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The Growth of Medicine from the Earliest Times to About 1800

Albert H. Buck

THE GROWTH OF MEDICINE

FROM THE EARLIEST TIMES TO ABOUT 1800

By

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PREFACE

Very few persons will challenge the truth of the statement that in the United States and Canada there are not many physicians who possess even a slight knowledge concerning the manner in which the science of medicine has attained its present power as an agency for good, or concerning the men who played the chief parts in bringing about this great result. Up to the present time no blame may justly be attached to any individuals or to any educational institutions for this prevailing lack of knowledge, and for two very good reasons, *viz.:* first, in a newly settled country, in which the population grows by leaps and bounds through the influx of foreign immigrants, the training of young men for the degree of M.D. must necessarily be almost entirely of a practical character, and consequently the teaching of such a subject as the history of medicine would be quite out of place; and, second, the treatises on this subject which are purchasable by English-speaking physicians are of rather too scientific a character to appeal either to the undergraduate or to the busy practitioner. The first of the reasons named, it may now safely be assumed, is rapidly losing its validity, if indeed it has not already ceased entirely to afford a legitimate excuse for neglecting the study of this branch of medical science. On the other hand, the second reason mentioned is still in force,—so far at least as the present writer knows,—and, if such be the case, it certainly cannot fail to act as a deterrent influence of great potency. Here, then, is my apology for attempting to prepare an account of the history of medicine which shall present the essential facts truthfully and with a sufficient degree of attractiveness to win the continuing interest of the reader; which shall place before him, and especially before those who are just at the threshold of their professional career, word pictures of those physicians of past ages whose lives

may safely be taken as models worthy to be copied; and which shall describe, so far as I am able to do this, the methods which they employed to advance the science of medicine, to gain genuine professional success, and to merit the enduring esteem of later generations of physicians. If my efforts prove successful in producing this kind of history it is fair to expect that, in a comparatively short time, those physicians whose interest may have been aroused by the perusal of this less complete and more popular work, will demand something of a more exhaustive character—a book, for example, like the admirable history which Max Neuburger, of Vienna, is now publishing, and of which two volumes have already issued from the press (the first in 1906 and the second in 1911).[1] It is to this work and the excellent history written by the late Dr. Haeser, of Breslau, that I am chiefly indebted for the information supplied in these pages; and I therefore desire to make special mention here of this indebtedness. The other sources from which I have been an occasional borrower are all mentioned in the "List of Authorities Consulted." Footnotes and cross-references in the text interfere greatly with one's pleasure in reading a book, and I have therefore not hesitated to introduce them sparingly.

It gives me a special pleasure to call attention here to the far-sighted generosity displayed by the founder of The Williams Memorial Fund in making it practicable henceforth for the Yale University Press to accept for publication medical treatises which deal with the historical and scientific questions of this branch of knowledge, but which for sound business reasons cannot be published on a merely commercial basis.

And I have the further pleasure of expressing my real appreciation of the skill with which the University Press has solved the problems of a suitable size and style of type

[1] A third volume is in course of preparation, but the probable date of its publication has not been announced. An English translation of the first volume (by Ernest Playfair) was published by Hodder and Stoughton, of London, in 1910.

for this volume, and of the sound advice which it has given with regard to the extent to which the effectiveness of the book may be increased by the introduction of pictorial illustrations.

To my friend, Lawrence F. Abbott, of New York, I am deeply indebted for the valuable assistance which he has rendered me throughout the entire progress of this work. Indeed, without this assistance, I doubt whether I should have had the courage to remain at my post to the very end.

ALBERT H. BUCK.

Cornwall, N. Y., December 29, 1916.

