way of measuring distances or even time, simply started walking in search of food or forced by the elements, without the slightest notion of where or how far he was going or what he would find. Incidentally, these primitive men moved faster ten thousand years ago than Napoleon’s Grande Armée did in the nineteenth century.

At that time there were three primary human races in Europe and Asia: the Caucasian or white-skinned people, who spread across Europe, favoring particularly the warm hospitable lands around the Mediterranean; the Mongolian or yellow-skinned people, who, in pursuit of the bison, the caribou, and the reindeer, crossed Alaska and reached North and South America, thus becoming the ancestors of the aboriginal American Indians; and, third, the Negroid race, which settled mostly in Africa. All these peoples belonged to the heliolithic cultures, the cultures of the sun and the stone, which centered around the Mediterranean, when Italy and Spain were still linked with Africa, America was linked with Asia at the point where Bering Strait is today, and Russia was practically an uninhabited barren land.

In the Mediterranean area there developed a neolithic culture, characterized by the use of polished stone, bone and horn implements, and many cultural advances, such as pottery making, weaving of linen, domestication of animals, and the cultivation of grain, fruit trees, and edible plants.
THE DISCOVERY OF ASTRONOMY AND MATHEMATICS

These were times of great discoveries. At night, when darkness descended upon the earth, there was nothing for man to do but look at the stars. After looking at the stars night after night, fascinated by their silvery glitter, man began to evolve and apply the science of astronomy, developing a calendar to guide him in planting and harvesting. Thus man came to know the heavens before he conquered the earth.

The discovery of astronomy was followed by the discovery of mathematics. Man's own body supplied him with a system of mathematics. First of all he realized that there was only one of him and one god and one sun. This gave him the number one. Then he became aware that he had two hands, two eyes, two ears, and two legs. This gave him number two, which gained new importance when he acquired a female companion. When a child was born to him, he had the number three. Marching forward, backward, to the left, and to the right, he developed the number four, to which he added himself, making five. This was a crucial moment. Upon reaching the number five, he realized that there was something in common between five fingers, five cows, five stars, or any five things. And so he based his whole system of mathematics on the number five, and later on ten, when he began to count with his two hands. At this point we come to a very interesting and amusing fact. The inhabitants in the cold north of Europe wore shoes to protect their feet from the cold, and their system of mathematics therefore remained pegged to the number ten. But the people in the warm south went barefoot or wore open sandals, and their system of mathematics eventually was based on the number twenty, the total of ten fingers and ten visible toes. The same custom of wearing or not wearing shoes is also responsible for the fact that in some languages, English, for instance, the word “fingers” is used for the hands and “toes” for the feet, while in the language of southern races, one word, for instance, dedos in Spanish, is used for both fingers and toes. This confirms semantically the common origin of a mathematical system.

OTHER DISCOVERIES

Time passed and many a dawn must have witnessed the joy brought
by a new discovery. Baskets were made with vegetable fibers, and, one
day, someone with a touch of genius lined the basket with mud. When
the mud dried, ceramics was born. Perhaps on another day our "genius"
tried to soothe the pain of a fractured arm with the damp coldness of
mud, and when the mud dried, the first cast was born.

RELIGIONS OF FERTILITY AND OF MYSTERY

Primitive magic rituals were probably the first form of worship on the
earth. One of the main impulses in the creation of magic medicine was
probably the great loneliness of primitive man. The whole world for him
was fraught with lurking terrors. In self-protection, he created myths and
legends and an animistic conception of the world, according to which a
spirit hovered around every tree, fountain, river, or anything else, and
everything was alive with invisible forces and endowed with supernatural
powers.

Let me tell you a case in point. Primitive man noticed that after a
burial anything planted in the same spot grew abundantly. Of course, any-
thing grows better on soil that has been dug and stirred, but they did not
know this fact yet and deduced instead that burial grounds lodged spirits
that stimulated the fertility of the earth. Thus were born the religions of
fertility, with the sacrifice of human beings in the corresponding rituals.
Harvests became vital periods in the life of villagers, for a bad harvest
meant starvation for all, and for that reason they developed into periods
of collective anxiety neuroses. Today we still have to cope with similar
phenomena, such as spring neuroses and Christmas neuroses, of which
I have spoken on other occasions.

Next to the religions of fertility grew the religions of mystery, which
ritualized the transit from death to life by making the males of the tribe,
upon reaching manhood, pass from a dark room, symbolizing death, to a
brightly lit room, where they were given stalks of wheat, symbolizing
the resuscitative powers of nature.

THE DISEASES OF PRIMITIVE MAN

Primitive man suffered from diseases caused or aggravated by envi-
ronmental factors, either physical—such as dampness, extreme cold or heat, poor shelter, insufficient clothing, inadequate food—or psychological—such as stress, anxiety, and fear of the unknown. Among the most frequent conditions were infections, arthritis, traumatisms, respiratory and gastrointestinal diseases, arteriosclerosis, dental processes, and mental diseases.

Primitive man learned to treat mild diseases with herbs, poultices, decoctions, massage, or heat. He also imitated various animals, pulling out thorns just as monkeys did, chewing laxative herbs because he saw animals doing it, giving himself enemas in imitation of the ibis, and bleeding himself just as the hippopotamus did. Major diseases were resolved by killing the victim, so that the sick man would not become a burden to the community.

THE FIRST “DOCTORS”

Soon man realized that he needed specialized persons to help treat certain pains and ailments, such as smallpox, compound fractures, arthritis, and mental disease. That was when the first “doctor” in history appeared.

The first doctors may be grouped in three categories. First were the healers, men who cured by means of natural resources, such as diet, herbs, mineral substances, massage, steam, psychotherapy, and other rudimentary empirical therapies. These were empirico-rationalist herbalists and bone setters, who claimed they had heard the mystic “call.” Second were the leeches, or prophet-healers, men who followed the same procedure but also claimed the power to make prophecies. (Incidentally, the word “leech” for “doctor” was still used by Charles Dickens.) Third were the true medicine men or witch doctors, who used both empirical remedies and magic. These men, who were at once medic, “scientist,” wizard, necromancer, priest, counselor, statesman, artist, and poet, were our true precursors.

At this point I should mention that there is a vast difference between witchcraft and magic. Magic was practiced by witch doctors and we shall discuss it later. Witchcraft, however, was practiced by so-called “witches”
and had only one purpose: to invoke the assistance of evil powers in causing harm or evil to another person. In fact, the witch's worst enemy was the witch doctor. On the other hand, magic was man's first attempt to understand nature and therefore was the precursor of science.

ENTER THE SHAMAN

There were two types of medicine men or witch doctors: first, the noninspirational seer, who still exists among the American Indians, a man to whom devils and spirits were supposed to talk and reveal all kinds of things, which he later imparted to his people; and second, and the most important because he is our direct predecessor, the shaman, who practiced exorcism and made prophecies, believed in demons and in a supreme being, a "specialist" in severe cases of disease, possessed by a spirit who spoke through his lips—he was a true medicine man and a member of probably the oldest medical religion in the world. Even today there is a belt of shamanism stretching from the Bering Strait to Scandinavia, and many a shaman still practices medicine in the numerous primitive villages existing in undeveloped regions of the earth.

The shaman was the most important person in his village. He knew more about everything than anybody else, and this aristocracy of knowledge made him tower over all his fellow villagers. He was doctor, wizard, poet, statesman, leader, and everything else that signified knowledge, wisdom, and power to his people. He was "the man who knows." Although his methods were primitive and his techniques of healing were based on magic and although to us he seems weird, even grotesque, and certainly unscientific, we must regard him with sympathy, for he was really sincere; he actually believed in everything he did, since he had a psychopathic personality. Most shamans were schizophrenic or psychopathic people, and their catatonic trances and hallucinations were interpreted by their fellow villagers as a sign of being in contact with the spirits. Besides, the shaman was the first man to apply some degree of logic in dealing, through magic, with the problem of disease. Although the shaman's thinking was logical to some extent, it was strictly unscientific.
SCIENTIFIC AND MAGIC MEDICINE

It is advisable at this point to review the difference between scientific and magic medicine.

Scientific medicine today is based on three things: what is done, how it is done, and why it is done. Thus, when you become physicians, you may one day, as skillfully as you possibly can (which takes care of the "how"), administer an injection of penicillin or perform a laparotomy (which takes care of the "what"), after you have studied the symptoms and signs and established the etiology of the disease and the need for penicillin or surgery (which takes care of the "why"). Magic medicine, on the other hand, was based exclusively on who (the personality of the shaman), where (the sacred place for his rituals), and when (the magic hour). Scientific medicine is based on an immediate and direct relationship with the patient, whether it involves verbal treatment, drugs, or surgery. Magic medicine was neither immediate nor direct. It was impersonal, and very often it was practiced far from the patient, since it was based on the supernatural powers of the shaman and his fantastic and emotionally guided association of ideas. The two main characteristics of magic medicine were the avoidance of harming the patient and the acceptance of the psychic component of disease. Both are highly laudable.

THE CONCEPT OF THE FOREIGN BODY

The shaman treated both minor ills and major diseases, a headache or stomach-ache and smallpox or insanity. For the shaman—and this is important for you to remember, for it is the oldest philosophical concept of disease—disease was the result of the entrance of a foreign object into the body. This foreign body could be physical—a fish bone or poison—or spiritual—a demon. In other words, to him all diseases came from without. Another concept was that when something entered the body, disease was a plus, but when the soul strayed out of the body, disease was a minus. These were, in primitive medicine, the basic theories on the causes of disease.

The shaman based his diagnosis on the concept that there was only
one disease, which he identified with the cause. The “clinical case history” consisted in interrogating the patient and those around him to ascertain if he was the victim of witchcraft, or if he had had any evil dreams or broken any taboos. Prognosis depended on auguries and oracles. Treatment, intended to either extract the object or spirit that had penetrated the body or return the soul to the body, consisted of magic, sucking or extraction rituals, massage, baths, vegetable drugs, exorcism, bloodletting, or spells.

THE SHAMAN AND HIS RITUALS

In the shaman, for the first time in history, were joined medicine, religion, and art, that is, knowledge, faith, and creativeness. His magic was an art of arts that attempted to govern the demons. It was a pseudoscience, based not on rational observation, as science is, but on his own experience of emotional states. It sought to combat human-produced and supernatural diseases through mechanistic and psychological magic rituals, based on analogy and not on experiment; and “natural” diseases through empirical means, such as fracture setting, medicinal herbs, isolation of the “possessed” person (infectious or mental), cranial decompression to expel the demons in an epileptic individual, and variolation. To combat disease, the shaman used sucking, bloodletting, purgatives, and cupping (all of which were intended to expel the causative agent, whether a foreign body or a demon), accompanying his treatment with dramatic gestures and much drum beating and rattle shaking, until he finally produced the “culprit” incarnating the disease (usually a pebble or tiny insect, which he kept concealed somewhere in his person) and declared the patient cured. Other times the shaman used professional “soul catchers” to retrieve the wandering soul of the patient. And in all cases he practiced verbal psychoanalytic exorcism.

The main ritual in magic medicine was the act of suction, performed by the shaman to draw the evil spirits out of the patient’s body. The suction was not real but purely symbolical. The shaman simply applied either his own lips or a hollow cane to the patient’s chest, and shammed, sometimes for hours, the motion of sucking, until he finally pulled out of his mouth a colored pebble or a tiny live lizard, which he presented to
the patient and his family as the evil spirit that had caused the disease. This was not really a shameless act of deception, for the shaman himself believed implicitly in it, and often by the power of suggestion he obtained the results desired.

MAGIC, PROGNOSIS, AND THERAPY

For the medicine man, the main problem was not diagnosis, since diagnosis is based on choosing from different possibilities and processes and the shaman had no choice, because he believed that there was only one type of disease, based on the intrusion of a foreign body or on possession by a spirit or departure of the soul. The main problem of a shaman was to make a good prognosis. Will the patient recover, or will he die? That was all that mattered. The prognosis, highly important to the village from an economical standpoint, was based on the interpretation of omens, through which they tried to explain the cause of disease. Immediate causes of disease were magic or witchcraft, dreams of disease, and moral delinquency or violation of the tribe's taboos.

Object intrusion was treated by suction and extraction of the disease-causing object, as already described, and by massage, steam baths, drugs, or trephining whenever required. Spirit intrusion was treated by bleeding or by a rudimentary "psychoanalytic" exorcism of the spirits.

To treat the loss of the soul, there were professional soul catchers, usually women. The soul catcher's method for retrieving souls was simple: she simply placed a grain of rice on top of the patient's head. Once the soul was returned to the patient's body, a palm leaf was wrapped around his wrist to make sure it did not escape again. These women had a higher status in the tribes than the other women, whose social status was deplorably low. To give you an idea of their situation, when a man borrowed something from another man, he left his wife as security, rather than part with his animals or tools. The security was good for three years, during which period the lender was entitled to make full use of the collateral.

Of course, if the patient were gravely ill, no time was wasted, for the patient represented one mouth more to feed, one body more to clothe, one bed more to provide. Therefore, the sick man was killed. However,
often the patient was buried alive, in the belief that the evil spirit was also being buried, or else he was devoured in an act of cannibalism.

A TALE OF CANNIBALS

Apropos of cannibalism, Sigerist used to tell an amusing story picked up by a French traveler while staying with the Bobos tribe in the Sudan. The Bobos are a happy, husky people and very enterprising. They do quite a bit of trading, and for currency they use sea shells, which they call cowries. One day, one of these enterprising men set out on a business trip, but first he called his best friend and implored him to guard his wife, who was very dear to him, for she was not only a good cook but extremely fat, and obesity was a sign of wealth and power. Upon the return of the traveling husband, his friend rushed to him and handed him 60,000 cowries. "What is this for?" the husband cried out in amazement. "After you left," replied his friend, "your wife became ill and began to lose weight rapidly. I had no sleep worrying over your interests and, finally, I decided to kill her, before she wasted away completely, and sell her at the meat market. It is a handsome amount I have made for you." The husband was so touched he could hardly speak. He promised his friend that, should the occasion arise, he would gladly do the same for him. However, he had one complaint, for his friend, a sentimentalist, no doubt, had saved his wife's bones as a souvenir. "You did wrong," he moaned. "These bones will remind me of my wife and make me sad. Besides, had you sold the bones, I would now have more cowries."

A MAP OF MAGIC

These drastic methods—cannibalism, killing, burying alive—for disposing of sick people are still practiced today among primitive tribes in the jungles of South America and Africa, in many islands in the Pacific, and in other isolated areas of the world.

You may be interested to know that there are maps of the areas in the world where disease was believed to be caused by object intrusion and of the areas where disease was believed to be caused by magic or witchcraft. These maps reveal similar concepts of disease in places remote from one another. These concepts are linked with anthropological character-
istics and cultures. This phenomenon will be of great importance some day, when the geography of schizophrenia and other mental diseases is studied in relation to the "normal" characteristics of cultural and religious beliefs in different areas of the world. We shall probably see then that paranoia is more frequent in places where it is believed that man can be possessed by evil spirits than in places where this idea is not accepted. Geography, after medical anthropology, is the most important ally of medical history.

A GLIMPSE AT THE SHAMAN OF TODAY

Many shamans can still be seen in action in the modern world. In Australia there are Arunta medicine men with the nose pierced by a bone, which they remove and point with whenever they wish to destroy an enemy. They also have markings on their chest symbolizing magic crystals, meaning that they are initiates in some of the most occult magic rituals. They dress scantily. Clothing, as you probably know, started more as a way to attract attention than as a protection against raw weather, which is the reason for the use of colorful feathers and furs. In Africa there are Zulu shamans who wear ugly baboon fur caps, symbol of authority and power, and carry a whole assortment of rattles, amulets, and talismans, which they use in their weird rituals. The shamans often make abrasions in the patient's skin and sprinkle them with revulsive vegetable or mineral powders. In South Africa there are shamans with buck horns around their neck, in which they carry their nostrums. Often the shamans travel around with all sorts of odd things strung on their caps, such as a sheep bladder, or things given to them in payment for their services. Shamans were usually paid in kind, instead of in money. Women were a favorite form of payment, which soon turned a shaman's home into a harem. Were we paid in the same manner here in New York, it makes one shudder to think what a frightful problem it would be to keep the payments in our cramped living quarters.

In this country, until recently one could find Ojibway medicine men preparing concoctions intended not for the patient but for the evil spirits that possessed him; Blackfoot Indians, fully attired in weird working gear, including a magic pouch or bundle containing stones, shells, and sucking
tubes, and ready to spring into action at the accompaniment of tambourine and rattle; and Navaho shamans chanting incantations to drive evil spirits away from their village.

PREVENTIVE MAGIC

We might conclude, then, that what the shaman used was actually a preventive magic, since he practiced isolation of those possessed by devils (primitive peoples, it seems, had more devils in their mind than we have germs in the world today) and trephining of the skull, which was often beneficial, because it relieved intracranial pressure; used medicinal plants; prescribed the most elementary and helpful measure in the face of an epidemic: prompt flight en masse from the site of the epidemic; and attempted a form of variolization by rubbing the skin with scabs from a patient, say, with smallpox, to induce a mild form of the disease as a preventive measure. Of course, his main technique was magic.

Let us not scoff at the word “magic,” for notwithstanding the ungodly practices it involves, the word has pleasant, even good, connotations. Even the most scientific authority, when talking about a successful drug, is liable to say, “It worked like magic,” or we may say that a woman is “bewitching,” or speak about “the spell” of a beautiful place, a sunset, or a poem.

MAGIC, SCIENCE, WITCHCRAFT, RELIGION

In speaking of magic, we must differentiate it from science, religion, and witchcraft.

Magic was based primarily on the personal powers of the medicine man, on what he himself could accomplish. Primitive religion, on the other hand, appealed to and depended entirely on the divine powers of a godly being. Magic commanded demoniac powers; religion implored the gods. Magic dominated the demons through conjuration; religion yielded to the gods through prayer. In magic, the demons were man’s servants; in religion, the gods were his masters. Magic was the first logical attempt to solve the riddles of nature, of man, and of disease; religion was a mystic attempt to cope with such riddles. Magic used specialized techniques governed by a philosophical theory and principles;
it had definite aims of a practical nature, such as to cure disease promptly. Religion, a corpus of self-contained actions, offered not means to an end, but means that were an end in themselves.

One of the main characteristics of magic, as it is of art, is its discontinuity. Art is a discontinuous process, for the artist follows only his own creative impulses. In his work, the artist, ignoring everything that has happened in art before him, re-creates all over again the whole process of art. In magic, the medicine man, like the artist, followed a discontinuous thought, basing his art only on the subjective experience of emotional states, on his hopes, his desires, his association of ideas. The shaman mistook his own wishes and objectives for the events that occurred to man and in nature. He used his own association of ideas to project his thoughts and make believe that things happened the way he wanted them to happen.

Science, unlike magic and art, is characterized by continuity, since it is based on observation, objective experience, rational hypothesis, and logical experimentation. In science, man tries to dominate nature by understanding and adapting to it, and he tries never to confuse the laws of nature with the laws of his own mental processes.

Witchcraft is entirely different from magic. It deals exclusively with evil, and conjures only evil spirits. Magic medicine wanted to do no harm; the sole aim of witchcraft was to do harm. Witches were the worst enemy of the medicine man.

FORMS OF MAGIC

There were a number of forms of magic, but the basic ones were: homeopathic magic, based on the principle of similitude, whereby mutilation of his effigy destroyed an enemy; contagious magic, based on the idea that destruction of some part of the enemy’s body—fingernail, hair, even excreta—would in turn destroy the enemy; and direct magic, which called for special rituals, such as drowning an effigy of the enemy in a hole in the ground filled with blood-colored water.

DEFENSIVE MAGIC

The most interesting form of magic, however, was defensive magic,
or *countermagic*, which used fetishes, amulets, and talismans to prevent disease.

**Fetishes**

The magic properties of fetishes, amulets, and talismans were predicated on the notion that everything in the universe, including inanimate objects, was animated by forces that could be subjugated by magic. A fetish was an object endowed with magical powers that could be used for either good or evil. Such magical powers could be natural to the object or could be imparted to it by the witch doctor. The word "fetish" derives from the Portuguese *feitico*, and this from the Latin *facticius*, meaning something made by hand. It was the name originally given by Portuguese sailors to magic-endowed statuettes obtained in North Africa. Later, the name was applied to a religion that was based on the use of fetishes.

Among the most important fetishes is a variety of nails. This is a strange fact, since iron, which was discovered much later than bronze or other metals, was distrusted by the religions because of its meteoric origin. Iron and black magic did not mix well. Iron was considered to have protective properties against the powers of darkness and therefore was used in many fetishes. Even today many people believe that a horseshoe brings good luck, which is one of several iron-based superstitions. Mirrors were also very popular fetishes (their magical properties are mentioned in *Alice Through the Looking-Glass*), and so were the medicine bundles carried round the neck by American Indians. These bundles were made of buck or snake skin and contained whistles, corncobs, little pebbles, lizards, rattles, scraps of rawhide, protective pigments, and other magic objects.

**Amulets**

Amulets (from the word *amalirii*, meaning to ward off) are objects with protective powers against black magic or the evil eye. Some of the most popular amulets down through the ages have been: Egyptian scarabs, symbol of resurrection and immortality; stars, symbol of something protective and remote; the Tau cross, symbol of St. Anthony, used by
his order to treat skin diseases; images of hands, like the protective hand of Fatima, daughter of Mohammed; dragons, a truly international symbol, still used right here in New York, in the New Year festivities of the Chinese; and gargoyles, chimeras, and goblins. You can still see examples of these last three creatures protecting the beautiful city of Paris against the powers of darkness from the lofty towers of Notre Dame. Also highly favored were phallic amulets, symbols of the powers of life, like the Italian and Spanish fica, a symbol of the sexual act.

_Talismans_

Talismans (from the Greek word télesma) are good-luck charms, such as lucky stones; coins; wheels (for instance, the prayer wheels of Tibet), symbol of eternity because they are round and have no beginning or end, the same reason that makes rings also a symbol of eternity (to this day rings are worn on the so-called ring finger because, in ancient times, it was believed that this finger was linked by a special vein to the heart); four-leaf clovers; and other objects. There were also living talismans called mascots, a word deriving from the Provençal masco, meaning witch. Generally, mascots were live animals that brought good luck, such as dogs, goats, cats, and rams (they are still used by military regiments and sport teams); but there are also symbolic inanimate mascots, such as the dolls and cloth animals seen hanging on car windshields. Mascots also are the pretty girls that accompany professional gamblers at the gambling tables in Monte Carlo or Las Vegas. Possibly the American slang word for a pretty girl, “doll,” derives from its original meaning of a good-luck mascot.

**APPRAISAL OF MAGIC MEDICINE**

Magic medicine deserves our sympathetic consideration, for it had a few good things in its favor. First, it was based on the principle of causing no injury to the patient. The rituals and manipulations of the medicine man were rather alarming looking, but they never harmed the patient. Second, it had a modern psychosomatic approach to disease, for it recognized that all diseases had a psychic component, and it always endeavored to eliminate the traumatizing cause from the patient’s mind.
Third, it was man's first attempt to understand the universe and to master it through "logical," non-religious methods. Magic medicine's basic concept—extraction from the patient's body of the disease-causing foreign body—still survives in modern forms of cathartic therapy, which, incidentally, was the only therapy known to man up to as recently as 100 years ago. Bleeding, enemas, purgatives, sudorifics, emetics, diuretics, and today psychoanalysis are all treatments based on the same principle that inspired the therapy of magic medicine: to eliminate from the patient's body or mind the causal agent of his disease by means of emesis, diuresis, purgation, or, in mental cases, psychoanalysis, supplemented by drugs.

THE MARCH OF MEDICINE

What followed after these periods of primitive medicine and of magic medicine?

I said before that primitive peoples settled primarily on the Mediterranean shores, a generous land warmed by a golden sunshine and bathed by the warm blue waters of the Mediterranean sea, the cradle of Western civilization, a cradle rocked throughout history by wars and revolutions, but also by great men and world-shaking discoveries.

One million square miles of paradisiacal land, mountains, coves, islets, and warm blue water that both united and separated the different countries grouped around it under the same sapphire sky, the Mediterranean area was God's gift to primitive man, that he might be inspired to create the first great civilizations. These great civilizations that sprang around the Mediterranean considered it their own private lake. The Romans called it Mare Nostrum, and until the seventeenth century the Spaniards boasted that they could navigate it without compass. The peoples around it communicated easily with one another. Even the wind that ruffles its waters is to this day shared alike by all; and the tales spun by the ragged storytellers in the zocos of Tangier are the same tales told by the more polished raconteurs in Andalusia or in Sicily, which points to a community of environment as well as to a community of thought.

Such, then, was the land on which true medicine saw the first light. In fact, Mesopotamia, between the Biblical rivers Tigris and Euphrates,
was probably the cradle of Medicine. There began the eastward march of medicine. Following the course east of the Mediterranean waters and the Nile, medicine reached Egypt and, later, the islands of Greece, where it flowered to towering heights. From Athens and the schools of Cos and Cnidus, it moved on, always eastward, to the great Italian universities: Salerno, Rome, Padua, Bologna; thence to France, and Montpellier and Paris became the centers of knowledge in medicine; and later to Cordova and Toledo in Spain. Leyden, the German universities, and England followed. And from there it crossed the Atlantic and reached the American shores, where it has developed into one of the greatest social forces in the world.

This great cavalcade of medicine through time and space has left a glorious heritage that should fill us with profound admiration and pride. You are the heirs to this glorious heritage. With skillful hands, a clear mind, and a singing heart, you too will one day become great physicians and keep your rendezvous with history.
AND NOW let me tell you a tale of two countries and three rivers. One of the countries is Mesopotamia, known in ancient times as "the land between two rivers" (today called Iraq, meaning coast-land), and its two rivers, of Biblical fame, are the Tigris and the Euphbra-tes. The other country is Egypt, with its one great, long, sacred river, the Nile.

The river has always been one of the most powerful symbols in the life of man and of peoples. An eighteenth-century Spanish poem by Jorge Manrique says: Nuestras vidas son los ríos—que van a dar a la mar, que es el morir. ("Our lives are the rivers—which flow toward the sea, which is death.")

It is easy to understand why the river is so profoundly important to man and to nations. A river will flow across, and water without distinction, many different lands, carrying not only boats and cargo and men,
but also ideas, the fruit of man’s thinking. Not only is the river a thing of utility, but it is also a thing of beauty, vividly reflecting the splendor of heaven and nature. The river is a force in continual motion, always the same and always different. It can bring life, and it can bring destruction. Indeed, the river is a unique symbol in both individual and collective history.

THE DESERT’S CHALLENGE

So-called *archaic medicine* is the medicine of the ancient civilizations—Mesopotamia, Egypt, India, China, and the primitive Americas. I have chosen Mesopotamia and Egypt because they are the best examples of this medicine. Lack of time will not permit us to look into the others. These civilizations created vast medical systems, which eventually disappeared almost completely. Archaic medicine is practically a fossil medicine. Only the vaguest traces of it remain in modern medical systems, in medical lore, and among the primitive peoples who still exist in the modern world.

By the beginning of recorded history, c. 4000 B.C., Mesopotamia and Egypt already had a great deal in common. Both countries had attained an astonishing degree of civilization; both had sprung from the desert and had been settled by man fleeing the desert in search of flowing water, which bears testimony to Arnold Toynbee’s comments on “the desert’s challenge to man”; and both had “river cultures,” that is, they depended exclusively on their great rivers. Their imperial glory, their history, which resounds with the clash of armies and the fall of kings, lasted several thousand years. Today nothing remains of it. Should you fly, as I have, over the sites where their legendary cities were, you will behold only the earth scorched by an implacable sun, some gaping holes left by archeologists in search of the treasures of antiquity, and a barren hill here and there, under which there may still lie buried perhaps a tomb or a temple, perhaps a crumbling city, the only remains of what long, long ago were two monumental civilizations that bore testimony to man’s primordial talent and ingenuity.

Although the ancient Mesopotamian and Egyptian civilizations developed on parallel lines, for many centuries they failed, as parallel lines
do, to establish contact with each other. In fact, 1500 years—a little eternity—passed before the two countries, Egypt, land of farmers, and Mesopotamia, land of traders, spanned the vast stretch of wasteland (today called the Syrian Desert) that united yet separated them. Two extraordinary cultures emerged simultaneously from the mists of antiquity in a comparatively small fragment of the earth, completely separated from all other then known communities, and yet they had no contact with each other. Perhaps this was due to the fact that Egypt was a geographical box tightly sealed by the Mediterranean on the north and by the natural walls conjured by rock and desert on the east, west, and south. Mesopotamia, on the other hand, was a swampland about the size of present-day Massachusetts, a vast and long corridor directly on the route of the great caravans that were traveling to the Mediterranean shores.

CARAVANS IN THE NIGHT

Caravans were the only means of communication in ancient times; they still are in desert regions. At first mules and donkeys were used; later, horses and camels. Loaded with dates and spices, perfumes and silks, day after day, year after year, the caravans jogged on, strewing their path with the news, customs, and ideas picked up in their travels across many strange and remote lands. In the long, dark nights, gathered around the fire, the leaping flames lighting now and then their dark bearded faces, the men discussed the things they had seen in their travels. They talked of sensuous dancing girls and dream-producing poppies and of other things related to the pleasures of the senses, but they also talked of the strange inventions and discoveries that were blossoming all over the then known world. Writing, the wheel, the ramp, the lever, magic, astronomy and astrology were all mentioned; the same things that later helped build the colossal monuments of Mesopotamia and Egypt.

THE MESOPOTAMIAN SAGA

The first settlers of Mesopotamia were the brown-skinned, hook-nosed Sumerians, a non-Semitic race. The Sumerians, fleeing the desert beyond Mesopotamia, migrated to "the land between two rivers," and on the
marshes along the river banks erected their mud villages. The Sumerians were skilled in the use of certain metals, such as copper, and of the wheel, but since they lived in swampland and had no roads, they used few wheeled vehicles, and those they did have were chiefly war chariots. Later, the southern Sumerian people were conquered by a Semitic people called Akkadians. From these two races stemmed the great Mesopotamian civilization.

This civilization was based on the concept of each city as an independent state with its own gods and priests; on the practice of irrigation and cultivation; on farming, rather than hunting; on the use of waterborne vessels and of a barter system instead of money. But perhaps its greatest achievements were the development of a pictographic cuneiform writing on clay tablets, the calendar, and mathematics.

In the north of the land, the Mesopotamians built the city of Nineveh, a legendary name that still rings with the poetry and romance of ancient times; in the center they built the city of Babylon; and in the south, the city of Ur.

But Mesopotamia was not destined to know peace. Century after century, for more than 3000 years, invasion after invasion ravished land and cities. The Amorites, the Hittites, the Kassites, the Chaldeans, and other peoples kept first one city then another ringing with the clash of arms and the clang of war chariots. Now Babylon (made the capital of his empire by the great King Hammurabi), now Nineveh (made the capital of Assyria by King Ashurbanipal), now Ur fell, only to rise to power again as a principle city of the Babylonian Empire and its famed King, Nebuchadnezzar, only to fall to the Persians when it was under Nabonidus, the last Chaldean king of Babylonia.

The centuries witnessed the repeated clash of armies and the death of ruler after ruler; the collapse into dust of towering walls and battlements and the birth of new ones; the creation of gigantic war machineries and their destruction. The horse, which the Mesopotamians never used as beast of burden, preferring the donkey instead, became, joined to chariots, a powerful factor in war. Moreover, instead of killing the defeated enemy, the Mesopotamians learned to use him as they might use an animal. This was the beginning of slavery. Technologically, this represented a porten-
tous discovery, for thereafter manpower became a great force in the building of cities and temples.

And in those times nothing was as important as building great walled cities and towering temples, for man lived in perpetual fear of both his fellow men on earth and the evil spirits above. Thick walls around their cities, thick walls in their houses were considered their best defense against all enemies, human or supernatural. How revealing of human psychology a study of human dwellings throughout history would prove! In Mesopotamian times, frightened man sought shelter in houses built like fortresses. In New York our buildings have invisible walls, walls of glass, behind which, visible to one and all, people live and toil as in mammoth transparent beehives. Man may have lost his fears, but he has also lost his privacy and with it his individuality, drowned in the anonymity of the modern dwelling.

The slavery-based Mesopotamian economy, ruled by priest-kings, contrasted sharply with their theocratic democracy, which required everyone to labor at the irrigation canals in peacetime and to be a soldier in wartime. The family was the social unit, and social classes included teachers, artisans, beggars, and slaves.

Communication was limited by the lack of roads. All travel was done by foot, on donkeys, or on river rafts. Kings were buried together with their courts, their jewels of gold, silver, lapis lazuli, and malachite. Remarkable were their mechanical inventions: the wheel, the pulley, the screw, the level, the wedge, and the inclined plane.

Thus the Mesopotamian civilization grew and developed, moving now to one place, now to another. War raged endlessly among the Assyrians of Nineveh in the north, the Babylonians in the middle of the land, and the Chaldeans of Ur in the south. To use a simile close to your daily activities, civilization emerged in Mesopotamia as an isolated nucleus, in a manner similar to what happens in the laboratory when you strike a gelatin plate with a wire loop dipped in a bacterial solution. Soon isolated colonies began to appear on the plate. That is what happened in Mesopotamia. Suddenly, patterns of culture cropped up in isolated areas of the country, usually blessed with temperate weather and the proximity of water, and these patterns gradually developed into villages, towns, and
big cities. In the transition from village to big city there prevailed a feverish defensive activity against demons and against possible invaders, resulting in formidable walled towns.

From their original democracy, the Mesopotamians went on to theocracy; from their use first of flint and stone, they were spurred by war to use copper and bronze.

Egypt, on the other hand, was born and developed in a different way. The Neolithic clans that, fleeing the desert, settled on the banks of the Nile became a farming people, completely dependent because of lack of rain on the river, which with an iron grip governed every aspect of their daily life. Unification by Menes of the various clans in the Upper and Lower Nile, with Memphis as the capital, marked the beginning of the great Egyptian dynasties, under which Egypt reached the zenith of early civilization. Later came all sorts of invasions—Persian, Greek, Roman—and for a long time, under multiple wars and invasions, the unfortunate land of Egypt contracted and expanded like an ameba under a microscope.

Meantime, a new type of human being, completely different from primitive man, was emerging. This man, among many other things of import, gave us the first medical systems in the history of medicine. To know this man, we must look at his art, for there is perhaps nothing more revealing about a people than their art. Man has two ways of expressing himself: art and science. Art is an individual manifestation; it is the I expressing individually its own emotions. Science is a collective manifestation, the we pooling its rational knowledge and trying to accomplish something according to a method or system.

ART IN MESOPOTAMIA AND EGYPT

There is no need to delve deeply into the arts of Mesopotamia and Egypt to notice the difference between the two, which in turn affords an idea of the difference between the two peoples.

Mesopotamian art was static, rigid, geometric, massive, agoraphobic. It glorified gods, demons, and the dead. It feared open spaces, the awesome flatland that stretched endlessly all around, and the unfathomable celestial immensity above. It sought to fight the amorphous universal chaos through a rigid geometry, opposing nature’s curved lines—except
for the horizon there are no straight lines in nature!—with man-created straight lines, and it reflected their monolithic state.

There is no need of traveling far to look at Mesopotamian art. Here in Manhattan we have some fine examples. In some respects New York City is like a Mesopotamian city of 4000 years ago. Our skyscrapers are really a modern version of the ancient ziggurats, a type of architecture conceived by Mesopotamians and unconsciously copied by the great modern architects, Frank Lloyd Wright, for instance. The ancient ziggurats were solid stone structures built to form a staircase on the outside, wide at the base, narrower and narrower as the steps reached up to touch the sky, the same principle followed with many of our new skyscrapers.

The word “ziggurat” means pinnacle, the top of a mountain, and to the top of their ziggurats the Mesopotamians went to pray to their gods, whom they identified with the stars. They believed that the nearer to the gods they were, the better they could be heard. Where, then, could they go to pray, they who lived on flatland and knew no mountains? So, in the middle of the desert they erected these gigantic ziggurats, some of them seventy stories high, and around them they built their cities, and around their cities they raised huge walls, some of them 90 feet high. Theirs was an art of power, but also of fear, fear of the unknown, of what lay beyond the horizon or lurked in the darkness at night, fear above all of the wrath of the gods, who, hiding behind the stars in the heavens, kept blinking at them with inscrutable yellow eyes.

Egyptian art, on the other hand, was an art not of power but of endurance. Mesopotamian art spoke only of gods, demons, and death; Egyptian art extolled the social, the daily, and the bureaucratic life of the state.

While the Mesopotamians were building their ziggurats, in Egypt another type of colossal monument was being constructed. Today, some five thousand years later, the Sphinx and the pyramids still stand in all their splendor in the middle of the desert, the former like a gigantic paperweight trying to keep the wind from blowing the land away; the latter, to paraphrase Cyril Connolly, like indestructible movie stars who for millennia have been signing autographs for those who have come from near and far to look at them.
A TALE OF THREE RIVERS

Many Egyptian monuments—temples, colonnades, sphinxes, pyramids, tombs—still stand in all their original glory. I have roamed the inside of the Egyptian pyramids and temples and have stood amazed before their bas-reliefs and statues, so well preserved despite the millennia. Favorite themes were gods, battles, daily life, and the dead.

A JOURNEY TO BABYLON

Let us now make an imaginary trip to a Mesopotamian city 3000 years before Christ. What would we see? If we arrive by caravan or on foot at night from the vast, dark desert beyond the city walls, we would be dazzled by the city lights, blazing in the immense surrounding darkness, reminding us of a modern city on arrival by airplane at night. But the Mesopotamian city was lit not by electricity but by thousands of wick lamps filled with salt impregnated in castor oil. Later, when they discovered the oil fields of Mosul (today one of the causes of the cold war of nerves), they used oil lamps. In the middle of the lights we would behold a monumental tower, stretching up hundreds of feet in the air. It is the Tower of Babel. The building of this legendary tower, as well as practically every event of import in the history of Mesopotamia, is recorded in the Bible. According to the Bible, the children of man attempted to build a tower that would reach heaven, and Jehovah, to prevent its completion, "confounded their language" so that they would not understand one another. The unfinished tower served not only as a temple, but as an observatory from which the Mesopotamians studied the passage of the stars.

By the way, the Bible also describes a flood that laid waste all of Babylon. One day the rivers began to rise and the waters flooded the land. Houses and buildings came tumbling down, for their bricks were made of mud or soft clay hardened in the sun. Except for a few buildings of stone, the splendid city was razed to the ground. The mud banks left behind by the receding waters have been traced by archeologists in the corresponding strata of the earth. Soon after the flood, catastrophe again visited the unfortunate city. Storms of sand and silica engulfed whole sections of Mesopotamia, and Babylon was buried once again. Thus the glory of Babylon—the resounding clash of armies, the splendor
of kings and palaces, the might of soaring temples, the pomp and pag-
eantry of the great parades, the fabled hanging gardens—vanished for-
ever under a vast deluge of water, sand, and dust.

Now let us continue our imaginary visit to the ancient Mesopotamian
town. We soon approach the towering city walls. At the city gates, which
are always closed at night for fear of the demons lurking in the vast
darkness of the desert, we are kept waiting. Suddenly we hear the great
noise made by heavy bolts being lifted; the doors open, and we enter the
city.

Ahead of us there is a magnificent avenue, flanked by great bronze
lions. We walk on slowly, stopping to look now at an imposing temple,
now at a ziggurat looming tall and majestic against the dark velvet of
the sky. Next morning, in the bright daylight, we shall visit the two
centers of life of the city—the temple and the market—in search of the
knowledge that moved us to travel so far in time and space. But now, in
the middle of the night, we shall only stroll around slowly and breathe
in the mystery exuded by the ancient city, by its strange streets quivering
under the leaping flames of lamps and torches, its sealed houses harboring
the secrets of a strange people, its towering ziggurats casting their pro-
tective shadows over man and land.

In the morning we see the rich in their great houses made of red clay
bricks; the poor have straw roofs on their gray clay dwellings. Their
entire economy, we observe, is based on agriculture. The land, irrigated
by man-built canals, is rich and fertile. The canals are held sacred, and
anyone caught desecrating a canal is promptly condemned to death.
Evidently the Mesopotamians had a notion of public health: they sensed
that by protecting the waters against pollution they protected themselves
against disease, the most prevalent of which were intestinal and ocular
infections. The people whom we see are dressed, not in linen, but
in cotton. They use metals for barter and have little meat but plenty of
fish and vegetables. They make beer, palm wine, and barley bread, and
at their feasts serve such exotic dishes as garlic soaked in sour cream. The
sacred date palm tree is present in all their art works and monuments.
Mass burials must have been held when their rulers died, but only the
bones remain, and these are silent. They have a sewage system, a calen-
dar, an alphabet with twenty-four symbols, a mathematics system, archives, and libraries. They have set aside certain days for resting, and they realize the necessity for isolating the sick. They have developed an astrological system concerned not with nativities, but with the study of the heavenly mechanics, which therefore is the precursor of astronomy. The temple is the town's central structure, and the market its center of activity. Temple and market rule Mesopotamian daily life.

MARKET AND TEMPLE

The temple and the market are both of interest to us. Patients were taken to the market, so that passers-by might learn of their symptoms and suggest treatments, which they did in the same manner you and I might discuss the dishes in a menu at a restaurant. As to the temple, medicine was taught there among other things.

The temple's importance in Mesopotamian daily life was immeasurable, for each city was an independent state ruled by a god. Since gods interfere little in the affairs of mortals, there was a priest who acted not only as God's representative on earth but also as king and master of the city. The priest guided everyone, both inside and outside the temple, not only on the path to God, but also on business matters and all other aspects of life. Bakers, carpenters, and all kind of tradesmen flourished around the temple in a theocratico-feudal type of economy.

The high priest, who later became a king-priest, was also responsible for what were politely called "temple virgins." That was the understatement of the millennium! Theirs was the second oldest profession in the world. Yes, I said the second, for the oldest profession is not the one you are thinking of; the oldest profession was medicine. The second was nursing. But in this case, the nurses or temple virgins were a combination of priestess and tart who tended to the needs, physical and spiritual, of all travelers in the city. This combination, of course, made temples a very enticing place to visitors.

MESOPOTAMIAN PHYSICIANS

In Mesopotamia, medicine was a secret magico-religious craft, taught in special schools within the temples. There were three kinds of medical
men, all of them priests. In archaic medicine, physicians were always priests. Hence medicine was of a religious nature. The three kinds of doctors were: herb doctors, knife doctors, and spell doctors, a classification that roughly parallels our own of internists, surgeons, and psychiatrists. These doctors practiced a highly rudimentary medicine, and were trained in the temples to diagnose and treat disease. Even magico-religious medicine had "specialists," and the most important were: baru or seers, specialized in divination and forecasting; ashipu, exorcists skilled in incantations to drive away evil spirits; and meduci, skilled in sorcery and the use of drugs. Also, barbers helped in minor surgery and in branding slaves.

DISEASE IN MESOPOTAMIA AND EGYPT

Both in Mesopotamia and in Egypt the most prevalent diseases then were dysentery, the scourge of the river; ocular ailments, the curse of the sands; and arthritis, the bane of humidity. The people also suffered from typhoid, leprosy, and malaria. Symptoms were believed to be the disease itself.

In Mesopotamia, disease was no longer regarded as the result of the intrusion in the body of a foreign object. They believed that disease was either a punishment by the gods for sins committed or possession by demons, and the sick man was a sinful man who required expiatory rituals. Doctors were as careful in classifying and screening demons as we are today in classifying and screening germs. Their legions of demons (more than 6000 were classified in Mesopotamia alone) were the equivalent of the multitude of causes we could list today for infections and neuroses. Mesopotamia therefore was the cradle of necromancy and of magic. Mesopotamians believed in demons and spirits who "specialized" in causing certain diseases, thus planting the seed for the future doctrine of specific infectious germs.

Mesopotamian doctors tried in their own fashion to make a diagnosis, which was strictly "etiological" in nature. Diagnosis was based on hepatoscopy, astrology, and the interpretation of dreams, omens, and auguries.