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PART I

ANCIENT MEDICINE

CHAPTER 1

DEVELOPMENT OF THE SCIENCE AND ART OF MEDICINE

Friedlaender says that "in the temple of history, now hoary with age, medicine also possesses its own chapel, not an accidental addition to the edifice but a large and important part of the noble building." In this chapel is preserved the record of the efforts made by man, through the ages, to maintain his body in good condition, to restore it to health when it has become affected by disease or damaged by violence, and to ward off the various maladies to which it is liable. It is a record, therefore, in which every practitioner of medicine should take a deep interest. Rokitansky, the famous pathologist of Vienna, expressed the same idea very tersely when he said: "Those about to study medicine and the younger physicians should light their torches at the fires of the ancients." Members of the medical profession, however, are not the only persons in the community who take an interest in the origin and growth of the science of medicine and the art of healing the diseased or damaged body; the educated layman is but little less interested than the physician, being ever ready to learn all he can about the progress of a branch of knowledge which so profoundly affects his welfare. But hitherto the only sources of information available for those who are not familiar with French or German have been treatises of so technical a character that even physicians have shown relatively little disposition to read them.

The science of medicine developed slowly from very humble beginnings, and for this earliest period the historian has no records of any kind which may be utilized for his

guidance. It is reasonably certain, furthermore, that this prehistoric period lasted for a very long time, probably several thousand years; and when, finally, some light on the subject appeared, it was found to emanate from several widely separated regions—*e.g.*, from India, Mesopotamia, Egypt and Greece. Then, after the lapse of additional hundreds or even thousands of years, there was inaugurated the practice of making written records of all important events, and, among others, of the different diseases which affect mankind, of the means employed for curing them or for relieving the effects which they produce, and of the men who distinguished themselves in the practice of this art. While the "science of the spade" and that of deciphering the writing of the papyri, monuments and tablets thus brought to light, have already during the last half century greatly altered our ideas with regard to ancient medicine, there are good reasons for believing that much additional information upon this subject may be looked for in the not distant future. It is plain, therefore, that a history of the primitive period of medicine, if written to-day, may have to be modified to-morrow in some important respects. On the other hand, the facts relating to the later periods are now so well established that a fair-minded writer should experience no serious difficulty in judging correctly with regard to their value and with regard to the claims of the different men to be honored for the part which each has played in bringing the science and art of medicine to their present high state of completeness and efficiency.

The subdivision of the history of medicine into separate periods is certainly desirable, provided it be found practicable to assign reasonably well-defined limits to the periods chosen. But, when the attempt is made to establish such subdivisions, one soon discovers that the boundaries pass so gradually the one into the other at certain points, or else overlap so conspicuously at other points, that one hesitates to adopt any fixed plan of classification. Of the four schemes which I have examined—viz., those of Daremberg, of Aschoff, of Neuburger, and of Pagel—that of Neuburger seems to me to be the best. That which has

been adopted, however, in the preparation of the present outline sketch combines some of the features of both the Pagel and the Neuburger schemes.

Periods in the History of Medicine.—There are nine more or less distinctly defined periods in the history of medicine, to wit:—

First Epoch: *Primitive medicine.*—This period extends through prehistoric ages to a date which differs for different parts of the world. The duration of this period, in any case, is to be reckoned by thousands of years.

Second Epoch: *The medicine of the East*—that is, of the cultivated oriental races of whose history we possess only a very fragmentary knowledge.

Third Epoch: *The medicine of the classical period of antiquity*—the pre-Hippocratic period of Greek medicine.

Fourth Epoch: *The medicine of the Hippocratic writings*—the most flourishing period of Greek medicine.

Fifth Epoch: *The medicine of the period during which the centre of greatest intellectual activity was located at Alexandria, Egypt.*

Sixth Epoch: *The medicine of Galen*—an author whose teachings exerted a preponderating influence upon the thought and practice of physicians in every part of the civilized world up to the seventeenth century of the Christian era. This period is also characterized by the gradual diminution of the influence of Greek medicine.

Seventh Epoch: *The medicine of the Middle Ages*—a period which includes a large part of the preceding epoch. Its most characteristic feature is the important part played by the Arabs in moulding the teachings and practice of the medical men of that time (ninth to fifteenth century).

Eighth Epoch (fifteenth and sixteenth centuries): *The medicine of the Renaissance period*—characterized chiefly by the adoption of the only effective method of studying the anatomy of man—the actual dissection of human bodies.

Ninth Epoch (from the beginning of the seventeenth century to the present time): *Modern medicine.*—This epoch may with advantage be divided into two periods—the first extending to about the year 1775, soon after which

time Jenner began his important work on the subject of vaccination; and the second to the present time. No attempt will be made in the following account to cover this second period.