Hepatoscopy, or inspection of the liver, was widely practiced in Baby-
ion. A clay model of a healthy sheep's liver was compared with the fresh liver of a sacrificed animal. Any alterations on the fresh specimen were carefully marked on the clay model and were later studied at length to determine what type of disease ailed the patient. This, of course, was not a true anatomical dissection. It merely acquainted the doctors externally or morphologically with the liver. You may ask, "Why the liver instead of the heart?" They examined the liver because they observed that in both beast and man the biggest and bloodiest organ was the liver. As you know, the liver holds one sixth of all the blood in the human body. They were highly impressed by this, so much so that they concluded that the liver was the source of human blood and seat of the spirits that animated the human being. The liver was examined in situ, "in the palace of the liver," as they called it, its scarlet architecture of vessels and ligaments sharply etched beside the greenish moon of the gall bladder.

Another popular form of diagnosis was based on the examination of omens, such as the flight of birds. If the bird headed to the right, it was a good omen; if to the left, it was bad. Incidentally, the left later was called sinister, which gives you the source of the evil meaning of the word "sinister." A little oil poured over water was another source of diagnosis, particularly among the poor. The shapes adopted by the oil determined the outcome of the disease.

Therapy, also "etiological" in nature, was based on driving out the possessing demon through expiatory rituals, spells, prayers, sympathetic magic, and offerings of milk, honey, and beer. They also used therapeutically fruits, cereals, spices, flowers, herbs, mineral and animal substances, massage, poultices, and baths. Besides an extensive pharmacopoeia, they used physio- and psychotherapy.

The Mesopotamians also practiced strange rituals to cure disease. For example, when a man was suffering from a genitourinary disease that had been caused, they believed, by an enemy of the patient, they made a clay model of the male sexual organ, let it dry out in the sun, wrapped it in animal flesh and fat, making a sort of pie, wrote the name of the patient's enemy on it, baked it, and then gave it to a cat to eat. Since the cat was considered a magical animal, they believed that such a procedure not only broke the spell cast on the patient, but also cast the dis-
ease back at the enemy. This result was probably never attained, but how many cats must have died of indigestion!

CLAY TABLETS AND CUNEIFORM WRITING

We have learned about all these therapies through the 30,000 clay tablets (800 of which are medical) recovered from Babylon. These tablets were the first "shorthand" in history and are our main source of information on Mesopotamian medicine. One of the tablets, which dates back to about 4000 B.C., contains the oldest medical prescription known. In some tablets many drugs are described.

The Mesopotamians invented a cuneiform type of writing. A hard-pointed reed was used to make the wedge-shaped signs—hence the name "cuneiform"—on soft red clay tablets, which were then baked in an oven or in the sun until they became rock hard and practically indestructible, and then they were sealed in envelopes also made of clay. To read the tablets, one had to break the envelopes. The writing looks like the marks a little bird might leave on fresh snow. Later on, the Mesopotamian people associated these signs in their minds with sounds and things, and they made pictograms and phonograms just as children still do when playing. For instance, a child today may represent the name Campbell by drawing a camp with a tent, and a bell. Writing was the province of priests and scribes, from whom doctors developed later on.

Since all writing was done on tablets, and the last line on each tablet was repeated on the following tablet, you can imagine how voluminous book-length material must have been and the vast problem posed by its classification and storage in libraries. The Egyptians invented the alphabetic signs, but the Mesopotamians invented libraries.

Prescriptions also were written on tablets, and one can readily imagine the risk doctors ran if the prescription proved to be wrong. The patient might get mad and hurl the tablet at the doctor's head, in which case the doctor, not the patient, might be killed with his own prescription!

Prescriptions were signed by the physician by means of a seal consisting of a stone cylinder inscribed with various signs (probably of some of the instruments he used), as well as an image of his god. The cylinder was rolled over the soft clay at the end of the prescription.
THE CODE OF HAMMURABI

One of the most important documents left us by the Mesopotamian civilization is the Code of Hammurabi. King Hammurabi, one of the ablest rulers of Babylon, drew up a code of laws, had it engraved on a pillar of black diorite, and set it up in the temple at Babylon. Now preserved in the Louvre, the Code of Hammurabi, the oldest in existence, contains, among many others, the first laws relating to medical practice. Among other things, it established both the fees payable to physicians for satisfactory services and the penalties should their ministrations prove harmful. One of the latter examples reads: "If the doctor shall open an abscess with a bronze knife and shall kill the patient or shall destroy the sight of the eye, his hands shall be cut off."

THE CONTRIBUTIONS OF MESOPOTAMIA TO MEDICINE

The main contributions made by Mesopotamia to Medicine were: their systematic descriptions of jaundice, ocular diseases, and fevers; their notion of contagion; their vast pharmacopoeia; and their legal codification of medical practice as contained in the Code of Hammurabi.

Although the terms "Babylonian" and "Mesopotamian" are used synonymously, we should remember that Babylonian science, including medicine, preceded the first millennium before Christ, that is to say, it preceded even pre-Homeric Greece; that Assyrian science was contemporary (seventh century B.C.) with the beginnings of Hellenism, and that Chaldean science was post-Hellenic.

As the cradle, together with Egypt, of medical culture, Mesopotamia is an immense wall on which archeologists are still rapping their knuckles in search of the rich historical treasures hidden within its ancient stones.

"THE GIFT OF THE NILE"

Let us now turn our eyes back to Egypt and look briefly at its medicine and medical systems. I have already told you something about how Egypt—originally about the size of the state of Maryland, and today about the size of Texas and Arizona combined—was born and developed. Mesopotamia's rival, yesterday as today, Egypt was a "socialist" the-
ocracy in which the Pharaoh was a god, just as Mesopotamia was a "democratic" despotism and the king was a mortal.

An oasis in the desert, a corridor of fertile land between vast expanses of desert, Egypt, as Herodotus said, was "the gift of the Nile." The river gave life to the country. Yet, every year without fail, between June and September, the river waters, with regard to neither man nor beast, rose majestically and flooded the land, sowing their path with destruction. The Egyptians believed the tears of their goddess Isis made the sacred river overflow, a very poetic explanation, but the real culprit was the melting snows from the high mountains to the south.

This periodic overflowing of the Nile forced the Egyptians to devise means and ways to protect themselves. They developed a calendar to tell them when to expect the floods. They invented a geometrical system to help them re-create the boundary lines of private properties, which were wiped off by the waters every year. They built dams. And, above all, they created, even before they formed families, a huge bureaucratic state for the sole purpose of maintaining the unity of the people, which the river periodically destroyed. Observe this interesting fact. Many people believed that the family preceded the State: men and women joined in love and had children, a family was founded, and then all the families together formed what is called a state or a nation. This is to be doubted. Looking back at the origin of Mesopotamia and Egypt, we guess that at first groups of men and women, slightly above the level of beasts, roamed the earth, wandering from place to place. These people had no family structure. Later, the men of these hordes, only the men, developed the habit of gathering together, away from women and children, and at these gatherings they discussed war raids, the women they hoped to capture from other hordes, religious rituals, and other things. Eventually these gatherings of men became a superstructure, which later governed the family when it was finally created. In other words, the state probably preceded the family.

In Egypt, this process was accelerated in a way unique in history. Four thousand years before Christ, there already existed in Egypt a highly developed civilization, yet only a few hundred years before there had been only flints and stones and Neolithic man.
What is the story of the growth of Egyptian civilization? How could a civilization that produced such astounding things as the pyramids be created in just a few hundred years? The Nile, of course, is the answer. The Nile, with its periodic floods that threatened life itself, forced the Egyptians to move at a pace that we could say had the speed of lightning, for in prehistory time was measured in thousands of years. From the urgent need for protection against the whimsicalities of the river sprang, then, the towering Egyptian state, the greatest bureaucracy the world has ever known. When the state is all-powerful, the bureaucrats take over. And so they did in Egypt. Scribes, priests, doctors, artisans, craftsmen, and everyone else were functionaries in the gigantic structure that was the Egyptian state. Thus a river can deprive a people of their individuality and force them into absolute uniformity.

**THE EGYPTIAN'S WAY OF LIFE**

Thus, from a neolithic culture, Egypt, under the Pharaohs, almost jumped to a civilization that invented the alphabetic signs, knew hieroglyphic writing, used metals and metal alloys, made papyri for writing purposes, had a great caste of scribes, from whom sprang the first physicians, and, with only the level, the ramp, and the roller, built the most astounding monuments the world has ever seen—the pyramids.

Tomb walls and papyri depict and describe the Egyptian way of life—their consanguineous marriages; their work and their games; their simple wool and cotton garments; their meals of barley bread, dried fish, milk, dates, and beer; their adobe or mud houses, lit by salt soaked in castor oil; the cruel life of the slaves toiling at the mines or pyramids; and the women, their breasts gilded and blue tipped, their eyes painted with lead sulfide, their lips stained black and green.

They also tell how they made glass by mixing colored silica (sand and alkali or natron), using cobalt for dark blues; and how they discovered copper when bits of malachite (copper ore) fell into a fire and turned into glittering copper beads.

They practiced circumcision, used soda to wash themselves, anointed themselves with perfumed oils to counteract the dryness of the climate, employed bronze razors, and applied cosmetics. Women shaved their
heads and used social and ceremonial wigs; men also shaved clean and used ceremonial wigs and false beards. The rich lived in stone mansions with glassless windows. The poor had little or no furniture.

They made papyrus from a plant, indigenous to the Nile shores, which they cut into thin strips and pressed flat into a membrane the size of our typewriter paper. These sheets were glued together, forming scrolls sometimes 15 or 20 feet long, which later were called volvulus, the precursor of our own "volume." For writing they used a pointed reed dipped in a mixture of water, coal, gum, and soot.

Their social structure included the Pharaoh and his royal entourage, aristocrats, craftsmen, warriors, workers, and slaves. Outstanding among the Pharaohs was Akhenaton, who established a monotheistic cult to the sun disk and had his wife, Nefertete (meaning "the beautiful one has come"), who was also his sister, immortalized in art. Thanks to him, more than three thousand years later she of the swan neck, the beauteous Nefertete, still gazes down upon us, her remaining crystal eye sparkled by a secret inner dream.

Egyptian life was dominated by the fear of death. The Egyptians lived in terror of death, for it represented the end of everything they knew and the beginning of the unknown. Life was pleasant in the valley of the Nile. There were picnics and music and dancing girls. The food was good and so was the beer and the wine. But what was there after death? A way had to be devised to protect themselves against this unknown. To them the body and the soul were as one; therefore, if the body was protected, the immortality of the soul was assured. They tried to do this in two ways: mummification and impregnable tombs. Neither one provided them with the eternity they so craved. Many tombs were desecrated by thieves long ago and others have been unearthed by the curious hand of the archeologist. But, who knows? The Egyptian land most probably still holds in its entrails many others, which may still prove to be an eternal dwelling for those who built them.

MUMMIFICATION AND THE KA

Mummification in Egypt was developed to a remarkable degree, for the Egyptians believed that the ka or soul returned to the body after
death. If the physician’s mission in Egypt was to prevent putrefaction of the humors inside the living body, the embalmer’s mission was to prevent putrefaction inside the dead body.

Three methods of embalming were used. The first method consisted simply in immersing the body, after removing most of the viscera, in a salt bath for seventy days. The second method consisted in the injection of cedar oil into the body cavities so as to dry out the body. The third was practically a dissection. With a metal hook they drew out the brain (which had no meaning to them) through the nostrils and rinsed the cranial cavity with drugs. Next they made a four inch lateral incision in the abdomen and removed the whole abdominal contents, after which they filled the cavity with spices and essences and placed the body in natron for seventy days. Only the heart was left intact in its original position. After the seventy-day period, the body was washed and bandaged from head to foot in strips of linen smeared with gum, and placed in a wooden case shaped in the figure of a man with the face of the deceased painted thereon. Only then was it laid to rest in the sepulchral chamber, together with canopic jars containing the viscera, to wait for the Final Judgment. Thus they tried to preserve the body (and succeeded, even for millennia), so that should the wandering ka ever return, it would find a body in which to live again. Yet, though millions of embalmings were performed, not the slightest progress was made in anatomy, which was studied only in sacrificed animals at the temples or in the kitchen.

THE SECRET OF EGYPTIAN ART

The fanatic concern of the Egyptians with death is the very essence of Egyptian art. While the Mesopotamians feared demons and evil spirits, the Egyptians feared death. Not realizing that there was immortality in biological paternity, they sought it instead in death, around which they created a gigantic cult. That is why Egyptian art is not a funereal, but a funerary art, that is, it is not sad or lugubrious, not of skeletons and chills, but of great magnificent mausoleums and tombs, decorated and filled with all the necessities, comforts, and trappings of daily life. Every pyramid, every tomb, was really a temple erected to the deceased, who thus became like a god. The palaces and mansions of the Pharaohs, the high
priests, and the wealthy aristocrats were only transient dwellings; their real dwelling place was the grave. And graves were made huge, massive, indestructible, so that they would forever endure the passage of time.

Like Mesopotamian art, Egyptian art lacks originality, color, variety of form. Ruled by the law of frontality, it never represented a lifted foot, rarely a woman, never a smile. An art for the illiterate, it reflected the technology of the times and was a hymn in stone to the immortality that comes only with death.

The Egyptians' lack of individuality is also reflected in their art. It has no depth, no third dimension, no perspective. It shunned the elusive curve; it is all straight lines, geometric, rigid, uniform, utterly monotonous.

The monotony of Egyptian art is readily visible. Its images—kings, priests, warriors, man-beast gods, for zoolatry was rampant—are endlessly repeated. The Egyptians believed in the power of repetition. They knew that if the image of a god or a priest was repeated often enough, eventually it would be accepted by the people. This is the same technique used today in advertising.

Egyptian art is monumental, monolithic, hieratic, sepulchral. There is also something in Egyptian art that is almost mineral and inorganic. Why is this so?

I have drawn my own conclusions. Primitive man was, above all, a tactile creature. The ape also went about touching everything it saw. But man in Mesopotamia and Egypt was already developing the visual faculty, and the vastness he saw stretching, horizontally and vertically, before his eyes terrified him. What evil forces lurked in those vast unknown open spaces? This agoraphobia, this horror of the great surrounding vacuum, was instinctively, psychologically, fought with soaring walls that kept out the outer world, with massive towering structures that broke the yawning emptiness, ahead and above, with geometrical things that challenged the shapeless world beyond, turning all things into solid, concrete objects that could be seen and touched and grasped. The world then became enclosed, flat, bidimensional, geometrical. Pictures of the endless rows of columns in ancient Egypt, row upon row of columns stretching vertically as if to touch the sky and horizontally as if to touch
A TALE OF THREE RIVERS

the horizon, point to the agoraphobia that ailed the ancient Egyptians, just as the open airy structures of the Greeks indicate their love of open spaces and of nature. The endless rows of columns were crutches for agoraphobic eyes to lean on as the gaze traveled the vast barren distances.

Unlike Greek art, Egyptian art is not an art of beauty. It is an art of duration. It never attained beauty, but it has endured through the centuries and it faithfully represents the great civilization that inspired it.

THE MEDICAL PAPYRI

The main sources of information on the Egyptian civilization are their monuments, their mummies, and their papyri, several of which constitute some of the oldest medical documents in the world. Written twelve centuries before the Corpus Hippocraticum, these medical papyri provide an idea of Egyptian diseases, most of which were transmitted through water, flies, and food.

Most important of the medical papyri are the Ebers and the Edwin Smith. Of a later date, and more fragmentary, are the Hearst and the Berlin papyri.

The Ebers Papyrus, discovered in Egypt by Professor Georg Ebers, describes internal diseases and lists traditional therapies, just as household remedy books did in the seventeenth century. Besides amulets and talismans, Egyptians used at least one third of all the medical substances known today, including opium, gentian, castor oil, and colchicum, though they ignored their specific indications.

The Edwin Smith Papyrus, found in Luxor by the man whose name it bears, an American Egyptologist, is the oldest surgical treatise in the world and probably the first scientific document in the history of medicine. It describes 48 surgical cases and contains some amazing comparisons. Its author evidently was moved not only by a spirit of inquiry, as revealed in his description of lesions and other cases, but also by a poetic imagination. The convolutions of the brain are compared with “molten copper”; a fractured skull is like a “cracked ceramic vase”; a crushed vertebra telescoped inside another is like “the imprint of a foot on damp cultivated ground.” Only a man of great knowledge and imagination could have written this papyrus. It has been said that this man was the
first real medical man whose name we know. I refer to Imhotep, a name
meaning, "he who cometh in peace," truly a great name for a physician.

"HE WHO COMETH IN PEACE"

A man of lofty brow and shaven skull, Imhotep, who lived a little less
than 3000 years before Christ, distinguished himself as a statesman (he
was Vizier and Minister of State to Pharaoh Zoser) and astronomer, and
he was one of the greatest architects of all time. He designed and built,
not far from present Cairo, the oldest surviving stone monument in the
world, the Step Pyramid of Sakkara, a magnificent tomb, 200 feet high,
with six gigantic steps. I have visited the pyramid of Sakkara. Towering
defiantly in the midst of the gray sands of the Libyan desert, the majestic
loneliness of this pyramid of red-tinted stone is one of the most inspiring
sights I have ever seen. The task of building this monument with two
million blocks of stone must have been herculean.

Unfortunately, little is known of Imhotep as physician, except that
for many years after his death he was worshiped as the god of medicine.
Upon his death, he was transported up the Nile in a funeral barge, his
body swathed in perfumed linens, his neck girded by a necklace of talis-
mans, his coffin covered with flowers and surrounded by moaning women
with bare shining torsos. This was the beginning of his glorification first
as hero, then as semigod, and ultimately as god of medicine, until his
cult was eventually identified with that of Aesculapius in Greece. Imho-
tep and Egyptian medicine are the connecting links between the world of
calcined deserts and the sunlit cosmos of rational Greek medicine.

EGYPTIAN MEDICINE

It is important to remember that the most ancient scientific documents
are medical and mathematical, and the most ancient of all such docu-
ments is believed to be the Corpus Hippocraticum (compiled in the fifth,
sixth, and seventh centuries B.C.). But prior to the Corpus there existed
a scientific tradition that was already old when Greece was young. Py-
thagoras, Thales, and Hesiod, in the sixth, seventh, and eighth centuries
B.C. respectively, linked their work on mathematics to the old Egyptian
theories.
A TALE OF THREE RIVERS

The *Iliad*, which credits Egypt as the place where Greek drugs originated, already contained the beginning of a medicorational system, which dates medicine as far back as the tenth century b.c. But whereas Greece left us an important selection of its writings, Egypt left us only what time itself preserved, chiefly religious breviaries and funeral texts. Greek texts are a product of their Golden Age; Egyptian texts, made when Egypt’s sun was already setting, are merely copies of ancient texts. This explains the inferiority of Egyptian texts, though the Edwin Smith and Ebers papyri record several scientific observations that were repeated twelve centuries later in the *Corpus Hippocraticum*. The Greek miracle therefore was a resurrection of the scientific tradition of Egypt and the Near East.

Because of the sources mentioned, we are more familiar with the medicine of ancient Egypt than with that of Mesopotamia.

In Egypt, magico-religious medicine, the most popular because it was the least expensive, coexisted with empirico-rational medicine (drugs and diet), which because of the higher cost was limited to the wealthy. In Egyptian medicine, a basic cause of disease was considered to be the *whdw*, a principle involving the materia peccans in the fecal content of the bowel, responsible for putrefaction.

Though still primitive, the Egyptian concept of disease represented one step ahead of the Mesopotamian concept. Their concept, unlike the Mesopotamian, was not based on the role of the liver, but on the vital functions of respiration and circulation. This concept, one of the first physiologic theories of disease, sprang from a simple assumption. Man, the Egyptians knew, required two things to survive: air and food. They also knew that the body contained a magic fluid—blood—vital to man, since its loss could be fatal, and that the blood was related to the beatings of the heart. (Thus air, food, and blood became the three basic elements of Egyptian physiology.) From this they drew a conclusion that proves to us how the geography of a country can be a definite influence on medical thinking.

Egyptian life centered on the Nile and the canals that irrigated the land. To the Egyptian people the canals meant life or death. The image therefore of the canal-irrigated land was indelibly stamped on their minds. And this image they translated into an equivalent system for the human
body. The body also had canals that conducted life- or death-giving blood. This was the first concept of the circulation of the blood.

Medical practice, which was shared by physicians, priests, and medicine men, reached such a degree of specialization and hierarchy in Egypt that most physicians were experts in one disease only, there being even physicians who were exclusively “guardians of the royal anus” of the Pharaoh. The physician was summoned for an ordinary ailment, the priest for a grave one, and their fees were paid in kind. The patient’s clinical case history was studied first, after which he was given a general examination in which the physician’s sense of smell was as much a guide as were palpation, percussion, and pulse taking. When the diagnosis was based on magic, the demon or spirit that had to be expelled was specified. Empirico-rational diagnoses were symptomatic, and the symptoms—pain, fever, tumor—were believed to be the disease itself.

Therapy was based on diet and medicinal plants, rarely on surgery. Popular remedies were enemas (in imitation of the sacred bird of the Nile, the ibis), castor oil, hot sand, and the external application of animal fat, particularly ox fat. The Egyptians had a materia medica of a vegetable (fruits, garlic, wheat), animal (ox fat), and mineral nature (antimony, copper, alabaster). They had no apothecaries. Physicians themselves, assisted by their servants, prepared all medicaments. They also used the cauterity, raw meat as a hemostatic, lancing, psychotherapy, and, above all, an eliminative and humoral therapy that made of purgatives a daily requirement and of regular bowel movement an eternal blessing.

A TALE OF A RIVER

We started this lecture on archaic medicine with a story of three rivers, and now I would like to end it with an old Egyptian story about one river.

In ancient Egypt there was an old teller of tales around whom youngsters loved to gather and listen to his tales of strange happenings and remote lands. One day the youngsters said to the old storyteller, “Tell us the meaning of truth and beauty.” The old man smiled and bade them follow him to the river. Once there, he invited them to sit underneath a palm tree. The sun was setting beyond the river, and water and sky were
aflame with the fire of topazes and rubies. The youngsters stared expectantly at the old man, but he said nothing. Silently and patiently they waited. In the solemn hush of the sunset hour, the murmur of the river rose like a symphony, at first slow and timid, then powerful and majestic, strengthened by the spirit of the people to whose lands, near and far, the river gave life. Suddenly, from the green depths of the palm tree above their heads, a bird broke out into a breath-taking trill. Spellbound they listened to river and bird, while water and sky glowed like sacred flames. When the bird finished his song, the old storyteller, smiling, said, “Now you know the meaning of truth and beauty.”

In your own way, my young friends, you are trying to find the truth and the beauty in medicine, and I would like to be the teller of tales who helps you find them. To do this, you must first listen to the majestic river of medical history, which brings you the wisdom of past civilizations. And then you must listen, as if to a bird, to your own heart beating with the noble ambition to attain greatness through service to mankind, which is the key to our profession.
IV: SONG OF THE MARE NOSTRUM

Philosophers and Physicians
(Medicine in Classical Greece
and Imperial Rome)

A young man runs at dawn

It happened in Athens about 2300 years ago. In
the small hours of the morning, a disheveled young man named Hippocrates (no relation to his famous namesake, the Father of Medicine) was seen running wildly through the streets of Athens. The story, as told by Plato, says that the youth ran until he reached the house of Socrates. Even philosophers must sleep, and the great Greek philosopher was soundly asleep when the upset young man rapped loudly with his staff on the door, making the stillness of the night scamper down the lonely streets. Socrates, his eyes veiled by the cobwebs of sleep, slowly opened the door.

"Master, are you asleep?" the youth inquired, a foolish question, for how could anyone be asleep after the great noise he had made.

"What," retorted Socrates, "makes you come here at this unearthly hour and tear me away from my bed?"

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“Oh, Master,” wailed the youth. “I am deeply upset. Protagoras, the great teacher and philosopher, has just arrived in Athens.”

“And why are you upset?” replied Socrates, “What possible harm can come to you from Protagoras’ presence in Athens?”

“Oh, Master, can’t you see? If I cannot be with Protagoras, if I cannot learn from him, if I cannot share his knowledge and become a great philosopher like him, then he shall be causing me great harm.”

Socrates smiled, “If I took you, instead, to your namesake, Hippocrates, what would you like to learn then?”

And the youth answered passionately, “I would learn everything he knows. I would then become a physician.”

Socrates then took the ambitious youth by the hand to see Protagoras.

I do not know of any young man today who in the early hours of the morning would run wildly through the streets of Manhattan merely because a great teacher had arrived in the city. For that matter, I do not know of any old man either who would do that! But this story merely illustrates the great thirst for knowledge that for the first time in history a people, the Greeks, showed.

WISE MEN FEAST IN THE EVENING

Let us listen to Plato again. A group of distinguished artists and philosophers were supping one evening at the house of Archagathon, a wealthy Athenian, in the Greece of Pericles.

The Greeks had the first meal of the day, which they called breakfast, that is, break-the-fast, around eleven in the morning, an equivalent of our lunch. It consisted of sweets, cheese, grapes, figs, and barley water mixed with wine. Their next meal, around seven in the evening, was the convivium, or a meal that is shared with family and friends, in an atmosphere of joy and relaxation. But the symposium was their most interesting gathering. “Symposium” then meant a banquet, but sharing the pleasures of the table was not the only purpose of these banquets. The guests enjoyed very much indeed the golden wine of Greece, but above all they enjoyed discoursing on all things in both heaven and earth.

At Archagathon’s banquet, once his guests were “drenched in wine,” as Plato euphemistically says, their minds apparently unaffected by the
spirits they had imbibed, they began to talk about medicine, for among them there was one Eryximachus, a very learned physician.

“How do you define medicine?” someone asked him. And Eryximachus replied, “Medicine is the study of the love affairs of the body.”

This is not only a very charming definition, but also a very apt one. Medicine is the study of the “loves” and “hatreds” of the different organs in the body.

THE GREEK MIRACLE

We are now face to face with a new type of man in history, a man who, as in the first anecdote, searched passionately for knowledge and at the same time also derived pleasure therefrom, as in our second anecdote. To the Greek philosophers, knowledge was not only power, but also pleasure. Pericles, head of the State of Athens in the Golden Age, on the eves of battle whiled away the hours discussing philosophy with his commanders. The Spartans recited Euripides while waiting to attack Athens. “No,” they cried out, after listening to Euripides’ words, “we cannot destroy the city that gave birth to such a great man.” And Socrates on his deathbed, after drinking the cup of hemlock, bade one of his pupils, “Crito, we must sacrifice a cock to Aesculapius.” He wanted a cock sacrificed to Aesculapius, the god of medicine, because he had created the hemlock that would open for Socrates after his death the doors to philosophical immortality!

Such was the kind of men that made possible what we call today the Greek miracle. In previous lectures we studied man in Neolithic times and man in Mesopotamia and Egypt. We have seen man’s pitiful fear of demons, of gods, of darkness, of the world beyond. Now we meet a man in whom conscience had finally awakened. This awakening of the human conscience and of human dignity was the Greek miracle ushered in by the Greek philosophers, that is to say, “lovers of truth.” And to love something—truth, ideas, persons, art—is far greater than to own it.

THE MIRACULOUS PENINSULA

The physical structure of this miracle was relatively a modest one.
Greece was, and still is, a small country, barely 51,000 square miles, including its islands. This is small in comparison to the some 4,000,000 square miles of Europe. A small peninsula, founded on solid rock, sprinkled with olive, orange, and lemon groves, graced with the scent of flowers and the song of nightingales, its shores washed by the silver blue waters of the Mediterranean—such was the land where man's conscience first awakened. Big ideas do not require much space to be born in. In that small peninsula were also born the concepts of rational medicine and the first code of moral ethics in medicine.

I believe in the influence that geography has upon the destiny of men and nations. The geography of a nation determines her history. Mesopotamia and Egypt had cultures born out of the vast immutable desert and an art based on the use of dark granitic stone, with which they built massive forbidding-looking obelisks, ziggurats, and pyramids. Greece was a peninsula and a cluster of islands surrounded by the forever changing wide open sea, in itself a symbol of freedom, and its basic artistic material was marble, smooth and polished, pure and beautiful, with which they built graceful buildings and statues of gods and Venuses. For the Greeks were not interested in power. To them beauty meant everything.

TO BE A GREEK

To be a Greek in ancient Greece was more than to be born in Greece; to be a Greek was to share in certain views of the universe, peculiar to the Hellenic community, and in their love of truth and beauty. From this attitude sprang an "open sea" civilization, which maintained its unity down the centuries thanks, as we shall later see, to the unifying power of the Homeric poems and the quadrennial Olympic games.

Prior to the Greek miracle, there had been the millennia of the Bronze Age, succeeded by the great migrations south of Nordic peoples in search of warmer climates. Around 2000 B.C. blond, blue-eyed Aeolians, Ionians, and Dorians reached and settled on the Greek peninsula and adjacent islands. All these peoples, mixing in the same Mediterranean melting pot, gave rise to a new force in history.
THE TIME-AXIS

It was not too long—a few centuries at the most—after the arrival in Greece of these Nordic nomads that a series of unrelated events occurred, almost suddenly it seemed, in different parts of the then known world, events to which we owe the culture and civilization of our day. We may set the time of these events at around 600 B.C., a period of exceptional import in the story of mankind, called "time-axis" by the great contemporary German philosopher and psychiatrist, Karl Jaspers. The period to which I refer witnessed the great awakening of the human mind.

During that fateful fifth century, there arose in various parts of the world the voices of a series of prophets which awakened a deep yearning for truth and freedom. In the little land of Judah it was Isaiah and others; in China, Confucius and Lao-Tse; in India, Buddha; and in Greece, the first philosophers, many of whom were physicians.

THE TREMENDOUS QUESTIONS

To these pre-Socratic Greek philosophers we owe the development of plain, rational thinking, untouched by either fear or magic. Such thinking is the basis of modern science and modern medicine. These men, the Greek philosophers who appeared six centuries before Christ, for the first time looked around them and asked three momentous questions: "What is Nature?" "What is the primary cause of all things in Nature?" "What is man?" With these three questions the scientific mind was born, the dignity of man was awakened, and the garden of thought began to be watered for the final blossoming of the Greek miracle.

From the very beginning, Greece was confronted with one main difficulty. How could it create and maintain unity among its peoples, spread as they were all over the islands? Distances then were tremendous. Travel was very difficult and time consuming. The Greeks hit upon two things to maintain their unity: the epic poems, the Iliad and the Odyssey; and the Olympic games.

HOMERIC MEDICINE

The Iliad and the Odyssey, compiled c. 1000 B.C. and attributed by
legend to a wandering blind bard named Homer, had for the Greeks the
same uniting power that the Bible had for the Jews. These poems (the
first narrates the siege of Troy; the second, the adventures of Ulysses)
contain medical descriptions of more than 150 different types of wounds,
together with a very elementary treatment. Most of the descriptions
concern traumatology, for the *Iliad* was an epic of war, as the *Odyssey*
was an epic of peace. The Greeks had a fearsome weapon, the iron sword,
with which they could with the speed of lightning split the skull, cleave
the ribs, or sever the legs. Yet, the only treatment they knew was to
extract missiles and to staunch bleeding with medicinal herbs, a tourniquet,
or bandages. Interestingly enough, the *Iliad* does not mention wound
infections or pathology of any kind. Victims of a blow or a wound, it
seems, either died immediately, as if they were in a hurry to attain the
immortality granted to valiant warriors, or were promptly cured, as if
they were anxious to return to the battlefield. There was no time, it
seems, for either pathology or infection.

THE OLYMPIC GAMES

To the uniting power of the epic poems was added that of the Olympic
games. Many of you are probably fond of sports and follow the Olympic
games. The original Olympic games started in 776 B.C., and they came
to mean so much to the Greeks that they measured time by the interval
of the four years between the games. Thus, they spoke of the tenth or
the twentieth or the hundredth Olympiad. The Marathon race, a part
of the Olympiads to this day, commemorates a great historical and
athletic feat. When the victorious Athenians entered the conquered city
of Marathon, a messenger in two and a half hours ran, without pausing,
the twenty-two miles from Marathon to Athens to deliver the news of the
victory, whereupon he dropped to the ground dead. I dare guess that,
robbed of all his body's sugar by his titanic effort, he died of acute
hypoglycemia.

THE FIRST PHILOSOPHERS

Almost five hundred years passed from Homer's day to the Greek
philosophers who, with their inquiring spirit, paved the way for Greece's
Golden Age. Outstanding among the various groups of philosophers were: the Milesians (Thales, Anaximander, Anaximenes); the Pythagoreans (Alcmaeon of Croton, who performed dissections on animals; Pythagoras of Samos, founder of the school, who believed in the immortality and transmigration of the soul, was one of the first to practice experimentation, and made the science of numbers the basis of his philosophical system; and Democritus of Abdera, who conceived the atomistic theory); and the Sicilian school, represented by the physician Empedocles of Agrigentum.

One of the greatest men of his time, and a majestic figure in his purple robe, with a golden laurel wreath on his brow, Empedocles held that the universe was composed of four basic elements—water (already suggested by Anaximenes), air (already suggested by Thales), fire (already suggested by Heraclitus of Ephesus), and earth. This theory, later developed by Hippocrates, became the basis for the humoral doctrine which for centuries was to dominate medical practice. It made all-important not only the humors in the body but the air it breathed, the vital spark or pneuma (as Empedocles called it, a word easily recognized in many modern medical terms) located in the blood and the heart. These two doctrines, the humoral and the pneumatic, became the basis for a new and more rational approach to medicine. Empedocles' concept that antagonistic powers of love and hatred governed the earth made him a precursor of Sigmund Freud.

It is noteworthy that although the Greeks had a truly scientific mind, their language had no word for "science" or "scientist." They called science a number of things—philosophy, for instance, or theory—and they called the applied scientist, technician, or technologist an "artisan," that is, one skilled in the practice of an art, usually a manual art. But to the Greeks, science, whether pure or theoretical, was purely a matter of philosophy.

AN ART OF BEAUTY

Greek art was an art of open seas and wide horizons. It was an art based on the cult of beauty and freedom, just as the preceding Egyptian art had been based on the cult of eternity, and, later, Roman art would
be based on the cult of power. Each of these three arts reflected the attitude on life of the people who created it.

One of the first great statues made by the Greeks, the "Winged Victory" or "Nike" of Delos, has great artistic importance for one reason. In Egyptian and Mesopotamian art, all statues were always symmetrical, were always done on the frontal plane, and always had the feet flat on the ground. Furthermore, except as a goddess or empress, woman was never represented, nor was motion. The "Nike" of Delos is the first asymmetrical portrayal known of a woman, smiling and running. Her foot, poised in midair, a beautiful example of Greek artistic asymmetry, conveys vividly the sense of motion, and the whole statue conveys as well the feeling of a great inner life. In the woman's smile one can sense the Greek spirit, which set the human being above all things. The Greeks developed individuality in sculpture, and conceived their gods and goddesses as men and women, while, through their philosophers, they often made men and women think, talk, and behave like gods and goddesses.

Healthy, serene, and lovely, the Venus of Milo, more a type than an individual, is an exceptional example of that infinite serenity (ataraxia, we call it today) which the Greek attained, not with pills as we do, but by cultivating an inner beauty.

Another perfect representation of the Greek spirit was the "Winged Victory of Samothrace," conceived as the symbol of a naval victory. It is said that originally she adorned the prow of a ship. One can sense in the folds of her garment the soft breeze wafted by the sea.

The Greek statue of the Discobolus is, with the Doryphorus of Polycleitus, one of the most famous anatomical representations of antiquity. It also reveals the Greek canon of beauty. The anatomy of arms and limbs is accurate enough, for they knew them well, having treated many injuries of such parts in athletic tournaments and in the Olympic games; but the trunk of the body reveals their ignorance of what lay under the skin in this part of the body. Both Greeks and Romans had a horror of opening the great cavities of the body. As a result, they knew little of what was inside the body and, artistically, treated it in symbolic fashion. Until Homer's times, it was believed that the seat of life was in the liver. Later, they believed it was in the heart. Much later, long after Homer, the
Greeks began to think that perhaps the brain was the seat of life. The Parthenon, an exceptionally beautiful example of ancient Greek architecture, was a temple erected by Phidias in honor of the goddess of Athens, Athena Parthenos, meaning the virgin goddess. It was built in the glittering Golden Age of Pericles, a period graced by such luminaries as Herodotus, Aeschylus, Sophocles, Socrates, Plato, Thucydides, Praxiteles, and Hippocrates. In contrast to older temples, which, destined to house only the gods, were made like massive fortresses, the Parthenon, the first temple accessible to the people, was built completely open to the breezes and the radiant sun of Greece. To this day it remains one of the most glorious sights in the world. I have seen it in daylight, atop the sacred hill of the Acropolis in midtown Athens, suspended like a marble harp from the radiant blue sky, and at night, with moonlight polishing its patina of immortality, it becomes the greatest monument to the miracle that was Greece.

DEMOCRACY, SLAVERY, AND ANATOMY

The panorama of Greek medicine is rather complex, but perhaps we could simplify it by dividing it into two main systems of healing: one, based on suggestion and psychotherapy, was temple healing; the other, based on more scientific principles, was empirico-rational medicine.

Before we gaze at the panorama of Greek medicine, let us first make a brief digression and consider a curious fact that relates Greek democracy and slavery to animal and human anatomy.

We usually think of Greece as a great democracy. This is not wholly true. Greece was a democracy in the sense that its citizens could assemble together, as we do today, to decide the fate of a city, or the action to be followed in war, or which man was good for public office. But not everyone was a citizen; as a matter of fact, there were very few citizens of Greece.

In the Greek polis or city-state, which was always built around the agora or public market, a market for the trade and exchange not only of goods, but also of thoughts and ideas, free men were a minority. In most towns, only one man in a thousand was a free man. There were even places with only one free man in ten thousand. Thus, though its
free men practiced democracy, Greece was not truly a democracy, since its social system was based on slavery. Slaves were usually prisoners of war, the sons of other slaves, or criminals. And once a slave, always a slave, unless the slave was fortunate enough to have a kind owner who might eventually give him his freedom or allow him certain privileges—wearing a ring, for instance, or the right to marry and have a family and a business.

With slavery as the basis of the social system, many interesting things related to slavery occurred that had medical implications. The Greeks, like the Romans, dreaded touching the dead body. They, who so ardently cultivated health and beauty, shied away in horror from the lifeless body. It would have never occurred to a Greek to make a dissection or necropsy, to open and study the body’s large cavities: the abdomen and the chest. The limbs and the skull were explored sometimes, but the big cavities, never. They believed that the vital animal spirits of the body dwelled in such places, and that it was not for mere human hands to tamper with what belonged to the sacred realm of religion.

Since the anatomical knowledge of the Greeks was based chiefly on the study of monkeys, little was known about internal human anatomy or even about animal anatomy in general. There is a very interesting example of their ignorance about animal anatomy. The Greeks tilled the fields mostly with oxen. The ox, strong, patient, dumb, was the perfect animal for such work. The Greeks devised a harness with which to steer the beast around the field. Later, when they employed horses, mules, and donkeys for transportation, they used the same heavy, cumbersome harness that was used on the oxen, not realizing that the weight would quickly exhaust these beasts. The Greeks had determined the pulling power of these beasts and that of man, and although the horse could pull fifteen times more weight than a man, such power was reduced to four by the harness. In other words, a horse with the heavy harness could only pull the same load of cereals (then the main trading commodity) as four slaves. Unfortunately, the horse ate as much as four slaves, and since there were far more slaves than horses, no doubt this was one of the reasons why slavery lasted so long. Much later the Romans devised a light harness that restored the horse’s pulling power to fifteen.
times that of man. This, in turn, fostered a decrease in slavery. Thus we have the paradox that, because of lack of knowledge of animal anatomy, slavery lasted for so many centuries.

APOLLO AND CHIRON THE CENTAUR

People in antiquity required a god of medicine. The Egyptians had Imhotep. The Greeks had Apollo and Aesculapius (Asklepios), and other minor health deities, such as Artemis and Athene.

Apollo was the god of health, but he could also cause disease as a punishment. Apollo, legend tells us, was in love with the nymph Coronis. Apollo had a beautiful white crow that was also quite a rascal, for he loved to carry gossip back and forth. One day the crow informed Apollo that Coronis had been seen dallying with a mortal, her cousin Ischus. Apollo, in a fit of anger, turned the tattling white crow black, and then with arrows killed both Coronis, who was heavy with his child, and her lover. The legend is that Apollo removed the child by some sort of celestial “Caesarean” section, named it Aesculapius, and sent it to Mount Pelion, the domain of a centaur called Chiron.

Centaur, unique creatures conceived of by the Greeks, were half man, half horse, wicked, and endowed with great powers. They were healers and builders and artists, and they could do many things with their hands. The most gifted—and also kind and gentle—centaur of them all was Chiron, to whom Apollo had taught the art of healing. From the word “chiron,” meaning the hand, is derived the word “chirurgos,” the name that was originally applied to surgeons. If “physician” meant originally one who understands nature, “surgeon,” derived from “chiron,” meant one who can do things with his hands.

THE HEALING DREAMS

The wise and kind Chiron trained the child Aesculapius in the healing art, and so many healing miracles did he later perform that, after his death, Aesculapius became the god of medicine and hundreds of temples, called Asklepieia, were erected to him throughout Greece. One of the most famous was at Epidaurus; others were at Cos, Pergamum, and Tricea, the ruins of which I have visited in my journeys.
To the temples of Aesculapius flocked the sick for the healing ritual known as “incubation,” or temple healing. Traces of temple healing can be found in present-day spas. People today go to spas to drink the waters and rest, but any benefits derived from this may very well be due as much to the power of suggestion in the healing properties of the spa as to such properties themselves. In the early days of temple healing, the methods employed were of a mystical and supernatural nature, but later the routine followed was similar to the routine followed in any modern spa.

The Aesculapian temples were usually built near natural springs, amid magnificent scenery, and the grounds were provided with inns, stadiums, theatres (the still well-preserved theatre in Epidaurus accommodated 20,000 spectators), sports arenas, libraries, and all sorts of amusements to entertain the pilgrims while they waited, sometimes for weeks and even months, to gain entrance to the temple. This long waiting period must have actually prepared them psychologically, for every day the temple tablets (the equivalent to today’s electronic newsboard) listed all the miraculous healings performed.

When their turn came, the sick would enter the temple at night and lay down, at the feet of the gold and marble statue of the god, for the incubation sleep. It has been said that opium and other drugs were given them to induce a deep, lethargic slumber. During the dream, Aesculapius, carrying a staff with a serpent entwined around it (which later became the symbol of medicine), appeared with his two daughters, Hygeia and Panacea, made suggestions, gave advice and drugs, and even performed operations. In the morning the patients woke up healed or improved, or at least filled with renewed hope. Before departing, they paid the temple with gold, food, prayers, or songs, according to their means, and made votive offerings to the gods. Among these there were images of heads, breasts, legs, fractured skulls, and male genital organs, all showing different lesions.

Interestingly enough, whereas the gods of other civilizations were always portrayed with a stern even ferocious countenance, Aesculapius and his daughters were depicted with handsome, kind, and wise faces, another example of how the Greeks humanized their gods.
Today we know that the temple priests knew medicine; in fact, most of them were physicians, and it was probably they who tended the sick while they slept. But the priests were shrewd; they knew that medicine from the hands of the gods would prove far more effective than from their own hands.

This was temple medicine, and, judging from the stone tablets unearthed in temple ruins, the sick who resorted to this type of healing were legion. But there were many others, especially the poor, who could not afford to travel or wait for their turn to enter the temple. These had to be content with the services of mere mortal physicians.

These mortal physicians were really the first professional empirico-rational physicians. They considered disease a natural process and a physical blemish. To them the patient was not a sinner; instead, they considered the sinner a sick person physically incapacitated. They therefore accepted disease as a disharmony of the physis, thus becoming physiologos, men capable of interpreting nature and of correcting disease through a preventive medicine based on diet, gymnastics, psychotherapy, and a few medicinal drugs.

THE TRAVELING PHYSICIANS

Stone bas-reliefs often depicted Greek physicians at their office or iatreion (which usually was located on the same premises as his home), with a chest nearby crammed with cupping vessels, books, and tools.

Physicians in those times were known by various names. There were periodeutai or itinerant physicians, city physicians, iatros or court physicians, tekhnites or craftsmen, military physicians, and many others.

The periodeutai, the most important physicians, at least numerically, represented empiric medicine. They learned their art through apprenticeship to experienced physicians and had to swear an oath to the profession, which originally was a secret cult of a few privileged families whose ancestry, it was claimed, went back to Aesculapius.

The periodeutes was really a combination of physician and craftsman, and his was a rather sad and sorry lot. In the first place, he had to travel from town to town, almost always following the same routine. Immediately upon arrival in a town, he set up shop in the main square, dra-
matically displaying all his instruments and tools, donned a cloak of
brilliant colors, and, in his most impressive voice, began to recite poetry
or even to sing. When a crowd had gathered around him, he promptly
offered his medical services. Thus he tried to collect patients in each
town. In the second place, competition was so fierce, that the periodeutes
often quarreled bitterly over patients.

One anecdote of the period relates that one day, in the streets of
Athens, a physician observed an extremely pale and sickly looking man,
whereupon he set out after the man to offer him his services. The man,
oberving this, broke into a run. The physician ran after him and soon
five other physicians joined in the chase. Finally they cornered the poor
man and one of them said, “Before you open your mouth, we are going
to tell you what disease ails you.” But the poor man quickly interposed,
“Before you open your mouth, let me tell you something. I’m not a
patient. I’m a doctor!”

Also, as a result of competition, they soon developed a new art called
pronoia. Instead of a diagnosis, they made a prognosis. And he who
could tell the fastest what ailed a patient and what course the disease
would follow got the most patients. Prognosis was developed to such a
degree that before the patient could even speak, the physician would tell
him what disease he had, what course it would take, and what therapy
he should follow. This method, as you can well imagine, often led to the
wrong diagnosis, the wrong prognosis, and, of course, the wrong therapy.
In fact, many physicians simplified medicine so much that, in the words
of a colleague of mine, they reduced it to “one ill, one pill, and one bill.”

On the other hand, this attitude developed a new practice in medical
history of exceptional value—the habit of naturalistic observation and
reasoning, which led to the establishment of many symptoms and signs,
among them that group of signs denoting death called facies Hippocratica.

Were you to ask me, “What did the Greek physicians find in their pa-
tients?” I would answer that, as proved by their descriptions, what they
“saw” were signs, symptoms, and groups of symptoms, or syndromes,
very much like those we ourselves see today.

Of course, often different prognoses were made by different physicians,
and then heated arguments ensued during which, witnesses of those times
report, the contenders thought nothing of sticking their tongues out at each other or even tweaking each other's noses.

Despite all these difficulties, a new approach in medicine was developing, and for this new approach we are indebted to two particular schools: the School of Cnidus in Asia Minor, which was interested in diagnosis and whose therapy was based on treating symptoms, not patients; and the School of Cos, which was interested in prognosis and therapy. Above all, we are greatly indebted to a man from Cos, a man named Hippocrates and known to all of us as the Father of Medicine.

THE GOOD HIPPOCRATES

It is usually thought that the advent of Hippocrates marked the beginning of medicine. This is not so. Actually, Hippocrates appeared almost halfway on the road marked at one end by Imhotep, the Egyptian god of medicine, and at the other end by modern medicine, as exemplified let us say by Fleming and Freud. In other words, the concept of the antiquity of medicine is evident only if one realizes that Hippocrates appeared halfway between the first medical men in history—the Mesopotamians and the ancient Egyptians—and the physicians of today.

Hippocrates' personality emerges from the mists of time as vague and diffuse as that of two other great men, Homer and Shakespeare. As with these two men, we know practically nothing of Hippocrates' life, we do not have a reliable image of his face, and we are not even sure that he actually wrote all the works attributed to him. We only know that he is mentioned a few times by his contemporary, Plato. We know that he was born at the time of Pericles (about 2500 years after Imhotep and 600 years before Galen), on the little island of Cos, then famous for its limestone and silk industries and for its many butterflies, which spangled the island with all the colors of the rainbow. We know that, as an itinerant Asklepiad, he traveled throughout the sunny landscapes of the Hellenic world, that he lived a long life, and that he died at Larissa, near his birthplace, although the date of his death is not accurately known.

The iconography of Hippocrates underwent a marked evolution throughout the ages. At first he was portrayed as a kind, dignified, old
"country doctor," the type one would like to have as family doctor. His noble face seemed to be lined from identification with the suffering of his patients. Later, in the Middle Ages, his face was so distorted that he looked stern and forbidding, a long-bearded owlish man with piercing eyes, reminiscent of the ferocious-looking gods of the Mesopotamians and the Egyptians.

THE HIPPOCRATIC CORPUS

One thing we do know about Hippocrates, and that is that he spent his life studying patients. I would like to stress the word "patients," for this was the first time in history that a physician studied not diseases but patients. In this fact lies one of Hippocrates' claims to glory.

Hippocrates did many great things for medicine. We know of these through the Hippocretic writings, although, like Homer, Christ, and Socrates, Hippocrates himself probably never wrote a word. People in those times did little writing. The spoken word was the main vehicle for disseminating thoughts; writing as an educational tool came later. The Hippocretic writings are largely the texts of Hippocrates' lectures and speeches as taken down by his disciples and followers in Cos, Cnidus, and Sicily, mixed probably with their own notes.

In the third century B.C., long after Hippocrates' death, Alexandrian scholars compiled the notes into the Corpus Hippocraticum or Summa Hippocratica. The corpus, which probably sums up the wisdom of many other physicians, comprises some seventy-two large volumes and encompasses all branches of medicine. It contains the first scientific clinical case histories, forty-two of them. In twenty-five of these histories, the patient was observed until he died, and a complete record of the clinical observations—symptoms, group of symptoms and signs—is given. I would like to add that in the 2300 years that have elapsed since Hippocrates one cannot find clinical case histories as concise, clear, and accurate as those of the Father of Medicine.

THE CONCEPT OF HIPPOCRATES

Although in his time, and even for some centuries after his death, Hippocrates was acknowledged only as an able practitioner, later
on he was recognized as the greatest physician of ancient Greece.

In the little town of Cos there is still a plane tree (now supported with wooden props and stone pillars) in whose shade Hippocrates is reputed to have taught his pupils while examining the sick. He is said to have examined them thoroughly, while questioning them at length on their complaint, their past history, their family history, and their environment. This is what today we call the “biographical” approach. He was also skillful in the art of pronoia and, by using the pulse as a lie detector, was even able to detect any false symptoms claimed by the patient merely to test his wisdom. Physicians this skillful often doubled their fees.

Thus Hippocrates initiated a new approach to medicine, based on the concept that disease was a natural process produced by natural causes, such as diet, climate, way of life, and environment.

Disease, including epilepsy, was no longer considered sacred. Disease was considered the result of a natural process, which altered the four humors of the body. The body, they believed, combated these changes through a process (apophas, pepsis, crisis) called “coction,” meaning that the body “cooked” the peccant or changed humor to the boiling point, and then, in the stage called “crisis,” eliminated it. Thanks to this vis medicatrix naturae, this healing power of nature or physis, the patient’s health was restored.

THE DOCTRINE OF THE FOUR HUMORS

The doctrine of the four humors, basis of the Hippocratic concept of disease, universally accepted by Hippocratic physicians, established that the four elements of the universe—fire, air, earth, and water—corresponded with the four elements of the human body as conceived by Hippocrates: yellow bile, blood, black bile, and mucus, today called: blood serum, blood, blood sediment, and fibrin.

You have seen test tubes of sedimented blood in your laboratory work, and you can readily imagine your predecessor, the Greek physician, gazing at such a tube while the blood slowly became four differently colored layers. The red blood cells, because of their size, settled down very slowly. The bottom cells, he saw, became dark (they called them
black bile; we, black sediment), while the top cells remained light (they called it blood, and so do we), which we know happens because they absorb oxygen. He also saw the blood clotting and exuding a clear liquid (their yellow bile; serum, we call it), which rose to the top; while another substance, whitish in color and visible when some of the blood itself was removed, formed at the bottom (this substance, which we know is responsible for blood clotting, they called “phlegm” or mucus, and we call it fibrin). Here you have the basis for Hippocrates’ theory of the four humors: the top serum, the two middle red-toned layers of blood, and the fibrin.

The Greek physician also observed something else that gave rise to the saying that the blood of a pregnant woman turns into “a white beast.” Why a white beast? Because in the blood from a pregnant woman, and also from a patient with an infectious disease, the velocity of the sedimentation rate changes noticeably. The red blood cells settle down much faster and, lacking time to absorb oxygen, the order of the layers is changed, with the fibrin usually ending up at the top. There is the “white beast.” The Greeks must have noticed that there was more fibrin in the blood of diseased patients, and, consequently, attributed to it the main pathogenic role. Alterations in the phlegm, they thought, must be the cause of disease, which was probably what started in medical history the whole trend of thought toward the pathogenic effect of phlegm.

The following table shows the correspondence established in the humoral doctrine among elements of the universe, humors of the blood, their qualities, and the organs that were the site of the humors.

<table>
<thead>
<tr>
<th>UNIVERSE</th>
<th>BLOOD</th>
<th>QUALITIES</th>
<th>ORGANS</th>
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<tr>
<td>Fire</td>
<td>Yellow bile</td>
<td>Hot and dry</td>
<td>Liver</td>
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<td></td>
<td><em>(Blood serum)</em></td>
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<td>Air</td>
<td>Blood</td>
<td>Hot and wet</td>
<td>Heart</td>
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<td></td>
<td><em>(Blood)</em></td>
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<tr>
<td>Earth</td>
<td>Black Bile</td>
<td>Cold and dry</td>
<td>Spleen</td>
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<td><em>(Dark sediment)</em></td>
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<tr>
<td>Water</td>
<td>Mucus</td>
<td>Cold and wet</td>
<td>Brain</td>
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<td><em>(Fibrin)</em></td>
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THE CONCEPT OF DISEASE

We have now reached the point in medical history where disease was no longer considered a punishment meted out to sinners by the gods, a view that made of the sick person merely a sinner. Now the sinner was regarded as a sick person, a man with a physical blemish.

Hippocrates also established the fact that a person becomes ill at a certain place in space and at a certain moment in time and that at this intersection of time and space, certain things may happen to a person. In other words, he studied the whole man, and he inserted the disease process at a certain moment in the history of the patient’s life. This is the same biographical approach to disease applied today in clinical medicine, psychosomatic medicine, and psychiatry.

There are many other concepts that Hippocrates introduced, but I shall mention only one more, the concept of *ponos*, which is exactly the same concept described recently as “stress” by Dr. Hans Selye, that is, the specific response of the human body to nonspecific aggressions, meaning *ponos* or suffering.

Hippocrates also introduced many medical terms that are still used daily, such as chronic, exacerbation, relapse, resolution, crisis, paroxysm, peak, and convalescence.

Concerning therapy, Hippocrates believed first and above all in dietetics, and then in a very few vegetable drugs, to correct the symptoms (*contraria, contrariis curantur*), expectorants, and stimulants. Only if these measures failed did he resort to surgery, which he did reluctantly and with considerable asepsis. Therapy was always based on the *vis medicatrix naturae*, or natural healing power of the organism.

THE IMMORTAL OATH

We may be profoundly proud of our heritage from Hippocrates and particularly of the “Hippocratic Oath,” a noble and beautiful code of medical ethics, adopted as a pattern by medical men throughout the ages. You will take the oath a few years hence, and you will then see why the Hippocratic Oath has endured almost unchanged to this day. Based on the Golden Rule, the code contains recommendations on the relations between disciple and teacher, between physicians themselves, and between
physician and patient. With beautiful simplicity, it shows to the graduate the dignity and responsibility of his calling. It marks that moment in history when a great man realized that to be a good physician it is imperative to follow a high standard of ethical conduct and, above all, to feel unselfish love and devotion for mankind.

Let us now read the Hippocratic Oath:

I swear by Apollo the physician, and Aesculapius, and Health, and All-heal, and all the gods and goddesses, that, according to my ability and judgment, I will keep this Oath and stipulation—to reckon him who taught me this Art equally dear to me as my parents, to share my substance with him, and relieve his necessities if required; to look upon his offspring in the same footing as my own brothers, and to teach them this art, if they shall wish to learn it, without fee or stipulation; and that by precept, lecture, and every other mode of instruction, I will impart a knowledge of the Art to my own sons, and those of my teachers, and to disciples bound by a stipulation and oath according to the law of medicine, but to none others. ¶ I will follow that system of regimen which, according to my ability and judgment, I consider for the benefit of my patients, and abstain from whatever is deleterious and mischievous. I will give no deadly medicine to any one if asked, nor suggest any such counsel; and in like manner I will not give to a woman a pessary to produce abortion. With purity and with holiness I will pass my life and practice my Art. I will not cut persons laboring under the stone, but will leave this to be done by men who are practitioners of this work. ¶ Into whatever houses I enter, I will go into them for the benefit of the sick and will abstain from every voluntary act of mischief and corruption; and further, from the seduction of females or males, of freemen and slaves. Whatever, in connection with my professional practice or not, in connection with it, I see or hear, in the life of men, which ought not to be spoken of abroad, I will not divulge, as reckoning that all such should be kept secret. While I continue to keep this Oath unviolated, may it be granted to me to enjoy life and the practice of the art, respected by all men, in all times! But should I trespass and violate this Oath, may the reverse be my lot!

THE POST-HIPPOCRATIC SCHOOLS

After Hippocrates, many schools of medical philosophy sprang up, each of which developed its own theory of disease, into which they tried to fit all pathological phenomena. Among these schools we may mention:
the Dogmatic school, based on speculative thought, represented by Thessalus of Cos, Draco, and Diocles of Carystus; the Empiric school, which accepted diseases as groups of symptoms to be studied, represented by the Alexandrians Philinos of Cos, Archagathus of Peloponnesus, and Heracleides of Tarentum; the Methodist school, which accepted that diseases come from an abnormal state of the pores—too constricted or too dilated—its main exponent being Themison of Laodicea; the Pneumatic school, which blamed all disease on disturbances of the pneuma, represented by Athenaeus of Attalia, Archigenes, and the great Aretaeus of Cappadocia; the Eclectic school, which changed its theories to meet the current need, represented by Agathinus of Sparta, Pliny the Elder, Dioscorides, a master of medicinal plants, Rufus of Ephesus, almost as great as Galen, and, later, the elegant, sophisticated, erudite Roman, Celsus of the golden Ciceronian eloquence; the Stoic school, initiated by Zeno, who liked to lecture in his porch or stoa (hence the name of Stoics given to his followers); and the Peripatetic school, to which belonged the three greatest philosophical minds of all time: Socrates, Plato, and Aristotle.

THE GREAT THREE: SOCRATES, PLATO, ARISTOTLE

Socrates, who could stand on a street corner all day discussing philosophy, made two great contributions to civilization: he taught people to think, and he made other philosophers shift their attention from the study of the universe to the study of man. His was a unique contribution, yet his people rewarded him by accusing him of corrupting the habits of the youths of Athens, for which they condemned him to die by his own hand, by drinking hemlock.

Plato, Socrates’ disciple and teacher to Aristotle, was the greatest philosopher of ancient Greece, perhaps of all times, and a non-naturalistic metaphysician. He believed that man’s most powerful and noblest tool was his brain, and that with his brain alone man could decipher the secrets of nature. He worked in astronomy and was the first to use the word “anesthesia,” though in a different sense than we use it today. In his Symposium, already mentioned, through the lips of the physician Eryximachus, he defined medicine as “the art of learning the love affairs
of the organs of the body." In a wood near Athens, he founded his famous Academy, a center of learning that endured for nine hundred years.

Plato accepted the existence of an immortal soul in the thorax, considered the liver as the mirror of the soul, the spleen as its "duster," and disease as an alteration of the humors. He also accepted the unity of the body and soul, thus heralding the concepts of psychosomatic medicine. The body was made by God in the shape of the most perfect of all geometrical figures, small triangles, which were abundant especially in the bone marrow. He stated that the blood "circulates," and described such diseases as epilepsy. Bathing and dieting, he believed, were the best therapy. Like all philosophers in Greece, he was deeply interested in medicine. Conversely, all physicians were interested in philosophy, a happy state of affairs that is slowly returning nowadays.

The best pupil at Plato's Academy was Aristotle of Stagira, whose learning had no limits. Born forty-three years after Plato, and his pupil for twenty years, he was tutor to the magnificent but paranoiac Alexander the Great. Aristotle's mind was a vast empire of knowledge. He knew everything that was known in his time about philosophy, medicine, logic, mathematics, music, natural history, zoology, and botany. I consider him one of the three (the other two were Leonardo da Vinci and Goethe) greatest minds of all times.

It was Aristotle who restored medicine to the realm of biology and reinstated man, who until then had been considered a mystical entity, to his true nature as an animal. He accepted the heart as the seat of emotion; gave a teleological explanation of anatomy; and asserted as basic principles that research must proceed from the particular to the general, and that all knowledge came from without, through the senses and perception, as opposed to Plato's concept that all knowledge came from within. Plato's influence probably delayed Aristotle's mind from flourishing in a naturalistic direction.

Aristotle believed that the true philosopher should begin his studies with medicine, while the physician should end his with philosophy. A fast-talking, restless little man, he constantly paced up and down when teaching, while his pupils copied his sayings in notebooks. Among his many notable pupils were Theophrastus, Diocles of Carystus, and Praxa-
goras of Cos, whose pupil, Menon, forged the link between Greek and Roman medicine.

THE CHICKEN OR THE EGG

You may be amused by Aristotle's answer to one of mankind's greatest riddles, a riddle that remains unsolved to this day. Someone once said to Aristotle: "You are reputed to know everything. Tell me, then, what came first, the chicken or the egg?" And Aristotle promptly replied, "Neither. The cock came first." An extraordinary reply. By indicating that the male animal, the cock, and not the hen, came first, he implied the bisexual nature of animals. Today we know that until the sixth or seventh week of development the human embryo is bisexual. This dualism is even stronger in lower animals. In ancient religious myths, the male, and Adam in the concept of Paradise, had both sexes, male and female. Aristotle's seemingly humorous answer therefore contained the germ of a great biological truth.

NO GREATER FOOL THAN A WISE FOOL

The formidable tower of knowledge that was Aristotle may sound more human to you if I tell you a story of something that happened when he was preceptor and tutor to Alexander the Great, who in twelve years conquered practically all the then known world, established a vast powerful empire, and earned for himself eternal glory in history textbooks.

By the way, I do not concur with this opinion. I believe that Alexander was a very sick young man, a paranoiac who actually slew millions of persons and contributed very little to the progress of science or art. His great contribution was that he founded the city of Alexandria in Egypt, which, as you shall see later, became, after Athens, the second great center of learning, when Ptolemy, one of Alexander's generals, founded Alexandria's huge library and museum.

To return to Aristotle, there is a charming humorous story that illustrates that even a savant can be very human and just as much if not more of a fool as anybody else. It seems that Alexander fell passionately in love with a young and beautiful maiden, called Phyllis, whom he had captured in India. Evidently seeking revenge for the loss of her freedom,
Phyllis, it seems, had been for a long time taking small doses of arsenic, in the superstitious belief that she could transmit the poison to Alexander and kill him. Aristotle learned of Phyllis’ evil designs and warned Alexander. “Master,” the latter inquired, “what should I do?” “First,” answered Aristotle, “I shall tell you that it is philosophically wrong to become involved with a creature who can bring you nothing but troubles and headaches.” And second, being a practical man, Aristotle prescribed twin beds. Eventually he noticed that only one bed was being used, whereupon he prescribed separate rooms. This, he saw, was of no help either.

By now Phyllis had decided to do something herself about the meddling Aristotle. Using all her powers of seduction, she lured Aristotle into falling in love with her. One day she asked Alexander to hide behind some drapes and watch her make a fool of the great savant. She then had Aristotle fetched. “I want you to be my horse,” she ordered him and, harnessing his neck, made him ride all around the room on his hands and knees, at which point Alexander emerged from behind the curtains and sternly reprimanded Aristotle, a scene that has been immortalized in paintings and sculpture. But Aristotle remained undaunted. Looking at Alexander with great dignity, he said, “This only proves my point. If this girl can make a fool of a wise old man like me, imagine what she will do to you.”

The story goes on to say that from separate rooms Alexander and Phyllis went back to twin beds, and finally to one bed, and Aristotle resigned himself to his philosophy and Alexander to the possibility of being killed in such a bizarre fashion. Even great and wise philosophers can be wrong.

THE SCHOOL OF ALEXANDRIA

From the island of Cos, Ptolemy I, Soter—Alexander’s Greek general who later became Pharaoh of Egypt and founded a dynasty—moved to Egypt and conquered the land. In Alexandria, Ptolemy I, Soter, created what was called the Museum. The word “museum” means temple of the muses, of which there were nine: four of poetry, one of history, one of tragedy, one of comedy, one of song and dance, and one of astronomy.
All were sheltered at the Museum, which besides the first great library in history containing some 700,000 books (later burnt down by a mob of fanatics) also housed the first great medical publishing house and the first great center of research. Athens and Alexandria may now seem very near to us, but in those days to travel from Athens to Alexandria took as long as traveling from New York to London before the steamboat was invented. Yet Alexandria was as dependent on Athens as New York was originally dependent on London. For Alexandria was a Greek province, let us not forget, and Greek wisdom was deeply rooted in the Museum.

In Alexandria the first great clinical school, in fact, the first university in the world, was established, complete with laboratories, cafeterias, and a publishing house with half a million works in the form of papyrus scrolls. To this home of learning went such men as the mathematicians Archimedes and Euclid, the geographers Strabo and Ptolemy, and the astronomer Eratosthenes. In Alexandria also anatomical dissection of human bodies was practiced for the first time systematically. This paved the way for the concept that disease was seated in the organs, not in the humors. Compilations of Hippocratic works were made in Alexandria by scholars. People, thirsting for knowledge, flocked to the museum halls, and between 300 B.C. and 30 B.C. thousands of pupils matriculated in the school of Alexandria, a considerable number for those times.

HEROPHILUS AND ERASISTRATUS

Outstanding among the Alexandrian physicians were Herophilus of Chalcedon and Erasistratus, both born about 300 B.C. Herophilus, a Hippocratic clinician and father of anatomy, studied the brain and the sensory nerves, and named (based on its length of twelve fingers) the duodenum. His pathology was humoristic, traditional, and Hippocratic. An authority on detection of the pulse, pharmacology, and obstetrics, he discovered the *torcular Herophili* and the *calamus scriptorius*.

Erasistratus, a great physiologist, differentiated between sensory and motor nerves, initiated pathological anatomy, experimented in metabolism, and discovered the tricuspid valve. A pneumatist, he rejected the view that disease was caused by maladjusted humors.
Some time later, the sophisticated Roman writer, Celsus, in his famous encyclopedia *De re medicina* summed up the wisdom of Alexandrian medicine. Alexandria replaced Athens as the world center of learning, and from its shores the cultural Hellenization of the Roman world continued, until the death (30 B.C.) of Cleopatra, last Queen of Egypt, which marked also the end of the glory that had been Alexandria.

**The Golden Heritage**

The heritage left us by the ancient Greeks is indeed great and immense, and so should be our gratitude to them. Many are the contributions to medicine made by Greece. The main ones incorporated in modern medical science are: the objective observation of disease as a natural process engendered by natural causes (disease being the body’s efforts to restore the normalcy of the *physis*), and belief in the spontaneous healing properties of nature and of the human body. They also compiled clinical case histories, and studied the patient rather than the disease. They believed in elementary therapies, diet, and herbs, and in surgery only as a last recourse.

They also bred a new type of physician, a man who was at once a humanist and a humanitarian, modest, kind, learned, conscious of the dignity and responsibility of his calling, a man such as Hippocrates, a man who should be the pattern for all who study and practice the art of medicine. Above all, the Greeks created an ethical code of professional medical practice.

And so, my friends, on the morrow, when you are already physicians, do not forget the men who long, long ago set for our profession a pattern and a standard undimmed throughout the centuries and enduring to this day. Remember to look back now and then at the garden of history and at the men who peopled it, whose thoughts and endeavors determined the future course of medicine. There is Socrates with his ugly, saddle-nosed face, who became beautiful the moment he began to speak; and there is Plato leaning over a flower, studying geometry in its petals; and Aristotle, nervously pacing up and down while delivering a dissertation on biology; and there is Hippocrates, with kind, understanding eyes studying a child brought to him in pain. These men remain forever alive in
the great bright garden of history. With a glint of hope in their eyes, they are looking at you, my young friends. For in you there is once again the fulfillment of their promise.

A TORRENT OF LIONS

Whereas Greece slowly and graciously rose and fell on the historical scene as the greatest civilization of the ancient world, Rome descended upon it like a torrent of lions and, in a few centuries, conquered all the known world. At the time when Greece had faded as a historical power, the proud imperial eagles of Rome had already swept across the skies of Europe, Africa, and part of Asia.

Rome in the seventh century was inhabited by a handful of Aryan merchants ruled by Etruscan kings. Etruscan medicine, a curious combination of magico-mystical rituals and practical surgery, was the first medicine practiced on Roman soil. When, one century later, the Etruscans were expelled, the Romans created an aristocratic republic, which at first was ruled by the patricians and later by vote of the people or plebe, a step that led to the creation of a senate as the supreme political power in Rome. Later, foreign and civil wars led to the formation of the triumvirates, and finally to the ascendancy of the Emperors or Caesars, who sometimes were saints and philosophers, but more often rogues and schizophrenics. In spite of the persecution of its martyrs, Christianity gained ascendancy, and about the same time the Roman Empire was split into two: the Oriental Empire, with its capital located in Byzantium; and the Occidental Empire, with the capital located in Rome. Eventually, malaria and inflation—one a human and the other an economic disease—together with repeated invasions by Vandals, Huns, and Tartars, brought the collapse of the Western Roman Empire. But the Byzantine Empire would endure for another thousand years as a defiant bastion of Christianity.

In Rome, a curious type of city-state, pagan religions were gradually replaced by Christianity, and the crude Roman technology became enriched by Greek culture. Latin became the language of business, and Greek the language of science.
As technology continued progressing, reaching heights never attained by the more philosophically minded Greeks, industry and mining developed, thanks to a social system based on a mighty military power and on slavery, which supplied abundant and cheap manpower for work. In contrast, Roman science was a servile imitation of the past, and their art a pretext for architectural glorification. Their megalomania for the colossal produced towering triumphal arches and colonnades, huge temples, and vast arenas and coliseums, epitomizing the Roman cult of force. This was a world of athletes and adventurers, empire of the javelin and the lance, the sword and the bow, with great importance being ascribed to that offensive weapon par excellence—the shield.

Their cities, made of brick, clay, and marble, had fine torch-lit streets and wide roads, arsenals and central heating, draining canals and food inspectors. They ate bean porridge and nonfermented bread dipped in honey, and at their *prandium* and *convivium* drank wine diluted with oxymel.

**PARCHMENT AND VOLUMES**

By the way, you may be interested in knowing how books were made. On another occasion I told you that Egyptian books were made of papyrus, which was fashioned by gluing together strips cut out from a plant indigenous to the shores of the Nile. Papyrus was an expensive material. The Greeks and the Romans developed a new material, parchment, which was nothing else but the dermis of goats, calves, and lambs, stretched, shaped, and degreased. Instead of tanning it, as is done with leather, they merely let it dry out, wound it into huge rolls, and wrote on it with ink made of soot mixed with water. These rolls, of course, were difficult to write on; however, one day it occurred to them to make a codex or, as we call it, a book. They cut the parchment in rectangular strips and put them together. If the strips were folded once, it was called a folio; if folded twice, it was a quarto; and if folded four times, it was an octavo. The whole thing they called a volume. All these terms are still used today.

The introduction of parchment contributed greatly to the progress in learning in medicine, for it made available to many the Hippocratic col-
lection, which became the source book for all physicians for hundreds of years to come.

MEDICINE IN ROME

As in Greece, Roman medicine originally was magical. Priests of the cult of Aesculapius practiced medicine side by side with a vast assortment of quacks and charlatans, who dealt in wholesale healing, even though often their only medication was goat fat or, as in the case of the famous Cato the Censor, cabbage juice. Cato even ordered his patients to bathe in the urine of persons who had fed on cabbage. His medical experiments ended by his killing his own wife.

Medicine was left chiefly in the hands of slaves, until the first Greek physicians arrived in Rome. Most prominent among these Greek immigrants was Asclepiades of Bithynia, who conquered the Imperial City with his golden tongue—an infallible way to impress the oratory-bewitched Romans—and became the most fashionable physician in Rome. He created a system of solidistic philosophy based on his concept that the body was made of atoms. It was he who initiated the Methodist school of thought with his theory (later developed by Themison of Laodicea) that disease was caused by alterations in the organic pores, which later helped to simplify treatment of the great masses of slaves.

THE ROMAN PHYSICIANS

The first physicians in Rome were slaves. Later, when Julius Caesar granted freedom to all freeborn Greek physicians practicing in Roman territory, they became medici liberti manumitidis. A kind emperor, Antoninus Pius, instituted state regulations protecting municipal physicians, which greatly improved their lot and, in some cases, Antonius Musa, for instance, even enabled them to amass great fortunes and, though they were only liberated slaves, be honored with monuments. Still, physician-slaves could be bought for some $340.00, less $60.00 if they were castrated. The physicians of the invincible Roman legions, and of military hospitals or valetudinaria, coexisted with Palatine or Imperial physicians and with "specialists." After the establishment of medical licenses in A.D. 200, medical societies and civil hospitals were created,
and Imperial laws for medical students, such as the one prohibiting visits to brothels, were passed, much to the grief of the students.

**Disease as Inferiority**

Disease was considered a sign of physical inferiority and was treated by physiotherapy, hydrotherapy, diet, psychotherapy, or surgery, which used the soporific sponge. Even then, therapeutics comprised magic. Next to the polished effigies of the new gods hung ancient Etruscan mirrors of polished bronze engraved with images of succubi. A barbaric polypharmacy, including turtle blood, camel's brains, and crocodile excrement, was used as much as new drugs and techniques. Fear of touching the dead body paralyzed all progress in anatomy, which was studied only in animals and during vivisection of criminals. To study the great organic cavities, so feared by the ancients, Roman physicians dared to practice dissections—short and quick, to forestall putrefaction—in Barbary monkeys.

**The Advance of Public Health**

The most important Roman contributions to public health were their marvelous aqueducts, which to this day give Rome the best water supply of any city in Italy—public baths and swimming pools, sewers, fountains, and wells. At its zenith, Rome could boast of having more than one hundred twenty-two gallons of water per inhabitant daily. Yet, the poor had to bathe in the Tiber, the streets were filth ridden, and in small towns and villages excrement streamed down the streets.

The Romans had public health inspectors, but personal hygiene degenerated into an end instead of a means, into effeminate fastidiousness and depravation. Sports evolved into athletics, and hygiene into weakness. Later, with Christianity, neglect of body became the rule, and the unclean body was the only possible dwelling for the pure soul. The nude, fluid in line, Greek statuary was replaced by the rigid, austerely robed statuary of Christianity. Overindulgence in the pleasures of the body—sumptuous banquets of highly spiced food, torrents of wine and hydromel (the Roman Coca-Cola), unhealthy siestas in the torpid shade of the atrium, provocative massages by the sensuous hands of licentious slave
girls—set the Romans far on the road to degeneration and destruction. Little or nothing could the Roman physician do against all this, even if the physician was the great Clarissimus Galen.

CLARISSIMUS GALEN

To this day Galen excites a feeling of ambivalence among physicians. Since Roman medicine is linked to such unpleasant things as slavery and dogmatism, which are exactly the opposite of what medical progress requires, that is, a climate of absolute freedom, Galen’s glory must be constantly revindicated. But Galen, whose word and work were articles of faith and made of him the dictator of medicine for fourteen hundred years, was really a modern author.

Born at Pergamum, Clarissimus Galen was baptized Galenos, meaning “a tranquil sea,” he who was so atrabilious! In his seventy years of life, he served as physician first to gladiators and later to the Roman emperors Marcus Aurelius, Commodus, Pertinax, Didius Julianus, and Septimius Severus. Galen conquered the Imperial City with his gifted tongue and his great culture, and upon his death left a pyramid of more than 500 works, which became the basis of his dictatorship of medicine for fourteen centuries. His anatomy, based exclusively on dissection of monkeys and only two human corpses, was nevertheless correct; his physiology and pathology were speculative; his therapy was empirical; and his endorsement of the Aristotelian notion that the body is the vehicle of the soul was the basis for the monotheism of Arabs and Christians.

Galen believed in both the Hippocratic nosology and humoral pathology. He recognized that the blood moved in the arteries, but had no idea that it circulated. He held that the body was made of parts, not humors. Later, in the Renaissance, Paracelsus would destroy Galen’s pathology; Vesalius, his anatomy; and Paré, his “first intention cures.” Galen’s theological viewpoint, which made him the spoiled child of Christian psalmists, did great damage to his physiological investigations.

Whereas Hippocratic medicine was humoral and philosophical and therefore antiquated, Galenic medicine was anatomic and consequently modern. His concept of a vital spirit or pneuma breathed in by man, which at his death returned to its source of origin, becoming a universal
pneuma, expounded that such a spirit, mingling with the blood, turned into "natural spirit" in the liver, then passed through the veins, and, upon reaching the heart, was transformed into "vital spirit." From the heart it passed through the arteries and finally became "animal spirit" in the brain, whence it was carried forth by its "branches" or nerves.

Galen initiated the use of "galenicals," or vegetable simples, and turned practical hygiene into applied physiology, that is to say, into the eclectic application of rest, diet, sleep, and exercise. In accepting the Aristotelian concept of the relation between body and soul, the responsibility of the individual, and the Christian interpretation of life, Galen once again reunited medicine and philosophy, which had been separated by Hippocrates.

AFTER GALEN

After Galen, Christianity imposed a religious medicine and disease became a requisite for purification and divine grace. Galen’s disciples were excommunicated and priest-healers were glorified. Upon his death, Galen’s writings disappeared and were not resuscitated until they were translated into Latin in the thirteenth century, which helped prolong the cultural coma that was to last one thousand years. In decreeing that every human organ was made perfect by the Creator, Christianity discouraged anatomical studies and experimental medical research.

To summarize, the Roman contribution to the progress of medicine consisted primarily in the improvement of collective hygiene through a public health system that included irrigation, draining, aqueducts, thermal baths, gymnasia, inspection of markets and brothels, antimalarial measures, burial of the dead out of the city, and military hospitals. To this may be added the legalization of the medical class by such means as title licenses and examinations, medical insurance, social and military medicine, the systematization of medical instruction, and a higher social standing for the physician.

Then one day the boots of blonde barbarians from the north invaded Rome and trampled the imperial purple and the blood-soaked togas strewn over the floor of the Roman Capitol, which rang with the clang of bronze and steel, announcing the dawn of the Middle Ages.
V: DAWN AT MIDNIGHT

Byzantine Healers, Arabian Hakims,
Monks, Crusaders, and Medieval "Doctors"
(Byzantine, Arabian, Monastic,
and Medieval University Medicine)

I

THE LIGHT IN DARKNESS

If you have ever taken a walk in the country in the dead of night, as I have, you may have asked yourselves the same question I asked: "How dark is darkness?" Alone in the open country, under the distant dark sky, I felt at first that the still, silent world around me contained nothing but darkness. But once my eyes became used to the dark, the night was "switched on" and I began to see all kinds of glows in the dark. There was the glow pouring down from the stars, and that of glowworms in the earth and of fireflies flitting from branch to branch, and glinting eyes that quickly opened and closed here and there, and a flashing sparkle in waters nearby. As the night wore on, all the phosphorescences in both heaven and earth began to merge before my eyes, until they finally turned into the first silver and gold light of dawn. I then realized that there is light in darkness, that, after all, light and darkness are one and the same thing. After darkness there is always light,
and again darkness, and so it goes, on and on and on, in an endless cycle. This is a symbol of human life, and also of history. In the short time available for this lecture, we shall make together a long journey from light to darkness and back again to light.

This journey will take us through the Middle Ages, a period unjustly called, at least part of it, the Dark Ages, for did we not just say that there is always light in darkness? In any case, we can hardly call dark an era that produced the magnificent Gothic cathedrals, Dante’s *Divine Comedy*, and such men as Albertus Magnus, Arnold of Villanova, and Roger Bacon. And we can hardly call dark a period that witnessed the birth of the three great institutions of modern medicine: universities, hospitals, and public health. We must therefore revise our notions about the Middle Ages.

A NEW LOOK AT THE MIDDLE AGES

The Middle Ages spanned some 1000 years, from about A.D. 500 to the year 1450, when printing was discovered, or, if you prefer a more political date, the year 1453, when Constantinople fell to the Turks, which marked the beginning of the Renaissance. Of that millennium, the only part that might be called the Dark Ages is perhaps the first three or four centuries. Mankind during those centuries plunged back, indeed, into ignorance and magic. But during the remainder of the Middle Ages, a fascinating age of contradictions, of feudalism, ecclesiasticism, chivalry, barbarism, dogma, romanticism, and rebellion, man struggled bravely against his abysmal ignorance, his crushing fears, and the multiple dangers that threatened him, physically and spiritually.

The Middle Ages are not what the name implies, that is, the middle age or the age of maturity of Europe. If anything, they are the childhood of Europe. European man began once again to make use of his thinking faculties. He sensed that new times and new things of great portent were forthcoming and that he had to prepare to face them with a new clear vision.

By the way, it may not be realized that during the Middle Ages Oriental technology was far more advanced than European technology and that until the thirteenth century Europe, technologically, was but a mere
appendix of Asia. While Greece and Rome were weaving subtle philosophies, the Chinese were busy inventing gunpowder, paper, printing, alchemy, vaccination, plastic surgery, and even the pocket handkerchief, which was unknown to the fastidious Greeks, who could weave subtle philosophies but had to wipe their noses on their togas.

Please understand that when I speak of the Middle Ages I speak not just of different countries, but of different historical forces. There is no better way to realize what those forces were than by looking at a map of Europe, North Africa, and Asia Minor during the Middle Ages.

THE THREE MEDIEVAL STREAMS

If we look at a medieval map, we see the three historical forces that shaped the medieval world. First, there is the vast Arabic or Islamic world, stretching from China to Spain, from Samarkand to Toledo, where medicine, though never original but borrowed from other peoples and places, was nurtured with loving care and devotion, while in the rest of the world it was allowed to wither and perish. Second, there is the Byzantine Empire, and in the center the fabulous city of Byzantium—later called Constantinople and today called Istanbul—where medicine was limited to making voluminous compilations of classical medical knowledge. And third, there was Italy, France, England, and part of Spain, a world of monasteries and universities, where monastic and university medicine was born. These three great forces made up the complex picture of the Middle Ages and markedly influenced the historical course of medicine. Unitizing East and West and establishing a communication between Orient and Occident were, among other things, the romantic journey of the Venetian Marco Polo, the Crusades, and the migration of scholars and humanists from Byzantium to Italy, France, and Spain.

MEDIEVAL MAN: WARRIOR, MONK, VILLAIN

I should tell you at this point that medieval man was generally one of three things: a warrior, who ultimately developed into that great fighting figure of the Middle Ages, the Crusader, or into a feudal lord, king, or emperor; a monk—the physician of the Middle Ages—who, in the solitude of a monastery, devoted himself day and night to studying and
working in many fields, including medicine, and who sometimes became a saint or a pope; or a peasant or artisan who was completely subservient to his master. These peasants and artisans eventually became a decisive factor in the destruction of the feudal system.

The warrior, a professional soldier, a knight-errant, or a Crusader, was always ready for war. He had powerful weapons—swords, maces, daggers, lances, axes, and, later on, crossbows. And, above all, he had coats of mail, suits of armor, and shields. For the greatest symbol of offensive war is not the lance or sword but the shield, which protects a warrior against counterattacks. The truly aggressive weapon is the shield, for anyone who wishes only to defend himself against aggression carries a weapon, but if he intends to be the aggressor, like the medieval warriors, if he wants to attack and invade other peoples, his first concern is to protect himself against the weapons of his intended victims. In those days, even the horses were well protected.

The parts of the body that they protected the most, usually with plates of armor, present interesting medical connotations. In those days of lance and sword the easiest place to penetrate with a weapon was the abdomen; therefore most injuries were abdominal. The abdomen thus became the best-known cavity in the human body, which supported the ancient theory that the seat of life was located in the abdominal organs, especially in the liver, which appeared big and full of blood when the abdomen was ripped open on the battlefield.

The second cavity most frequently penetrated, first in battle and later by surgeons, was the rib-protected thorax, and then the heart was considered the seat of life.

The last cavity to be opened, not just accidentally but by deliberate surgery (and I am not referring to the trepanations performed in prehistoric times to let the devils out of the head, but to surgery done exclusively to reach into the brain), was the skull, and then the brain was considered the seat of life.

The monk who exemplified the second type of man of the Middle Ages was the Hospitaler, a member of the Order of the Knights of St. John. This Order founded in Jerusalem the first hospitals and later moved to the islands of Malta. Both monk and crusader, the Hospitaler also
learned medicine so that he might be able to tend battle casualties and later he used this knowledge to create some of the first hospitals founded in Christianity.

The third type of medieval man, the peasant or "villain," as he was called because his little community was called "villa," cultivated the earth and pledged subservience and loyalty to his master in return for protection against war, famine, and other disasters. Thus a system was eventually created that might be compared to a pyramid. The broad base was made up by the people (feudalism began as a popular movement!), and at the apex stood the feudal lord, who held complete and despotic authority over artisans and peasants. These were obliged to turn over to their masters part of the fruits of their labor in peacetime, and to serve him in wartime, while the master in turn was responsible for their lives and welfare. Many feudal lords were so powerful that they became kings and even emperors, and challenged the authority of the popes, who at that time constituted the other great religious-political power.

BYZANTIUM: KINGDOM OF GOD ON EARTH

Let us now look into the origin of the three great forces previously mentioned: Byzantium and Byzantine medicine; the Arabian Empire and Arabian medicine; and monastic and university medicine in Italy, France, Spain, and England. These three forces became the three rivers that carried all the medical wisdom and knowledge of ancient Greece across the thousand-year stretch of the Middle Ages to the shores of the Renaissance.

Byzantine medicine was born in the ancient city of Byzantium, which became the eastern capital and last outpost of the Roman Empire after the western half of the empire and Rome itself had succumbed to the Nordic barbarians. Byzantium—politically Roman, culturally Greek—soon became the admiration and envy of the rest of the world. Silks and porcelains, gilded mirrors, damasks, tapestries, jeweled enamels, gold chalices, sandalwood caskets, gorgeous gems, carpets, and ceramics crammed the treasure chests of the city, which, with its thousand gilded domes gleamed like a cloud of gold above the blue Bosporus and the
still waters of the Golden Horn. (I recently visited Byzantium, that is, Istanbul, and found it still to be—from St. Sophia to the seraglio—one of the most beautiful cities in the world.)

Partly surrounded by the waters of the Bosporus and the Golden Horn and partly by the towering walls built by Emperor Theodosius, Byzantium was a veritable walled bastion in the middle of a vast expanse of land populated by terror-stricken peasants, for Byzantium was continuously attacked. Mongols, Turks, and Tartars, for a thousand years without pause or mercy, charged against the walls of the city, which had become the most coveted gem in the world. But isolated Byzantium withstood it all. Life within the formidable walls for ten centuries followed the only course possible for one that was cloistered and confined. Since the Byzantine people could not look straight ahead at the horizon, they looked up at the heavens, and prayed to God. And Byzantium became God’s kingdom on earth.

The Byzantine emperor, the Basileus, was regarded as Christ on earth; his political code was the Bible; his parliament, the Holy Apostles; his offices were the basilicas, vast and towering and ablaze with gilded mosaics and stained glass windows in all the colors of the rainbow.

JOURNEY INTO TIME

Under the three great emperors—Constantine I, Julian the Apostate, and Theodosius—Byzantine culture developed in flight from the present to the past. Renouncing travel in space, since fierce enemies were ravening on the other side of the walls, the Byzantines journeyed into time.

The artists devoted themselves to time-consuming miniatures and filigree work. Their art was fraught with perfectionism and preciosity, symbolic of their besieged city where time was not of the essence. The Oriental aversion to depicting the human figure turned Byzantine art toward abstract and geometric motifs, a hypnotic art that inspired visionary dreams.