The Beginnings of Medicine.—In the early period of man's existence upon this earth he must have possessed an exceedingly small stock of knowledge with regard to the maintenance of his body in health and with regard to the means which he should adopt in order to restore it to a normal condition after it had been injured by violence or impaired in its working machinery by disease. With the progress of time, utilizing his powers of observation and his reasoning faculty, he slowly made additions to his stock of facts of this nature. Thus, for example, he gradually learned that cold, under certain circumstances, is competent to produce pain in the chest, shortness of breath, active secretion of mucus, etc., and his instinct led him, when he became affected in this manner, to crave the local application of heat as a means of affording relief from these distressing symptoms. Again, when he used certain plants as food he could scarcely fail to note the facts that some of them produced a refreshing or cooling effect, that others induced a sensation of warmth, and finally that others still, by reason of their poisonous properties, did actual harm. Sooner or later, such phenomena as nausea, vomiting and diarrhoea would also be attributed by him to their true causes. In due course of time his friends and neighbors, having made similar observations and having tried various remedial procedures for the relief of their bodily ills, would come together and compare with him their several experiences; and so eventually the fact would be brought out that the particular method adopted by one of their number for the relief of certain symptoms had proved more effective than any of the others. Thus gradually this isolated community or tribe of men must have learned how to treat, more or less successfully, the simpler ills to which they were liable.

Lucien Le Clerc quotes from the Arab historian Ebn Abi Ossaïbiah the following account of the manner in which

bloodletting probably first came to be adopted as a remedial measure:—

Let us suppose that in the earliest period of man's history somebody experienced the need of the medical art. He may, for example, have felt a general sense of heaviness in his body (plethora), associated perhaps with redness of the eyes, and he probably did not know what he should do in order to obtain relief from these sensations. Then, when his trouble was at its worst, his nose began to bleed, and the bleeding continued until he experienced decided relief from his discomfort. In this way he learned an important fact, and cherished it in his memory.

On a later occasion he experienced once more the same sense of heaviness, and he lost no time in scratching the interior of his nose in order to provoke a return of the bleeding. The nosebleed thus excited again gave him entire relief from the unpleasant sensations, and upon the first convenient occasion he told his children and all his relatives about the successful results obtained from this curative procedure. Little by little this simple act, which was a first step in the healing art, developed into the intelligently and skilfully performed operation of venesection.

Primitive man also increased his stock of knowledge in the healing art by reading attentively the book of nature,—*i.e.*, by observing how animals, when ill, eat the leaves or stems of certain plants and thus obtain relief from their disorders. The virtues of a species of origanum, as an antidote for poisoning from the bite of a snake, were revealed, it is asserted, by the observation that turtles, when bitten by one of these reptiles, immediately seek for the plant in question and, after feeding upon it, experience no perceptible ill effects from the poisonous bite. The natives of India ascribe the discovery of the remarkable virtues of snakeroot (the bitter root of the ophiorrhiza Mungos) as an antidote for poisoning by the bite of a snake, to the ichneumon, a small animal of the rat species. The instinctive desire to escape pain taught man, as it does the lower animals, to keep a fractured limb at rest, thus giving the separated ends of the bone an opportunity to reunite; after which the limb eventually becomes as strong as it ever was. Simple as this mode of acquiring useful medical

knowledge may appear to us moderns, there are good reasons for believing that hundreds of years must have elapsed before the accumulated stock of such experiences became really considerable. On the other hand, it is reasonable to suppose that this growth in medical knowledge took place more rapidly in certain tribes or races than in others, and that when, under the action of wars, the inferior men became tributary to those of greater intellectual powers, they acquired, through contact with their conquerors, additional knowledge at a much more rapid rate. One great hindrance, however, stood in the way of such progress. I refer to the deeply rooted belief, entertained by man in this primitive period of his existence, in the agency of malevolent spirits (demons) in the production of disease,—a belief which continued to exist for many thousands of years. Out of such a belief developed the necessity of discovering some practical method of appeasing the evil spirits and of thus obtaining the desired cure of the ills of the body. Usually some member of the tribe who had displayed special skill in the treatment of disease, and who at the same time was liberally endowed with the qualities which characterize the charlatan, was chosen to be the priest or "medicine man." It was his duty to employ measures suitable for expelling the demon from the patient's body and for restoring the latter to health. Possessing great influence, as these superstitious people believed he did, with the unseen gods, such a physician-priest must have discouraged all efforts to increase the stock of genuine medical knowledge; for such an increase would necessarily mean a diminution of his own power and influence.