Physicians also, since they could not travel in space, traveled in time, avidly delving into the past in search of the knowledge and wisdom that make man feel no longer alone. It is my own theory that this was the reason behind the great medieval compilations for which Byzantine medi-
cine is famous. To Oribasius of Pergamon, Aëtius of Amida, Paul of Aegina, and Alexander of Tralles we owe the monumental tomes in which is preserved the medical lore of ancient Greece.

THE PATIENT AS A SAINT

There being no one in Byzantium to garner the heritage of Galen and again raise the torch of experimental medicine, Byzantine medicine became a matter of faith. The sick person was regarded as a potential saint; prayer was adopted as the best medicine; the priest was the best physician; the Church, the best hospital; and Christ, the Supreme Healer.

In Byzantium, medicine was in the hands of priests and Magi. The guardian saints, Cosmas and Damian, shed their light over the city. Nevertheless, the Roman appetite for luxury and sensual pleasures endured. Paradoxically, philosophic mysticism and Oriental demonology, magic and alchemy, existed side by side with the influences of Christianity. A medicine of priests, Byzantine medicine bowed to ecclesiastic authority. Taking their example from Christ, the Great Physician, the fathers of the Church practiced medicine. They also erected hospitals, one of which with annexes could accommodate 7000 patients. The sick were fed on fruit and wine, temple sleep was practiced, and physical and spiritual healing was promised to the faithful.

The ancient pagan cults survived solely among the wealthy. Christianity, with its appeal to the unclean, the diseased, and sinners, became a powerful revolutionary force. The sick person became a privileged being, and medicine was founded on faith and miracles, the divine word, and prayer. Faithful Christians renounced classical hygiene. The patients of the priests were mostly laborers and the needy, and the diseased body was extolled as the best abode for the healthy soul.

Exhausted by waves of epidemics and the continuous menace of invasion, Byzantium, after a dramatic siege, finally fell to the Ottomans in 1453, a date that marks the end of the Middle Ages. By the way, the siege and fall of Byzantium is one of the most dramatic in History. The Ottoman invaders, overnight, rolled their entire fleet over greased lumber across the Galata Peninsula and set it afloat on the waters of the Golden Horn surrounding Byzantium. Later they crossed the invulner-
able walls through a little service door, the Kerka Porta, left open by a
e negligent or disloyal servant, who thus ushered in the great massacre
of Byzantium. The migration west of Byzantine scholars and physicians
greatly helped in the transmission to Europe of Hellenic wisdom and
in the eventual birth in the Renaissance of the movement to revive classi-
cal knowledge known as humanism.

When Byzantium—or Constantinople, as it was already called—fell, its
ccontemporary, the Arabian Empire, also was on the verge of collapse.
Thirty-nine years after the fall of Constantinople, with the conquest of
Granada by the Catholic kings, the Arabian empire finally fell also.
But by then Arabian medicine had been for many centuries highly

developed.

THE PERSIAN ORIGINS OF ARABIAN MEDICINE

Arabian medicine had its origin, so to speak, in the disgrace that befell
one Nestorius, Patriarch of Constantinople. Nestorius dared assert that
the Virgin Mary was the mother not of God but of Christ, and, accused
of heresy, he fled to the Libyan desert. There, in the green shade of the
towering date palms of an oasis, Nestorius and his followers, having paid
dearly for their aspirations to heal man’s soul, turned to healing man’s
body, and avidly drank of the medico-philosophic waters of classical
Greece. Later, they poured the ancient Hellenic nectars into Syriac ves-
sels, translating into Syrian the ancient Greek medical works and estab-
lishing in Persia, among others, the famous Jundishapur medical school.
When the Arabs much later conquered Persia, avid also for knowledge,
they filled their nomad’s pouches with Nestorian parchments and trans-
lated them into Arabic, just as still later these in turn would be translated
into Latin at Salerno and Toledo.

An impetuous Semitic people, the Arabs, fired by the word of Mo-
hammed, in the seventh century set out to conquer the world. Scimitar
in hand, they carved an empire that stretched from China to Spain, in-
cluding all North Africa, and, centering their power in the caliphates of
Baghdad and Cordova, created a mighty civilization, which some cen-
turies later succumbed to the Tartars in Baghdad and the Spaniards
in the west.
THE GIANTS IN ARABIAN MEDICINE

The caliphs were generous patrons to scholars, and next to their seraglios stood the library, lined from floor to ceiling with yellowed parchments bound in leather and gold. Cordova alone had fifty hospitals, seventy public libraries, and the most renowned university in Europe in the tenth century. Schools of medicine flourished in Samarkand and Baghdad, Ispahan and Alexandria, Cordova, Seville, Toledo, Granada, and Saragossa.

The Eastern or Baghdad caliphate was illuminated by the minds of three Persian medical luminaries: Rhazes, Haly Abbas, and Avicenna.

Rhazes “the Experimenter,” head of the great hospital of Baghdad and the greatest clinician of the Arabic world, was the author of more than a hundred and fifty works, among them Liber Continens, reputed to have weighed twenty-two pounds, comprising not only medicine, but also philosophy, astronomy, and mathematics. This work gained Rhazes much fame. It also cost him his sight. The story is that an offended hierarch ordered Rhazes to be beaten on the head with his own book until one or the other broke. Rhazes’ head broke first, and the injury is said to have brought on his blindness. A close follower of Hippocratic methods, Rhazes compiled many case histories and wrote the first monographs in history on the distinction between measles and smallpox.

Haly Abbas, a Persian sage, wrote the Liber Regius, the first medical work translated into Latin and the most popular until the appearance of Avicenna’s Canon.

The wise man and systematizer of Arabian medicine was Avicenna, one of the greatest medical figures of all times. Poet, statesman, and astrologer, a lover of wine, women, and song, the “Prince of Physicians,” as Avicenna was called, wrote perhaps the most studied medical work ever written, the Canon Medicinae, in which he endeavored to reconcile the teachings of Galen with those of Aristotle. For many centuries after Avicenna’s death, the five-volume, over one-million-word, Canon was—and still is in the East—the Bible of medical learning.

The giants of the Western Caliphate of Cordova were four: Albucasis, Avenzoar, Averroës, and Maimonides.

Albucasis, the surgeon, the Arabian Vesalius, defying tradition and
the Koran, wrote *al-Tasrif*. This was a complete and the first illustrated account of surgery, repeatedly translated into Latin and beacon of European surgery until Paré.

The Sevillian, Avenzoar, a ladies’ man, physician to Almohadic caliphs, was perhaps the greatest clinician of his time. He despised Avicenna’s *Canon* and was the most Hippocratic among the Arabian physicians.

Averroës, a pupil of Avenzoar and physician to a caliph in Marrakesh, was mainly a pantheistic philosopher, whose unorthodox opinions led him to death in prison in Morocco.

The wandering Cordovan, Maimonides, hygienist and mystic, by basing theologic principles on reason, did for Judaism what Averroës did for Islamism and St. Thomas for Christianity. He studied patients, not diseases, and left us his wisdom-permeated *Guide for the Perplexed* and his priceless axiom: “Teach thy tongue to say I know not, and thou wilt progress.”

THE CONTRIBUTIONS OF THE ARABS: CHEMISTRY, PHARMACY, HOSPITALS

To the Arabs we are indebted for three great contributions to medical science.

One of them was medicinal chemistry, or alchemy, as it was then called, which the Arabs developed to a high degree of perfection. They took great delight in preparing all sorts of medicinal concoctions and invented methods of distillation, sublimation, and crystallization that are still used today.

The Arabs were also the originators of pharmacies. Until late in the Middle Ages there were no pharmacies or pharmacists. Physicians dispensed their own prescriptions. The Arabs created an intermediary, the pharmacist. A lover of gossip and a great teller of tales, the pharmacist loved to sit outside his door and engage passers-by in conversation while his hands kept busy concocting some medication or other. The Arabs also introduced many drugs, such as benzoin, camphor, senna, laudanum, myrrh, to mention only a few, and the word “drug” itself is of Arabic origin.

The third great Arabian contribution was the creation of magnificent
teaching hospitals—in the Caliphate of Cordova alone there were more than fifty—which had everything imaginable to help the patient recover his health. There were separate wards for men and women and wards for different diseases, with specialists for each disease. The hospitals had libraries and lecture halls, murmuring fountains to cool and soothe feverish patients, and music and storytellers to amuse them. On departure from the hospital, each patient was given a sum of money to tide him over until he could resume work.

THE JOY OF LIVING

A sensuous and self-indulgent people, fond of comfort and the pleasures of the body, the Arabs built beautiful cities with street lights, glass windows, public baths, magnificent gardens, and an architecture that was spacious, airy, traced with arabesques as delicate as fine old lace. Their architecture heightened the joy of living, in sharp contrast to the massive forbidding-looking structures of previous times or those that followed in the Romanesque period, which symbolized an aggressive militant church.

One of the most beautiful examples of this Arabian architecture is the Alhambra in Granada. It illustrates perfectly the Arabs’ love for the graceful and the gracious. With yielding chalked-stone, alabaster, and wood, the life-fond Arab built monuments to life, like the Alhambra, even as, later, the death-minded Spaniard, with unyielding naked stone, built monuments to death, like El Escorial.

By the time the Islamic Empire fell, learning had already resumed its path westward. In Italy, the school of Salerno was already well established, and Europe once again was to provide the center of learning to the then known world.

Meantime, there emerged in Europe a new type man whom we could properly call “medieval man.”

THE MAN ON THE DEFENSIVE

Medieval man was a man on the defensive. Torn by fears—fear of God in heaven and the devils in hell, of plagues and epidemics, of wars and invasions, of famine, of death and the darkness that lay in the be-
yond—medieval man reacted by creating a collective way of life for himself.

Everything in the Middle Ages bore the imprint of this collective character: the Crusades and the Church, feudalism and town planning, the hospitals, universities, and public health regulations.

THE MEDIEVAL TOWN

Unfortunately, medieval man lacked the means, or perhaps the wisdom, to organize properly a smooth, efficient collective life. To protect himself, he built walls around his community and then fell victim to the crowding and confinement imposed by the stone belt with which he had surrounded himself. Life in the medieval household throughout Christendom was not only cramped and difficult; it was truly chaotic.

Houses had no sanitation, no heat or water or glass in the windows. Ceilings were low, rooms were either too hot or too cold, according to the season, and were shared with dogs, cats, pigs, and other domestic animals. People ate with their fingers; only one spoon, to be shared by everybody, was set on the table. Leftovers were thrown on the floor for the animals to eat. They seldom bathed, and their clothes were so stiff with filth that they had to sleep naked.

Medieval iconography depicts many a home scene with people feasting and carousing while in the same room a physician is bleeding a patient or giving an undoubtedly painful enema with an animal bladder, or while a barber is practicing a surgical intervention, or while someone is bathing, with the inevitable domestic animals roaming the house.

Cities also were chaotic. There were no regulations on the width of streets, and a house could be built anywhere, even in the middle of the street. People simply walked around the house. This situation must have gone a little too far, for finally one day it was decided that a man should ride a horse through the city streets with a lance across his saddle, and the length of the lance would be the minimum width of the street, within which no building was allowed. The streets were so deep in mud that people wore very high heels or even walked on stilts. In Paris—today the most beautiful city in the world—the mud was so thick, particularly after rain, that the city was originally called Lutetia, from lutum, meaning mud.
Animals wallowed in the mud, especially pigs and dogs, and sometimes there were so many of them that pedestrians could not reach their destination and had to return home, and horses were frightened by the animals and threw their riders off. Refuse was thrown from the houses and the stench was unbearable. This appalling situation finally forced the towns in the thirteenth century to pave their streets.

THE MARKET SQUARE

In self-protection, the people eventually were forced to establish a minimum of cleanliness, and they started with the market place.

The market place (together with the monastery and the castle, the three key history-making places in the Middle Ages) was the meeting place for everything and everybody: for religious, cultural, and political gatherings, for the townfolk and strangers alike, whether poor or rich, humble or of exalted position, for the sick to discuss their ailments and seek advice from passers-by, as well as for buying and selling food and other merchandise. In a flash of sound common sense and public health spirit, it was decreed that the market place be cleaned scrupulously every night. The meat and fish stalls had to be washed thoroughly, and rotting meat or fish could be sold only to strangers visiting the town. Best of all, it was forbidden to throw garbage within one thousand feet of the market place. Thus the danger of food contamination was drastically reduced, and this became the first public health measure taken in the Middle Ages. But the gap between the desire for a certain amount of hygiene and the actual uncleanliness remained formidable.

THE GOTHIC CATHEDRALS

Two main sources of recreation in the Middle Ages were the great Gothic cathedrals and public baths.

Once or twice a year, the illiterate—which included everybody, except clergymen and physicians—took a holiday and made a pilgrimage to the Cathedral of Chartres or one of the other great cathedrals. The cathedrals were not only veritable encyclopedias in stone, but also the favorite setting for the pomp and ceremony of the Church and of the wealthy and the privileged classes. Great parades were held, with beat-
ing drums, waving pennants, knights in shining armor, and purple-robbed, bejeweled Church dignitaries. And everywhere, glowing like precious gems, there were exquisite stained-glass windows, so many of them that little room was left for statuary or paintings. In these windows were depicted the life of saints, the epics of warriors, and the flora, fauna, trades, and many other things of those times. In the Middle Ages, gazing at stained-glass windows was as popular as watching television is today.

The great Gothic cathedrals were built after the transition from Byzantine architecture, which I have already described, to Romanesque architecture, which was solid and massive, with a strong Asiatic influence. Romanesque churches were built like fortresses ready to withstand assault, with so little light inside that murals and mosaics had to be replaced by statuary, which was easier to see and touch. The Gothic church, on the other hand, with its multiple piers, ribs, and buttresses, looked like a huge animal with its skeleton on the outside, a church, so to speak, supported by crutches. Fine examples of this type architecture are Notre Dame in Paris and the Cathedral of Chartres. Gothic churches had so many stained-glass windows that no space was left for murals or mosaics. Instead, all kinds of relief work depicted the story of the religion, arts, trades, and technology of the times. Thus the Gothic churches became encyclopedias in stone to enlighten visually those who could not read.

THE PUBLIC BATHS

The second source of recreation, bathing, was limited to a small number of persons. Religious persons refused to bathe, for they considered it a sin. There are numerous documents bearing testimony to the fact that in some convents monks and nuns never bathed, from the day they entered the convent till the day they died. There are many amusing tales on the subject. One in particular comes to mind.

Two monks, one old and one young, were traveling together. One day they came to a stream and they removed their shoes and socks in order to cross it on foot. “Brother,” remarked the young monk, “how terribly dirty your feet are.” And the old monk with great dignity replied, “When you reach my age, your feet will be just as dirty.”

Bathing was considered sinful, for it meant exposing the body, which
in turn exposed one to the temptations of the flesh. Nevertheless in the
cities there were public baths, which were the scene of great bacchanalia.
Often men and women bathed together in the nude, in water strewn with
rose petals, while music was played and wine served, which reminds me of
another little story.

A priest, passing one of these public baths, saw a group of men and
women merrily bathing in the nude. The priest, horrified, addressed the
revelers. “It is a sin for men and women to bathe together in the nude,”
he cried out. “We are not together,” answered a man. “There is a parti-
tion between us,” and he pointed to a low wooden fence in the middle
of the bath. “You do have a partition,” said the priest. “That is fine. But
what happens if the devil comes and you feel the temptation?” “We re-
move the partition,” replied the man.

Such was the public bath in the Middle Ages. Of course, you can
easily imagine how great a source of disease these baths were.

THE MEDIEVAL MONASTERIES

As I said before, the third great stream of medical knowledge in the
Middle Ages was monastic and university medicine.

Constant wars in the Arabian and Byzantine empires made knowledge
gradually move westward. Italy, France, and Spain began to be watered
by various currents of learning. By the time Constantinople fell, those
vast coffers of stone, the medieval monasteries, were well filled with the
knowledge gathered together by the Arabs, via the Syrian translators, and
by the Byzantine copyists.

Medieval monasteries were a combination of school, hospital, inn,
and news center. Most monasteries were strategically located on the
great routes that every traveler had perforce to cross. Returning cru-
saders, pilgrims, merchants, all in their travels eventually stopped at the
monasteries to eat, sleep, or rest, and they chatted with the monks and
told them about the lands they had been to, and the peoples and the
things they had seen and heard during their travels. For the Crusaders,
the monasteries were veritable havens, where their aches and wounds
were soothed and tended.

You know, of course, that the Crusades represent the first instance in
history that great masses of people rallied to a single idea: to recover the Holy Sepulchre in Jerusalem. In the sense of a people rallying to one single idea, the Crusades were the first great "democratic" movement in history. One Crusade succeeded another—seven of them in all, including the shameful and tragic Children's Crusade—each consisting of thousands who, on foot or horseback, blindly followed their leaders. In the name of religion the greatest and bloodiest massacres in history took place. Christians, Jews, Arabs—people of all faiths, in a mass war psychosis—massacred one another with equal cruelty, and blood so flowed in Jerusalem that often the streets ran red from one end of the city to the other.

MONTE CASSINO, FIRST RELIGIOUS MEDICAL SCHOOL

The number of wounded Crusaders treated at the monasteries must have been incalculable. Two of these monasteries were to become the first medical schools in Europe: Monte Cassino and Salerno. Both names were often in the headlines during World War II, one because it was destroyed and the other because American troops made a spectacular landing there.

Situated near Naples, both Monte Cassino and Salerno were well linked in medieval times with the rest of Italy. Benedictine monks, following the preaching to care for the sick of St. Benedict of Nursia, founder of their order, started at Monte Cassino a religious center of medical teaching as well as a hospital. Later, about 70 miles away, in the seaside resort of Salerno, they helped create the first non-religious lay center for the teaching of medicine.

In their medical practice and teachings, these monk-physicians drew extensively from their vast collection of Hippocratic and Galenic writings, and translated into Latin and reviewed the classical Greek and Roman medical works, which had been preserved by the Arabic translators and the Byzantine copyists. The greatest translator of medical works from Arabic into Latin at Monte Cassino was Constantine the African, a native of Carthage, who initiated the flow of Arabic Medicine into Europe and served as link between Monte Cassino and Salerno. Thanks to him Hippocrates' and Galen's works, which for centuries had been buried in
the dust of oblivion, became textbooks in Salerno. Later, many great men studied at these two centers of medical teaching.

SALERNO, FIRST LAY MEDICAL SCHOOL

Salerno saw the beginning of lay or non-ecclesiastic medicine. Its faculty had the first lay medical teachers in history and even women teachers. A true Civitas Hippocratica, Salerno, for the first time in history, in the thirteenth century, granted the title of “doctor.” Before that, physicians were called physic or physicus and, academically, magister. These first physicians from Monte Cassino and Salerno later moved north and created the first great universities (the word universitas originally meant association of students), precursors of our modern medical schools. These universities profited by the avalanche of learning represented by the translations of Greek and Arabian medical classics made by Gerard of Cremona at the famous College of Translators in Toledo, which reached its most glittering hour in the twelfth century.

THE MEDIEVAL UNIVERSITIES

In those times there were schools ruled by the students, such as those at Bologna and Padua, and schools ruled by the teachers, such as those of Paris, Montpellier, and Oxford. These schools were among the first great medical schools in Europe. In the twelfth century, the schools of Montpellier (then a Spanish outpost), Oxford, Paris, and Bologna were founded; in the thirteenth century, those of Cambridge and Padua; in the fourteenth century, those of Prague, Vienna, and Heidelberg. Later, other schools were created in Spain and in other countries. The medieval universities reflected the passionate yearning for learning of medieval man. At first, only clerics were allowed to attend medical schools; later, the lay people prevailed until finally ecclesiastic medicine was separated from lay medicine.

At most of these schools, the methods of teaching were the lecture (lectio) and the discussion (disputatio); the method of research was a theoretical and dialectical discussion of problems; the textbooks were the afore-mentioned translations of ancient medical works, as well as new compilations, commentaries, compendiums, and clinical case histories,
which in those days were called, respectively, *summa*, *commentarium*,
*conciliator*, and *consilia*.

**THE LIFE OF THE STUDENT**

You may be interested in making the acquaintance of the students who attended these first universities. Their life, I assure you, was far from easy. You are very fortunate that you do not have the difficulties and inconveniences they had.

Your precursors in the Middle Ages started medical school at an early age—twelve or thirteen. A few students were wealthy; the others even had to beg on street corners. In the Middle Ages begging was a religious act, and it was not frowned upon or considered shameful. Students usually lived in small, cold, dark rooms, lit only by tallow candles. Medieval houses had windows but no glass panes. They were dark and gloomy, with naked walls beaded by humidity and floors covered with straw. The poor students must have shivered night and day for lack of warmth and food. Those with a little money went to the market at lunch time and bought perhaps a piece of chicken or pork or beef and some vegetables for dinner. The others begged, borrowed, or stole a piece of tripe or sausage. But all of them drank beer, lots of warm beer. In fact, often the students took their teachers out the evening before examinations and plied them all night long with beer, until both students and teachers were completely inebriated. In the morning they all went directly from the tavern to the examination halls. The idea was that in view of the teachers’ (and the pupils’) painful condition, examinations would be a mere formality or would at least proceed without any difficulty. Once the examinations were over, teachers and students went back to the tavern to celebrate. I strongly recommend that you do not attempt any such tricks.

Another favorite form of diversion was street brawling. Students were the terror of the towns where they lived (I understand they still are in some places), so much so that after sunset respectable citizens locked up their women and their valuable belongings and bolted their street doors, leaving the town at the mercy of the students. Nevertheless, students led a rugged life.
The first class started at five o'clock in the morning, which meant that the students had to get up at four in dark, cold, damp rooms and, often without breakfast, rush out into dark, freezing streets and on to a cold classroom, where only the teacher had a seat—exactly the opposite of our situation today. The students either sat on the straw-covered floor or remained standing. Classes often continued without interruption until five in the evening—twelve and sometimes fourteen hours, with only a short break for lunch. The teacher read or recited Galen, another man dissected, and a third one pointed out the parts of the corpse mentioned by the teacher. After class, they—at least the studious ones—went back to their bleak rooms to study for hours in the flickering light of a solitary candle.

Yet so powerful was the zeal for learning, so intense was the desire to acquire knowledge, that people by the thousands stood for hours in the squares in Paris, Padua, Bologna, and Oxford to listen to the great teachers of the time, men like Albertus Magnus, Pietro d'Abano, Taddeo Alderotti, Thomas Aquinas, Arnold of Villanova, and Roger Bacon, the amazing Franciscan monk who in his writings anticipated aviation, roentgen rays, the cinema, television, and submarines.

THE MEDIEVAL HOSPITAL

The second great contribution of the Middle Ages was the creation of hospitals. The word "hospital" derives from the name "hospitaler," then applied to the monk in charge of greeting incoming patients. Today the word "hospitality" symbolizes graciousness, kindness, and courtesy, three qualities that should always be requisites in our own hospitals.

The third medieval contribution to medicine was the adoption of various public health measures in the cities. These we have already discussed.

Eventually, the cities created the medical position of consul, a sort of municipal sanitation and public health inspector, who checked on the condition of foods. They also began to bury the dead outside the town limits, and adopted other preventive measures against epidemics.

Here you should remember that the three contributions of the Middle Ages to medicine had a common denominator: they were all collective
enterprises. They all symbolized man on the defensive, who sought protection in collective measures; protection against earthly enemies by means of walls around the cities; protection against the devil through belief in religious dogmas; protection against disease by means of hospitals; protection against the unknown by acquiring learning at the universities; and protection against death through public health measures.

"COLLECTIVE" DISEASES

Diseases too were "collective" in the Middle Ages. Besides plague, leprosy, and deficiency diseases, mass epidemics of a psychologic nature were common, such as the dancing mania, flagellation, and tarantism. It is symbolic that the Middle Ages began with the great plague of Justinian in the sixth century and ended with the greatest plague of all, the Black Death, in the fourteenth century. The Black Death killed, some authors estimate, 43,000,000 persons. In France and Italy it wiped out half of the population; in Venice, three-fourths. For lack of burial ground, rivers, after being blessed by the Pope, were turned into graveyards for thousands of victims. The only defense they knew was to put the greatest possible distance between themselves and either the infected area or, at least, those who had the disease. Therefore, victims of the plague were often forced to wear special garments (in the case of lepers, sackcloth and a rattle) to warn off other people. They already knew that epidemic diseases, such as plague, smallpox, and leprosy, were contagious, although they believed that they were transmitted by some sort of poison in the air. Later on, in Venice, quarantine was established to fight off infections.

MEDIEVAL MEDICAL CONCEPTS

Out of the darkness of the early Middle Ages there emerged once again the ancient classical medical concepts, together with new concepts. These new concepts, however, were still based on Aristotle's philosophy and on the humoral and pneumatic pathology of Hippocrates and Galen. The body, they still believed, was made up of four humors, alterations in which caused disease. Natural spirits, created in the liver, were converted into vital spirits in the lungs and into animal spirits in the brain.
Diagnosis was based on a perfunctory examination of the patient and, above all, of the urine. I mentioned before that the sick person often did not go to see the physician, but merely sent a servant with a flask of urine, and the physician would send back his diagnosis. Often, to test their physician, patients sent the urine of a friend or relative, or even of a cat or dog, or just plain white wine. The accuracy of the diagnosis determined the honorarium to be paid to the physician.

Treatment was based on the principle of *contraria contrariis curantur* and included vegetable galenicals, Arabian minerals, baths, and diet. Because disease was still considered to be caused by the entrance of a foreign body into the human organism, therapy was mainly of an eliminative or cathartic nature. The three basic forms of therapy therefore were bleeding, cupping, and purging, plus emetics, sudorifics, and diuretics, the idea being to draw out of the body the altered humors responsible for the disease. Enemas with soapsuds or medicinal liquids were also a favorite remedy. Next to this, there flourished what has been called "garbage pharmacy," loathsome foul mixtures made of all kinds of animal and human excretions. Until the late Middle Ages, using a knife on the body was beneath the dignity of physicians, and, consequently, surgery was left to barbers, bath keepers, and executioners.

**MEDIEVAL MAGIC**

Medieval medicine coexisted with magic. Amulets and talismans were widely used, and astrology was considered the best way to determine or predict the course of human life and disease. Medieval magic included such things as linking the organs of the human body with the signs of the zodiac; faith in healing saints; the "royal touch," which could cure scrofula or tuberculosis of the bones and lymph nodes (Charles II is reputed to have "touched" and "cured" 100,000 patients); belief in *incubi* and *succubi* or evil spirits that came to earth and had sexual intercourse with human beings in their sleep; belief in "little people" or gnomes merrily cavorting in the moonlight; and, above all, numerous objects supposedly endowed with healing power, such as bezoar stones, unicorn powder, beads from the halo of a saint, or feathers from the wing of an angel, to mention a few. Such was "the other side" of the medieval moon.
“LONG ROBE” AND “SHORT ROBE”

A detail that might be of interest to you is that university-trained physicians wore a “long robe” and long sleeves, to differentiate themselves from the “short robe” practitioners who had no academic training, such as barbers, bath keepers, bleeders, surgeons, and even executioners. Because physicians had also been clerics, they received no remuneration until very late in the Middle Ages. When medicine finally became a profession, accessible to all instead of only to the clergy, a remuneration to doctors for their services became customary.

But even today, as a relic from the Middle Ages, there are physicians who tend the poor without remuneration. I believe ours is the only profession that does this. At least, I do not know of any engineer who would build a bridge just for the love of it. In any case, from the thirteenth century on, medicine, as if reflecting the splendors of a magnificent century, began to show an eagerness for learning, and the universities became the threshold to an imminent period of medical search for new truths.

We have made too swift a journey through one thousand years of history and several continents. Still, it has been enough to make us appreciate that the Middle Ages do not deserve to be called the Dark Ages, since it was then that the three institutions that are the basis of modern medicine were created: hospitals, universities, and public health.

DAWN IN THE SCARLET SUNSET

Above all, we must remember that behind the multifaceted façade of the Middle Ages, behind the crested turrets, the shining armors, the golden cupolas of Byzantium, behind the flying pennants of the Crusaders, the flitting white steeds of the Arabs, the pomp and ceremony of the church and the wealthy, behind the squalor, the dirt, and the fear, there lived and worked a group of men—monks in monasteries, physicians and teachers in universities, barbers and surgeons in the streets, students all over—who tried hard to create something new, anticipating the wisdom of the days to come. Deep in the scarlet sunset of a dying age, these men nonetheless had the minds and hearts to look ahead, as if they could already see the brilliant dawn that heralded the Renaissance.
VI: THE SMILE OF THE REBEL

Artists, Adventurers, Physiks, and Barbers
(Medicine in the Renaissance)

I

WOULD like to tell you the story of Renaissance Medicine, and perhaps the best way to do this is to tell you the story of a certain immortal drawing. I refer to the drawing done by a pupil of Titian, the Flemish painter Jan Stephan Calcar, for the title page of the greatest medical book ever written, De humani corporis fabrica by Andreas Vesalius. I shall tell you not only about the drawing, but also about the men, the forces, the ideas, and background that inspired this work. For these same things inspired also that wonderful phenomenon known as the Renaissance.

Our story begins on a bright, frosty December morning in 1537, in the “fair city” of Padua, as Shakespeare later called it. Padua at that time was the center of medical learning in Europe, just as Italy was the world center of artistic creation. That morning, under the cool blue skies of Padua, a magnificent procession slowly advanced through the narrow
THE SMILE OF THE REBEL

streets toward the Bishop’s palace. Leading the procession, in regal crimson or purple robes, were solemn-looking professors from the university and Church dignitaries of haughty mien, followed by proud knights in shining armor and marching soldiers with glittering halberds. Behind them a small band rent the air with the blare of trumpets and the beating of drums. Last of all marched the students, the poor in threadbare cloaks, the rich with plumes like cocks’ combs on their wide-brimmed hats. The procession arrived at the Bishop’s palace. In a stately hall, glittering with crystal chandeliers and silver cressets, professors, churchmen, nobles, knights, and students congregated. The Rector of the University and the Bishop spoke. A young man of twenty-three years was granted the title of doctor of medicine. His name was Andreas Vesalius.

A YOUNG MAN FROM BELGIUM

Vesalius, born in Brussels, belonged to a distinguished medical family that hailed from Wesel, Prussia, hence the name Vesalius. As a boy, Vesalius already dissected cats, mice, and moles. Some men are born artists or born scientists; Vesalius was a born anatomist. It is not strange therefore that he was sent to study at the medical schools of Louvain and Paris.

At that time in both Louvain and Paris, Galen’s teachings still reigned supreme. In the best of cases, medical teaching was limited to the professor reading from one of Galen’s texts, assisted by an ostensor and a demonstrator. The professor sat on an elevated platform; his two assistants stood by the corpse, if one were available. One of the assistants dissected the body, which was considered menial work; the other pointed to the parts exposed while the professor read about them from Galen’s text. Sometimes the professor would tell the students, “I have now reached a part so difficult that you would never understand it, so we shall skip it completely.” That was the accepted method of teaching. When human bodies were not available, the teacher, like Sylvius in Paris, recited Galenic passages over the remains of a dog.

The students were never allowed to approach or touch the body. A barber, or a barber-surgeon, or even a hangman, was hired to dissect the corpse as quickly as possible, before it decomposed. The students
merely listened, probably bored by the endless litanies of Galenic wisdom.

Vesalius, a rebel by nature, from his early youth concluded that this was not the way to learn anatomy. Neither was it the way to learn medicine. He could not be content with listening to a teacher who servilely followed tradition. Learning to him was looking at things with inquiring, avid-to-learn eyes. Learning, above all, was seeing. It is not strange, then, that Vesalius was a rebellious student. He often contradicted his teachers, and finally he quarreled with the most famous teacher in Paris at that time, Sylvius. When Vesalius dared correct the great Sylvius, who parrot-fashion repeated Galen’s sayings, he was very nearly expelled from school.

GIBBETS AND CANDLELIGHT: THE YEARS IN PARIS

Vesalius thirsted for knowledge. He wanted to penetrate the mysteries of the human body. But corpses were difficult to obtain. And so, on dark winter nights, together with a friend, Vesalius would repair to the Cemetery of the Innocents in Paris. There, often with their bare hands, they would unearth whatever remains they could—sometimes an arm, sometimes a head, sometimes only bones. On occasion, in the dead of night, they would go to the outskirts of Paris to steal, right off the gibbet, the corpses of criminals who had been executed by hanging or perhaps tortured to death with a slow fire under their bare feet. From the shreds of flesh left and the bones Vesalius would choose whatever could be used for dissection or the study of anatomy. Shaking with fear and cold, their gruesome burden hidden under their cloaks, they would sneak past the city gates, down dark alleys, and up to their lodgings. Once there, they sprinkled their stolen goods with vinegar, to disguise the stench, and then proceeded to dissect by candlelight or moonlight all through the night.

THE ANATOMIST AND THE SAINT: THE YEARS IN VENICE

Those were Vesalius’ heroic years. He left France and went to Venice, to a hospital run by an adjacent convent of Teotin monks. There he must have met the great religious Spanish reformer, St. Ignatius of Loyola. How I wish that there were records of the conversations that
must have taken place between these two men: one a religious fanatic, a zealous adherent to tradition, founder of the feared military-like Order of the Jesuits; the other by nature a rebellious leader, a true conquistador, a man of science searching for the truth above all traditions. How many clashes of wills and ideas the gray walls of the hospital must have witnessed! How many times irate words from the lips of these two men must have drifted across the quiet, dark green waters of the canals surrounding the hospital!

THE GREAT CHALLENGE: THE YEARS IN PADUA

Later Vesalius went to Padua, where, as I said before, he was graduated as a doctor of medicine. The day after graduation, Vesalius was appointed Professor of Surgery and Anatomy. His teachings were destined to start the great medical revolution of the Renaissance.

We know how Vesalius looked during those portentous years. His countenance was vividly portrayed by Calcar on the frontispiece drawing for the Fabrica and on other occasions. It is worth studying. Dressed in the style of his time, with a close-fitting vest and voluminous puffed sleeves, his red hair is thick and crisp, his pointed beard aggressive, his eyes piercing, and his smile challenging. Let us not forget this challenging smile of Vesalius, for we shall end our story with another challenging smile—that of a woman.

Let us now return to Calcar’s famous drawing for the title page of the Fabrica. In the center of the drawing is Vesalius conducting a dissection. Piling around him is a colorful, rather chaotic-looking crowd—students, physicians, professors, scholars, and other people from the town of Padua who have come to watch the dissection. A skeleton, used for teaching purposes, towers above the dissection table. There are boxes with Vesalius’ tools and there are dogs and monkeys, symbolizing his use of comparative anatomy. As you know, Galen never performed human dissections. His anatomy, which was still dogma and law in Vesalius’ time, was an anatomy of female apes. And yet it was applied erroneously to human beings and used in medicine for more than twelve hundred years. But what we see in Calcar’s drawing is a true dissection, a true anatomy class, and a true teacher, who with his own hands opened
up the human body and exposed for everyone to see all the mysteries of the human anatomy.

Compare Calcar’s drawing with the iconography of a similar anatomy class in Bologna by the famous anatomy teacher, Mundinus, and you will promptly realize the vast gulf that existed between both classes. Mundinus, perched on his platform like a king on his throne, pompously recited Galen, while a hangman or a barber cut open the corpse, and a demonstrator pointed to the organs mentioned in the teacher’s recital. There was no communication between teacher and pupils, no questions, and no discussions as to whether Galen was right or wrong. The whole scene exuded orderliness, the orderliness that goes with a static, un-creative, and erroneous type of teaching.

FACES IN A PAINTING: THE INDIVIDUAL AND THE COLLECTIVITY

If you look at paintings of the Middle Ages, you will see that all the faces, whether of saints, sinners, captains, knights, soldiers, or physicians, look almost alike. Whether it is a bas-relief, a painting, a drawing, or a tapestry, all the faces in medieval art have a similar look. In contrast, every face in Calcar’s drawing, as in most Renaissance paintings, is different from the others. No two faces are identical. Here was a new type of human being that took pride in being different. This was the beginning of man as an individual. The collectivity of the Middle Ages was giving way to the individuality of the Renaissance.

Calcar’s drawing, made in the fourth decade of the sixteenth century, vibrates with this new spirit of man and of this age, an age imbued with a vigor and strength unknown in all the preceding centuries. To know Calcar’s drawing, to know Vesalius, to know the ideas of his time, is to know medicine in the Renaissance.

“OF COURSE, VASELINE!”

Apropos of knowing all these things, let me tell you a little anecdote told by the greatest American neurosurgeon of modern times, Harvey Cushing, a devoted student of Vesalius. Years ago, on the occasion of an American Medical Association meeting, Dr. Cushing, together with a colleague, Dr. Streeter, organized a Vesalian exhibit, which included an
extensive collection of Vesaliana: the *Fabrica*, drawings, paintings, manuscripts, iconography, tools, and many other wonderful things related to Vesalius and the Vesalian world. The exhibit was set up next to other exhibits of baby food, drugs, and all the other products that are usually displayed at medical conventions. Dr. Cushing and Dr. Streeter were putting the final touches to their exhibit when a solitary physician, loaded with samples collected from the other booths, came up to them. Dr. Cushing gently asked, "What can we do for you? May we explain anything to you?" "I don't want any explanations," grunted the physician. "All I want are samples." Puzzled, Dr. Cushing asked, "Samples of what?" and the physician answered, "My God, samples of your product. Vaseline, of course. Vaseline!"

This is a humorous but also deplorable story. Here was one physician who had no knowledge of, or even interest in, the greatest figure in the history of medicine.

**THE FABRIC OF THE RENAISSANCE:**
**NATIONALISM, REFORMATION, HUMANISM, ART**

But we want to know more about Vesalius—what kind of man he was, what were his thoughts, what was the world around him like, in fact, all the circumstances that influenced him and finally led to the creation of his masterpiece. To know this we must re-create in our own minds the thoughts that must have crossed the mind of the twenty-three-year-old Vesalius when he was graduated as a Doctor of Medicine. Surely he must have felt how wonderful it was to be young, to be a doctor, and to be in Padua, the European center of the arts and sciences. He must have felt the unrest brewing around him, which heralded great events and great deeds. Everyone, the man in the street and the man of science, must have sensed this ferment in the air, this seething that presaged imminent changes in their lives and in the whole world. Let us look at the forces that led to the memorable events and achievements, including Vesalius', that made of the Renaissance a glorious period in the history of mankind.

There were several forces in motion then. First of all, was the emergence of *nations*. Up to then people had spoken of the Roman Empire,
the Byzantine Empire, the Arabic Empire. All that was now passing. Instead, political nationalism was spreading all over Europe. Nations were being born: the Italian nation, the French nation, the Spanish nation. The first European state was created in Spain. After the Moors were finally defeated in Granada, the Catholic rulers, Ferdinand and Isabella, created the first modern conception of a national state or nation. The medieval societies of the clergy, the nobility, and the guilds were integrated into one society, and with the introduction and spread of paper and metallic money, the static spacial medieval economy became a dynamic economy.

Another force, parallel to the growth of nationalities, were the new religious faiths. Instead of one religion predominating in most of the world, as in the Catholic Roman Empire or the Islamic Empire, new faiths began to appear. The most important was the Reformation movement, started by the Augustinian friar, Martin Luther. Attacking the Roman Catholic Church and preaching the return to the original simplicity of Christianity, Luther created a new religious movement that triggered many religious conflicts and European wars.

Next to political nationalism and religious reformation, other forces helped create the atmosphere of the Renaissance. One of these was Humanism, a movement started by men like Petrarch, Erasmus, and Boccaccio. These humanists felt that the only way to break completely with medieval scholastic and ecclesiastic tradition, and step from the lingering medieval twilight into bright sunlight, was to return to the classical fountains of wisdom. Arabic had been the language of religion and science for almost 1000 years. Now the humanists began a crusade for the return to Greek and, later on, to Latin. Classical ideas returned; a new appreciation of art and literature developed; freedom of thought was craved; and human dignity once again asserted itself.

With Humanism another movement was born, the true Renaissance, an artistic movement. Artists suddenly discovered the beauty of the human body. Michelangelo, Titian, Verrocchio, Pollaiuolo, Raphael, Leonardo, Tintoretto, to mention only a few, asserted that the main purpose of art was not to represent Nature, or to depict allegories and symbolism as in the Middle Ages, but to expose the beauty of the human
form. This, of course, had a tremendous impact on anatomy and medicine. Artistic interest in the nude body led to scientific interest in its inner workings, in what Vesalius called the "fabrica" of the human body.

While the artist and the scientist were exploring the mysterious regions of the human body, other bold men grew curious about what lay beyond the Atlantic waters. The invention of the compass helped, and Columbus' ships set out to explore new routes and new lands. America was discovered and, together with gold and silver and befeathered Indians, the conquistadors brought back new herbs and new drugs and new healing agents. Thus another type man was born in the Renaissance: the adventurer. The word "adventure" comes from *advenire*, meaning "come what may." The adventurer was a man who wanted to go places—come what may.

CONQUISTADORS AND SURGEONS

There was more than one type of adventurer in the Renaissance. Adventurers were not only the men of arms called *condottieri*, who swarmed all over Italy, or the conquistadors and navigators who discovered new lands, but also the surgeons. The surgeon explored the unknown regions of the human body with the same passionate interest with which the navigators explored the *terra incognita* of the Americas. There is, no doubt, a psychological similarity between those who set out with their ships to discover new lands in the world and those who set out with their scalpels to discover new areas in the human body.

Other discoveries that exercised a profound influence upon the Renaissance were Galileo's telescope, which unlocked the mysteries of the heavens, and gunpowder. Gunpowder brought about the destruction of the feudal system. It also created a new medical problem: the wounds caused by firearms, wounds that were strange and terrifying. Although gunpowder had been used in China for many centuries, not until the fourteenth century did European surgeons come face to face with the horrible wounds produced by gunshot, and they did not know how to treat them. Surgeons had been accustomed to cold-steel wounds, which healed "by the first intention," by a nonsuppurative closing of the wound; but firearm wounds, deep and destructive, always became infected, which
prompted them to believe that gunpowder "poisoned" the wounds and that pus was not only inevitable but "laudable." We shall presently see how this erroneous concept was overturned by a French barber-surgeon of great courage and wisdom—Ambroise Paré.

THE PHYSICIAN-HUMANISTS

Among the physician-humanists, there are a few whom we should remember.

Conrad Gesner, a Swiss, was interested, like many of the other humanists, in the study of nature through botany. Besides being a great botanist, Gesner was also a great zoologist and physician.

Another symbol of Humanism in the Renaissance was Thomas Linacre. Personal physician to Henry VIII (the English King who missed greatness because of his greed and lust), Thomas Linacre founded the Royal College of Physicians of London, taught at Oxford and Cambridge, and was a typical example of the first universal doctors of the Renaissance.

In Paris, Jean Fernel, author of *Universa medicina*, also raised the flag of Humanism and tried to integrate medical systems in his books. In Spain, Andrés Laguna was an outstanding humanist, and even greater was the unfortunate Michael Servetus, discoverer of the circulation of the blood in the pulmonary system. Accused of heresy by Calvin because of his theological writings, Servetus was slowly burned at a stake of green wood—that his agony might be greater—in Geneva.

The great astronomer, Nicolaus Copernicus, a physician and humanist of Polish descent, studied at Padua, and in the year 1543, the same year Vesalius' *Fabrica* appeared, published a treatise on the revolution of the celestial bodies. The year 1543 therefore marks the greatest revolution in the history of anatomy and of astronomy. Copernicus' book demolished the ancient Ptolemaic theory of the universe with the earth as the center and the planets and the sun revolving around the earth.

Copernicus conceived the heliocentric system, which established the sun as the center of the universe and the earth as only another planet revolving round the sun. He thus taught man a great lesson in humility. The second lesson came from Darwin, when he established that man was
not the center of the zoological scale, but only one step further in the biological evolution. The third lesson took place in our time, when Sigmund Freud declared that the center of man’s mental life is not the conscious but the unconscious mind.