In what must still be termed the age of primitive medicine, but undoubtedly at an advanced stage of that epoch, there were performed surgical operations which imply a remarkable advance in the invention of cutting instruments and in the knowledge of the location and nature of certain comparatively rare diseases, and at the same time great courage and wonderful enterprise on the part of those early physicians. As evidence of the correctness of these

statements the fact may be mentioned that trepanned skulls belonging to the neolithic period have been dug up in various parts of the world—in most of the countries of Europe, in Algiers, in the Canary Islands, and in both North and South America. From a careful study of these skulls it has been learned that the individuals upon whom such severe surgical work had been done—sometimes as often as three separate times—recovered from the operation. The instruments used were made of sharpened flint (saws or chisels). Pain in the head, spasms or convulsions, and mental disorders are suggested by Neuburger as the indications which probably led to the performance of the trepanning. This author also makes the further statement that the ancient Egyptians employed knives made of flint for opening the dead bodies which they were about to embalm and for the operation of circumcision. Recent excavations have thrown additional light upon the state of medical knowledge during this neolithic age. Thus, there have been found specimens of anchylosed joints, of fractured bones, of flint arrow heads lodged in different parts of the skeleton, of rhachitis, of caries and necrosis of bone, etc. The following quotation is taken from the printed report of a lecture recently delivered in London by Dr. F. M. Sandwith, Consulting Surgeon to the Khedive of Egypt. Speaking of certain excavations made in the Nubian Desert and of the oldest surgical implements yet discovered, he says:—

> In one place a graveyard was found, and here were remains of bodies with fractured limbs that had been set with bark splints. One was a right thigh bone that had been broken, and was still held in position by a workmanlike splint and bandages. All the knots were true reef-knots, and the wrappings showed how the strips of palm-fibre cloth were set just as a good surgeon would set them in these days so as to use the full strength of the fabric.

Among the most ancient remedies may be mentioned talismans, amulets and medicine stones, which were furnished—presumably at a price—by the physician-priests, and which were believed to afford the wearers protection

against evil spirits (the "evil eye," for example). Various objects were used for this purpose, and among them the following deserve to be mentioned: disks of bone removed with the aid of a trephine from the skull of a dead human body and worn with a string around the neck; the teeth of different animals; bones of the weasel; cats' claws; the lower jaw of a squirrel; the trachea of some bird; one of the vertebrae of an adder, etc. And where these measures failed, the priests resorted to incantations, religious dances, and the beating of drums or the rattling of dried gourds filled with pebbles. Primitive races of men inhabiting the most widely separated parts of the earth appear to have adopted means almost identical with those just described for driving away evil spirits. The holding of these superstitious beliefs is one of the most extraordinary characteristics of the human race. It played an important part throughout the classical period of Greek and Roman civilization, and also during the Middle Ages. Christianity undoubtedly was a most potent agency in hastening the eradication of the feeling, but even this great power has not yet sufficed entirely to do away with superstition; for traces of this weakness may still easily be detected in some of the men and women with whom we daily come in contact.

CHAPTER II

ORIENTAL MEDICINE

The researches of the scholar working in combination with the engineer have unearthed—more particularly in Mesopotamia, in Egypt and in Greece—evidences of an ancient medical science far advanced beyond that briefly described in the preceding chapter. These evidences relate to nations that flourished as far back as four thousand years B. C. While they are very fragmentary and cover historical events which are often separated from one another by long periods of time, these data nevertheless suffice to give one a fairly good idea of the then prevailing state of medical knowledge. Both Pagel and Neuburger adopt the plan of discussing these different nationalities separately, and I shall follow their example.

Medicine in Mesopotamia.—As appears from the most recent investigations the Sumerians were the first occupants of the region lying between the Euphrates and the Tigris rivers. It was from them that their Semitic conquerors, the Babylonians and the Assyrians, received a civilization which, already about 4000 B. C., had reached a wonderful degree of development. The canalization of the low-lying lands of that region, the organization of a religious and civil government of a most efficient type, the invention first of picture-writing and then of the cuneiform characters, the cultivation of the arts and natural sciences and especially of astronomy and mathematics to a high degree of perfection,—these are among the things which were accomplished by this very clever race of men. In addition, however, to these useful activities the Babylonians developed and cultivated diligently the science of astrology—that is, the science of predicting human events

(such as the death of the king, the occurrence of the plague or of war, etc.) from various telluric and cosmic phenomena—an eclipse of the sun, peculiarities of the weather, the condition of vegetation, etc. The deeply rooted love of the human race for the supernatural—a characteristic to which I have already briefly referred—facilitated the development of this harmful practice, and kept it alive through many succeeding centuries. Walter Scott, in his romance entitled Quentin Durward, gives an admirable portrait of a typical astrologer whom Louis XI. of France maintained at his court during a part of the seventeenth century.

While in other parts of the Orient the science of medicine, as already stated at the beginning of this chapter, made a noteworthy advance beyond the conditions observed among the primitive races, in Mesopotamia this science, which was far more important to the welfare of its inhabitants than all the other branches of knowledge combined, received very little attention and consequently made only insignificant advances. The British Museum has in its possession several thousand tablets which were dug up from the ruins of Nineveh and which represent a part of the library of the Assyrian King, Assurbanipal (668-626 B. C.). Translations of the text of only a very few of these tablets have thus far been published, and from these, which embody the greater part of our knowledge of Assyrian medicine, it appears that, for the present at least, the estimate recorded above must stand. A few new facts, however, have been brought to light, and they appear to be of sufficient importance to merit brief consideration here.

In the first place, Herodotus, who visited Babylon about 300 B. C., has this to say in relation to the state of medicine in that city:—

> The following custom seems to me the wisest of their institutions next to the one lately praised. They have no physicians, but, when a man is ill, they lay him in the public square, and the passers-by come up to him, and if they have ever had his disease themselves or have known any one who has suffered from it, they give him advice, recommending him to do whatever they found good in their

own case, or in the case known to them; and no one is allowed to pass the sick man in silence without asking him what his ailment is.[1]

The Babylonians held some rather strange beliefs regarding the construction of the human body and the manner in which its functions are performed. The living being, as they maintained, is composed of soul and body. The intellect has its seat in the heart, the liver serving as the central organ for the blood, which they considered to be the true life principle. They divided this fluid into two kinds—blood of the daytime (bright arterial) and that of the night (dark venous). Although the blood was held by them to be the basis of life, they evidently attached a certain value to respiration, for one of their prayers begins with these words: "God, my creator, lead me by the hand; guide the breath of my mouth." Disease was always looked upon as something (usually personified as a demon) that entered the body from without and that consequently had to be expelled. There were special demons for the different diseases. Thus, Asakku brought fever to the head, Namtar threatened life with the plague, and Utukku attacked the throat, Alu the breast, Gallu the hand, Rabisu the skin, and so on. The most dreaded demons were the spirits of the dead. Special amulets were employed as protective remedies. Prayer formulae were also used. Here is one among several that I find mentioned in Neuburger's treatise:—

Wicked Consumption, villainous Consumption, Consumption which never leaves a man, Consumption which cannot be driven away, Consumption which cannot be induced to leave, Bad Consumption, in the name of Heaven be placated, in the name of Earth I conjure thee!

The genuine remedial agents employed in Babylonia were of a most varied nature: a mixture of honey and syrup of dates; medicinal herbs of different kinds for internal administration; bloodletting; the use of cups for drawing blood to the surface of the body; warm baths and

[1] Book I., section 197, of Rawlinson's translation.

cold shower baths; rubbing oil over the body; medicated clysters; the use of various salves; the use of secret remedies which were composed of various ingredients and which bore such names as "the Sun God's remedy," "the dog's tongue," "the skin of the yellow snake," "the medicine brought from the mountain of the human race," etc.