CARDANO, PSYCHIATRIST AND GAMBLER

Another great Renaissance humanist, and a true pioneer in psychiatry, was Girolamo Cardano. He was also a skillful professional gambler, and a very controversial figure, highly praised one minute, condemned and ignored the next. Cardano’s son was beheaded for poisoning his own wife and, as a result of this tragedy, Cardano wrote a book on moral insanity, wherein he established a concept that became one of the basic factors in nineteenth-century psychiatry.

FRACASTORO, EPIDEMIOLOGIST AND POET

The greatest Italian humanist-physician was Girolamo Fracastoro, born in 1478. The “big four” of Renaissance medicine—Fracastoro, Paracelsus, Paré, and Vesalius—were born within a period of thirty-six years; they were contemporaries during twenty-seven years; and during four fateful years, 1543 to 1546, their words and deeds revolutionized anatomy, surgery, epidemiology, and medicine.

In Fracastoro we meet a type man frequently found in the Renaissance—the solitary man of learning. In contrast to the Middle Ages, when men of learning flocked to convents, monasteries, and universities, in the Renaissance the intellectual was more of a “lone wolf,” a lone fighter for truth. Such was Fracastoro. A wealthy man of noble lineage, he led a quiet life of study and work in his beautiful country house near Verona. There, surrounded by works of art, books, globes, astrolabes, and other instruments, he devoted his life to studying mathematics, astronomy, geology, and the practice of medicine. He studied particularly infectious diseases and evolved a new and dynamic concept of epidemiology, one of the revolutions of the Renaissance. In his book, De contagione et contagiosis morbis, he established the concept that infection traveled from one person to another, directly or indirectly, through “fomites”—he was the first to use the word—or seeds of disease, which multiplied rapidly
and propagated their like. He also described exanthematous typhus for the first time.

Fracastoro was also a music composer and a poet, and it was he who, in one of his poems, gave syphilis its name. Syphilis, one of the "new" diseases of the Renaissance, was then spreading all over Europe. Possibly a mild form of syphilis already existed in Europe long before the Renaissance, but the virulent type was probably brought from America by the men in Columbus' ships. Upon their return from America, many of Columbus' sailors, and with them the disease, went to the war that was then raging between France and Italy. Syphilis soon spread all over Europe in epidemic form, terrorizing all peoples. At that time it was generally called "love sickness," but nations blamed one another for the disease, so that it came to be known as the "Neapolitan disease," the "French disease," the "Spanish disease," and the "Portuguese disease." To avoid the blame for it, each country named the disease after another country.

Until one day Fracastoro wrote a beautiful poem entitled, Syphilis sive morbus Gallicus, in which he told of a young shepherd, named Syphilus, who offended the gods and was punished with a loathsome disease, the symptoms of which, as described by the poet, were exactly the same as those of the "love sickness." Thereafter the disease was called syphilis.

WEYER, SAVIOR OF "WITCHES"

Another great Renaissance pioneer in psychiatry was the Swiss-Dutchman Johann Weyer. In those days mental patients in Europe were believed to be in communion with the devil, to indulge in witchcraft, and to hold sexual orgies on the Sabbath. As a result of these beliefs and of a virulent book on witchcraft entitled, Malleus maleficarum ("The Sledgehammer on Witchcraft"), written by two vengeful Jesuits appointed by the Pope to investigate witches, it is claimed that from 300,000 to 1,000,000 persons, most of them mental patients, were tortured or burned alive. One of the few courageous men who dared protest against such barbarity was Weyer. In his book De praestigiis daemonum, he bravely proclaimed that these people were neither witches nor possessed
by the devil, but only mental patients, and that as such they deserved more charitable treatment. His work was later reinforced by that of the Spaniard, Juan Luis Vives, father of modern psychology, who in self-imposed exile in Bruges passed the time weaving a philosophy as fine and subtle as the famous Belgian lace that his wife wove in her lace-shop in Bruges.

PARACELSIUS, THE LONE CRUSADER

It is time we met Paracelsus, the great lone fighter for a new dynamic pathology. His portrait as a young man, twenty-four years old, shows him as an obese, sulky, arrogant, defiant man, with evidences of a thyroid disorder, a goiter. As a matter of fact, he was born in a region near Zurich where goiter was frequent. The son of a physician, Paracelsus grew up among the pine forests of Switzerland, where his father visited miners and tended their diseases. Little is known of his student days, but it seems he attended various schools, received his medical degree in Italy, and at the age of twenty-three started on a journey that was to last some twelve years. He roamed all over Europe, went to Asia Minor and North Africa, and visited many of the islands of the Mediterranean. He refused to study books; instead, he opened the book of nature and studied the world and the people in it. He wandered all day long through mountains and valleys, through big towns and small towns. He talked to everybody, important people and humble people, the learned and the illiterate, and he wrote a great deal and lectured everywhere. But at night he always got drunk, and often wound up in drunken brawls, only to wake up in the morning and wander some more and write his esoteric, complex, and revolutionary books.

On his return to Switzerland, through the influence of one of his patients, Erasmus of Rotterdam, one of the great philosopher-humanists of the Renaissance, Paracelsus was appointed Lecturer on Medicine at the University of Basel. Unfortunately, he quarreled often with his colleagues and even felt the necessity of dramatizing his great hatred for the old, dogmatic authority. One night, in front of the medical school, the shocked town watched him build a huge bonfire with the books of Galen and Avicenna. They watched the dogmatic wisdom of these and
other old medical masters disappear into blazing flames and clouds of smoke, while Paracelsus proclaimed that he had more wisdom in the hairs of his beard than there was in all the books there burning. Since he was as beardless as a eunuch, the symbol was obvious. Of course, he was promptly chased out of town, whereupon he resumed his wanderings. At the age of forty-eight he died, prematurely old but rebellious to the bitter end.

Paracelsus faithfully maintained his conviction that the ancient authors could no longer be considered accurate and that medicine should no longer be based on the idea that all diseases were alterations in the humors of the human body. Instead he created a dynamic pathology. He established the concept of diseases as entities and added the concept that the causes of disease frequently came from outside. Disease to him was a weakening of the *archaeus* or vital principle. He rejected the polypharmacy of the Middle Ages, with its complicated drug mixtures; instead, besides introducing the use of metals in therapy, he advocated basic “specifics” (*arcana*) and simple vegetable elixirs and tinctures. He also wrote extensively on sylphs, gnomes, dryads, salamanders, and other fanciful creatures.

Paracelsus’ name, then, is linked not to a system but to a rebellion. In spite of his being so discredited during his life, he opened wide the doors to a new concept of medicine. Perhaps he left no school of thought, but he opened a path for men with bold ideas to follow. He conceived of himself as reformer, crusader, and fighter. His heritage may have helped the next great episode in the Renaissance drama—the rebellion in the realm of surgery.

**PARÉ, THE GOOD MAN**

This revolution came with Ambroise Paré. Paré was not a physician. Born near Paris, Paré’s only ambition was to become a barber-surgeon, to secure a college permit that would entitle him to perform minor surgical operations. His face in his portraits is kind, wise, and learned; it is the face not of a dogmatic man who has spent much time at universities, but of a nice country doctor.

Many are the claims to glory of Ambroise Paré, but the main one
springs from his courageous deed while in service with the army of King Francis I of France, then fighting to conquer Turin from the Spaniards. As I said before, all gunshot wounds then were considered poisonous and, consequently, were treated with boiling oil in order to “decontaminate” them. The results are easy to imagine. There was the searing pain of boiling oil superimposed on the pain of the wound and of infection, and there was the consequent horrible trauma. One night Paré ran out of oil. Some fifty soldiers lay moaning with pain from gunshot wounds, waiting for treatment. Lacking oil, Paré despairingly prepared a mixture of egg yolk, oil of roses, and turpentine, and applied it to the soldiers’ wounds. That night he could not sleep, sure of finding all the soldiers dead in the morning. But next morning, to his great surprise, he found that some of the men he had treated with boiling oil were dead and the others, their wounds badly inflamed, were in great pain and feverish, but those treated with the improvised mixture had little pain and their wounds were not inflamed. Thereafter Paré eliminated boiling oil from the treatment of wounds and used instead his simple, much more natural, and humane form of treatment. He also experimented with chopped onion poultices on infected burns and proved empirically their bactericidal effect, a discovery confirmed during World War II.

Later on, following this path of conservative and humane surgery, he replaced the cautery in amputations by ligature of the vessels and reintroduced the podalic version in obstetrics. He crowned his life by remaining a simple, honest man, who summed up his philosophy in the words: “I just dress the wounds; God heals them.”

Of course, next to the honest, dedicated “short robe” surgeons, such as Paré, there flourished all kinds of quacks whose “surgery” often went no further than making an opening on a patient’s scalp, just as medicine men and shamans had done thousands of years before them.

Plastic surgery advanced with the work of surgeons like Gaspare Tagliacozzi, who perfected rhinoplasty, and, thanks to the writings of Erasmus and other humanists, obstetrics also progressed, passing from the hands of midwives to the better-trained hands of barber-surgeons and physicians.

And so, you have met perhaps the five greatest figures among the great
Renaissance medical men who symbolized the new philosophical thinking of that wonderful era. You have met Fracastoro and Paracelsus, symbols of the revolution in medical thought, representatives of great new concepts, of an antidogmatic approach to medicine and a dynamic pathology; and you know Johann Weyer, who initiated the revolution in psychiatry; and Paré, who represented the new conservative and empirical approach in surgery; and Vesalius, who represented the “new look” in anatomy.

ARTISTS AND ANATOMISTS: TO DISCOVER AND TO SURVIVE

Now that we have reviewed the medical panorama of the Renaissance, let us return to Vesalius. To understand fully Vesalius’ artistic conception of anatomy, you must first realize that he lived in times when not only artists but even men of arms and mere adventurers were deeply interested in the human form.

Historically, the Renaissance was also a period of violence, an aggressive, cruel period, fed by political and amorous intrigues. People thought nothing of using sword or dagger to fulfill their ambitions or attain their desires. Machiavelli justified murder in his writings. Benvenuto Cellini, in his *Life*, boasted of his innumerable crimes that stained the streets of Rome with blood. The Borgias used terror as their principal weapon. A way of life that commands to kill or be killed naturally awakens a sharp interest in the human body. Every muscle and every movement of the body suddenly acquires a vital importance, for they can mean life or death.

This interest in every part of the body, in its multiple bones, muscles, tendons, and ligaments, is vividly reflected in the paintings of Verrocchio, Raphael, Titian, Pieter Brueghel, Albrecht Dürer, Cellini, and, above all, in the paintings and sculptures of that giant of the Renaissance, Michelangelo. I myself stood awestruck before his “Moses,” at the church of San Pietro di Vincoli in Rome. Moses sits in absolute immobility, and yet the power exuded by his immobile muscles is frightening. This colossal statue so impressed Sigmund Freud that he made a very interesting psychoanalysis of it. Even in Michelangelo’s paintings for the Sistine Chapel we see angels that look like men, and even his Christs are power-
ful athletic giants. Michelangelo, like many of the other artists of his time, did many dissections of the human body, and his knowledge of anatomy is evident in his colossi in athletic poses and in all the other work he did.

AND LEONARDO

Precursor of Vesalius was Leonardo da Vinci, probably the most creative genius the world has ever known. (I would place Aristotle and Goethe with him.) Besides being a great artist, da Vinci was equally versed in medicine, biology, politics, warfare, music, engineering, and philosophy. He did more than 1500 anatomical drawings, among them some magnificent studies of the fetus inside the womb and his famous study of human intercourse, in which the anatomy is wrong but the design is masterful. Leonardo paved the way for Vesalius' epic achievements.

We left Vesalius at the moment when he was made a physician. It is time to return to him and witness his hour of glory.

THE FABRICA

In 1538 Vesalius, impatient with the anatomical errors made by Galen, decided to write and illustrate his own anatomy, based on dissections not of monkeys but of men. And so he embarked on his famous project, the compilation of the Fabrica. It took him nearly five years to complete this book. For the first time, someone looked at anatomy with new, rebellious eyes. Until then people had been intrigued only by the origin of the organs in the human body; Vesalius was intrigued by the design of the organs, muscles, and bones. As the title of his book, Fabrica, indicates, he was interested in the "workings" of the human body, all of which, he felt, were closely integrated and each of which was a vital part of the whole magnificent unit, the human body. Vesalius not only knew more anatomy than anyone else before him, but he also knew it better and in a different way. In the Fabrica he did more than just correct Galen's anatomical errors; he actually started a revolution in the teaching of medicine. With the help of the painter, Jan Stephan Calcar, he did his famous tabulae or illustrations, in which he introduced the
concept of living anatomy, dealing a death blow to the dogmatic anatomy of the past. The corpses were hung from ropes and straps in living positions, against a background of lovely landscapes borrowed from the outskirts of Padua.

After the illustrations—more than 300—were finished, Vesalius had woodcuts made, loaded them on mules together with the huge manuscript of the book, and sent them with a merchant across the Alps to Switzerland. There, in Basel, in 1543, the Fabrica was printed by Johannes Oporinus, the most famous Swiss printer of the time.

A beautiful book of more than 600 pages, printed in Latin, the Fabrica was destined to be the greatest medical book ever published. The muscular men of the Fabrica, in their lifelike positions in different stages of dissection, remain to this day strangely beautiful. There is a great dignity to them, and yet there is also a strong, pleading quality about them, as if they had ripped their bodies open in a mute sign of appeal to some invisible deity.

Having at twenty-eight years of age left an indelible mark on the face of medical history, Vesalius, attacked by the Galenists and opposed in other quarters for his revolutionary ideas, resigned his chair at Padua and went to Spain, where he became physician to Emperor Charles V and later to King Philip II. Little is known about his life in Spain. At the age of fifty he went on a pilgrimage to the Holy Sepulchre, and on the return journey his ship was wrecked off the Mediterranean coast, and Vesalius met his death and was buried in the isle of Zante.

THE RENAISSANCE REVOLUTIONS

We have reached the end of our swift cavalcade through the Renaissance. In recapitulation, we have seen Calcar’s drawing for the title page of the Fabrica, whose story I have tried to tell you, which symbolizes everything that happened in medicine in the Renaissance. First, there was the Vesalian revolution in anatomy, which initiated the “new look” in anatomy, the conception of the human body as a “fabrica,” as an architectural structure. Second, there was Paré’s revolution in surgery, which initiated a humane approach to surgery and helped the patient to recovery, instead of making it more painful and difficult. Third was
THE SMILE OF THE REBEL

Fracastoro’s and Paracelsus’ revolution in internal medicine, which initiated a new dynamic pathology. And fourth was Weyer’s revolution in psychiatry, which regarded mental patients with hallucinations as patients instead of as witches.

THE SMILE OF VESALIUS

At the beginning of our story we mentioned Vesalius’ challenging smile. Vesalius was not afraid to challenge the world around him because he knew he was fighting for the truth. Great men, like Vesalius, Paré, and Paracelsus, men who struggle alone for a great cause, are like great rivers. Debris may block their waters, but it never stops them from flowing. Tenacious and undeflected, the river pursues its path, fertilizing the land and sowing life everywhere on its course to the sea.

AND THE SMILE OF MONA LISA

There is another famous smile that symbolized also the challenging spirit of another great Renaissance man—the smile of Mona Lisa, Leonardo da Vinci’s immortal masterpiece. For the controversial smile of the great lady who for four years sat for Leonardo is really the smile of the great master himself. It is the smile of the challenging spirit that characterized the Renaissance itself. It is the smile of all “the great doctors” and the great artists of the Renaissance, whose hearts and minds were bathed in light, a light that kindled the dawn of the Modern Age, illuminating the landscape of beauty that is Art and the landscape of truth that is Science.
VII: THREE WINDOWS TO MEDICAL HISTORY

Experimenters, Teachers, and Theoreticians (Medicine in the Baroque, Enlightenment, and Romanticism Ages)

We shall now open three windows looking out into three very interesting periods in the history of mankind: the seventeenth century, or the Baroque Age; the eighteenth century, or the Age of Enlightenment; and the nineteenth century, which comprised two periods: Romanticism and Positivistic Naturalism.

The panorama presented by these three centuries is too vast, the figures that populate it are too numerous and too active, for us to encompass it all. Instead, we shall look out the three windows and focus our attention on one single vignette in each century depicting various moments in the lives of three men, each one of whom symbolizes his time and the place in which he lived.

The first vignette presents the discoverer of the circulation of the blood, William Harvey, as an English medical student in Padua one summer morning in 1598, when the Baroque Age was beginning. The
second vignette depicts an afternoon in Amsterdam, in mid-eighteenth century, the Age of Enlightenment, with the great Dutch clinical teacher Hermann Boerhaave. The third vignette recounts an evening in Paris, late in the nineteenth century, when Naturalism, spurred by the great French investigator Claude Bernard, was in full swing. The endeavors and achievements of these three men should give us an adequate idea of the progress made by medicine in each of those periods.

THE BAROQUE AGE

In the seventeenth century, the Baroque Age, the political history of mankind involved a constant effort at adaptation to a new order of things. New universal religions blossomed, and new horizons opened up overseas. The printing press facilitated communication among nations, while horse-driven vehicles increased communication among towns. The mariner's compass was now sweeping away formerly insurmountable barriers, just as gunpowder not too long before had swept away feudalism and local frontiers. Nations turned Protestant in religion and Republican in government. The flight to Plymouth of a handful of Puritans in the Mayflower was to culminate in the foundation of the greatest world democracy—the United States of America.

Scientific academies prospered everywhere. The first medical journal made its appearance in Paris. It was the glittering time of Shakespeare, Cervantes, El Greco, Velázquez, Rubens, and Rembrandt. Germany was weakened by the Thirty Years' War. Holland, Sweden, and France were growing stronger. The economic and social structures of the Baroque Age were founded on the development of individual effort and on the advancement of the middle classes. Polemics and wars raged between the Reformation and Counter-reformation. Great philosophers, such as Descartes, Francis Bacon, and others, stressed the value of the experimental method in science. With the wane of Spanish power, the French and the English struggled to become the dominant power in Europe. History began to be truly universal.

MOTION AND EMOTION

The art of the period was Baroque, a term derived, via Spanish and
Portuguese, from the Arabic word *buraq*, originally used by jewelers to describe irregularly shaped pearls. Baroque art was characterized by profuse curves and contorted forms expressive of great movement and emotion. Baroque art came close to the flamboyant Gothic style of the fifteenth century, in which curves were preferred to straight lines, since the former were held to be more dynamic. Initiated in Italy by painters like Caravaggio and architects like Bernini, the Baroque style had many great followers in all countries: Rubens and Van Dyck in Flanders; Frans Hals in Holland; El Greco, Velázquez, and Murillo in Spain—to mention only a few. Artists, seeing with new eyes the world around them, broke away from rigid forms and eliminated sharp contrasts by means of chiaroscuro.

Parallel to this trend in the arts, medicine also became concerned mostly with morphology and motion. The same trends toward dynamic motion, emotional expression, and profuse ornamentation that prevailed in art, trends born out of rebellion against the preceding classical austerity in art and religious stringency, were reflected in medicine, turning Vesalius' static anatomy and Paracelsus' mystical nosology into something dynamic and rational.

**THE AGE OF MEASUREMENT**

The descriptive universe of Copernicus was replaced by the dynamic world of motion of Kepler, Galileo, and Newton. This was the beginning of modern physics. Alchemy reached the status of modern chemistry with the research work of the English scientist, Robert Boyle; and biology was organized on the basis of descriptive anatomy and embryology. The Baroque Age was also an age of measurement. Interest in the quality of nature and in the elements of the world was replaced by interest in the quantity of nature and in the dimensions of the world. Science ceased being qualitative and mystical and became quantitative and rational with the work of three men: Bacon, who considered form as purely empirical; Galileo, who considered science as mathematical reasoning; and Descartes, who considered it as metaphysical rationalism and who established the scientific value of doubt, the dichotomy between soma and psyche, and the mechanistic notion of the human machine.
“SPECIALIZED” ANATOMY

Under the impact of Vesalius’ work, “specialized” anatomy made considerable advances. Great progress was being made everywhere: Francis Glisson’s studies on the liver; Wirsung’s studies on the pancreatic duct; Stensen’s work on the parotid gland—to mention only a few. Vesalius’ static Fabrica was set in motion. General motion in space was replaced by local motion with the study of blood vessels and secretory glands, the basis of modern physiology. The sceptre of education passed from Padua to Leyden. The Italian, Francesco Redi, in opposition to the old Galenic etiology, introduced a new concept: contagium animatum. A great anatomico-clinical monument was born in this period: the famous book, Sepulchretum, by Theophilus Bonet, of Geneva, which contained more than 3000 clinical case records.

MORNING IN PADUA

It is in this exciting atmosphere that we first meet in Padua in 1598 a young English student, William Harvey. In this period, Padua unfolded like a flower before the eyes, wide with curiosity and wonder, of students from all of Europe. From England and Germany, Switzerland and Spain, France and the Low Countries, from places all over the world, the students came in large, noisy flocks, many of them on foot, with capes threadbare, shoes battered and dusty; others had gorgeous plumes on their hats, gilded carriages, and servants. But one and all had the same craving for knowledge and adventure, and Padua, for three centuries the purest and brightest beacon of cultural light in Europe, had beckoned to all alike.

Padua then had narrow, unpaved streets that seethed with noisy, gesticulating crowds. Houses were low-roofed and often had no glass in the windows. But at night Padua acquired some of the enchantment of neighboring Venice. The stars atop the sleeping campaniles poured their glittering dust over silent roofs and dark quiet streets. Furtive figures, cloaked in the darkness of night, scampered silently down the winding alleys in search of adventure. Now and then, a blazing torch, held high by an invisible hand, cast dancing shadows over the pavement and the walls.
A CLASS IN THE ANATOMICAL THEATRE

The students felt so very fortunate to be in Padua. The town, with bells chiming lightly through the air, looked always festive and gay and made young blood run warmer in the veins. And so, the students, in gay, noisy bands, in the morning clambered up the university stairs and went into the anatomical theatre.

I visited the ancient anatomical theatre not too long ago, and I still recall my emotion at seeing the small hall, barely twenty-five by thirty-five feet, in which students must have crowded in great discomfort. The small oval pit is surrounded by six ascending galleries as narrow as those of a provincial Spanish bull ring. Students must have stood on tiptoe and stretched their necks to the aching point to catch a glimpse of the dissecting table through the beplumed hats of those in front of them.

Now let us return to the students on the morning of our story. At least three hundred of them, perhaps more, elbowed, nudged, and jostled one another, vainly trying to repress their restlessness and discomfort while waiting for the dissection to begin. Impatient voices and shuffling feet echoed loudly in the hollow wooden box that was the anatomical theatre. The window curtains were suddenly drawn and darkness descended upon the theatre. Two four-candled candelabra and eight single candles were lit and held aloft by students. Shadows capered on the naked walls. The air smelled of sweat, the old leather of boots and scabbards, and the dead flesh of the body to be dissected.

The entrance of the academic dignitaries was greeted with solemn silence. The directors of the University occupied seats at one end of the dissecting table, the professors lined up behind them, though many of them, for lack of space, were forced to stand in the empty, open space underneath the first tier of benches. The councillors of the various nations (as the groups of foreign students were called) occupied the first tier, and behind and above them the students crowded into a human pyramid. At the other end of the dissecting table sat the massarii or anatomists.

The school was authorized to dissect only two corpses a year, one male and one female, but often bodies stolen from cemeteries were dissected.

The entrance of the teacher, Fabricius ab Aquapendente, always cre-
ated a moment of drama. The wooden door squeaked like a soul in agony and all eyes immediately turned to it in expectation. Candlelight flickered over the small dark man dressed in black, whose reputation was as great as his bad temper. So widespread was Fabricius' reputation that even tailors, cobblers, butchers, shopkeepers, and street peddlers fought to watch Fabricius dissecting. Fabricius, his sallow visage almost wax-like, took his place by the dissecting table and, looking at no one, with deft hands, already bejeweled with the rubies of gout, quickly cut open the body. The flickering candlelight, like the tongue of a compassionate dog, licked the gaping flesh.

WATCH UNDER THE STARS: WILLIAM HARVEY AND GALILEO

On the tier occupied by the English natio, a young man of twenty intently watched the master's experienced hands. Short, dark, with shining black eyes, the young man looked like a Spaniard. His name was William Harvey.

Born in Folkestone, Kent, the eldest of seven sons of the Mayor of Folkestone, young Harvey went to grammar school in Canterbury (where Chaucer's winged fantasies still lingered) in the years when the skies of England echoed with gunbursts of victory over the Invincible Armada. Later, he entered Caius College, Cambridge, after which he went to Italy, attracted by the giants of anatomy and science: Vesalius, Colombo, Fabricius, Casserio, Galileo, Sanctorius, and many others.

When Harvey arrived in Padua, the air was charged with the nova scienza. Fifty-four years earlier, Vesalius' Fabrica had burst like a rocket on the horizon. The illustrations by Calcar for the Fabrica were great windows of light opening on to a new anatomy.

Harvey learned from Fabricius of the existence of the venous valves, first described by Fabricius in his little book, De venarum ostiolis. And Harvey was in Padua when Fabricius published his first physiological work on the formation of the chick in the egg and of the human embryo. To the impact of Fabricius' teachings on Harvey must be added that of Galileo's work, which initiated modern physics and the science of dynamics. Harvey was a pupil of Galileo. Surely of an evening he must have called on his master, craving an opportunity to look through Gali-
leo's telescope at the stars, winking like the eyes of countless celestial cats in the skies of Padua? From Galileo he learned about the movement of the stars and the heavenly bodies. Above all, Harvey was exposed in Padua to the feeling of dynamic change that seethed throughout the transition period between the Renaissance and the Baroque.

THE BLOOD-CIRCULATION CONTROVERSY

Speculation about the circulation of the blood was at its height at that time. The old Galenic theory still prevailed: as revealed by dissection, there were two vascular systems—one, the venous, was full of blood which, it was assumed, was produced in the liver; the other, the arterial, was always found empty and therefore must serve to distribute a vital force throughout the body. But the Spaniard, Michael Servetus, had already described the lesser or pulmonary circulation; and six years after Servetus' death, the Italian, Realdo Colombo, one of Vesalius' successors at Padua, described, on the basis of experiments with live animals, the passage of the blood from the right to the left ventricle and its change of color in the lungs. Colombo's work was followed by the work of Gabriel Fallopius and later by that of Fabricius. But before Fabricius, one Andrea Cesalpino came very close to the truth when he asserted that the heart, not the liver, as Galen had said, was the central organ of the vascular system. Cesalpino demonstrated that the blood moves, was the first to use the word *circulatio*, and wrote that the movement of the blood is continuous from the veins to the heart and from the heart to the arteries.

SHAKESPEARE'S LONDON

Imbued with all these ideas, full of dreams and the desire to fulfill his destiny, in 1602 Harvey said goodbye to exciting Padua and returned to England. Back in England, he found a changed London, the early seventeenth-century London. Although Baroque art had failed to grow deep roots in England, its main characteristics—over-ornamentation, over-emotionalism, and an effect of great motion—were reflected in the literary work of such English writers as Browne, Bunyan, Milton, Lovelace, and Shakespeare.
Harvey in the same year of his return revalidated his title of Doctor in Physic at Cambridge, joined the Royal College of Physicians, got married, and began a quiet life of work and study.

These were for England great years, rich in achievement and creation. Under the peaceful reign of James I, English genius flourished everywhere, industries prospered, and the empire expanded rapidly overseas. It was the era of iron men and wooden ships. It was also the era of great writers. At the Rose, the Swan, and the Globe theatres, Shakespeare’s plays, which were as Aristotelian as Harvey’s own work, often resounded with the words “blood” and “heart.”

In this atmosphere Harvey launched on his life’s great endeavor. His mental chemistry must have reflected the dynamic spirit of the times. The new animated view of nature and life must have inspired him to leap from Vesalius’ static anatomy to that *anatomia animata* which today is called physiology. It may also have inspired his embryologic discoveries, which were simply another form of creating animate anatomy in time, even as his physiology did in space.

Harvey started his experiments on the movement of the blood “in space” and investigated the two movements that persisted in the human being from birth till death: the pulse and respiration. He used only his senses and some 80 different animals, which he vivisected, studying the heartbeat *in vivo*, trying to determine how much blood was pumped by the heart during systole. This question in itself was a stroke of genius, finally leading him to the conclusion that all the blood in the body could not possibly come from food, that it could not be replenished hour after hour, and that it certainly could not just remain in the tissues. There could only be one answer, he deduced: the blood flowed from the heart to the arteries and thence back to the heart through the veins. There only remained for him to demonstrate this. All this Harvey discovered simply by observation, reasoning, and experimentation, a method that ever since has served as a model for all research.

**THE FATEFUL LECTURE**

One April morning, in the year 1616, William Harvey, dressed in black, with a pale face reminiscent of Shakespeare’s, long hair, a long
mustache, and a pointed beard, his eyes like two black diamonds, the
sparkle of which Van Dyck would later capture in a portrait, gave his
first Lumleian Lecture before the College of Physicians in London, in
which he announced that the blood moved and that it moved in a circle.

AFTER HARVEY

William Harvey’s achievement was a perfect symbol of the inquisitive
spirit of the Baroque. After Harvey, there grew the desire to discover the
intrinsic texture of things invisible to the naked eye. Fabricius and Fal-
lopius had replaced the Galenic humors by the concept of the “fiber” as
the basic unit of the body. The microscope, invented possibly by Janssen,
a Dutch lensmaker, and rediscovered by Galileo, was put to great use by
Malpighi, originator of microscopic anatomy, who described the capil-
lary circulation and red blood cells (he introduced the term “cell”)
though he mistook them for fat cells. A merchant of Delft named Leeu-
wenhoek, one of the greatest of the first microscopists, constructed hun-
dreds of microscopes and dedicated his life to studying the structure of
minute plants and animals, while at the same time his neighbor, Ver-
meer, the painter, was imprisoning in his magnificent paintings the mi-
ute details of everyday life. This is an excellent example of how in history
concern with one thing (in this case the minute) can become dominant
even in unrelated fields.

Others helped to demote the liver from the important place it had in
the Galenic system. One of these was Pecquet, who described the lym-
phatic circulation (first discovered by Gaspare Aselli), showing that the
lymph—with the blood one of the two principal fluids of the human
body—circulated through special vessels and never entered the liver.

THE MEDICAL SECTS: THE BODY AS MACHINE OR LABORATORY

Three schools were outstanding in clinical medicine in the Baroque:
the iatrophysicists, the iatrochemists, and the systematists. For the iatro-
physicists, like Redi (who disproved the myth of “spontaneous gener-
ation”), Borelli, Bagliivi, and Sanctorius, the human body was a machine;
and pathology, a matter of tension of the fibers and density of the organic
humors. For the iatrochemists, the body was a laboratory; and organic
movement, the result of chemical ferments. Their leader was the Belgian mystic, van Helmont, who ascribed pathologic processes to the diseased organs and considered water a substratum of the body. His therapy of small doses of plant tinctures was a healthy reaction against the barbarous horse-doctoring of the age. His work was completed by Franciscus de le Boë, otherwise known as Sylvius, and by Thomas Willis, who described the vascular ring at the base of the brain, since then known as the “circle of Willis.”

RETURN TO COMMON SENSE: SYDENHAM

The systematists were represented by Thomas Sydenham, who served as captain with Cromwell’s Roundheads, just as Harvey served with the King’s Men. Sydenham was a good, kind man in the best Hippocratic tradition. He shut his textbooks and opened his eyes to the patient, thus restoring Hippocratic concepts. His clinical case records are masterpieces. He used naturalistic remedies and described various morbid species as painstakingly as a botanist classifies his plants.

Sydenham recommended the application of common sense in medicine, clinical observation, the treatment of the whole patient, and the study of particular diseases instead of disease in general, of syndromes rather than of patients. This was the beginning of diagnosis of one definite sickness in the patient. Sydenham also divided diseases into acute, “caused by God,” which could be biological or animal (called today epidemiological), and chronic, “caused by ourselves,” which could be biographical or human (called today psychosomatic). His motto was: “I regard myself as answerable to God for the care of my patients.”

NEW DRUGS AND OLD EPIDEMICS

Therapeutics in the Baroque were at a standstill, though cinchona was imported in large quantities from Peru. Surgery remained in the hands of barbers and made a modest progress. Clysters, bleeding, and purges were stand-bys for most physicians, whose pompous hats, black robes, scarlet heels, and powdered wigs aroused Molière to ridicule them. Barber-surgeons gradually formed a guild, while surgeons were assimilated into the medical profession and allowed to wear “long robes.”
Epidemics were rampant, among them the Great Plague of London, described in Daniel Defoe's *Journal of the Plague Year* and in Samuel Pepys' *Diary*, and the plague in Italy, described by Manzoni in his novel, *I Promessi Sposi*. Academies flourished everywhere: the Accademia dei Lincei in Rome, Accademia del Cimento in Florence, the Royal Society in London, the Académie des Sciences in Paris, the Collegium Naturae Curiosorum in Halle.

**THE PILGRIM'S PROGRESS**

The greatest historical event during the Baroque period was the voyage of the English Pilgrim Fathers, in the *Mayflower* (1620), and their settlement in the New World, marking the beginning of American medicine. Prior to the arrival of the Puritans, the Indians had practiced shamanistic medicine. The conquistadors had brought Spanish culture to the continent, founding the first university of the New World in Mexico in 1553 and the first chair of medicine in 1580. The first medical book, by Francisco Bravo, was published in 1570, and in 1551 the first degree of doctor in medicine in America was granted in Peru.

Almost half of the first Puritan settlers died within three months after disembarking from the *Mayflower*, mostly from famine, smallpox, and typhus. They had no physicians, only a handful of surgeons. Medicine was in the hands of the clergy. One deacon, Samuel Fuller, functioned for many years as a physician. Another cleric, Thomas Thacher, issued the first American medical publication on smallpox, and a parson-physician, Cotton Mather, introduced vaccination. Such was the origin of what eventually became the glorious American Medicine. Man searched everywhere for new marvels. Sir Thomas Browne, the English humanist-physician, in his memorable *Religio medici* wrote memorable words that might have been an answer to man's search: "All the wonders we seek without us are within us."

**SUNSET IN LEYDEN**

In the city of Leyden in Holland, in the middle of the eighteenth century, every evening, at the magic hour of sunset, a man cloaked in dark velvet could be seen promenading through the university's botanical
gardens, which he himself had created. This man was Hermann Boerhaave, the Dutch Hippocrates, epitome of the Age of Enlightenment, so beloved by his townspeople that on one occasion, when it was announced that he had just recovered from an extremely severe attack of gout, the whole city of Leyden officially celebrated the event with popular festivities and splendid illuminations.

The extraordinary thing is that Boerhaave himself contributed nothing new to medicine. And yet patients came to consult him from all over the world, including China. There is a story that a letter from China addressed to “Dr. Boerhaave, Europe,” was promptly delivered. But if Boerhaave contributed nothing to medicine in the way of discoveries, new methods, techniques, instruments, or medical literature, he distinguished himself as one of the most extraordinary medical teachers of all times. So great was his personality that the center of medical learning shifted from the Italian universities to the School of Leyden.

THE GREAT BOERHAAVE

At the time we meet Boerhaave he was at the height of his career, a middle-aged man with a kind, pensive face. Far away were the days when he had studied theology, for, like many other students of his time, he had been attracted to both medicine and the ministry. But a philosophical dispute regarding Spinoza, whose side he took, and its resultant ostracism, made Boerhaave realize how impossible it was to reconcile the two professions. He therefore gave up theology and entered medical school.

He started practice in Leyden, and success came to him soon. In winter he taught chemistry and, later, clinical medicine; in summer he taught botany in his own botanical gardens. He could lecture on hundreds of plants from memory, and yet prior to his appointment to the chair of botany he knew nothing about botany. His lectures drew students from all over Europe and even America. He alone trained more than half the physicians in Europe, and he did it with only the twelve beds that had been allotted to him in an old hospital in Leyden.

Aside from his masterly clinical histories, academic addresses, and works on botany, Boerhaave wrote only two small treatises on clinical descriptions and aphorisms. But his extraordinary personality turned
Leyden into the cradle of modern medical instruction, where attention was focused on the patient's clinical case history, on his condition, and on the clinical diagnosis of his disease. Boerhaave's magnetic personality and exceptional bedside manner and powers of observation, together with his professional integrity, turned every single examination of a patient into a magnificent demonstration of how medicine ought to be practiced—with an inquiring scientific mind, but also with human kindness. The scores of students that attended his classes were as devoted to him as the scores of patients that crowded into his waiting room.

BOERHAAVE'S DAYS

Boerhaave's days were fully occupied by his private life, bedside visits, lectures, and correspondence with physicians from all over the world. But the severe attacks of gout from which he suffered finally forced him to retire before his time. At the age of seventy he died of heart failure. His grave is preserved at the Church of St. Peter in Leyden, and his statue near the ancient hospital where he worked is wreathed in flowers whenever a congress is held in that city.

Mechanistic in theories, Boerhaave believed the body was composed of "solids" and "fluids," represented by salts, spirits, water, and so on. He introduced structural elements, namely, fibers and vessels, and explained the motion of the body by the laws of mechanics and hydrostatics. According to him, the substance of the brain created the intangible nervous spirit. He also established the dangers inherent in high temperatures and laid the foundations for the treatment of fever by cooling the patient. He established the pathographic canon—still in force today—comprising: examination of the patient, his clinical case history, tentative diagnosis, study of the evolution of the disease, and, in some cases, necropsy. His method of treatment made of the physician a minister of nature, whose mission was to preserve life by means of diet and cardiotonics, plus eliminative medication to remove the cause of the disease. Like his famous predecessor of forty years earlier, Sylvius, he liked to teach at the patient's bedside. To him the patient meant more than the disease.

Despite all his theories, Boerhaave above all men revered the figure
of Sydenham, who was a non-theorist himself. Later, Boerhaave in turn would be worshiped by Albrecht von Haller, his most famous pupil, who called Boerhaave the highest medical master of all Europe, just as Osler later called him a "medical Goethe." Another physician Boerhaave held in high esteem, to whom he sent numerous books for research purposes, was Richard Mead, the second of the famous line of British physicians who successively inherited a gold-headed cane (in those days a fashionable appendage of the profession) originally carried by John Radcliffe and today preserved at the Royal College of Physicians in London. Mead investigated inoculation, which had been imported from China in the form of variolation by Lady Mary Wortley Montagu.

Worshiped by all, Boerhaave was indeed a front-rank intellect, independent, generous in disposition, smartly dressed and attractive in appearance, and learned in discourse. One single glance at the portrait of this man, standing by the window in the peaceful Leyden sunset, is enough to make one realize that his mere presence must have been of more value to his patients than all prescriptions. His countenance is a reflection of his ruling principle that simplicity is the token of truth.

THE EIGHTEENTH-CENTURY CONFLICTS

Eighteenth-century Europe was rent by political and religious struggles. The invention of the printing press and the production of maps had fostered navigation and communication. The dominant philosophy, under the influence of Voltaire, was founded on reason, and experimentation was based on invention rather than on verification. Scientific life was centered in academies and universities and around scientific journals; remarkable progress was made in the natural sciences; physics adopted rational mechanics; and a new force, electricity, studied by Gilbert, Franklin, Galvani, and Volta, revolutionized the world. Modern chemistry was born with the discovery of oxygen and the work of Black, Priestley, and Scheele. Lavoisier discovered the analogy between combustion and hematology. Biology marched forward with the work of Linnaeus, Buffon, and Erasmus Darwin.

In medicine, this was an age fertile in theories and systems that vied with one another. Leading among these theories was Georg Stahl's
“animism,” which accepted the “anima” or soul as the supreme principle of life, source of all vital movement, regulator of all the functions of the body. The anima prevented the putrefaction of the body that comes at death, when the anima no longer exists. As you can see, the anima was not too different from the ancient *pneuma* or *physis* or Paracelsus’ own *archaeus*.

Other theorists, contemporaries or followers of Stahl, such as Frederic Hoffmann, based their own systems also on a mysterious force which they called by different names. To the “vitalists,” later in the eighteenth century, it was a “vital principle” that was the source of all vital phenomena. Hoffmann, a successful colleague of Stahl at the University of Halle, called it “ether,” alleging that this mysterious force was transmitted by the nerves, responsible for all movement in life, and the cause of atony or hypertonia when its nature suffered any disturbance.

HALLER, THE GREAT

The eighteenth century had an impressive list of medical titans. Outstanding among these was the Swiss, Albrecht von Haller, a great savant and linguist and an incredibly prolific writer. The gigantic mass of material he wrote in his life included more than 2000 scientific papers, numerous articles on poetry, medicine, physiology, botany, philosophy, and religion, any number of books, including four historical novels, and more than 14,000 letters to the great and the near great of his time. Though he was a strict Roman Catholic, he corresponded with rakes like Casanova and atheists like Voltaire. He made of the University of Göttingen, where he taught for seventeen years, the first modern university and center of research in the world. He established irritability as a specific property of the muscles and sensibility as the exclusive property of the nerves, and maintained that life was the specific property of living matter.

THE OLD SCHOOL OF VIENNA

Three schools of medicine reaped the harvest of Leyden: the old Vienna school, the Edinburgh Medical School, and the English school. The old Vienna school was founded, under the aegis of Empress Maria
Theresa, by one of Boerhaave’s most eminent pupils, the Dutch Gerhard van Swieten, who organized the medical faculty and set up clinics and libraries. His work was supplemented by another Boerhaave pupil, Anton de Haen.

At about the same time, in Vienna, Leopold Auenbrugger, physician and part-time musician, after watching his father ascertain wine levels by tapping the casks, began to diagnose chest ailments by tapping the chest and listening to the echoes. His discovery brought no reward in his lifetime, though recognition was granted him later, thanks to Laënnec and to Napoleon’s physician, Jean Nicholas Corvisart, who introduced modern surgical techniques in France, reintroduced Auenbrugger’s percussion method, and, despite being rejected for the post of physician to the Necker Hospital because of his refusal to wear the wig *de rigeur*, became medical director of the Charité in Paris.

A GALLERY OF THE DEAD

Anatomy at this time was based on the comparative study of morphology, proceeding from Fallopius’ “texture” to Bichat’s “tissue,” and from animism to vitalism. Among the great anatomists of this period were Morgagni, Jakob Benignus Winslow, Antonio Scarpa, the brothers Monro, and Antonio de Gimbernat.

Pathological anatomy made great progress with Morgagni, who at the age of eighty published five volumes comprising seventy personal letters to colleagues, correspondence being then the only means of spreading knowledge, since there were no medical journals. This great work of Morgagni is like a necropsic parade, comprising over seven hundred cases which he studied throughout his long life, a veritable gallery of the dead which included rogues, maids, prostitutes, princes, and bishops. Morgagni proved that each disease has its seat in a specific organ, and was the first to classify diseases as anatomicopathological entities. Pathological anatomy thus became a dynamic process, since disease was a process in motion, in contrast to normal anatomy, which was static.

In public health, the outstanding figure was Johann Peter Frank, self-appointed advisor to kings and emperors on how to protect the people’s health, a reformer but not a revolutionary, who believed in state “health
police" to control the hygiene of the people at large, even deciding when people should go home after an evening of waltzes!

THE RISE OF SPECIALTIES

Specialties began to rise on the horizon, among them cardiology, hematology, pediatrics (the latter impelled by the interest in children created by Rousseau and Pestalozzi), and, toward the end of the eighteenth century, psychiatry, stimulated among others by Pinel, superintendent of the Bicêtre Hospital for the insane in Paris. Pinel tried to turn diagnosis into an exact science, but his chief claim to glory lies in his having actively participated in the Revolutionary Convention for the Rights of Man, which ultimately granted insane persons freedom from chains.

VAMPIRISM AND BRUNONISM

Meantime, therapeutic methods adhered to traditional lines, based mainly on diet, bleeding, purges, and clysters. Fashionable ladies, like Madame de Maintenon and Ninon de Lenclos, thought nothing of submitting to such eliminative treatments even while they attended the theatre. Phlebotomy was so fashionable that it became a true form of vampirism, and whole countries, like France, were practically bled to death. Physicians became famous for devising horrendous things, like the *louisine* or *guillotine*, perfected by Joseph Ignace Guillotin and Antoine Louis, one of the most efficient killing machines ever invented by man.

Across the English Channel, on British soil, there arose a man, the Scotsman John Hunter, who though he never graduated or had formal training as a physician became a colossus in anatomy and surgery. In his country house he kept hundreds of animals, from fishes and birds to leopards and buffaloes, for the study of comparative anatomy, and in his own private museum he collected nearly 14,000 anatomical specimens of animals. He united anatomy, medicine, and surgery on a foundation of experimental and biological learning, and as such he was the founder of surgical pathology.

The now dominant system of "vitalism" had reached its full expression with Bordeu, Barthez, and others in France, and in Scotland with Wil-
liam Cullen, whose neuropathology distinguished as the chief property of life the nervous tone of the solid parts, which if disturbed caused disease.

This concept was opposed by another Scotsman, John Brown, a parson and school master of dubious habits, who turned his attention to medicine and developed the concept that the fundamental quality on which the phenomena of life depended was excitability, which mobilized organic energy, and that an excess or a deficiency in excitability caused diseases, which should be treated by the drastic contraria contrariis therapy. It has been said that the “Brunonian System,” which received the approval of the National Revolutionary Convention in France, destroyed more lives than the French Revolution and the Napoleonic wars together. Brown himself succumbed to it when he took an overdose of laudanum.

MESMERISM AND HOMEOPATHY

Two other “curative” systems, based mainly on the powers of suggestion, were mesmerism and homeopathy.

Viennese Franz Anton Mesmer, a friend of Mozart, claimed that the universe was full of magnetic fluids that could be mobilized by means of a magnet. In his “magnetic” chamber in Paris, assisted by soft music and handsome young men (who were beheaded later, during the French Revolution), Mesmer, dressed in purple cloth and his magnetic wand in hand, “treated” a great number of wealthy, sex-hungry, hysterical women.

Homeopathy was introduced by the German, Samuel Hahinemann, who, widowed at the age of eighty, married a young society woman and moved from the provinces to Paris, where he practiced medicine for another eight years and became one of the best-known physicians in the French capital. His theory was that impairment of the vital force was the cause of acute diseases, and that all diseases were of a general nature and should be treated with another disease of a similar nature and mild in form.

QUACKS, EPIDEMICS, ENEMAS

Despite the advances in medicine, superstition and quackery pros-
pered as never before, as proved by the great success of the Venetian adventurer and amateur healer, Casanova; of Cagliostro with his elixir of life; the Comte de St. Germain; and the Scotsman, James Graham, with his "Temple of Health" in London, where the high priestess was the future Lady Hamilton. Graham's temple was famous for its perfumed, musical, "celestial bed," which he claimed had electric currents that varied according to the amorous vigor displayed by the couples happily ensconced in it.

Epidemics in the meantime were ravaging Europe, where, during this century, more than sixty million persons died from smallpox. Hygiene was practically nonexistent. Women's wigs were provided with small deposits of honey and vinegar in order to engage the attention of the lice, and kings, like Louis XIV, in the words of Madame Pompadour, "stank like rotten meat."

Enemas were a highly favored therapy. Louis XIV had 2000 enemas throughout his life. Court ladies took soap or oil enemas sous-la-jupe, while sitting in their boxes listening to a concert. Bleeding was also popular. Forty-three million leeches were imported into France in one year alone. In this period of medical "vampirism" more blood was shed than during the wars of the time.

THE DISCOVERY OF VACCINATION

The greatest medical contribution of the eighteenth century was vaccination, discovered by an English country doctor, Edward Jenner, who, despite the fame that later came to him, was happy to live, practice, and die in the village of Berkeley, where he was born. It was there that he noticed that milkmaids contracted cowpox but never smallpox, which led him to inoculate a young boy with pus obtained from a milkmaid infected with cowpox. The boy developed a slight exanthema, but he did not develop smallpox when later inoculated with this disease. After a lengthy controversy, vaccination replaced Oriental variolation.

MEDICAL LIFE IN THE AMERICAN COLONIES

In the meantime, life in the American colonies had become stabilized and students were drawn to England, Scotland, or Holland to learn
medicine. Those who could not afford the trip learned medicine through apprenticeship to a practicing physician. The American physician was a surgeon from the very beginning. Physicians took home those patients requiring special attention. There were homes for the helpless, and in 1751 the first hospital was founded in Philadelphia. In all these projects a vital role was played by Benjamin Franklin, a printer of many talents who practiced the ideals of the French Encyclopedists, applied electricity to paralysis, invented the lightning conductor and bifocal lenses, collaborated in the foundation of the first American magazine, the first hospital, the first school of medicine, and the first philosophical society, and made Philadelphia the cradle of American medicine.

Among the first famous American physicians were Thomas Cadwallader, the first to teach anatomy in Philadelphia; John Morgan, founder of the School of Medicine (the first in America) of the College of Pennsylvania; William Shippen, the first to teach obstetrics in America; and Benjamin Rush, who became “the Sydenham of America.”

By 1776 the American colonies had won their independence from England and the United States of America was born, adopting the principles of the French Encyclopedists and the Rights of Man fourteen years after Rousseau had laid them down in his *Le Contrat social*. Thirteen years after the Declaration of Independence, George Washington became President and the march westward began.

America had already greatly benefited from the teachings and, above all, the example of the great Hermann Boerhaave, who from his little hospital in Leyden, Holland, had shed across the Atlantic, upon the adventurous shores of young America, the light of his wisdom and the warmth of his kindness.

**SUNSET IN THE RHONE VALLEY**

At the Sorbonne, in Paris, there is a huge painting by Lhermitte in which Claude Bernard is seen standing by his laboratory bench, giving an electric shock to the vasomotor nerves of a rabbit. His strong, dignified countenance has a noble beauty, of which Louis Pasteur made particular mention in his funeral oration in honor of the great physiologist. In his white smock, pince-nez, and knotted cravat, Claude Bernard looks
more like a being from some superior planet than like a physiologist from
this world. Claude Bernard was not just a great physiologist; he was
Physiology in person. Therein lay his greatness—and also his frailty.
We meet Claude Bernard late in the nineteenth century, at his farm in
St. Julien. He is standing near a window. The sun is setting over the
Rhone valley. Putting aside his work, with pale, tired eyes, he stares at
the crimson-splashed vineyards, source of the solemn, philosophical
Beaujolais wine. This is the moment he loves most. The day is behind,
and all day he has worked at his experiments and on his writings. Now
he can watch nature and let peace like a tender melody fill his whole
being. Slowly the melody merges with his inner harmony. And Claude
Bernard then feels that the exhaustion, the frustrations, the anguish,
which are the price of his many endeavors, are worth while, because he
is striving for a better understanding of the marvelous symphony of life,
which at that very moment is unfolding right there before his eyes, in the
glittering silver of the first stars, in the soft shadows of the land, in the
melody from crickets and frogs rising like a cloud from the dark, still
waters of the ponds in his vineyards.

THE WORLD OF CLAUDE BERNARD

Claude Bernard was born during the period of Romanticism, in the
first half of the nineteenth century. With the mortal defeat of the Na-
poleonic eagle, whose wings for so long had so arrogantly spread over
Europe, the Old World, exhausted from repeated warfare, lapsed readily
into a period of political lethargy. There had been a gradual architec-
tural rebirth in France. Rebuilt by Napoleon III, Paris was now a proud
metropolis, with magnificent sweeping avenues, set amidst a fine tap-
astery of parks and towering sculptured monuments. Further to the east,
Nicholas I and the Russians were casting envious glances at Istanbul, the
mosque-studded city coveted by all nations down the centuries. France's
former dream of setting up a universal monarchy had now been ex-
ploded. The European nations now strove for a system of opposite equal
forces in a state of equilibrium, the so-called “balance of power” estab-
lished at the Congress of Vienna by Metternich and other diplomats.
This "dancing congress" of Vienna gathered more than one hundred crowned heads from all over Europe. Monarchs, as a contemporary diplomat remarked, watched one another grow fatter and fatter now that Napoleon could no longer disturb them. This balance of power endured with only slight modifications until the outbreak of World War I. During this time, Britain and France aided Turkey against Russia, Italy became consolidated into a single kingdom, the Franco-Prussian war saw the defeat of France, and Germany formed a unified empire. The last quarter of the nineteenth century was a period of comparative quiet and stability in Europe, while the British empire spread from Canada and India to Africa. On the American continent, the Latin American countries marched victoriously toward independence, and the United States, after the horrors of the Civil War, emerged a powerful, democratic nation.

Positivistic philosophy prevailed in France, and naturalistic philosophy, an outgrowth of Romanticism, was popular in Germany. The industrial revolution was on the way. Technical inventions multiplied rapidly, among them the steamboat, the locomotive, the automobile, the telephone, radio-telegraphy, and motion pictures.

FROM "PARTS" TO TISSUES

In medicine, the leadership of the French school was established. Modern histology and topographical anatomy were founded in Paris by Xavier Bichat, who in one winter session alone dissected six hundred corpses. For Bichat, disease had its seat not in the organs in general, but in one particular organ. He held that life was a "complex of functions which resisted death," consisting of vital force, reaction, and resistance. Thus medical theory progressed from Galen's "single parts," Fallopio's "textures," Fabricius' ordimento, the "fibers" of the Baroque, and Boredeu's "mucous tissues," to the tissues of Bichat as the basic unit in the living being.

THE CELL THEORY

The success of the microscope had led to the development of the cell theory, conceived by Schleiden and Schwann, whose work was com-
pleted by Henle and Remak. Physiology in France took root from Bichat's vitalism, and extraordinary progress was made in circulatory and respiratory physiology and the physiology of the senses. The romantic speculations of naturalistic philosophy were finally replaced by a genuine mensurational and practical examination of nature. Towering figures began to appear on the horizon, such as Johannes Müller, who, inspired by Goethe, dedicated himself to medicine and whose encyclopedic work covered the nervous system, the sensory organs, the physiology of secretions, and embryology, in which he used the microscope in contrast to Bichat's macroscopic anatomy.

THE WAVE OF PROGRESS

In Vienna a new school of medicine sprang into existence, thanks to the greatest pathologist of the century, Rokitansky, who studied first the autopsy findings in more than 100,000 dissections, and then the clinical case histories. Working closely with him was Skoda, who laid the foundations of present-day physical diagnosis. Pediatrics progressed, partly as the result of the interest in children inspired by Charles Dickens' novels. Psychiatry advanced with Esquirol and Georgete. Surgery also progressed in France—the armies of Napoleon numbering many distinguished surgeons, such as Percy, Larrey, who was present at Waterloo, Dupuytren, and others. England and Germany also had various prominent surgeons. In the United States there were Philip Syng Physick, J. Marion Sims, and Ephraim McDowell. Surgery was becoming more of an intellectual than a manual task, preservational instead of amputational, though the pleural and peritoneal cavities still remained a mysterious inner sanctum. The next step forward was the discovery of surgical anesthesia, whose precursors were Indian hemp, the soporific sponge, hypnotism, and laughing gas.

Anesthesia was an American contribution. Two dentists, Crawford Williamson Long and Horace Wells, had already used ether and nitrous oxide respectively. Surgical anesthesia began in 1846 when the dentist William Thomas Morton anesthetized a patient for the surgeon John Collins Warren, Jr. Chloroform fumes were used in operations and deliveries by Dr. James Young Simpson, of Edinburgh.
PATHOLOGY BECOMES "AUDITIVE"

The greatest figure of this period was Corvisart's pupil, René Théophile Laënnec, a Catholic realist, physician at the Necker Hospital in Paris. Laënnec, faced with a young woman whose obesity made direct auscultation difficult and embarrassing, had the inspiration to roll a sheet of paper into a tube and apply it to her chest to listen to the "spoken tongue" of the diseased organs. This idea, it is said, came from his having seen children in the street listening at one end of a hollow trunk to the noises made by a playmate at the other end. Thus the stethoscope came into being and pathology, hitherto visual, now became auditive.

THE "REPUBLIC OF CELLS"

In the second half of the nineteenth century, medicine changed from European to national and vernacular. The progress in diagnosis was spectacular, reflecting man's sharpened curiosity about the universe and himself. Medicine, which in the Middle Ages was made in the library, just as today it is made in the laboratory, was in this period made mainly in hospitals. The humanitarian aspect of medicine inspired Henri Dunant to create the Red Cross.

Another important development in medicine was the cellular concept of disease, conceived by a German of great genius, Rudolf Virchow, who brought Hippocrates' humoral pathology to the intimate level of the cell and laid the foundations for the modern concepts of disease. For Virchow, the cell was the fundamental element in the human body. He asserted that the parts of the body formed a community of cellular units, a "republic of cells," whose "classes" were the cells and its "territories" were the organs, the systems, and the organic apparatus. This "cellular democracy" was the opposite of the ancient "absolutist empire" of blood humors. Thus disease came to be considered as a civil war between germs and leukocytes, the latter being the police force of the cell state.

FROM MAGIC BULLETS TO ANTISEPSIS

Among the greatest accomplishments of the nineteenth century were Paul Ehrlich's "magic bullets" and the advances made in research on
tropical diseases. These were preceded by the creation of medical bacteriology through the work of Robert Koch, who discovered the bacillus of tuberculosis, and by the great discoveries of the founder of bacteriology, Louis Pasteur, who began by studying the “diseases” of wine and eventually established the basis of the concept of infection. Seventy years before Fleming, Pasteur had already investigated *Penicillium glaucum* and its effects on certain ferments, thus anticipating the antibiotics.

Pasteur’s work was to stimulate another stirring event in the history of medicine—antisepsis and the elimination of infections in operations, thanks to the work of Joseph Lister, who took the gigantic step forward from the old heroic surgery to antiseptic and aseptic surgery, which prevented infection instead of treating it. Lister’s work was supplemented by that of Oliver Wendell Holmes in Boston and Ignaz Semmelweis in Budapest, who separately discovered the infectious origin of puerperal fever, which at that time was killing thousands of women in childbirth. Thus mankind was liberated from the terrible scourge of infection, just as previously it had been liberated from pain by anesthetics.

In the field of neurology, several Frenchmen pioneered: Duchenne; the great Charcot, teacher to Freud; Pierre Marie his successor; and Paul Broca. Their counterpart in England was J. Hughlings Jackson, and on this side of the Atlantic, S. Weir Mitchell, of Philadelphia.

**AMERICA GOES WEST**

While Claude Bernard was developing his epic career in physiology, America was expanding westward. The prairies were gradually invaded, and hunters and trappers were succeeded by pioneers, settlers, traders, preachers, and, later, by physicians, lawyers, and bankers. In 1847 the American Medical Association was born.

Philadelphia became the center of medicine and the American horizon was at the beginning of the century already studded with great physicians—John Morgan; Benjamin Rush, one of the signers to the Declaration of Independence and a pioneer of occupational therapy and psychiatry; Ephraim McDowell, of Kentucky, who performed the first resection of an ovarian cyst; Daniel Drake, who compiled a masterly medical geography of the Midwest; William Beaumont, who studied physiology in vivo
in the stomach of a half-breed with a gastric fistula caused by buckshot; and others. The greatest physician of the century was the Canadian, William Osler, humanist, philosopher, philanthropist, professor at McGill University and at the universities of Pennsylvania, Johns Hopkins, and Oxford, who was the incarnation of the modern ideal of a great physician and teacher. South of the Rio Grande, the hour of glory struck for Carlos Finlay, the "Pasteur of the Americas," discoverer of the role of the mosquito in transmitting yellow fever; for Hipólito Unanue, the father of Peruvian medicine; and for the student and martyr, Daniel Carrión, who died after self-experimenting with verruga peruana.

THE FOUR FAILURES OF CLAUDE BERNARD

For lack of time, we cannot reweave the glorious tapestry of all these great medical figures of the nineteenth century. Instead we shall symbolize in Claude Bernard the tremendous accomplishments of this century.

The son of a wine merchant, Claude Bernard went to the Jesuit school at Villefranche, on the French Riviera, and later worked for two years as assistant in a pharmacy in Lyons. As a youth he was interested in play-writing and poetry and had marvelous dreams of literary fame. But his preparation for life consisted of four failures.

While still an assistant in the Lyons pharmacy, one of his plays, a light comedy, was produced, but it promptly failed. At a later date, some of his experiments on the tympanic chord also failed. Next, success passed him by when he applied for the post of assistant professor to the medical faculty in Paris; it was granted to Bichat instead. And finally his marriage ended in failure, for his wife, enraged by his experiments with dogs, which befouled her carpets, brought up their two daughters to hate "that cruel vivisectionist of a husband," and finally she obtained a separation from him. These failures did not affect Claude Bernard's success in science.

THE YEARS AT THE SORBONNE

After some negligible successes in minor suburban playhouses, Claude Bernard was advised by a dramatic critic to leave literature alone and
devote himself to medicine. Under the sponsorship of the great physiologist, Magendie, whom he eventually succeeded at the Collège de France, Claude Bernard was graduated in 1843, at the age of thirty, and thereafter devoted himself solely to his experiments, which he conducted with primitive equipment in a dismal, damp cubbyhole in the Collège de France. His sole encouragement came from comrades like Berthelot, the chemist, Paul Janet, the psychologist, and Renan, the historian, who every Monday evening met Bernard at his workshop to talk philosophy and natural sciences.

THE DOG WITH THE SILVER CANULA

The difficulties Claude Bernard had to cope with were revealed in some typical incidents. The local police used to watch closely the physician who seemed to enjoy torturing dumb animals. One day a dog fled from his laboratory with a silver canula fixed in its stomach. As luck would have it, the dog, which had been sold to Bernard's laboratory by a rogue, was owned by the local police inspector. Claude Bernard was summoned to police headquarters to answer the charge of stealing and tormenting the animal, but he promptly convinced the police inspector of the noble purpose of his experiments and thereafter he was granted official protection for his research. The inspector's dog was restored to health.

"... LA SCIENCE, C'EST NOUS"

Claude Bernard worked devotedly for eleven long years before he was granted full recognition. In 1854, a special Chair of Physiology was created for him at the Sorbonne.

He taught his pupils to "think physiologically" and left behind a notable school of followers. He devised a method that started by observing reality and then proceeded to confirm or reject it through analytical experiment, breaking it down into a series of component moments. Tracking down the metabolic fate of ingested foods, beginning with the sugars, he revealed in a series of brilliant experiments that, starting from an intrinsic substance, which he called glycogen, the liver could produce sugar, which established the glycogenic function of the liver. He also
discovered that the body secreted certain substances that passed into the blood, which became the basis of the concept of internal secretions. He, furthermore, established the concept of the milieu intérieur, or internal environment, and how essential its stability is to a “free and independent life”; the functional correlation of the organs; the specific correlation of the organs; the specific selectivity of toxic agents; the unity of physico-chemical phenomena in the living being; and the principles of experimental physiological research. His *Introduction à l'étude de la médecine expérimentale*, one of the greatest medical classics, is still of value to scientists. He consolidated the philosophical positivism of his day and affirmed the need for teamwork with his famous words: “L'Art, c'est moi; la Science, c'est nous,” that is to say, “art is I; science is we.”

In the final years of his life, under Napoleon III, he became a member of the French Senate in the radiant Paris of those days, but because of poor health and the breakup of his marriage he denied himself the privileges of his position. When he died, his funeral, an event of great solemnity, commanded tributes from all Europe. Though he had advised his students to hang up their imaginations with their hats on entering the laboratory and put them on again on leaving, his own work reveals an originality of thought worthy of a true bard of science.

Such was the Claude Bernard we saw standing by the window, watching the golden sunset above the vineyards of St. Julien with eyes that reflected the profundity of a man to whom science was a religion and to whom the divinity of God was assimilated in the divinity of man.

THE “GREAT DOCTORS”

Together with William Harvey and Hermann Boerhaave, Claude Bernard symbolizes the “great doctors” who enriched the history of medicine in these three memorable centuries with the greatness of a brilliant mind and the goodness of a noble heart.
VIII: THE VAST THRESHOLD

Investigators, Clinicians, Psychiatrists, and Space Physicians
(Medicine in the Twentieth Century)

The Eiffel Tower and a Masquerade Ball

The Twentieth Century, our century, began with an ironical paradox, with a frivolous note. Fifteen years after its erection, the French people were still arguing whether the Eiffel Tower should be moved from Paris because, they said, it spoiled the view. And Parisians, past masters at the quick sortie, promptly quipped that the best view in Paris was from the Eiffel Tower—because that was the only place from which one could not see the Eiffel Tower.

The preceding century also had started in a light vein. On the first of January, 1800, a great masquerade ball was held at the Court of Weimar to usher in the new century. The festivities were dazzling and for long the fun was remembered by all. Goethe, one of the greatest encyclopedic minds of all times, attended disguised as Jupiter, and Schiller, the great poet, was also there. Yet people still discussed with mute fear the menacing progress of Napoleon’s Grande Armée. And even Goethe was
impressed by the progress medicine was making when he heard that a physician named Corvisart, by mere percussion of the chest, could diagnose diseases invisible to the eye. Corvisart finally was granted the opportunity to practice percussion on the imperial chest of Napoleon, whom he treated in the midst of one of his campaigns.

THE MOMENTOUS YEARS

But all that was past history. On the historical threshold of the twentieth century, people all over the world felt, like Dr. Pangloss in Voltaire's *Candide*, that this was "the most wonderful of worlds." Everything, it seemed, had already been discovered, and life was easy and comfortable. On the world stage, things also had been changing, and people felt perfectly at ease. After the turbulent preceding centuries, an era of peace had finally arrived. They looked at Europe and they saw an optimistic political picture: the "balance of power" among France, England, and Germany was in perfect equilibrium. Their security was complete.

Modern art then was only beginning. In 1907, an inspired Spaniard, named Pablo Picasso, painted a strange picture of three ladies of easy virtue with faces in progressive states of distortion. With this painting, called *Les demoiselles d'Avignon*, Cubism was born, and a new trend in modern art began, based on the disintegration of the body-image in the mind of the artist, even as the spatial scheme of the universe was being disintegrated in the mind of the physicist.

Suddenly, when everything had seemed quiet and peaceful, the world plunged into the scarlet nightmare of World War I. Later came the Russian Revolution, and the failure of the League of Nations, followed by the first great modern crusade for democracy, the Spanish Civil War, and by the bloody nightmare of World War II. Then came the cold wars. In 1945, the atomic age began, and in 1957, with the first Russian Sputnik, the space age began.

THE DAZZLED PHYSICIAN

In a world where so many portentous things were happening, what was happening to the physician? Early in the century, the physician felt
that he held in his hands a vast and rich medical heritage of ideas, facts, tools, and methods. But he also felt like a man who holds a powerful weapon in his hands but does not know too well how to use it.

Vast and rich, indeed, was the medical heritage from the past. The frenzied search for knowledge about man and the world unleashed in the Renaissance had gained momentum with the years. The human being and the earth itself had slowly yielded and begun to open up before the tireless probing eyes of a long line of men determined to know the truth. What the Renaissance started, the succeeding centuries doggedly continued, with redoubled effort, without pause and without respite. Let us quickly review the glittering medical heritage of the physician in our century.

From the seventeenth century, a period of great intellectual activity in science and in the arts, there was a long list of pioneers in many branches of medicine who, with their work, paved the way for their successors. Prolific indeed was the seventeenth century in physiologists, anatomists, microscopists, and investigators, many of whose names are perpetuated in the anatomical structures they discovered. De Graaf, Malpighi, Valsalva, Leeuwenhoek, Sylvius, Sanctorius, Bagliivi, van Helmont, Willis, Sydenham are but a few in the seventeenth-century roster of great medical figures. And towering above all is Harvey, whose work so faithfully translated into science the characteristics of motion and emotion dominant in the art of his time.

From the eighteenth century, there was the work of a long list of men with encyclopedic minds who, generous with their knowledge, unstintingly labored to establish great schools and left behind also a long list of great disciples to carry on the torch of learning. This was indeed a century of great teachers and great schools. Cullen, van Swieten, de Haen, Pitcairne, the Monros, John Hunter, von Haller, Jenner, Morgagni, Boerhaave, Auenbrugger, Laënnec are but a few of the imposing figures in the medical world of the eighteenth century.

The heritage from the nineteenth century was even more fruitful. A new realism had been evident in the art and in the science of this age. Émile Zola, the great writer, searching for inspiration, used to attend Claude Bernard's lectures. This century, to which we today owe so much,
also resounds with the names of numerous men who blazed one of the
brightest trails in the art of healing. I shall mention only one instance
representative of such medical grandeur. Toward the end of the century
an international medical congress was held in London. The chairman
was Sir James Paget, one of the most inspired surgeons in the history
of medicine, and, among other remarkable men, there were present
Thomas Huxley, creator of new trends in zoology; Rudolf Virchow,
architect of the human cell and tissues; Robert Koch, who with his
microscope unveiled the secrets of the sphinx of tuberculosis; Louis
Pasteur, who converted the chaotic empire of the microbes into a cosmos;
and Lord Lister, a veritable Lincoln of Surgery, who freed mankind from
the shackles of infection. These six extraordinary men were all together
at the same congress exchanging ideas.

And yet, though great progress had been made in many medical fields
and the knowledge accumulated was vast indeed, physicians, intoxicated
with complex diagnoses, still treated disease as they had thousands of
years earlier.

THE TECHNIQUES OF STORYTELLING

Thus it was that the physician reached the gate of the twentieth cen-
tury. It would be impossible to encompass in the short time we have
all the wonderful things that have happened in medicine in our century.

In all my previous lectures I experimentally used certain techniques
to portray the spirit of the various stages of medicine down the ages.
When we discussed Mesopotamian and Egyptian medicine, I tried to
have you looking down from the top of a ziggurat or a pyramid at the
monolithic world of these ancient civilizations. When we spoke about
Greek medicine, I tried to evoke the spirit of classical medicine, free
and flowing, like the lines of a marble “Niké” under the blue skies of
Greece. For the Middle Ages I tried to conjure a live crowded tapestry;
for the Renaissance, a boisterous parade through the streets of Padua;
for the seventeenth, eighteenth, and nineteenth centuries, I invited you to
peer through three open windows into the parlor of each of these cen-
turies. On the easel of each lecture, I placed for you to study a word can-
vas depicting the main events in each period in the history of medicine.
How can we accomplish the same thing today? I invite you to join me in another experiment. Let us conjure up a typical twentieth-century sight that could be the key to the medical story of this age.

A WINDOW ATOP A SKYSCRAPER: THE FACELESS CROWDS

Should you open a window atop a Manhattan skyscraper and look down, what would you see? Great crowds. Rushing crowds. Faceless crowds. The same thing occurs in the world of medicine today. Look at the medical panorama of today and you will see great, rushing, faceless crowds of technicians, all of them toiling for the progress of medicine. Now and then a face, a place, a discovery, leaps out from the crowd. This is the exception. Medical history today is made by the steady flow of dedicated men—many of them general practitioners, that glorious infantry of medicine—who with their teamwork are steadily advancing our profession. A little while ago I mentioned a long list of men who made medical history in bygone centuries. Our experiment now will be to look at the medical panorama of the twentieth century without mentioning a single name. Much of the history of medicine in the past sixty years of our century is a matter of common knowledge. I shall therefore talk about movements, ideas, and trends, and you yourselves will mentally put in the names of the men evoked by such events.

CONVENTS, HOSPITALS, LABORATORIES

In the Middle Ages medicine was made in libraries and convents; in the nineteenth century it was made in hospitals; today it is made, above all, in laboratories. This means that there has been a progressive technicalization of medicine. Medicine in many ways is becoming less and less a Hippocratic art and more and more a technical discipline. Medicine today has also experienced drastic basic changes in the three main aspects of the profession: practice, research, and teaching.

CHANGES IN MEDICINE

*Medical Practice.* In the practice of medicine, the “family doctor” of the beginning of the century is now on the way out and is being replaced by a new type physician who is at once counselor, statesman, and advisor.
The physician no longer heals one patient only; he now heals great masses of patients.

Another trend of our time is the development of medical insurance and the creation of great health centers, which are absorbing many small private practitioners by offering them all the facilities of a great medical center.

Medicine has also changed in the sense that, though it uses the methods of the natural sciences, it is becoming more and more a social science, and as such its main goals are now not only to cure, but to prevent disease, to promote health, to rehabilitate the patient and restore him to society, and to prolong human life. In the sense that it is concerned with prevention and rehabilitation, medicine is a true social science. Furthermore, health is accepted today as an active dynamic process, involving not just the absence of disease but also the existence of a state of physical and mental well-being and social adequacy.

Medical Research. In medical research there has been a drastic change in our century: the lone research worker of the past who was also a general practitioner—like Jenner, the discoverer of vaccination, and many others—has been replaced by the research team. Nowadays we depend less and less on the so-called “lucky accident” in medical discovery, and more and more on systematic planning and study by institutional or private research teams.

Scientific research is the best tool available today for the exploration of man and the universe. In 1901 the Rockefeller Institute for Medical Research was founded, fulfilling Francis Bacon’s dream of a “house of science.” Other great research laboratories established at the beginning of the century were the Pasteur Institute in Paris, the Robert Koch Institute and the Paul Ehrlich Institute in Berlin, the Kitasato Institute for Infectious Diseases in Tokyo, the Oswaldo Cruz Institute for Tropical Diseases in Brazil, and the Lister Institute in London.

Millions of dollars have been poured by the United States government into gigantic medical programs to investigate anticarcinogenic substances, fetal, infantile, and maternal mortality, arteriosclerosis and hypertension, cholesterol metabolism, blood coagulation, the dynamics of arterial tension, rheumatism, alcoholism, and tuberculosis. Mass radiological exami-
nations have been conducted and antibiotic therapy has been used to
fight tuberculosis. Whole populations, in Haiti, for instance, have been
treated with penicillin in an attempt to eradicate yaws, syphilis, bejel,
and similar infections, and virus diseases and cell permeability are under
scrutiny. The conquest of poliomyelitis by a vaccine has kindled the hope
of eradicating other virus diseases. The electron microscope has been of
immense help in this last endeavor.

Medical Teaching. In teaching and education there has also been an
extraordinary change. Basically, medicine on the one hand is becoming
more verbal. We are now reviving the old anamnestic methods used by
the Assyrians and by Hippocrates and are giving dialogue with the
patient a basic role in diagnosis. On the other hand, medical teaching is
becoming also more visual for two different reasons: first, because it now
uses motion pictures and television; and second, because new instruments
and new techniques make practically everything in the human body
accessible to the human eye. We now not only know what all anatomical
structures look like, but we can actually see them alive and functioning.
We have fulfilled Vesalius’ dream: we can see the “fabric” of the human
body at work.

NEW TOOLS AND CONCEPTS

Medicine is today more technical in the sense that it uses many more
instruments and techniques than before, as in ophthalmology and cardiol-
ogy; it is more human in approach and scope, more “social” and pre-
ventive, more specialized but also more encyclopedic in its interrelations
with other sciences.

A philosophical difference is steadily being outlined among three main
groups of diseases called by the German philosopher-psychiatrist, Karl
Jaspers, somatoses (organic), bioses (functional), and neuroses (psycho-
genic). And yet, amazing as it may seem, we only know the etiology of
barely half of the 2000 known diseases, and they are the diseases common
to man and mammals, or biologic diseases. Of the other half, which
comprises biographic diseases, or pathologic events specifically inherent
to human life and biography, like asthenia or allergy, we know only the
pathogenesis but not the etiology.
THE VAST THRESHOLD

A NEW UNIVERSE: QUANTA AND RELATIVITY

One of the main factors responsible for the changes wrought in medicine in our time has been the progress in the natural sciences. The natural sciences were propelled forward early this century by the quantum theory, which holds that the emission of light by radiant bodies is not continuous and is caused by individual explosions. Thus atoms were in a way replaced by quanta or energy charges, and matter, like energy, became discontinuous and was reduced to a series of “probability waves.”

This theory was followed by the theory of relativity, the work of a contemporary genius who revolutionized the concepts of time and space, just as the quantum theory upset our ideas on matter and energy. Matter then became a pocket in space and time, a flurry of electric charges, a probability wave rolling through the void of space. Atomic physics has established a “space-time continuum,” the discontinuity of matter and energy, the concepts of finite space, time-relativity, a curved and four-dimensional universe, and the motion of matter in the form of energy jumps. All this is of major importance to us, because the revolution it wrought had wide repercussions in medicine.

THE NEW PHYSICS AND CHEMISTRY

Physics has played an important role in medicine, having enlarged the scope of research to include bacteriological and microchemical analysis, the analysis of the atoms. And now besides biochemical lesions, medicine studies, with the electron microscope, bacteria and viruses. Modern diagnostic methods include electrophoresis and microspectrophotometry, the electrocardiogram, electroencephalography and electromyography, pyelography, intracardiac catheterization, ventriculography, and stratigraphic radiography.

Chemistry has become integrated with physics as a result of the progress in organic syntheses and the elucidation of chemical structures, catalytic action, chain reactions, isotopy, and nuclear chemistry. Biology has discovered intracellular entities, such as viruses and genes, and is investigating whether viruses are living creatures, cell fragments, or microbial chemical seeds.
Anatomy has been influenced by the concept that form is function. Deep freezing of anatomical sections, anatomical cinematography, new techniques for vascular injection, and the electron microscope have originated a new physiological approach to anatomy. Physiology, now chiefly biochemical, studies functional hormonal interrelations, electrolytes, the neurovegetative system, enzymes, and especially the adrenal-pituitary-hypothalamic system.

Experimental psychology has progressed, having developed the concepts of inferiority complexes, the collective unconscious, psychological types, the mandalas, and the individuation process.

THE CHALLENGE IN SURGERY

We must now also consider the changes that have taken place in some of the main battlefields of medicine. The most dramatic changes have occurred perhaps in surgery. But before these happened, anatomy and physiology had already changed. Anatomy is no longer guided by the principles of Vesalius, but by a new principle: form is function, and any form in the human body is related to its function. Physiology itself is no longer concerned with organs or tissues or even cells, but is becoming more and more biochemistry. We are now past the tissue level; we are down to molecules and atoms and are even beyond their chemical structure. We are now applying the new knowledge and endeavoring to understand the processes of the human body in terms of energy and physics.

The great revolutions initiated early in this century by two men, one with his theory of relativity, and the other with his quantum theory, that is, that energy travels not in a continuous flow but in jumps, had an impact on physiology, and this in turn brought radical changes in surgery.

Throughout the ages the surgeon has been a heroic figure, the man with a glittering scalpel in his hand and the clock forever before his eyes. Today the surgeon no longer has to race against time. Today he works without watching the clock on the wall or the calendar in convalescence. He now follows only the biological clock that is the body of the patient. The surgeon today works as much with his keen brain as with his nimble fingers.
Surgery, "that skill that death loves not," as it was called in the thirteenth-century poem, the Regimen sanitatis Salernitanum, has changed from individual art into team science. After defeating its two ancient enemies, pain and hemorrhage, surgery is going on to conquer other fatal adversaries.

Now asepsis and antibiotics protect the patient against infection; analgesics and anesthetics protect him against pain; coagulants and anticoagulants protect him against hemorrhage and blood changes; and amino acids, electrolytes, and vitamins protect him against metabolic changes and dehydration. Surgery has less now of a heroic emergency and is ever more a conservative technique of physiological repair.

Antibiotics have eliminated surgery in certain specialties, for instance, urology and otolaryngology. Surgery today is more concerned with preventing infection, eliminating pain, maintaining a healthy metabolism, and accelerating by quick ambulation of the patient his return to society. The noble goal of rehabilitation, a social goal, now guides the steps of surgery.

The surgeon no longer uses the rather primitive tools of the "Stone Age" of surgery. He may not even use a knife; he uses sound instead. The advances in the physics of thoracic gases, ultrasound scalpels, "chemical scalpels" of proteolytic enzymes, new types of steel scalpels, some smaller than a fingernail, electronic and radar devices, radioactive tracers, new techniques, like ballistocardiography, and new tools, like the dermatome, enable surgeons today to probe into the most minute structures of the human body.

These tools, furthermore, are making possible a closer union between the surgeon and the physician. They were separated in the Middle Ages; they were later reunited. Today, both of them are working as a team with a common goal: health restoration and quick rehabilitation of the patient. More than ninety-six per cent of the wounded who reached medical care in World War II survived.

The surgeon is no longer the "adventurer" he was in the Renaissance, when he set out to explore the human body as blindly as Renaissance navigators explored the terra incognita beyond the seas. Nowadays he
explores man’s inner space with the same insight and accuracy that is shown by physicists exploring outer space.

But the drama of the amphitheatre remains unchanged. Just as the matador, alone with the bull in the arena in that dramatic instant that decides the corrida, has his “moment of truth,” so must the surgeon also pass through that crucial moment. All alone with his patient on the mysterious threshold of salvation or death, depending entirely on his skill and wisdom, he too must suffer his “moment of truth,” from which often his scalpel emerges like an emissary of God’s mercy in healing by the hand of man.

FROM THE GRANDE ARMÉE TO THE “LYTIC COCKTAIL”: ARTIFICIAL HIBERNATION

The advances in surgery have also made possible certain extraordinary innovations in medicine, such as blood and organ banks, open treatment of fractures, artificial organs, and a recent development that has a historical precedent.

When Napoleon, still smarting from his defeat in the scorching plains of Spain, again met defeat at Moscow in 1812, his soldiers, wounded, starving, and freezing, had to retreat on foot across the long, icy steppes of Russia. And yet those who were half frozen survived the trauma of wounds, amputations, and other major operations practiced under the most woeful conditions by the physicians of the Grande Armée, while those who were better protected against the cold died. This caused a lot of speculation and led to a number of experiments, which culminated finally in the discovery of what we call today “artificial hibernation.” Instead of boosting the defenses of the body, a state of suspended animation is induced by subjecting the body to freezing temperatures. In such a state, the body cannot react to trauma with the often fatal shock; instead it gradually, softly, quietly outlasts the period of shock and trauma and eventually recovers.

Credit for this method, which has saved so many lives, goes to a great young French investigator, who has used not only cold, such as ice packs, on the human body, but also certain drugs, which he has called
a "lytic cocktail," that block the neurovegetative system and induce a state of suspended animation or artificial hibernation. As he said, with typical Gallic humor, the "cocktail" sends the pituitary and the adrenal cortex off on a chemical holiday.

Artificial hibernation not only is a most useful agent in surgery, but it also has inspired new philosophical concepts of disease. One of them is indeed very challenging. Until now we have been content with developing drugs to fight the causes of disease. Why not look for drugs that will restrain the reactions of the body? This in itself is a revolutionary idea. Until now we have believed in the wisdom of the body, but cannot the body be a little too wise and react a little too much? By restraining the body's reactions, it might be easier to cure certain diseases in which the greatest trauma is caused not by the invading agent but by the body's reactions themselves.

THE NEW SPECIALTIES

New specialties sprang up in our century. Specialties came late in medical history. In England, late in the last century only dermatology and pediatrics were recognized specialties. The growth of specialization was fostered by two factors: first, medicine has become so vast and complex that it is impossible for one man alone to encompass it all; second, many of the new tools and instruments used in medicine today are too delicate and difficult for one man alone to handle them all. No physician could operate with equal ease the electrocardiograph, the electroencephalograph, the spectrophotometer, and numerous other complicated machines and apparatus used today for diagnosis or for therapy.

Talking about diagnosis and therapy brings to mind the noteworthy fact that in our century the emphasis has shifted from diagnosis to therapy. Ours is the century of therapy. It is as if man today, frightened by the threat of atomic holocausts, is more than ever concerned with finding a quick and sure cure for all diseases.

Diseases also have changed in our time. Diseases that come from within, such as anxiety, degenerative diseases, sclerosis, and circulatory diseases, are replacing diseases that come from without, such as those caused by trauma, toxicosis, and especially infection.
As I said before, every age has its "typical" dominant diseases. Collective ages, like the Middle Ages, had "collective" diseases like the great plagues; individual ages, like the Renaissance, had "individual" diseases like syphilis; ages of "contrast," like the Baroque period, had deficiency diseases like avitaminosis, or intemperance diseases like gout. Today, the dominant diseases are occupational and particularly those caused by anxiety or stress, which are destroying modern man, body and spirit. And these diseases are being combated by what is the most spectacular branch of modern medicine—therapeutics.

THE NEW THERAPIES: VITAMINS

The trend last century in therapeutics was rather nihilistic. The situation was sized up perfectly in the humorous comments of two great medical men who witnessed the transition in therapy from the last century to our own time. Oliver Wendell Holmes said, "If we would throw into the sea all the drugs we know, it would be so much the better for the patients and so much the worse for the fishes"; and William Osler said, "The young physician starts life having 20 drugs for each disease, and the old physician ends life by having one drug for 20 diseases."

In our time this pessimistic point of view is changing, as a result of our greater concern with therapy and of the spectacular advances made in different therapeutic fields. The change started in the last century, with the development of biological drugs, followed by the development, particularly in this country, of the vital amines, or vitamins. This in turn led to discoveries in amino acids and in nutrition. These were followed by the discoveries in chemotherapy—perhaps the most spectacular of them all—especially in the field of antibiotics.

THE ANTIBIOTIC SAGA

The treatment of infection 6000 years ago involved primitive man's first attempt to expel from the human body, through magic, the possessing "demon." In the Renaissance, treatment changed to physical means, which combated the "miasmas" or vapors that they thought had invaded the body. In the nineteenth century, the culprit became known as "germs" and was fought with "magic bullets," discovered by a German investi-
gator. Later, with the introduction of sulfonamides, germs were put to sleep with these compounds, which could be called "bacterial hypnotics"; and finally the yellow magic of penicillin was discovered, ushering in the Antibiotic Age.

Our "antibiotic age" had as a historical prelude the bacteriological findings of the last century and prophylactic chemotherapy. Its philosophical basis is the phenomenon known as antibiosis, or the microbial antagonism that prevails constantly in the soil in the fields, expression of the Darwinian struggle for survival in the invisible jungle of molds and bacteria. We have learned to exploit this microbial antagonism among bacteria; we have also learned to produce "deficiency diseases" in pathogenic microbes, by depriving them of vital nutritive substances. The most spectacular applications of these concepts were made by a prominent antibiotic pioneer, who inoculated human diseases into a handful of earth, and so robbed the germs responsible for pneumonia of their "armor of sugar," thus leaving them exposed to the attack of the leukocytes, the white blood cell warriors of the human body.

Another new approach to treating infection is to feed bacteria with certain types of food which, acting as a lethal monkey wrench within the complex metabolic workings of the biologic machine of the bacteria, disintegrates them.

The royal road that led to the dizzying heights attained by antibiotic medicine started, as you know, in 1928, twenty years after a German student had synthesized sulfanilamide and seven years before another German discovered the antimicrobial effects of Prontosil on hemolytic Streptococcus. One day in May of that historical year, a comparatively unknown Scottish investigator, working in his modest laboratory at St. Mary's Hospital, in London, observed that an intruding mold that had fallen from the smoky skies beyond his window had contaminated a culture plate and that a substance secreted by the mold was dissolving the bacteria. He then isolated a pure culture of the mold (Penicillium notatum), from which he extracted an active, nontoxic antimicrobial substance, which he called penicillin.

This started a chain of events that finally led to the wide use of penicillin in World War II and to the great discovery in this country by
an investigator, Russian by birth, of the antibiotic, streptomycin, which he found in a lump of earth lodged in the throat of a chicken. Later came the broad-spectrum antibiotics, chloramphenicol, chlortetracycline, and oxytetracycline, and many others of medium spectrum.

Altogether these thirty some years since the discovery of penicillin have given us the most powerful weapons ever conceived to fight bacteria. Of course, I personally do not believe that this is the final answer. The search, I believe, must continue, and not in one direction only. Perhaps there is greater wisdom in investigating not how to destroy bacteria, for bacteria are as vital as other things to the symphony of life, but how to coexist peacefully with bacteria, how to share the same world with them. Perhaps we can make them less virulent by fortifying our own defenses, or perhaps we can find the way to live with them in peaceful symbiosis. Peaceful symbiosis in medicine, together with peaceful symbiosis in politics, is the best source of hope for the future of mankind.

All the antibiotics produced today are regulated by the Food and Drug Administration, Washington, D. C. This agency certifies more than half a million pounds of penicillin yearly and more than two million pounds of other antibiotics.