Some of the predictions made by the Babylonian astrologers are of sufficient interest to be placed on record. Here are a few examples:—

If the west wind is blowing when the new moon is first seen, there is likely to be an unusual amount of illness during that month.

If Venus approaches the constellation of Cancer, there will be respect for law and prosperity in the land; those who are ill will recover, and pregnant women will have easy confinements.

If Mercury makes its appearance on the fifteenth day of the month, there will be corpses in the land. And again, if the constellation of Cancer is obscured, a destructive demon will take possession of the land, and there will be corpses.

If Jupiter and the other planets stand opposite one another, some calamity will overtake the land. If Mars and Jupiter come into conjunction, there will be deaths among the cattle.

If an eclipse of the Sun take place on the twenty-eighth day of the month Ijar, the king will have a long reign; but, if it take place on the twenty-ninth day of the month, there will be corpses on the first day of the following month.

If there should be thunder during the month of Tisri, a spirit of enmity will prevail in the land; and if it should rain during that month, both men and cattle will fall ill.

Besides these predictions, which were based upon phenomena connected with the movements of the stars and the conditions of the weather, there were others which the people themselves were competent to make without the aid of the professional astrologer or the official priest. Such, for example, are the following "omens":—

If a woman gives birth to a child the right ear of which is lacking, long will be the reign of the prince of that land.

If a woman gives birth to a child both of whose ears are lacking,

sadness will come upon the land and it will lose some of its importance.

If a woman gives birth to a child whose face resembles the beak of a bird, there will surely be peace in the land.

If a woman gives birth to a child the right hand of which lacks fingers, the sovereign of that country will be taken prisoner by his enemies.

The keen interest taken by the priests in the matter of predicting the outcome of various diseases led in due time to their making records of the nature, symptoms and progress of the latter. Although this practice was inaugurated purely for the purpose of enabling them to foretell with greater accuracy the probable issue of any given malady, it nevertheless served also to establish on a firm basis the custom of keeping records of the case-histories. Only one thing more was now needed to render this practice the first step in a genuine advance of medical knowledge; but this step could not be made in Babylonia, where priestcraft and superstition had struck such deep roots in the public life. It was only in free Greece, and at a time in its history when the spirit of Hippocrates exerted an overpowering influence over the minds of men, that the separation of the functions of the physician from those of the priest became possible and was in due time effected. (Neuburger.)

Before closing this very incomplete account of the state of medical knowledge in Babylonia, it will be well to mention some of the items of the law laid down by Hammurabi (circa 2200 B. C.) for the guidance of the physicians of that land with regard to the remuneration which they should receive. At the same time I shall make no attempt to reconcile the statement of Herodotus (given on page 12) with the wording of this law, which distinctly recognizes the existence of physicians in Mesopotamia. Possibly the conditions in Nineveh in the fourth century B. C. were different from what they had been eighteen centuries earlier.

If a physician makes a deep cut with an operating knife of bronze and effects a cure, or if with such a knife he opens a tumor

and thus avoids damaging the patient's eye, he shall receive as his reward 10 shekels of silver. If the patient is an emancipated slave, the fee shall be reduced to 5 shekels. In the case of a slave the master to whom he belongs shall pay the physician 2 shekels.

If a physician makes a deep wound with an operating knife of bronze and the patient dies, or if he opens a tumor with such a knife and the patient's eye is thereby destroyed, the operator shall be punished by having his hands cut off.

If a physician, in operating upon the slave of a freedman, makes a deep wound with an operating knife of bronze and thus kills the patient, he shall give the owner a slave in exchange for the one killed. And if, in opening a tumor with such a knife, the physician destroys the slave's eye, he shall pay to the latter's owner one-half the slave's value.

If a physician effects the healing of a broken bone or cures a disease of the intestines, he shall receive from the patient a fee of 5 shekels of silver.[2]

It would be difficult to imagine anything better adapted to arrest the development of medical knowledge in a nation than the promulgation of a law like that ascribed to Hammurabi; and one cannot be surprised at the statement made by Herodotus, eighteen centuries later, "that there were no physicians in Babylon." Foolhardy, indeed, would be the man who, for the sake of earning a possible reward of six shekels of silver, would be willing to risk the danger of having both his hands cut off; and yet every conscientious and faithful practitioner of medicine in Babylon at the time mentioned must necessarily have been obliged to run this risk.