Antibiotics have changed the face of medicine and of society in several ways: clinically, by compelling physicians to adopt new techniques of therapy; in research, by opening up new philosophical concepts about the prevention of diseases; educationally, by changing the natural history of diseases and the biological cycles of germs. Today, the fever chart of a pneumonia patient, which had not changed from the time of Hippocrates up to that of William Osler, is totally different. In the fields of urology and otolaryngology, antibiotics have replaced surgery, and surgery itself has been made more conservative.

Antibiotics are also changing society by increasing the life span of man, making inadequate the current retirement age of 65. This raises the problem of what to do with the additional years of life gained. There are more people to feed and there is not enough to feed them with. More food will have to be produced, and it will have to be distributed more equitably. The well-fed half of the world will have to eat less, so that the other less fortunate half may be able to eat better.
THE VAST THRESHOLD

THE NEW ENDOCRINOLOGY AND THE ENDOCRINE ORCHESTRA

The development of modern endocrinology has been spectacular; it started by studying the anatomy of the endocrine glands and wound up as a full-fledged science dedicated to investigating endocrine physiological functions and, more recently, the biochemistry of hormones.

The physician's clinical criterion also has changed. Endocrine diseases are no longer considered as mere hypertrophies of the endocrine glands, which could be treated simply by either stimulating or putting the brakes on the altered glands. Even when only one gland is clinically involved, endocrinopathies are now considered as a total imbalance of the endocrine system, requiring complex and subtle treatment.

We no longer consider hormones as simple "chemical messengers" in the blood, but as active substances. Hormones do not travel intact in the blood, as we used to believe, but they are split into countless chemical elements and, like unassembled machinery, fitted together again upon reaching their organic point of destination. Besides the concept of central hormones, we now also accept the concept of peripheral hormones that stimulate the terminal endings of the nerves and produce certain physiological effects. Phylogenically, we also accept that the hormone precedes the gland, as has been proved in lampreys, in which adrenaline has been observed before the adrenal glands develop.

THE SMALL PALE JUNGLE: THE HYPOTHALAMUS

Of enormous importance has been the introduction in endocrinology of the concept that the endocrine system has a functional correlation and interrelationship, that it is not, as we thought, a medley of unrelated musicians, each one playing his own tune, but is rather like an integrated orchestra with the hypothalamus as the conductor and the pituitary gland as the baton. The hypothalamus, acting through the hypothalamus-pituitary-adrenal axis, is now believed to be the director of the endocrine system. Present explorations of the diencephalon's jungle of pale nervous tissue—that tiny inner space of man where his primitive and emotional personality lies buried—hold out more promises of surprises than any present explorations of the vast outer space.
THE QUEST FOR PEACE OF MIND: ATARAXICS

To the list of antibiotics, hormones, and vitamins, other groups of drugs have been added. One of the most spectacular is the group named by an American physician as "ataraxics," a word derived from ataraxia, meaning peace of mind. The quest in our time for peace of mind has become as important as the quest for an ideal form in art was in the sixteenth century, or the quest for a philosophy of science was in the seventeenth century.

The ataraxics, or tranquilizing agents, which were developed as a by-product by a French laboratory while doing research work on anti-histaminic drugs, not only have brought peace of mind to people on the borderline between normalcy and insanity and have inspired a new approach to mental diseases, but are also influencing other fields. For instance, new mental hospitals are no longer planned and constructed like a jail or a fortress. Now they are being built along the same lines as the conventional hospital or even as a beautiful rest home. We therefore could say that the ataraxics have already influenced American architecture.

On the humorous side, the ataraxics have added a new item to the budget of hospitals. Patients treated with ataraxics no longer tear the sheets or their clothes, which deprives hospitals of their old source for cleaning rags.

But ataractic drugs, which leave the patient ataraktoς, with peace of mind, and psychochemotherapy, which employs lysergic acid diethylamide and other hallucinogenic agents, are but two of the many things that are happening in the field of psychiatry. Studies on the development of the concept of stress, the investigation of the mysterious hypothalamus, the study of endocrine psychiatry are a few others of great importance, which are bound to bring revolutionary changes in psychiatry.

Psychiatry has become one of the most important branches of medicine in our century. The new approach in psychiatry is a simple one. Mental diseases, it may turn out, may not be mental and may not be diseases; they may be basic alterations in the body's biochemistry. These alterations, then, would have to be approached not only from a philosophical viewpoint but, above all, from a viewpoint integrating physics, chemistry,
biochemistry, and even other disciplines. This multi-discipline approach may some day reveal that schizophrenia, the greatest problem in modern psychiatry, is nothing but a gigantic chemical mistake of the human body in producing some toxic derivative of, let us say, adrenaline, or whatever the unknown principle is that causes schizophrenia. This substance X, secreted in minute amounts, might make a man into a genius—a mystic like St. John of the Cross, a poet like Baudelaire, a writer like Edgar Allan Poe—but in large amounts it might turn him into a mental patient.

THE FOUR GIANTS IN PSYCHIATRY

To combat these diseases “from within,” including psychoses, which are a product of our age and which threaten not only man’s mental peace but his life and welfare, psychiatry has developed a new organicistic approach. This approach was initiated by the four giants of modern psychiatry, who, with their concepts of the neuron, conditioned reflexes, psychobiology, and integration of the nervous system, respectively, established the biologico-metabolic basis of organicistic psychiatry. It was further advanced when a Hungarian discovered Metrazol shock, a Viennese introduced insulin coma shock, a Portuguese discovered leukotomy, an Italian introduced electroshock, and the Americans introduced the use of hormones in psychiatry.

Research groups, like those at Creedmoor Hospital and at the Van Ophuijsen Center, have introduced a new and dynamic endocrinological and physiodynamic approach to psychiatric problems, and a new biochemical outlook. They have also established some of the intricate structures of mental diseases, and even initiated the quantitative identification of psychosis by physical means and by physical instrumentation.

THE PHYSIODYNAMIC PSYCHIATRY

The new physiodynamic psychiatry has made three great contributions: it has integrated the soma and the psyche in clinical psychiatry, as well as in the biochemical and endocrine approach to the etiology of mental disease; it has introduced the biographical approach, so vital in prognosis
and in making psychiatric case histories; and it has introduced biochemical agents in psychiatric diagnosis and therapy.

This last group includes: the study of biochemical and endocrine changes in schizophrenia; experiments with the drugs once called *fantastica* by the Germans (Verlaine and Baudelaire took these drugs themselves) and now called hallucinogenics, like mescaline or lysergic acid diethylamide, which create "pocket psychoses"; and the study of elements never before studied in mental disease, such as brain oxygen consumption, adrenal changes, hypothalamic function, and others.

The three great aims of modern psychiatry are to eliminate such symptoms as agitation, hallucinations, and negativism, which make the mental patient "different" from other patients; to restore communication with the patient, who is isolated as if on a walled island by his malady; and to treat the mental patient the same as any other patient.

Psychosomatic medicine also has been so highly developed that it now integrates the natural sciences with those branches concerned with the mind. As a result of all these developments, diseases are now either *biological* (organic) or *biographic* (mental), and, in spite of the old Cartesian dichotomy, the psychobiological unity has triumphed.

*A CERTAIN VIENNESE PSYCHIATRIST*

Notable has been the progress of the powerful diagnostic and therapeutic tool, called psychoanalysis, introduced at the turn of the century by a famous Viennese psychiatrist, who initiated a new medical anthropology of the mind by proving that the unconscious, instead of the conscious, constitutes the major part of the human mind. He changed medical pathology from visual to auditory, making it possible to "listen" to neuroses. His highly imaginative, almost poetical work, was nonetheless permeated with clinical realism. His main contributions were: the diagnosis and therapeutic assessment of human instincts; his concept of the various unconscious strata in the human mind; the interrelationship between mental life and the neurovegetative system; the historical integration of the event of disease into the biography of the patient; and the use of dialogue as a diagnostic aid and a healing tool.
THE BIOGRAPHICAL APPROACH TO DISEASE

Psychoanalysis proved to be most valuable because, among other things, it introduced the biographical approach to mental disease, showing that disease, especially mental disease, is not just an accident in human life; above all, it is part of the human biography. In this sense, it resurrected the old concept of Thomas Sydenham, which established that diseases are acute or biological and chronic or biographical. In other words, disease is linked to our own fate, free will, and environment. Psychiatry is, every day more, becoming integrated with medicine, and the mental patient is now treated with a total “global” approach.

THE WMA, THE WHO, AND TRAVEL MEDICINE

Our age has witnessed the birth of “new” specialties based on organs (cardiology), methods and techniques (ultrasound therapy, psychoanalysis), and environmental factors (tropical and industrial medicine). Medicine has become international. The World Medical Association, an association of medical societies, and the World Health Organization, an association dedicated to the eradication of disease in the most remote corners of the earth and to the active promotion of health, have joined forces and have helped to create new specialties, such as travel medicine. Man today travels at incredible speeds, and such fast traveling means that the body arrives at the point of destination before the mind, which is already creating new and serious ecological problems. The principles of medicine, psychology, medical ecology, and medical geography are being studied in order to help physicians in advising travelers of all ages, healthy or sick, on matters of nutrition, clothing, strains and stresses, and psychologic adaptation to strange places.

ATOMIC MEDICINE: ATOMIC PISTOLS AND ATOMIC COCKTAILS

Geriatrics, every day more important in our society, is progressing steadily. Another new specialty is atomic medicine, which uses radioactivity to destroy diseased or necrosed tissues. Among its various devices are the “atomic pistol,” which shoots radioactive gold bullets into cancerous tumors; radioisotopes, injected in solution; radioactive lamps that
train cobalt rays on cancerous tissues only; "atomic cocktails" containing radioactive iodine, it being possible to measure with a Geiger counter the radioactive iodine absorbed orally; and nuclear reactors that expose patients to radioactivity.

SPACE MEDICINE

The newest specialty is space medicine, an outgrowth, together with aeronautical medicine, of aeromedicine. Aeronautical medicine was born in this country about 40 years ago; space medicine, about 10 years ago. The purpose of space medicine is to protect man while he is traveling in outer space, whether in man-made moons, in cosmic satellites, or in jet-propelled rockets. Man inside these new vehicles will face a number of tremendous problems: acceleration and deceleration, decompression, weightlessness and spatial optics, psychological confinement, sexual loneliness, elimination of human excreta, nutritional factors and adaptation to the new night-day cycles, reactions when crossing the sound and heat barriers, and reactions to cosmic radiations. Space medicine will try to provide the answers to all these problems while man strives to penetrate the endless cosmic space and explore the moon and even the stars.

MEDICAL COMMUNICATION

In unison with all the foregoing, medical communication among physicians, and between the physician and his patient, has kept pace with medical progress, improving in every direction, including motion pictures, radio, radar, radiotelephone, and television. Journals also are showing a new and most promising trend, namely, the integration of culture and medicine, that is to say, a new humanism that tries to integrate the three personalities of the physician: social, professional, and human.

FACES IN THE CROWD, PLACES IN THE WORLD

As we end our brief flight over the panorama of modern medicine, let us return to the imaginary window atop a skyscraper that we opened at the beginning of this lecture, and let us cast an all-embracing glance at some of the places, faces, and things that have given the medicine of today its present grandeur.
In the far distances loom in true magnificence such places as the Mayo Clinic, world symbol of hope and learning, or Johns Hopkins Medical School and Hospital, another of the great world medical centers, where man can learn and practice the noble art of healing, or a place well known to all of you and much loved by all of us, the New York Medical College.

Prominent also are the many great new techniques and fabulous instruments: in one of the great pharmaceutical plants we might see, for instance, the production of penicillin by means of the banana oil separation process, which facilitates the extraction of penicillin; or we might see in a hospital an electron microscope being used, one of the most powerful tools in medicine today, or a cobalt-60 applicator treating cancer; or perhaps we might see artificial hibernation being practiced, experimentally in animals or clinically in human beings.

Far beyond the horizon we could watch the struggle of the World Health Organization against malaria; and in Haiti the injection en masse of penicillin, in a vast campaign against yaws; or an operation being performed in a hospital in New Guinea; or the distribution of drugs to patients at a Schweitzer leprosy colony; or a jet crew getting ready for space medicine experiments.

Numerous also are the faces we could see through our open window, the faces of great men who left an indelible imprint on the medicine and the science of the twentieth century. To mention only a representative few, there would be the man who started the revolution in physics, Albert Einstein; and the man who made history in microbiology and started the Antibiotic Era, Alexander Fleming; and the Pasteur of the Americas, Carlos Finlay, a great Cuban, who together with Walter Reed solved the riddle of yellow fever; and the great physiologist and Nobel Prize laureate, the Argentinian Bernardo Houssay. Looking further back we could see the “Big Four” of Johns Hopkins: Welch, Halsted, Osler, and Kelly, as painted by Sargeant; the great man of American neurosurgery, a true humanist, Harvey Cushing; and the great Mayo brothers. There would also be the great Spaniard—perhaps the greatest in Spanish medical history—Santiago Ramón y Cajal, who conceived of the doctrine of the neuron; Gregorio Marañón, humanist and physician; the great Eng-
lishman, Charles S. Sherrington, who together with the Russian, I. P. Pavlov, made possible our knowledge of the physiology of the nervous system and organicistic psychiatry; the Viennese, Sigmund Freud, creator of psychoanalysis, whose revolution in psychology is comparable to that of Copernicus in astronomy or Darwin's in biology. And we would see the great historians: Karl Sudhoff, the first great European medical historian; Henry Sigerist, my beloved friend and teacher, who did more for medical history and medicine as a social science than anybody else in our century; and one of the greatest American medical historians, Fielding Garrison.

We could also see some of the symbols of modern medicine: the mural depicting research at the Institute of Cardiology in Mexico, painted by Diego Rivera; the symbol that encompasses medical practice and teaching—the Flower and Fifth Avenue Hospitals of the New York Medical College; and above all that symbol of medical research, clinical practice, and teaching, the stained glass window at the Mayo Brothers' House, depicting in three different panels the history of research, of medical practice, and of education, and on which are inscribed the immortal words of W. J. Mayo: "Take of my experience, but give me of your dreams."
Epilogue:

TO BE A DOCTOR

My course on the History of Medicine had ended. Facing me were a hundred and twenty-eight young men and women. There were pale faces and swarthy faces, students with dark, blond, or red hair, but throughout the entire group the same restless light shone in their young eyes, as if they had captured a spark from the sun.

"You have asked me," I told my freshmen, the young princes in the Kingdom of Medicine, "what it means 'to be a doctor,' and I should like to end this course by answering that question.

"Ever since the day you first said those magic words, 'I want to be a doctor,' you have been wrapped in the colorful fabric of the history of medicine, a fabric woven from the ideals, wisdom, endeavors, and achievements of our glorious predecessors in medicine.

"You have just embarked on a fascinating voyage leading to the harbor of one of the most dynamic professions. Year after year new windows will keep opening before your eyes, revealing the multifaceted landscape of medical art and science."
"But medicine today is so complex that no human mind can possibly absorb it all, as was possible a few centuries ago. Only by using the history of medicine as a gigantic frame to contain what you learn is it possible to integrate the numerous fragments of medical theory and practice that will be taught you in your student years. Only through the history of medicine can one appreciate that to be a doctor, in the true sense of the word, is to be not only a wise man but, above all, a good man. To be a doctor is, in other words, to be a whole man, who fulfills his task as a scientist with professional quality and integrity; as a human being, with a kind heart and high ideals; and as a member of society, with honesty and efficiency.

"Contemporary medicine is founded on a series of events that resulted from the thoughts and deeds of a few men in the course of history. History is made by men, and the greatest among the makers of history is the physician because of the effects of his ministry on all other human beings.

"Man is the only creature able to make tools with which to make other tools, and of all the tools made by him, words are the most important. The fabric of medicine is woven with words that express the ideas from which they sprang. The original meaning of the three words—physician, medic, doctor—that describe our profession is highly illuminating. The word ‘physician’ derives from the Greek physis or nature, denoting that the physician has his roots in an understanding of the nature of things; the word ‘medicus’ comes from medērī or to heal, and the root med means to meditate or think, so that ‘medicus’ is equivalent to thinker and healer; the word ‘doctor’ originally meant master, instructor. Thus, semantically, our profession involves learning, knowing, healing, and teaching.

"In its turn, the word ‘medicine’ not only means what medical men do (many of the great figures in medical history, such as Pasteur and Paré, were not physicians), but also denotes a social science that uses the methods of the natural sciences to attain four objectives: to promote health, to restore health, to prevent disease, and to rehabilitate the patient.

"Every day, more and more, medicine becomes, above all, the prevention of disease and the promotion of health. For only by knowing the
healthy man can we cure him when he falls ill. Knowledge of the healthy man is obtained by studying our fellow beings, both the healthy and the diseased, not only in the mirror of classical and modern medical literature but also in current newspapers. You will then learn that poverty is still the main social cause of disease, just as it was the main cause in archaic times.

“The history of medicine epitomizes the history of civilization. The history of man has passed through three great stages: man learned to master nature by yielding to her laws; he learned to live in society by establishing the first communities; he acquired consciousness of his human dignity and of his ability to forge his own destiny, which in turn enabled him to acquire greatness.

“The physician, in his threefold capacity as a professional, as a member of society, and as a human being, has throughout history helped man in his physical, mental, and social ascent. As a professional man in particular, the physician has always acted as a healer, using magic, faith, empiricism, or rational resources; as a knower, for he knows the secrets of nature and of the human being; as a preventer, for he can arrest disease by forestalling its vanguards before they develop; and as an organizer, for he can guide society in fighting the historicosocial process called disease. To heal, to know, to prevent, to organize—these will be your four future spheres of professional activity, embraced in the expression ‘to be a doctor.’

“To be a doctor, then, means much more than to dispense pills or to patch up or repair torn flesh and shattered minds. To be a doctor is to be an intermediary between man and God.

“You have chosen the most fascinating and dynamic profession there is, a profession with the highest potential for greatness, since the physician’s daily work is wrapped up in the subtle web of history. Your labors are linked with those of your colleagues who preceded you in history, and those who are now working all over the world. It is this spiritual unity with our colleagues of all periods and of all countries that has made medicine so universal and eternal. For this reason we must study and try to imitate the lives of the ‘Great Doctors’ of history. Their lives, blazing with greatness, teach us that our profession is the only one that still
speaks of its duties in this world of today, in which almost everyone else speaks only of his rights.

"An ideal of service permeates all our activities: service especially to the patient, as a fellow creature isolated on the island of his suffering, whom only you can restore to the mainland of health. For that purpose you must know thoroughly not only the diseased, but also the healthy.

"Your own contributions to medicine can begin even in the golden years of student life. There is no need to wait for your medical degree to start making medical history. Many physicians while still students made historic contributions to medical science: Vesalius, Stensen, Laënnec, Remak, Freud, Best, men who believed in themselves and were dedicated to the profession you yourselves have chosen for your own.

"From now on your professional conduct must adhere to the moral code of medicine that began with the Hippocratic Oath. Despite its negative aspect in prohibiting a number of activities, the Hippocratic Oath was not a law but a precept self-imposed by physicians who accepted an ideal of devotion and service conjoined by their moral conscience. Five types of ethical duties must guide your life: duties to your teachers, to society, to your patients, to your colleagues, and to yourselves.

"You must have duties to your teachers, because they, the parents of your mind, are the most important people in your life next to your own parents. I do not mean only your university professors, but any physician from whom you learn anything—his science, art, ethics, self-denial, or example—that may become a source of inspiration in your professional life. You must honor your masters with devotion and friendship, for friendship is man's noblest sentiment, greater even than love.

"Your duty to society is to be idealists not hedonists: as physicians, to accept your profession as a service to mankind, not as a source of profit; as investigators, to seek the knowledge that will benefit your fellow beings; as clinicians, to alleviate pain and heal the sick; as teachers, to share and spread your knowledge and always because you are imbued with an ideal of service and not the ambition for gain. Thus will you maintain the dignity of our profession as a social science applied to the welfare of mankind.
"Your duty to your patients will be to act toward them as you would wish them to act toward you: with kindness, with courtesy, with honesty. You must learn when and how to withhold the truth from your patients, if by not telling them all the facts of their case you can relieve or console them, for you can cure them sometimes, and you can give them relief often, but hope you can give them always. Remember that a laboratory report is not an irrevocable sentence. A hematological determination, a roentgenogram, an electroencephalogram may supply vital information on the organic workings of the body; but it is even more vital never to forget that behind all such reports and data, there is a human being in pain and anguish, to whom you must offer something more than an antibiotic, an injection, or a surgical aid: you must, with your attitude, your words, and your actions, inspire confidence and faith and give understanding and consolation.

"To your colleagues you have the obligations of civilized men sharing a great and noble task and fighting for a common cause in a great crusade. Medicine lives, and it is nourished by the great social prestige it enjoys. Hence, never speak ill of a colleague, since to do so would be the same as speaking evil of medicine and therefore of your own selves. If you have something good to say about a fellow physician, say it everywhere; if you have not, then keep silent. You belong to a team of gallant professionals of all races and eras, bound together across the ages and continents by a glorious ideal.

"Finally, you will have obligations to yourselves. Every man in his youth forms an ideal profile of himself or of what he wants to be. He envisions, while young, an ideal program of things to do in life. The rest of his life is spent trying to fill in that profile with achievements. Some fail to reach fulfillment, and later it is tragic to see that ideal profile, of which they dreamed during their youth, in ruins, with the stumps of things begun but never completed. But in the majority of cases, that ideal silhouette created in youthful days really represents our true selves. You must live to be worthy of that silhouette. Your life, your work, and your personality as a physician must be such that your ideal profile of yourself will be filled in with brilliant achievements.

"Learn to live perceptively, using that key to wisdom that comes from
seeing everything with a total perspective and in view of eternity. Learn through science to correlate things in space; through history, to correlate events in time; and combine all this knowledge esthetically through the beauty of art.

"You are embarking on a noble career where there is no room for amateurs or dilettanti, a career in which we must all aspire to be masters of whatever we undertake, for the mistakes of medical carpenters and prescribers’ apprentices can have tragic results.

"Remember that the important thing in life is to be great not big—a great man, not a big man. Let your actions be great, but preserve your personal modesty and humility. What counts in a man and in a physician is his greatness. By greatness I mean grandeur in the things we do and simplicity in the way we do them; doing things that influence the lives of many people, but preserving always the greatest personal simplicity. For, greatness is simplicity. Know how to feel yourself an important part of the deeds of history. Try to find out as soon as you can what your ideal self is. Try to be what you truly are; otherwise you will be nothing. Such was Pindar’s theme: ‘Be what thou art.’ Man’s dignity rests in his ability to choose his destiny. You have chosen the best destiny of all, a life of dedicated service and dynamic activity. If you work with faith and without dismay, all your dreams will come true.

"In your future work you will be in good company. The great physicians of history, the glorious figures of the past, will always be near you. When you perform a dissection, a red-bearded young man with flashing eyes, Andreas Vesalius, will be peering over your shoulder; when you conduct a physiological experiment, the melancholy, pensive eyes of William Harvey will be watching you; when you teach medicine, the venerable figure of William Osler with his Apollonian head will come and sit like a medical Goethe beside you; and when you approach the sickbed, the shades of Hippocrates, Sydenham, and Fleming will gather round to counsel you, the young princes of our profession.

"The Greeks created the legend that Delphi, site of the famous oracle, was the center of the world, because if two eagles were to fly from any two points of the globe, sooner or later they would meet in Delphi. We now know that the two eagles of science and medicine do not fly only
in space but also in time, and their wings hover over the illustrious shadows of the investigators, clinicians, educators, pioneers, rebels, and martyrs of the history of medicine. The meeting place of those two eagles lies not in space but in time, in the future, and in the mind and the heart of every one of you who answered destiny's call to greatness when you decided 'to be a doctor.'"
RECOMMENDED READING

Many books, monographs, and articles on medicine, medical history, and history of the arts and civilization were consulted for the writing of this book. Here I wish to recommend only a few books for general reading on the history of medicine.

Once again I want to express my intellectual gratitude to the greatest medical historians of all time for their inspiration and enlightenment—their concepts, their words are found often in this book—and by greatest we mean the interpretative and creative historian; to Dr. Henry Sigerist and to Dr. Pedro Laín Entralgo, whose works have brought a new light into medical history; to Dr. Victor Robinson and to Dr. Douglas Guthrie for their lively handling of history and their charming storytelling technique; to all the other historians, here named and unnamed, for their many contributions to this field, their guidance, and their inspiration.

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"CLIO MEDICA" Series Directed by E. B. Krumbhaar, Paul B. Hoeber, 1932.

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Neuberger, Max: History of Medicine, 2 volumes, tr. by E. Playfair, London, Oxford University Press, 1910, 1925.
Osler, Sir William: The Evolution of Modern Medicine, New Haven, Yale University Press, 1921.


Singer, Charles J.: A Short History of Medicine, New York, Oxford University Press, 1928.


## NOBEL PRIZE LAUREATES

<table>
<thead>
<tr>
<th>Date</th>
<th>Name</th>
<th>Prize won for</th>
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<tbody>
<tr>
<td>1901</td>
<td>Emil von Behring</td>
<td>Work in serotherapy, especially against diphtheria.</td>
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<tr>
<td>1902</td>
<td>Sir Ronald Ross</td>
<td>Discovery of the way malarial organisms produce malaria</td>
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<td>1903</td>
<td>Niels R. Finsen</td>
<td>Treatment of lupus by concentrated light-rays.</td>
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<td>1904</td>
<td>Ivan Petrovich Pavlov</td>
<td>Studies on the physiology of digestion.</td>
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<td>1905</td>
<td>Robert Koch</td>
<td>Work on tuberculosis.</td>
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<tr>
<td>1906</td>
<td>Santiago Ramón y Cajal and Camilo Golgi</td>
<td>Studies on anatomy of the nervous system.</td>
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<td>1907</td>
<td>Charles L. A. Laveran</td>
<td>Recognition of role of protozoa in disease causation.</td>
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<td>1908</td>
<td>Paul Ehrlich and Elie Metchnikoff</td>
<td>Studies on immunity.</td>
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<tr>
<td>1909</td>
<td>Theodor Kocher</td>
<td>Work on physiology, pathology, and surgery of thyroid gland.</td>
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<td>1910</td>
<td>Albrecht Kossel</td>
<td>Studies on proteins and nuclear substances in cell density.</td>
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<tr>
<td>1911</td>
<td>Allvar Gullstrand</td>
<td>Work on dioptrics of the eye.</td>
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<tr>
<td>1912</td>
<td>Alexis Carrel</td>
<td>Achievements in suturing blood vessels, transplanting organs and blood vessels.</td>
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<td>Date</td>
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<tr>
<td>1913</td>
<td>Charles Richet</td>
<td>Anaphylaxis studies.</td>
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<tr>
<td>1914</td>
<td>Robert Bárány</td>
<td>Studies on physiology and pathology of vestibular apparatus.</td>
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<tr>
<td>1915–1918</td>
<td>No prizes awarded.</td>
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<tr>
<td>1919</td>
<td>Jules Bordet</td>
<td>Discoveries in field of immunity.</td>
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<td>1920</td>
<td>August Krogh</td>
<td>Discovery of regulatory mechanism of capillaries.</td>
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<td>1921</td>
<td>No prize awarded.</td>
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<td>1922</td>
<td>Archibald Vivian Hill</td>
<td>Explanation of thermodynamics of muscular contraction.</td>
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<td></td>
<td>Otto Meyerhof</td>
<td>Establishment of relation between oxygen consumption and the metabolism and lactic acid in the muscles.</td>
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<td>1923</td>
<td>Sir Frederick G. Banting and J. J. R. MacLeod</td>
<td>Discovery of insulin.</td>
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<tr>
<td>1924</td>
<td>Willem Einthoven</td>
<td>Investigation of electric current of the heart by means of his invention, the string galvanometer.</td>
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<td>1925</td>
<td>No prize awarded.</td>
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<td>1926</td>
<td>Johannes Fibiger</td>
<td>Discovery of spiroptera carcinoma.</td>
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<td>1927</td>
<td>Julius Wagner-Jauregg</td>
<td>Discovery of therapeutic value of malaria inoculations in treating paresis.</td>
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<td>1928</td>
<td>Charles Nicolle</td>
<td>Investigation of exanthematic typhus.</td>
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<td>1929</td>
<td>Christian Eijkman</td>
<td>Discovery of the antineuritic vitamin.</td>
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<td></td>
<td>F. Gowland Hopkins</td>
<td>Discovery of growth-producing vitamins.</td>
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<tr>
<td>1930</td>
<td>Karl Landsteiner</td>
<td>Discovery of human blood groups.</td>
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<tr>
<td>1931</td>
<td>Otto Warburg</td>
<td>Discovery of the respiratory ferment.</td>
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<tr>
<td>1932</td>
<td>Charles Sherrington and Edgar Douglas Adrian</td>
<td>Discoveries regarding function of the neuron.</td>
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<tr>
<td>1933</td>
<td>Thomas Hunt Morgan</td>
<td>Studies of chromosomes that transmit hereditary qualities.</td>
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<tr>
<td>1934</td>
<td>George H. Whipple, George R. Minot, and William P. Murphy</td>
<td>Discovery of value of liver treatment in anemias.</td>
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<td>1935</td>
<td>Hans Spemann</td>
<td>Discovery of organizer effect in embryonal development.</td>
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<td>Date</td>
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<td>Prize won for</td>
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<td>1936</td>
<td>Henry Hallett Dale and Otto Loewi</td>
<td>Discoveries relating to chemical transmission of nerve impulses.</td>
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<td>1937</td>
<td>Albert Szent-Györgyi</td>
<td>Chemical identification of vitamin C.</td>
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<td>1938</td>
<td>Corneille Heymans</td>
<td>Work on carotid sinus.</td>
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<tr>
<td>1939</td>
<td>Gerhard Domagk</td>
<td>Demonstration of value of sulfonamides in bacterial infections.</td>
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<tr>
<td>1940–1942</td>
<td>No prizes awarded.</td>
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<tr>
<td>1943</td>
<td>Henrik Dam</td>
<td>Discovery of vitamin K and its role in blood coagulation.</td>
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<td></td>
<td>Edward A. Doisy</td>
<td>Studies on vitamin K: sources, structure, synthesis, methods of purification.</td>
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<tr>
<td>1944</td>
<td>Joseph Erlanger and Herbert S. Gasser</td>
<td>Development of method to detect small changes in electrical potential of even single nerve fibers.</td>
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<td>1945</td>
<td>Sir Alexander Fleming, Sir Howard Florey, and Ernst B. Chain</td>
<td>Discovery and development of penicillin.</td>
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<tr>
<td>1946</td>
<td>Herman J. Muller</td>
<td>Study of influence of X-rays on genes and chromosomes.</td>
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<td></td>
<td>Bernardo A. Houssay</td>
<td>Demonstration of role of pituitary secretion in inhibiting body's use of insulin.</td>
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<tr>
<td>1948</td>
<td>Paul Mueller</td>
<td>Discovery of dichlorodiphenyl-trichloroethane (DDT)</td>
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<td>1949</td>
<td>Walter Rudolf Hess</td>
<td>Studies on control of organs by certain areas of the brain.</td>
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<td></td>
<td>Egas Moniz</td>
<td>Development of brain operation.</td>
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<tr>
<td>1951</td>
<td>Max Theiler</td>
<td>Development of anti-yellow fever vaccine.</td>
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<tr>
<td>1952</td>
<td>Selman A. Waksman</td>
<td>Co-discovery of streptomycin.</td>
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<tr>
<td>1953</td>
<td>Fritz A. Lipmann and Hans Adolph Krebs</td>
<td>Studies of living cells.</td>
</tr>
<tr>
<td>Date</td>
<td>Name</td>
<td>Prize won for</td>
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<tr>
<td>1955</td>
<td>Hugo Theorell</td>
<td>Work relating to oxidation enzymes.</td>
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<tr>
<td>1956</td>
<td>Dickinson W. Richards, Jr., André F. Cournand, and Werner Forssmann</td>
<td>New techniques in heart disease.</td>
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<tr>
<td>1957</td>
<td>Daniel Bovet</td>
<td>Development of drugs to relieve allergies and relax muscles during surgery.</td>
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<td></td>
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<td>Discovery of how genes transmit hereditary</td>
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<td>characteristics.</td>
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<tr>
<td>1960</td>
<td>Sir Macfarlane Burnet and Peter Brian Medawar</td>
<td>For the discovery of acquired immunological</td>
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<td>tolerance.</td>
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# Selective Medical and Historical Chronology

<table>
<thead>
<tr>
<th>Date</th>
<th>Persons (Events)</th>
<th>Medical Contributions</th>
<th>Historical Developments</th>
</tr>
</thead>
<tbody>
<tr>
<td>fl. c. 2980–2950 B.C.</td>
<td>Imhotep</td>
<td>First human medical figure known by his own name; physician, astrologer, prime minister, architect of the pyramid of Sakkara; after his death, deified as Egyptian God of Medicine.</td>
<td>Age of the great pyramids in Egypt and the ziggurats in Mesopotamia.</td>
</tr>
<tr>
<td>c. 2697 B.C.</td>
<td>Huang-ti</td>
<td>His Book of Medicine became the foundation of Chinese medical literature for centuries.</td>
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<tr>
<td>c. 2500 B.C.</td>
<td>Egyptian tomb carvings</td>
<td>Representations of surgery on doorposts of a tomb, discovered near Memphis by W. Max Müller, may be earliest pictures of surgical procedures.</td>
<td></td>
</tr>
<tr>
<td>c. 2250 B.C.</td>
<td>Code of Hammurabi</td>
<td>Oldest code of law carved on a column of diorite, discovered at Susa, 1901–2, established physicians' fees, reprisals in case of death or impairment of patient. May date from as late as c. 1700 B.C.</td>
<td>Beginning of settlements by Achaeans on the Greek peninsula. Height of Indian (Indus Valley), Egyptian, and Mesopotamian civilizations.</td>
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<tr>
<td>c. 1700 B.C.</td>
<td>Edwin Smith Papyrus</td>
<td>Deals largely with treatment of wounds; reveals apparent use of splints; may be a copy of an earlier document; acquired at Luxor in Egypt, 1862.</td>
<td></td>
</tr>
<tr>
<td>c. 1550 B.C.</td>
<td>Ebers Papyrus</td>
<td>Written in several dialects; list of diseases and more than 700 remedies; extensive discussion of eye and ear diseases; discovered in Thebes by Georg Moritz Ebers and published in 1874.</td>
<td>Greatest development of Cretan civilization.</td>
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</tbody>
</table>
c. 1500 B.C. Rig-Veda  Earliest Sanskrit medical document; lists spells and incantations as principal therapy.

Beginning of Mycenean Age of Greece.

668–631 B.C. King Ashurbanipal of Assyria Extensive collection of clay tablets from his library provide valuable medical information.


504–443 B.C. Empedocles of Agrigentum Physician, philosopher, poet; introduced theory of air, earth, water, and fire as primary substances, which are influenced by two basic forces, attraction and repulsion, Love and Hate; presented an early statement of conservation of matter; believed to have drained swamps to stem an epidemic of malaria.

Persian Wars, 500–449 B.C., described by Herodotus (c. 485–c. 425 B.C.), known as the Father of History. In three widely separated areas—Greece, India, and China—modern man was beginning to emerge.

c. 460–?377 B.C. Hippocrates of Cos Considered the Father of Medicine; taught the healing power of nature; used few drugs, relying largely on diet, fresh air, massage; accepted doctrine of the four humors; exerted moral influence as evidenced in Hippocratic Oath. His magnificent teachings, collected during the third century B.C. as the Corpus Hippocraticum, included 42 clinical case histories.

* This is not intended to be a complete chronology, but rather a selective list of medical figures and events to supplement the text of these lectures.
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<td>430–425 B.C.</td>
<td>Plague of Athens</td>
<td>Described in Thucydides’ <em>History</em> and later in Lucretius’ <em>De rerum natura</em>.</td>
<td>Peloponnesian Wars, 431–404 B.C., the subject of Thucydides’ <em>History</em>.</td>
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<tr>
<td>427?–347 B.C.</td>
<td>Plato</td>
<td>Pupil of Socrates; taught concept of unity of body and soul; first to use word anesthesia; founded Academy at Athens, where he taught until his death. In his <em>Symposium</em>, Eryximachus, a physician, defines medicine as “the art of learning the love affairs of the organs of the body.” His 35 dialogues and 13 epistles have all survived to modern times.</td>
<td>Spread of Hellenistic culture through the conquests of Alexander the Great, 336–324 B.C. Alexandria library founded by Ptolemy I Soter, general under Alexander.</td>
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<tr>
<td>384–322 B.C.</td>
<td>Aristotle</td>
<td>Son of a physician, pupil of Plato, and tutor of Alexander the Great; taught anatomy from animal dissections; conducted studies in botany, zoology, physiology.</td>
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<tr>
<td>335–280 B.C.</td>
<td>Herophilus of Chalcedon</td>
<td>A leading physician of the Alexandrian school; known as the “father” of anatomy and considered first to dissect human bodies and to study anatomy of the brain and spinal cord.</td>
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<tr>
<td>c. 310–c. 250 B.C.</td>
<td>Erasistratus of Chios</td>
<td>“Father” of physiology; conducted experiments in metabolism; observed that all organs were connected with veins, arteries, and nerves.</td>
<td>Consolidation of Roman influence and beginning of expansion. Punic Wars, 264–146 B.C., ending with destruction of Carthage and Corinth.</td>
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<tr>
<td>c. 220 B.C.</td>
<td>Archagathus</td>
<td>Greek physician and surgeon; freed slave, believed to be first practicing physician in Rome.</td>
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<td>c. 124–744 B.C.</td>
<td>Asclepiades of Bithynia</td>
<td>Opposed to Hippocrates’ theory of healing power of nature; discovered tracheotomy; urged more humane care of mental patients.</td>
<td>Julius Caesar, 1027–44 B.C. Vergil, 70–19 B.C.</td>
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<tr>
<td>fl. early 1st century A.D.</td>
<td>Celsus</td>
<td>His treatise, <em>De re medica</em>, a vast compilation of medical learning to his time; wrote also on agriculture, philosophy, jurisprudence; medical writings divided into three sections according to treatment: dietetic, pharmaceutical, surgical.</td>
<td>Age of Augustus, 31 B.C.—14 A.D., beginning of two centuries of peace and consolidation of the Roman Empire, which reached its height of ex-</td>
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<td>Era</td>
<td>Person/Event</td>
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<tr>
<td>fl. 1st century</td>
<td>Soranus of Ephesus Practiced in Rome under Hadrian; his writings on gynecology and obstetrics exerted wide influence until the sixteenth century.</td>
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<td>129/130–199/200</td>
<td>Galen Physician to Emperors, including Marcus Aurelius; revived theory of four humors and combined with four elements of Pythagoras; advocated a vast pharmacopeia. He studied anatomy in lesser animals, proved that the arteries carry blood. His concept of disease was anatomic. His writings formed the basis of medical thought and practice for more than 1000 years.</td>
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<td>c. 287</td>
<td>St. Cosmas and St. Damian Martyred Arabian Christian saints, twin brothers, who were later evoked as protectors against the plague in the fourteenth century.</td>
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<td>325–403</td>
<td>Oribasius Physician at Constantinople; writings include Synagogae medicæ, extensive compilation of early medical texts, and Euporista, a medical treatise for the layman.</td>
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<tr>
<td>448</td>
<td>Medical schools of Edessa and Nisibis Founded by the followers of Archbishop Nestorius, exiled from Constantinople, who established themselves in Persia and translated Greek and Roman medical writings into Syriac and Arabic.</td>
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<td>529</td>
<td>Benedictine monastery founded at Monte Cassino The cradle of religious medical teaching.</td>
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<td>fl. 6th century</td>
<td>Aëtius of Amida Physician to Emperor Justinian I at Byzantium; his Tetrabillon an extensive anthology in Greek of early texts.</td>
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<td>625–690</td>
<td>Paul of Aegina His Epitome noteworthy for description of surgery.</td>
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<tr>
<td>c. 865–925</td>
<td>Rhazes Persian physician at Baghdad, noted as a clinician.</td>
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<tr>
<td>936?–1013</td>
<td>Abul Kasim (Albucaasis)</td>
<td>Surgeon at Cordova and most important of Arabian surgical writers; his <em>On Surgery</em> was the first illustrated text in the field.</td>
<td>Western Empire, consolidated under Charlemagne, and subsequent rise of feudalism, monasticism. Explorations of the Norsemen.</td>
</tr>
<tr>
<td>fl. 10th to 13th centuries</td>
<td>Medical School at Salerno</td>
<td>First lay center of medical teaching in Europe, where the degree of “doctor” was granted.</td>
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<tr>
<td>980–1037</td>
<td>Avicenna</td>
<td>Physician-in-chief of hospital at Baghdad; his <em>Canon Medicinae</em> an attempt to reconcile the teachings of Hippocrates and Galen with those of Aristotle; writings include numerous clinical case histories; the <em>Canon</em>, together with writings of Galen, foundations of medicine during the Middle Ages.</td>
<td></td>
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<tr>
<td>1126–1198</td>
<td>Averroës</td>
<td>Physician at Cordova, whose <em>Book of Universals</em> was an attempt to establish a medical system based upon the writings of Aristotle.</td>
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<tr>
<td>1135–1204</td>
<td>Maimonides</td>
<td>Philosopher, Talmudist, physician to the sultan Saladin, for whom he wrote a treatise on personal hygiene; other works include commentaries on and extracts from Hippocrates and Galen, letters on dietetics, treatises on asthma, poisons, fits.</td>
<td>Commercial expansion and growth of towns; beginning of the guilds in Europe.</td>
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<tr>
<td>1137</td>
<td>School of Montpellier</td>
<td>Exact date of founding uncertain, but known to exist in 1137; other schools established at Paris (1110–13), Bologna (1138), Padua</td>
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</table>
(1212), Rome (1303), Oxford (c. 1167), Salamanca (1242).

1193–1280 Albertus Magnus
Called doctor universalis; greatest medical figure of the Middle Ages. While known largely for philosophical and theological writings, his Summa Naturalum, treating of the healing properties of plants, had wide influence in the sixteenth century.

1235–1312 Arnold of Villanova
Most widely known physician of his time; voluminous writer, whose works show the influence of all the medical trends of the late thirteenth century; student of alchemy; pioneer in the classification of disease.

1235–1315 Raimundo Lulio
Spanish philosopher and alchemist, who taught at Montpellier; studied Arabian chemistry.

215
1275–1326 Mondino de' Luzzi (Mundinus)
One of the greatest anatomists of the Middle Ages; taught at Bologna; introduced anatomy into the medical curriculum and performed human dissections; his Anathomia, although containing many errors, an important text until the sixteenth century.

c. 1300–1368 Guy de Chauliac
Greatest surgeon of the Middle Ages; taught at Montpellier; his Chirurgia, the classical surgical text until the sixteenth century, included a section on the history of surgery.

1348 The Black Death reached Europe
An example of the “collective” diseases characteristic of the Middle Ages, which began in central Asia in 1333 and ended its reign of death and devastation in Europe by 1350, to return periodically in milder form during the next ten years; 43,000,000 lives believed to have been lost in Europe.

1452–1519 Leonardo da Vinci
Painter, sculptor, architect, engineer, scientist, towering genius of the Renaissance; his ana-


Hundred Years’ War, 1336–1453, a century-long struggle to settle English claims to French territory. After English victories at Crécy, Poitiers, Agincourt, the English were driven from France by an army inspired by Joan of Arc. The end of the Middle Ages, around 1453.

The Renaissance initiated a period of heightened activity and significant de-
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<td>1478–1553</td>
<td>Girolamo Fracastoro</td>
<td>Mathematician, poet, musician, biologist, astronomer, who in his famous poem <em>Syphilis sive morbus Gallicus</em> gave the name of syphilis to the disease that appeared in so virulent a form during the siege of Naples in 1495; studied epidemics and described three forms of contagion: simple contact, indirect contact, transmission from a distance.</td>
<td><em>Humanism and Literature</em>—Petrarch, Boccaccio, Erasmus, Rabelais, Montaigne, Cervantes, de Vega, Shakespeare, Spencer, Marlowe, More, Tasso, Vives, Chaucer. Printing from movable type introduced in Europe.</td>
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<tr>
<td>1493–1541</td>
<td>Paracelsus (Philippus Theophrastus Bombastus von Hohenheim)</td>
<td>Physician and alchemist; spent most of his life as an errant physician, forced to move about as a result of antagonizing the citizenry wherever he settled; precursor of chemotherapy; believed in a specific remedy for every disease; his study of miners' diseases was an early treatise in occupational medicine.</td>
<td><em>Art</em>—Michelangelo, Raphael, Titian, da Vinci, El Greco, Dürer, Holbein, Cellini, Brueghel, Botticelli, Correggio, Tintoretto, Verrocchio, Caravaggio.</td>
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<tr>
<td>1497–1558</td>
<td>Jean Fernel</td>
<td>French humanist who, in his <em>Universa medicina</em>, introduced a modern division of topics, with sections on physiology, pathology, therapeutics; wrote earliest account of appendicitis.</td>
<td><em>Music</em>—emergence of modern music; counterpoint and polyphony; improved instruments.</td>
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<td>velopments in all phases of human endeavor.</td>
<td><em>Science</em>—Copernicus, Brahe, Kepler, Galileo, Cardano, Porta, Gilbert.</td>
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<td><em>Philosophy</em>—Bruno, Francis Bacon, Machiavelli.</td>
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<td><em>Religion</em>—Luther, Calvin, English Act of Supremacy, Edict of Nantes, rise of Puritanism, Saint Ignatius de Loyola, founder of the Society of Jesus.</td>
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<td><em>Exploration</em>—Christopher Columbus, Vasco da Gama, Ferdinand Magellan, Vasco de Balboa.</td>
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<td><em>Conquest and Colonization</em>—early</td>
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1511–1553  Michael Servetus  
Spanish physician and theologian; burned at the stake in Geneva for heresy by Calvin, together with his writings; discovered pulmonary circulation.

1514–1564  Andreas Vesalius  
Greatest anatomist of all time and, as such, one of the founders of modern medicine. Born in Flanders; student and teacher at Padua, where he performed dissections; his *De Humani corporis fabrica libri septem*, published in Basel in 1543, is a vast, beautifully illustrated (probably by Calcar) panorama of anatomy that served to correct anatomical errors of Galen; criticism of his book forced him to go to Spain, where he became court physician to Emperor Charles V (King Charles I of Spain).

1515–1588  Johann Weyer  
Dutch physician and opponent of witch-burning; his *De praestigiis daemonum* expressed view that witches were merely people whose minds were distorted or who had lost control of their emotions. His book counteracted the infamous witch-hunting manual *Malleus Maleficarum* by Spranger and Krämer (c. 1485).

1516–1565  Conrad von Gesner  
Humanist, renowned for studies in botany, zoology, medicine; professor of natural history at Zurich; his *Bibliotheca universalis*, written in 1545–1549, the most complete work of its kind to his time, although section on medicine never completed.

1517–1590  Ambroise Paré  
French barber-surgeon; after apprenticeship, became army surgeon in Italian campaigns of 1536 and 1545; invented several surgical instruments and reintroduced use of ligatures; wrote significant treatise on gunshot wounds and sur-


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<tr>
<td>1533–1619</td>
<td>Fabrizio ab Aquapendente (Fabricius)</td>
<td>Anatomist, physiologist, and surgeon; taught Harvey at Padua and is credited with stimulating his interest in blood's movement; <em>De venarum ostolos</em> (1603) described valves in the veins; wrote also on anatomy and physiology of the fetus, physiology of sight, respiration.</td>
<td>The Seventeenth Century was an era of widespread intellectual and scientific developments that prepared the way for the Enlightenment; a growing interest in natural science and the formation of academies; the rise of critical historical scholarship and the foundation of social sciences. A period that saw the publication of Descartes' <em>Discourse on Method</em> (1637); Milton's <em>Areopagitica</em> (1641); Hobbes' <em>Leviathan</em> (1651); Boyle's <em>The Sceptical Chemist</em> (1661); Newton's <em>Principia</em> (1687); Locke's <em>Two Treatises on Government</em> (1690).</td>
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<tr>
<td>1561–1636</td>
<td>Sanctorius (Santorius Santorio)</td>
<td>Leading representative of the Iatrophysical School; introduced quantitative mensuration into physiology; invented clinical thermometer and pulse clock; founded physiology of metabolism.</td>
<td>Science—Leeuwenhoek in biology,</td>
</tr>
<tr>
<td>1577–1644</td>
<td>Jean Baptiste van Helmont</td>
<td>Founder of Iatrochemical School; believed that all bodily processes were chemical and were controlled by a special <em>archeus</em> or spirit.</td>
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<tr>
<td>1578–1657</td>
<td>William Harvey</td>
<td>After receiving his medical training at Padua, this great English physician began practice in London; announced his discovery of the circulation of blood in 1616; published discovery in his book <em>Exercitatio anatomica de motu cordis et sanguinis in animalibus</em> in 1628; physician to James I and Charles I.</td>
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<tr>
<td>1581–1626</td>
<td>Gaspare Aselli</td>
<td>In the year before publication of Harvey’s work, announced discovery of lacteal vessels in his <em>De lactibus sive lacteis venis</em>.</td>
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<td>1597–1677</td>
<td>Francis Glisson</td>
<td>Graduate of Cambridge; responsible for original account of infantile rickets (1650); intro-</td>
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<tr>
<td>Year(s)</td>
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<td>Contributions</td>
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<tr>
<td>1600–1643</td>
<td>Johann Georg Wirsung</td>
<td>Bavarian physician and discoverer of the pancreatic duct (1642).</td>
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<td>1601–1672</td>
<td>Guy Patin</td>
<td>Colorful member of the Faculty of Paris, whose letters give vivid account of conditions of physicians of his times.</td>
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<td>1605–1682</td>
<td>Sir Thomas Browne</td>
<td>Humanist, physician of Norwich, England, whose <em>Religio medici</em> was an attempt to reconcile the skepticism of science with religious faith.</td>
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<td>1608–1679</td>
<td>Giovanni Alfonso Borelli</td>
<td>Neapolitan mathematician and a leader of the Iatrophysical School; presented a mechanical view of the human body.</td>
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<tr>
<td>1614–1672</td>
<td>Sylvius (Franciscus de la Boë)</td>
<td>Professor at Leyden and leading advocate of Iatrochemical School; believed all diseases could be explained and treated chemically; one of the first to introduce ward instruction into medical teaching.</td>
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<tr>
<td>1621–1675</td>
<td>Thomas Willis</td>
<td>Prominent English exponent of Iatrochemical School; his <em>Cerebri anatome</em> the most complete account of the nervous system to his time, and his <em>Pharmaceutica rationalis</em> presented the materia medica of the period.</td>
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<td>1622–1674</td>
<td>Jean Pecquet</td>
<td>Confirmed the work of Aselli on lacteal vessels and Harvey in <em>Experimenta nova anatomica</em> (1651).</td>
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<td>1624–1689</td>
<td>Thomas Sydenham</td>
<td>English physician whose work represented a return to the basic principles of Hippocrates; recommended clinical observation, treatment of the whole patient, and development of treat-Pascal in mathematics, Halley and Huygens in astronomy.</td>
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Religious Movements—Quakerism (George Fox); Methodism (John Wesley); pietism; rise of skepticism and growth of natural religion, deism.

Literature—Corneille, Racine, Molière, Milton, Dryden, Opitz, Calderon, Johnson, Pepys.

The Arts—Beginning of the Baroque period in architecture and sculpture; Bernini, Churriguera, the Monsarts, Wren.

Painting—Rubens, Rembrandt, Velázquez, Van Dyck, Vermeer, Murillo, Hals.

Music—Development of opera: Monteverdi, Scarlatti, Lully; piano developed; violin perfected.

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<td>1628–1689</td>
<td>Theophilus Bonet</td>
<td>Pathologist at Geneva, whose <em>Sepulchretum sive anatomica practica</em> (1679) included more than 3000 case records.</td>
<td>bringing William and Mary to the throne, 1689–1702.</td>
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<tr>
<td>1628–1694</td>
<td>Marcello Malpighi</td>
<td>Professor at University of Pisa at 28; one of the first to introduce the microscope into the study of anatomy; described the capillary circulation in 1661.</td>
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<td>1638–1686</td>
<td>Niels Stensen</td>
<td>Danish anatomist, physiologist, geologist, and theologian; discovered the parotid gland in 1661.</td>
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<td>1660–1734</td>
<td>Georg Ernst Stahl</td>
<td>Priest-physician of Bavaria, who propounded theory of <em>animism</em>: body is passive instrument of the immortal soul and disease is caused by misdirected activities of the soul.</td>
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<tr>
<td>1668–1738</td>
<td>Hermann Boerhaave</td>
<td>A leading physician of his time and remembered primarily as a great teacher; as professor of clinical medicine at Leyden, emphasized bedside teaching; his influence spread to other schools of the period through his many students.</td>
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<tr>
<td>1669?–1707</td>
<td>Giorgio Baglivi</td>
<td>Although a proponent of the principles of the Iatrophysical School, which compared parts of the body to small machines, this Italian physician was in his practice a follower of the teachings of Hippocrates, a careful observer, and practical clinician.</td>
<td></td>
</tr>
<tr>
<td>1679–1759</td>
<td>Gaspar Casal</td>
<td>Spanish physician who first described pelagra (1735), calling it <em>mal de la rosa</em>.</td>
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</tr>
</tbody>
</table>

*The Eighteenth Century, Age of the Enlightenment,* which was founded upon the conviction that man and the universe are subject to natural laws that can be discovered by human reason; this discovery would enable man to improve himself and approach perfection; a period that supported the rights of the individual and maintained a firm belief in the dignity of man.

*Intellectual and Scientific Developments*—Hume, Kant, Voltaire, Buffon’s *Natural History of Animals,* Linnaeus’ *System of Nature,* Priestley; Franklin; Lavoisier introduced quantitative analysis in chemistry; Diderot’s *Encyclopedia,* Lagrange, Black,
<table>
<thead>
<tr>
<th>Year</th>
<th>Name</th>
<th>Contributions</th>
<th>Related Figures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1682–1771</td>
<td>Giovanni Battista Morgagni</td>
<td>Teacher at Bologna and Padua who laid the foundations of modern pathological anatomy; established the organs as the seat of disease; first to correlate autopsy findings with clinical case histories; summation of his life's work published when he was 79—<em>De Sedibus et causis morborum per anatomem indagatis.</em></td>
<td>Scheele, Galvani, Volta, Gauss, Laplace, Condorcet, Erasmus Darwin.</td>
</tr>
<tr>
<td>1708–1777</td>
<td>Albrecht von Haller</td>
<td>Swiss-born poet, philosopher, statesman, and physician; student of Boerhaave and greatest physiologist of his time, whose <em>Elementa physiologiae corporis humani</em> brought together earlier observations and provided the basis for scientific physiology of the future.</td>
<td>Music—Bach, Handel, Mozart.</td>
</tr>
<tr>
<td>1710–1790</td>
<td>William Cullen</td>
<td>Graduate of Edinburgh and instrumental in establishing medical school at Glasgow; first to give lectures in the vernacular; introduced clinical lectures in Great Britain.</td>
<td>Economics—Adam Smith.</td>
</tr>
<tr>
<td>1718–1783</td>
<td>William Hunter</td>
<td>Prominent English anatomist of the eighteenth century; most significant work is <em>The Anatomy of the Human Gravid Uterus.</em></td>
<td>History and Political Philosophy—Gibbon, Hume, Bentham, Rousseau, Montesquieu, Berkeley.</td>
</tr>
<tr>
<td>1722–1809</td>
<td>Leopold Auenbruger von Auenbrugg</td>
<td>Viennese physician who introduced percussion in the diagnosis of chest ailments; results published in <em>Inventum novum</em> (1761).</td>
<td>Social Sciences—Growth of geography, anthropology, philology. Absorbing interest in humanity, throughout western Europe and America; demands for popular education, prison reform, abolition of slavery; profound reactions against wars; Pestalozzi brought about important changes in education.</td>
</tr>
<tr>
<td>1722–1776</td>
<td>Théophile de Bordeu</td>
<td>French physician and leading proponent of <em>vitalism</em>; believed that blood contained extracts from all parts of the body.</td>
<td>Religion—Spread of deism and freemasonry; rise of religious toleration; suppression of the Jesuits; decline of witch hunting; beginning of Jewish emancipation in Europe.</td>
</tr>
<tr>
<td>1728–1793</td>
<td>John Hunter</td>
<td>Younger brother of William Hunter and master of pathologic anatomy; did much to raise surgery to the status of a science; based all his work on careful investigation and observation.</td>
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<tr>
<td>Date</td>
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<td>Historical Developments</td>
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<tr>
<td>1734–1815</td>
<td>Franz Anton Mesmer</td>
<td>German physician; studied in Vienna; his interest in animal magnetism led to the development of a type of hypnosis known as mesmerism; gained extensive clientele in Paris, but government investigation led to failure and retirement.</td>
<td></td>
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<tr>
<td>1735–1788</td>
<td>John Brown</td>
<td>Pupil of Cullen and founder of Brunonis, theory that life is not a spontaneous condition but rather one maintained by external stimuli; advocated therapy by <em>contra</em> <em>tut</em> <em>s</em> <em>c</em>urrant.</td>
<td>Political Highlights—Peter the Great, Czar of Russia, 1689–1725. Frederick the Great, King of Prussia, 1740–1786. Seven Years' War, 1756–1763; British took Quebec, 1759; Peace of Paris, 1763, gave Canada to Britain. Catherine the Great of Russia, 1762–1796. American Revolution, 1774–1781; Declaration of Independence, 1776. Assembling of Estates-General, storming of Bastille and beginning of French Revolution, 1789; Louis XVI beheaded, 1793; Napoleon named First Consul, 1799.</td>
</tr>
<tr>
<td>1735–1789</td>
<td>John Morgan</td>
<td>Founder in 1765, with William Shippen, of the first medical school in the American colonies, at Philadelphia; also remembered for <em>Discourse on the Institution of Medical Schools in America</em> (1765).</td>
<td></td>
</tr>
<tr>
<td>1740–1796</td>
<td>Francisco Eugenio de la Cruz y Espejo</td>
<td>Patriot of Ecuador, pioneer in public health, and the first public librarian in his country. Most significant of his writings was on smallpox inoculation.</td>
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<tr>
<td>1741–1799</td>
<td>William Withering</td>
<td>English physician whose <em>Account of the Foxglove</em> (1785) described the proper use of digitalis in dropsy and introduced its use in other cardiac conditions.</td>
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<tr>
<td>1745–1821</td>
<td>Johann Peter Frank</td>
<td>Physician to Czar Alexander I, he maintained that the state should be responsible for the public health. Treatises on public health covered such topics as sewerage, water supply, school hygiene.</td>
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<tr>
<td>1745?–1813</td>
<td>Benjamin Rush</td>
<td>Great early American physician; graduate of Edinburgh; left excellent description of the</td>
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</table>
yellow fever epidemic in Philadelphia in 1793, in which he played an active part in treating victims by bleeding; his treatise on insanity one of the early American accounts in this field; wrote significant descriptions of cholera infantum, dengue; suggested extraction of decayed teeth as cure for disease.

<table>
<thead>
<tr>
<th>Year</th>
<th>Person</th>
<th>Event</th>
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<tbody>
<tr>
<td>1745–1826</td>
<td>Philippe Pinel</td>
<td>Superintendent of the Salpêtrière and pioneer in care of mental patients; his <em>Traité médico-philosophique sur l'aliénation mentale</em> (1801) showed the origin of mental diseases to be in pathological changes in the brain; interpreted the concepts of the French Revolution at the Bicêtre Mental Hospital in Paris by freeing the patients from their chains.</td>
</tr>
<tr>
<td>1749–1823</td>
<td>Edward Jenner</td>
<td>A pupil of John Hunter in London; as a result of observation that victims of cowpox did not contract smallpox, successfully vaccinated a country boy in 1796 with pus from a milkmaid in the active stage of cowpox; published his results in 1798.</td>
</tr>
<tr>
<td>1751</td>
<td>Founding of the Pennsylvania Hospital</td>
<td>The first independent hospital to be established in the United States.</td>
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<tr>
<td>1754–1825</td>
<td>Baron Pierre François Percy</td>
<td>Surgeon with the army of Napoleon.</td>
</tr>
<tr>
<td>1755–1821</td>
<td>Jean Nicolas Corvisart des Marets</td>
<td>Physician to Napoleon, remembered primarily for his translation of works of Auenbrugger on percussion.</td>
</tr>
<tr>
<td>1755–1843</td>
<td>Samuel Hahnemann</td>
<td>German physician, founder of homeopathy, advocating treatment of a disease by a minute dose of a drug that will produce a condition similar to the disease (<em>similia similibus curantur</em>).</td>
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<tr>
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<tr>
<td>1755–1833</td>
<td>José Hipólito Unanue</td>
<td>Statesman and scholar, one of the fathers of South American medicine. Founder of <em>El Mercurio Peruano</em> in 1791. Instrumental in creation of anatomical amphitheater in Lima for teaching purposes.</td>
</tr>
<tr>
<td>1765</td>
<td>Medical School of the College of Philadelphia</td>
<td>This was the first medical school to be founded in the United States. The first degree (M.D.) was conferred in 1771.</td>
</tr>
<tr>
<td>1766–1842</td>
<td>Baron Dominique Jean Larrey</td>
<td>Surgeon-in-Chief to the Grande Armée of Napoleon and greatest French military surgeon of his time; creator of the “Flying Ambulance.”</td>
</tr>
<tr>
<td>1768–1837</td>
<td>Philip Syng Physick</td>
<td>Occupied the first American chair of surgery to be established as separate from the teaching of anatomy; most famous operation was that for removal of several hundred stones from the bladder of Chief Justice John Marshall.</td>
</tr>
<tr>
<td>1771–1830</td>
<td>Ephraim McDowell</td>
<td>American physician who studied at Edinburgh; performed first ovariotomy.</td>
</tr>
<tr>
<td>1771–1802</td>
<td>Marie-François Xavier Bichat</td>
<td>Army surgeon during the French Revolution; one of the fathers of histology, his writings included detailed descriptions of healthy and diseased tissue; believed origin of disease to be in the tissues.</td>
</tr>
<tr>
<td>1781–1826</td>
<td>René Théophile Hyacinthe Laënnec</td>
<td>Inventor of the stethoscope (1819); his <em>Traité de l'auscultation médiate</em> (1819–1823) an important treatise on diseases of the chest; regimental surgeon during the French Revolution.</td>
</tr>
<tr>
<td>1784</td>
<td>First American medical journal</td>
<td><em>Cases and Observations by the Medical Society of the New-Haven County</em> was published.</td>
</tr>
<tr>
<td>1801–1858</td>
<td>Johannes Peter Müller</td>
<td>Famous physiologist and founder of scientific medicine in Germany; first to use microscope.</td>
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<tr>
<td>Year</td>
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<tr>
<td>1804-1881</td>
<td>Mathias Jakob Schleiden</td>
<td>After having been a failure in the field of law, turned to medicine and finally botany; recognized that plants are composed of cells.</td>
</tr>
<tr>
<td>1804-1878</td>
<td>Baron Karl von Rokitansky</td>
<td>From Bohemia, became professor of pathological anatomy at Vienna; made more than 30,000 autopsies, which were studied in connection with the clinical case histories.</td>
</tr>
<tr>
<td>1805-1881</td>
<td>Joseph Skoda</td>
<td>First teacher of medicine at Vienna to lecture in German; noted as diagnostician; wrote significantly on percussion and auscultation.</td>
</tr>
<tr>
<td>1809-1894</td>
<td>Oliver Wendell Holmes</td>
<td>Poet, essayist, and physician; professor of anatomy at Harvard; author of Medical Essays (1883), important contribution to medical history, and the then controversial On the Contagiousness of Puerperal Fever (1843).</td>
</tr>
<tr>
<td>1810-1882</td>
<td>Theodor Schwamm</td>
<td>Pupil of Müller; applied Schleiden’s cell theory to animals and published statement in 1839.</td>
</tr>
<tr>
<td>1811-1870</td>
<td>Sir James Young Simpson</td>
<td>Prominent Scotch obstetrician and professor at Edinburgh; first to use chloroform fumes in labor (1847).</td>
</tr>
<tr>
<td>1813-1883</td>
<td>J. Marion Sims</td>
<td>American obstetrician, practiced in Alabama and later in New York where he was instrumental in the founding of Woman's Hospital (1835); the position and speculum bearing his name made possible surgical treatment of vesico-vaginal fistula.</td>
</tr>
<tr>
<td>1813-1878</td>
<td>Claude Bernard</td>
<td>Became greatest French physiologist of the nineteenth century, after early years as pharmacist and unsuccessful playwright; conducted century of invention, discovery, and creativity in all phases of human enterprise that have provided the foundation for modern living; the era of romanticism and, later on, of natural positivism.</td>
</tr>
</tbody>
</table>

**Height of the Industrial Revolution**— Rise of engineering; development of Bessemer process; railway expansion; mechanization of agriculture; beginnings of the labor movement; invention of telegraph, telephone, photography, incandescent lamp, steamboat, automobile.

**Political and Economic Thought**— Ricardo, Owen, Malthus, George, Mill, Spencer, Marx, Engels; Communist Manifesto, 1848.

**Philosophy**—Schopenhauer, Nietzsche, Comte, Balmes, William James, Peirce, Bergson, Kierkegaard.

**Science**—Dalton, Maxwell, Thompson, Kelvin, Joule, Faraday, Lamarck, Poincaré, Agassiz, Lyell, Darwin (Origin of Species, 1859), T. H. Huxley, Mendel, Ohm, Hamilton.

**Literature**—Flaubert, Madame de Staël, Zola, France, Dumas, Balzac, Beaudelaire, Hugo, Proust, Wordsworth, Byron, Shelley, Keats, S윈burne, Hardy, Meredith, Dickens,
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<tr>
<td>1815–1878</td>
<td>Crawford Williamson Long</td>
<td>Country practitioner in Georgia, the first to use ether in a surgical operation (1842); published results in 1849.</td>
<td>Thackeray, Reade, Stevenson, Trollope, Henry James, Wilde, Doyle, Kipling, Conrad, Poe, Longfellow, Emerson, Dickinson, Mark Twain, Ibsen, Heine, Kafka, Dostoevski, Pushkin, Gogol, Tolstoi, Chekov.</td>
</tr>
<tr>
<td>1818–1901</td>
<td>Max von Pettenkofer</td>
<td>Bavarian, founder of experimental hygiene and of the first Hygienic Institute, at Munich, in 1875; studied home ventilation and recommended quarantine of travelers from plague areas; attributed spread of typhoid and cholera to condition of soil and soil-water and was responsible for improved drainage and sewage disposal methods in Germany.</td>
<td>Painting—Delacroix, Turner, Constable, Corot, Manet, Degas, Monet, Pissarro, Cézanne, Gauguin, Whistler, van Gogh, Toulouse-Lautrec, Rossetti.</td>
</tr>
<tr>
<td>1818–1865</td>
<td>Ignaz Philipp Semmelweis</td>
<td>Professor of obstetrics at Budapest and pioneer in antisepsis in obstetrics; observation of different conditions in a Vienna hospital, where examinations were made by students coming directly from dissections, influenced his thinking; <em>The Cause, Concept, and Prophylaxis of Puerperal Fever</em> (1861) led to heated controversy, resulting in his eventual insanity and death in an asylum.</td>
<td>Architecture—Early classicism challenged by a revival of Gothic style and romantic influence.</td>
</tr>
<tr>
<td>1821–1902</td>
<td>Rudolf Virchow</td>
<td>Pupil of Johannes Müller and founder of cellular pathology; developed concept that the cell is the seat of disease; became professor of pathology in Berlin in 1856 and director of the</td>
<td>Political Highlights—Napoleonic Era —Napoleon crowned Emperor in 1804, abdicated and sent to Elba in 1814, to return in 1815 only to be defeated at Waterloo three months later. The Congress of Vienna (1814–1815) brought together such world leaders as Metternich, Castlereagh, Nesselrode, Talleyrand, Alexander I of Rus-</td>
</tr>
</tbody>
</table>
Pathological Institute there, after a period of exile resulting from earlier political writings; cellular doctrine announced in 1858.

1822–1895 Louis Pasteur

French chemist and founder of bacteriology; developed antitoxin for diphtheria; his studies of wine fermentation led to discovery that destruction of germs by heat preserved the wine; proved that yeasts caused fermentation; discovered cause of pébrine, disease of the silkworm, and thus saved that industry from failure; showed that products of bacteria could be destroyed by other bacteria, foreshadowing development of antibiotics.

1825–1893 Jean Martin Charcot

French neurologist and physician to the Salpêtrière; creator of the greatest modern neurological clinic; a great clinician who wrote important descriptions of hysteria, muscular atrophy.

1827–1912 Joseph Lister

English Quaker and professor of surgery at Glasgow; recognizing that open wounds suppurated as a result of exposure to microbes in the air, saw the need to provide a sterile operative field and used carbolic acid for this purpose; *On the Antiseptic Principle in the Practice of Surgery* published in 1867.

1829–1894 Theodor Billroth

Founder of the Vienna School of Surgery; one of first to introduce antisepsis into operating rooms of Europe; his *Allgemeine chirurgische Pathologie und Therapie* (1863), translated into ten languages, is a classic.

1829–1914 Silas Weir Mitchell

Pioneer American neurologist who also gained fame as poet and novelist; advocated treatment of functional neuroses by prolonged rest, known as "Weir Mitchell's treatment."
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<tr>
<td>1833–1915</td>
<td>Carlos Finlay</td>
<td>Great Cuban physician, who discovered the role of the mosquito in the transmission of yellow fever.</td>
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<tr>
<td>1834–1911</td>
<td>John Hughlings Jackson</td>
<td>English neurologist, developed concept that voluntary movements are caused by impulses from cerebral cortex; other studies established syndrome called Jacksonian epilepsy.</td>
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<tr>
<td>1847</td>
<td>Founding of the American Medical Association</td>
<td>This organization was created to assure the maintenance of high professional standards.</td>
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<tr>
<td>1843–1910</td>
<td>Robert Koch</td>
<td>German country doctor; discovered the germ that causes anthrax and worked out the complete life cycle of the bacillus; developed concept of microbic specificity for every infection; founded Institute for Infectious Diseases.</td>
<td></td>
</tr>
<tr>
<td>1845–1923</td>
<td>Wilhelm Conrad Roentgen</td>
<td>Father of radiology; in 1896 announced discovery of what he called “X-rays,” which are produced by passage of an electric current through a vacuum tube.</td>
<td></td>
</tr>
<tr>
<td>1840–1902</td>
<td>Emil Kraepelin</td>
<td>Leading German in psychiatry, divided mental diseases into two categories: manic-depressive psychoses (curable) and dementia praecox (incurable). Responsible for systematizing psychiatry.</td>
<td></td>
</tr>
<tr>
<td>1849–1919</td>
<td>Sir William Osler</td>
<td>Canadian-born physician and humanist, whose <em>Principles and Practice of Medicine</em> (1892) was a standard text of the early twentieth century; professor of medicine at Oxford, McGill, University of Pennsylvania, and Johns Hopkins; other writings made important contributions to medical history.</td>
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<td>Year Range</td>
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<tr>
<td>1850–1885</td>
<td>Daniel Carrión</td>
<td>Peruvian medical student who died after inoculation with verruga blood; established the identity of Oroya fever and <em>verruga peruana</em>.</td>
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<tr>
<td>1850–1943</td>
<td>William Henry Welch</td>
<td>American pathologist, bacteriologist, medical educator, one of the founders of the Johns Hopkins Medical School, where he served as professor of pathology, director of the School of Hygiene and Public Health, and professor of the history of medicine; founder of the Institute of the History of Medicine at Johns Hopkins.</td>
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<tr>
<td>1852–1934</td>
<td>Santiago Ramón y Cajal</td>
<td>Great Spanish histologist whose improved staining methods led to important cytological discoveries related to the nervous system; demonstrated termination of nerve fibers into the gray matter; promulgated the neuron doctrine, showing the anatomical, functional, trophic, and reactional unity and independence of the neurons; described for the first time true relationship of nerve fiber to nerve cell.</td>
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<tr>
<td>1852–1922</td>
<td>William Stewart Halsted</td>
<td>First professor of surgery at Johns Hopkins; developed improved surgical procedures, many based on animal experiments; introduced rubber gloves into the operating room.</td>
<td></td>
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<tr>
<td>1853–1938</td>
<td>Karl Sudhoff</td>
<td>German medical historian, who turned to historical studies after many years as a practicing physician; first director of the Institute of the History of Medicine at Leipzig; writings include important studies on Paracelsus, plague literature, medieval medicine, syphilis.</td>
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<tr>
<td>1854–1915</td>
<td>Paul Ehrlich</td>
<td>Father of modern chemotherapy; at his institute at Frankfurt-am-Main, attempted to discover substances with chemical affinity for bacteria.</td>
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<tr>
<td>1855–1931</td>
<td>Sir David Bruce</td>
<td>English army surgeon who proved that the tsetse fly transmits sleeping sickness.</td>
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<tr>
<td>1856–1926</td>
<td>Richard von Krafft-Ebing</td>
<td>German exponent of psychiatry; his <em>Psychopathia sexualis</em> (1876) a significant study in the field.</td>
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<tr>
<td>1856–1939</td>
<td>Sigmund Freud</td>
<td>Viennese physician who made revolutionary contributions to psychiatry; developed the &quot;auditory&quot; principle in the treatment of mental disorders and the use of the dialogue in diagnosis; formulated concepts of the unconscious strata in the human mind, psychosexual development, regression, repression, instinctual forces, transference, sublimation; related disease to the biography of the individual.</td>
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<tr>
<td>1857–1952</td>
<td>Sir Charles Scott</td>
<td>English neurophysiologist; taught at Oxford; developed concept of integration of the nervous system; did basic studies of the physiology of high nerve centers.</td>
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<tr>
<td>1858–1943</td>
<td>Howard Atwood Kelly</td>
<td>Professor of gynecology at Johns Hopkins and founder of Kensington Hospital in Philadelphia (1883); <em>Operative Gynecology</em> (1898) and <em>Medical Gynecology</em> (1909) represented significant contributions; developed important techniques and instruments.</td>
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<tr>
<td>1860–1927</td>
<td>William Einthoven</td>
<td>Dutch physiologist and inventor of the electrocardiograph (1903).</td>
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<tr>
<td>1860-1924</td>
<td>William Maddock Bayliss</td>
<td>English physician and physiologist who, with Ernest Henry Starling (1866–1927), discovered intestinal secretin.</td>
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<tr>
<td>1860-1957</td>
<td>Rudolph Matas</td>
<td>New Orleans physician; introduced cocaine for spinal anesthesia; developed suture for endoaneurysm; developed continuous drip intravenous infusion.</td>
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<tr>
<td>1861-1949</td>
<td>August K. G. Bier</td>
<td>German surgeon; described technique for treating inflammation with active and passive hyperemia; introduced artificial hyperemia.</td>
<td></td>
</tr>
<tr>
<td>1861-1947</td>
<td>Sir F. Gowland Hopkins</td>
<td>German physiologist and biochemist and first to suggest the existence of vitamins (1912); developed method for estimating uric acid in urine.</td>
<td></td>
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<tr>
<td>1861-1940</td>
<td>G. Vanghetti</td>
<td>Introduced cineplasty, use of muscles from amputated limbs.</td>
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<tr>
<td>1863-1946</td>
<td>Simon Flexner</td>
<td>First director of the Rockefeller Institute for Medical Research; made important contributions to study of venoms, epidemic meningitis, poliomyelitis.</td>
<td></td>
</tr>
<tr>
<td>1864-1920</td>
<td>Ernest Wertheim</td>
<td>German surgeon who introduced radical operation for uterine cancer.</td>
<td></td>
</tr>
<tr>
<td>1865-1958</td>
<td>Chevalier Jackson</td>
<td>American physician; devised new techniques and instruments for use in esophagoscopy.</td>
<td></td>
</tr>
<tr>
<td>1866-1925</td>
<td>August von Wasserman</td>
<td>Director of Institute for Experimental Therapy, Berlin; with Neisser and Bruck developed serodiagnosis of syphilis.</td>
<td></td>
</tr>
<tr>
<td>1867</td>
<td>First International Medical Congress</td>
<td>Held in Paris, this meeting signified the beginning of international cooperation and exchange of ideas in the world of medicine.</td>
<td></td>
</tr>
<tr>
<td>1867-1929</td>
<td>Hideyo Noguchi</td>
<td>Japanese bacteriologist, who devised luetin test</td>
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*The Twentieth Century, which has witnessed the vast exploration of all areas of the earth and the first penetration into the mysteries of space; a period of democracy and dictatorship and seeking for peace and unity,*
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<th>Medical Contributions</th>
<th>Historical Developments</th>
</tr>
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<tr>
<td>1869–1939</td>
<td>Harvey Cushing</td>
<td>Professor of surgery at Johns Hopkins and Harvard; did significant work in neurosurgery and developed techniques for brain operations, also of pituitary gland; won Pulitzer Prize for his <em>Life of Sir William Osler</em> (1925).</td>
<td>which the seething nationalism of an earlier era has been tempered by a realization that national boundaries have lost much of their meaning; the concept of “One World” has grown, while at the same time technological progress has caused the world to shrink.</td>
</tr>
<tr>
<td>1870–1948</td>
<td>Reid Hunt</td>
<td>American pharmacologist; introduced acetonitril test for hyperthyroidism; demonstrated hypotensive action of acetylcholine.</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1870–1945</td>
<td>Hugh H. Young</td>
<td>American surgeon and urologist, who developed radical operation for prostatic cancer.</td>
<td></td>
</tr>
<tr>
<td>1870–1937</td>
<td>Alfred Adler</td>
<td>Austrian psychiatrist; an early associate of Freud but came to reject the latter’s emphasis on sex; introduced concept of the inferiority complex.</td>
<td></td>
</tr>
<tr>
<td>1873–1944</td>
<td>Alexis Carrel</td>
<td>French physician; later at the Rockefeller Institute; developed method of transplanting blood vessels and organs; introduced arterial end-to-end anastomosis.</td>
<td></td>
</tr>
<tr>
<td>1873–1941</td>
<td>Johannes Berger</td>
<td>German neurologist, who described the first electroencephalogram in man (1929).</td>
<td></td>
</tr>
<tr>
<td>1874–1956</td>
<td>Egas Moniz</td>
<td>Professor of neurology at Faculty of Medicine in Lisbon for many years; developed technique for prefrontal lobotomy, thereby introducing surgery into the field of psychiatry (1935).</td>
<td></td>
</tr>
</tbody>
</table>
1874–1953  Arturo Castiglioni  Italian medical historian; professor of the history of medicine at the University of Padua and taught at several American and South American Universities.

1875–  Ernst Ferdinand Sauerbruck  German physician; while working at clinic in Breslau, introduced pneumatic cabinet for chest surgery (1904).

1875–  Carl G. Jung  Swiss-born psychiatrist and pupil of Freud, with whom he later disagreed; founder of analytic psychology; introduced concept of extraversion and introversion; suggested two areas of the subconscious: the personal, comprised of repressed episodes in the life of the individual, and the collective, made up of inherited or racial tendencies.

1877–  Ugo Cerletti  Italian neurologist; developed electroshock therapy; results first published in 1938.

1879–  Augusto Pi Súñer  Spanish physiologist; occupied Chair of Physiology at Seville and Barcelona before going to Central University of Caracas, where he established Institute of Experimental Medicine.

1881–1955  Sir Alexander Fleming  English physician, whose chance observation in 1928 of the contamination of a Staphylococcus culture by Penicillium notatum, which destroyed the staphylococci, led to the isolation and development of penicillin and introduced the Antibiotic Age.

1883–1957  Evarts A. Graham  American surgeon who, with Warren H. Cole, introduced cholecystography (1924); also performed first total pneumonectomy for lung cancer in 1933.

1885–1950  George R. Minot  Boston physician; with W. P. Murphy, introduced use of raw liver to treat pernicious anemia.

1888–  William Osler  Canadian physician; professor of medicine at Johns Hopkins University; founder of modern medical education in the United States.

1895–  John Jacob Abel  American chemist; developed the process of manufacturing sulphonamides, which revolutionized the treatment of infectious diseases.

1919–  Hugh Hefner  American publisher; founder of Playboy magazine.

1925–  John Kenneth Galbraith  Canadian economist; professor at Harvard University; author of The Affluent Society.


1935–  Martin Luther King Jr.  American civil rights leader; received the Nobel Peace Prize in 1964.


1950–  Harry S. Truman  American politician; 33rd President of the United States (1945–1953).


Painting—Matisse, Picasso, Modigliani, Dufy, Miró, Klee, Braque, Gris, Dalí, Roualt, Léger, da Chirico, Kandinsky, Mondrian, Tanguy, Utrillo, Pollock, Chagall.

Sculpture—Brancusi, Arp, Lehmbuck, Armitage, Moore, Roszak, Epstein.

Architecture—Wright, Gilbert, McKenzie, Lutyens, Ostberg, Gropius, Rohe.

Music—Puccini, Ravel, Respighi, da Falla, Schönberg, Strauss, Gershwin, Bartok, Stravinsky, Prokofiev, Vaughan Williams, Shostakovich.

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<tr>
<td>1886-</td>
<td>Edward C. Kendall</td>
<td>American physiologist and chemist who isolated pure thyroxin (1914) and cortisone (1936).</td>
</tr>
<tr>
<td>1887-1960</td>
<td>Gregorio Marañón</td>
<td>Eminent Spanish endocrinologist, biographer, historian, and humanist; the greatest contemporary Spanish physician.</td>
</tr>
<tr>
<td>1887-</td>
<td>Bernardo A. Houssay</td>
<td>Greatest Argentine physiologist, endocrinologist, and educator; demonstrated that the pituitary can promote diabetes through influence on carbohydrate metabolism. Director of the Institute of Biology and Experimental Medicine, Buenos Aires.</td>
</tr>
<tr>
<td>1888-</td>
<td>Selman A. Waksman</td>
<td>Russian-born scientist, working at Rutgers since 1918; with colleagues discovered streptomycin in 1944; has made significant contributions to the field of antibiotics.</td>
</tr>
<tr>
<td>1891-1941</td>
<td>Sir Frederick A. Banting</td>
<td>Canadian surgeon who, with Charles H. Best, isolated insulin in 1921.</td>
</tr>
<tr>
<td>1891-1957</td>
<td>Henry E. Sigerist</td>
<td>Greatest of modern medical historians; born in Paris; director of Medical History Institute at Leipzig and later of the Institute of the History of Medicine at Johns Hopkins.</td>
</tr>
<tr>
<td>1892-</td>
<td>James B. Collip</td>
<td>Canadian physician and biochemist; isolated parathormone, active principle of the parathyroid glands (1925).</td>
</tr>
<tr>
<td>1893-</td>
<td>Albert Szent-Györgyi</td>
<td>Hungarian biochemist who isolated vitamin C (1927).</td>
</tr>
<tr>
<td>1895-</td>
<td>Gerhard Domagk</td>
<td>German pathologist and chemist; discovered therapeutic effects of sulfanilamide, isolated in 1908 by Paul Gelmo.</td>
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**Historical Developments**

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<tr>
<th>Year</th>
<th>Name</th>
<th>Contribution</th>
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</thead>
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<td>1898-</td>
<td>Sir Howard A. Florey</td>
<td>With colleagues at Oxford, carried forward study of penicillin and published first clinical results in 1941.</td>
</tr>
<tr>
<td>1899–1960</td>
<td>John F. Fulton</td>
<td>Physiologist and medical historian, affiliated with Yale from 1929; active in aeromedical research during World War II; writings encompass historical, neurological, and physiological topics.</td>
</tr>
<tr>
<td>1900–1957</td>
<td>Manfred J. Sakel</td>
<td>Austrian psychiatrist who worked in Vienna and Berlin before coming to United States in 1936; in 1927 introduced insulin shock treatment in psychiatry.</td>
</tr>
<tr>
<td>1901–</td>
<td>Conrad A. Elvehjem</td>
<td>American biochemist who isolated nicotinic acid (niacin) in 1938.</td>
</tr>
<tr>
<td>1903–</td>
<td>Adolph F. J. Butenandt</td>
<td>German chemist who isolated progesterone (1934) and testosterone (1935).</td>
</tr>
<tr>
<td>1906–</td>
<td>Ernst B. Chain</td>
<td>German biochemist who went to England and was affiliated first with Cambridge and later Oxford, where he was a leading member of the group responsible for the successful extraction and purification of penicillin.</td>
</tr>
<tr>
<td>1907–</td>
<td>Hans Selye</td>
<td>Vienna-born physician and endocrinologist, now director of the Institute of Experimental Medicine and Surgery at the University of Montreal; his search for the organism's general reaction pattern led to evolution of stress principle and general adaptation syndrome theory.</td>
</tr>
</tbody>
</table>
Date | Persons (Events) | Medical Contributions | Historical Developments
--- | --- | --- | ---
1912-- | Edward L. Rickes | American biochemist; isolated vitamin B_6_2_, the active principle of the liver. | 1900–1961
1913-- | Choh Hao Li | Chinese biochemist working in the United States; in 1943 isolated pure form of adrenocorticotropic hormone (ACTH). | Further Developments of the Twentieth Century in Brief
1914-- | Henri Laborit | French physician who introduced the use of artificial hibernation in surgery; also, the use of chlorpromazine in treatment of anxiety of pregnancy. | In addition to the achievements of the outstanding men of medicine already mentioned, the twentieth century has produced far-reaching advances in many areas of the medical sciences.
1900–1961 | Further Developments of the Twentieth Century in Brief | New specialties have been developing, in response to the great technological progress of recent years: aeronautical and space medicine, travel medicine, atomic medicine, industrial medicine.

New techniques and instruments have appeared: the portable basal metabolism apparatus (1918); the arthroscope (1922); the electron microscope (1926); the gastroscope (1932); the dermatome and the microtome (1943).

Progress in surgery has been astounding, with the introduction of new instruments and equipment, improved and specialized anesthetics, and significant developments in pre- and post-operative care. Other achievements include: radical operation for prostatic cancer (1904); use of frozen section for surgical biopsy; Novocain used as spinal anesthesia (1905); first valvotomy for relief of constriction of the aorta (1914); resection of the pericardium in chronic adhesional pericarditis (1924); successful re-
section of the aorta in treatment of aneurysm (1944).

Advances in endocrinology comprise, in part: the preparation of a racemic adrenalin (1904); synthesis of thyroxin (1926); the first extract of the adrenal cortex (1929); isolation of prednisone and prednisolone (1954).

Many antibiotics and other drugs have been developed: heparin (1917); diphenylhydantoin (1937); sulfapyridine (1938); sulfathiazole and sulfadiazine (1940); dicoumarin (1941); bacitracin (1945); chloramphenicol and nephenezin (1947); chlorotetracycline (1948); oxytetraycline and meprobamate (1950); reserpine and erythromycin (1952); oleandomycin, cycloserine, and isoniazid (1954); synthesis of penicillin (1957).

Research in cancer has been characterized by simultaneous work in the medical, physical, and biological fields. The metabolism of cancerous cells is being studied, together with methods of arresting this growth by means of radioactive isotopes. In 1960 a major breakthrough was achieved, with the linking of eight forms of cancer with viruses.

Progress in the prevention of poliomyelitis was made with the introduction of the Salk vaccine in 1953 and the Sabin vaccine, tested for the first time in the United States in 1960, after having been used in other major countries of the world, including the Soviet Union.

Other contributions of importance in psychiatry are: the ever-growing integration of soma and psyche in clinical psychiatry; the ever-expanding use of the biographical approach in the psychiatric case history; use of biochemical and chemotherapeutic agents in diagnosis and therapy; development of ataractics; use of endocrine therapy in several psychiatric conditions.
The twentieth century has witnessed the discovery of a succession of vitamins, after the introduction of the concept of vitamins in 1912, and the existence of deficiency diseases has been established.

Medical history has made great progress through the work of medical historians the world over, and the first International Congress of Medical History was held in Antwerp in 1920.

Scientific research has become the vital tool for the exploration of the universe. World-wide cooperation has been fostered through the establishment of the World Health Organization and the World Medical Association.
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