Medicine in Ancient Egypt.—Of the sources of information with regard to the knowledge of medicine possessed by the ancient Egyptians the most important are the following: Homer's Odyssey; Herodotus; Diodorus; Clemens of Alexandria; Pliny's Natural History; Dioscori-

[2] From the statements just quoted it appears that a certain kind of bronze (an alloy of copper and tin, with the addition perhaps of a little zinc) was used in Assyria, in the manufacture of surgical knives, as early as during the twenty-third century B. C. Dr. Meyer-Steineg, Professor of the History of Medicine in the University of Jena, Germany, assures the writer that knives made of this material are susceptible of being given as keen a cutting edge

des; the Papyrus Ebers; the Papyrus Brugsch; and the Papyrus Birch, in the British Museum. Then, in addition to these sources, there are the inscriptions found in recent times on the walls of the temples and the pictures painted on the wrappings of mummies, from both of which considerable information with regard to various therapeutic procedures and to the details of the process of embalming has been derived. Some of this information extends back to about 3000 B. C. The healing art was at that time entirely in the hands of the temple priests, who formed an organized body with a sort of physician-in-chief at its head. Two of these—Athotis and Tosorthos—attained such a high standing and possessed such influence that they were chosen Kings of Egypt. The practice of obstetrics was entrusted to the care of women who had been trained to this work and who acknowledged the authority of a skilled head-nurse of their own sex. The patients who had received treatment for their ailments at one or other of the temples presented to these institutions gifts in the form of sculptured or painted representations of the diseased or injured parts of the body. In these and in other ways medicine and pharmacy received contributions which were of no mean value. Botanical gardens were established at various places in Egypt and were cultivated with care. Chemistry—a name which derives its origin from a word in the Egyptian language—also made considerable progress as a science. On the other hand, the knowledge of the structure and functions of the different parts of the human body was very imperfect and remained unchanged for many centuries. This would probably not have been the case if the work of preparing the bodies for the process of embalming had not been entrusted entirely to mere menials, men who had no interest in anything but the mechanical part of their occupation.

According to the statement of Clemens of Alexandria[3]

as are those made of the best of steel. At least one such bronze knife may be seen in the collection of ancient surgical instruments, votive offerings, etc., which he is making for the benefit of the University.

[3] A Christian ecclesiastical writer who lived about the year 200 A. D.

the Egyptian science of medicine is set forth in the last six of the forty-two hermetic books, which were composed, according to the prevailing belief, by the god Thot or Thoüt (= Hermes of the Greeks). The first one of these six books is devoted to the anatomy of the human body, the second one to the diseases to which it is liable, the third to surgery, the fourth to remedial agents, the fifth to the diseases of the eye, and the sixth to diseases of women. As to the remedial agents, Neuburger says that it has not been found practicable to identify more than a very few of the Egyptian drugs enumerated by Dioscorides. Homer, who wrote at least five hundred years B. C., has something to say on this subject in the Odyssey.[4] His words are as follows:—

> Such drugs Jove's daughter owned, with skill prepar'd,
> And of prime virtue, by the wife of Thone,
> Aegyptian Polydamna, given her.
> For Aegypt teems with drugs, yielding no few
> Which, mingled with the drink, are good, and many
> Of baneful juice, and enemies to life.
> There every man in skill medicinal
> Excels, for they are sons of Pason[5] all.

A physician of the present age, on reading the histories of the ancient Egyptians, Greeks and other oriental nations, finds it almost impossible to realize that many of the characters designated as gods and goddesses, possibly all of them, were not mythological persons, as they would have been termed only a few years ago, but real human beings like ourselves. Such, for example, was the opinion of Cicero who, when asked why these people were spoken of as gods, gave the following reply:[6] "It was a well-established custom among the ancients to deify those who had rendered to their fellow men important services, as

[4] Lines 285-292 of Book IV. of the Earl of Derby's translation, first published in 1864.

[5] Pason is the same as Apollo, who was believed by the Greeks to have been the inventor or discoverer of the art of medicine.

[6] See Le Clerc's *Histoire de la Médecine*, Amsterdam, 1723.

Hercules, Castor and Pollux, Aesculapius, Bacchus and many others had done." And I find that those modern authors of the history of medicine whose works I have consulted, are quite ready to accept even the gods called by the Egyptians Osiris (or Serapis), Isis, and Thoüt (or Hermes) as genuine historical personages. Such a belief receives some degree of confirmation from the following inscriptions which, according to the authority of Le Clerc,[1] were found engraved upon two columns discovered in the city of Nyoa, in Arabia:—

(On the first column): My father is Cronos, the youngest of all the gods. I am King Osiris, who have visited with my armies every country on the face of the earth—the remotest inhabitable parts of India, the regions lying beneath the Bear, the neighborhood of the sources of the Danube, and the shores of the Ocean. I am the oldest son of Cronos, the scion of a fine and noble race. I am related to the day. There is no part of the earth which I have not visited, and I have filled the entire universe with my benefits. (On the second column): I am Isis, Queen of all this country, and I have been taught by Thoüt. There is nobody who has the power to loosen what I shall bind. I am the oldest daughter of Cronos, the youngest of the gods. I am the wife and at the same time the sister of King Osiris. To me is due the credit of having been the first to teach men agriculture. I am the mother of King Horus. I shine in the dog-star. It is I who built the city of Bubastis. Farewell, Egypt, my native land.

The discovery of the art of medicine, says Le Clerc, was attributed to Osiris and Isis, and they were also credited with having taught it to Aesculapius.

At the cities of On (Heliopolis), Sais, Memphis and Thebes were located the most celebrated of the Egyptian temples, which were dedicated not merely to the worship of their numerous gods, but also to the dissemination of knowledge of various kinds and to the care of the sick and maimed. In a word, they were—like the Aesculapian temples at Trikka, Epidaurus and Cos, of which some account will be given farther on—both hospitals for the

[1] At bottom of p. 15 of his *Histoire de la Médecine.*

treatment of disease and schools for the training of physicians. The chief priest of the temple bore also the title of the "physician-in-chief," and exercised the prerogatives of a chief magistrate. Under this system medical knowledge advanced to a certain stage and then made no further progress. The preponderance of the priestly (*i.e.*, the superstitious) influence was too pronounced to permit anything like real progress.

The papyrus Ebers makes mention of a number of diseases, and among them the following may be noted: abdominal affections (probably dysentery), intestinal worms, inflammations in the region of the anus, hemorrhoids, painful disorders at the pit of the stomach, diseases of the heart, pains in the head, urinary affections, dyspepsia, swellings in the region of the neck, angina, a form of disease of the liver, about thirty different affections of the eyes, diseases of the hair, diseases of the skin, diseases of women, diseases of children, affections of the nose, ears and teeth, tumors, abscesses and ulcers.

In the matter of diagnosis the Egyptian physicians not only employed inspection and palpation, but were in the habit of examining the urine. A statement made in the papyrus Ebers is good ground for the belief that they also employed auscultation to some extent.

Therapeutics constituted beyond all question the strongest part of Egyptian medicine. As might be expected from the strange mixture of the priest and the medical man in every physician, the remedial measures commonly employed consisted in part of prayers and incantations, and in part of rational procedures and the use of drugs. Among the latter class of remedies the following deserve to be mentioned: emetics, cathartics and clysters. Bloodletting, sudorifics, diuretics and substances which cause sneezing were also often employed in Egypt. To produce vomiting the favorite agents were the copper salts and oxymel of squills. Castor oil disguised in beer was given as an aperient. Pomegranate was the drug preferred for the expulsion of worms. Mandragora and opium were also employed as remedies. Foreign drugs were largely imported by the Phoenicians,

and in their successful campaigns against Asiatic nations the Egyptians learned much about the use of these rarer remedies. The different forms in which the Egyptians administered their remedies included potions, electuaries, gums to be chewed but not swallowed, gargles, snuffs, inhalations, salves, plasters, poultices, injections, suppositories, clysters and fumigations. The physicians, in their practice, were subjected to very strict rules regarding the amount of the doses to be given and the manner of administering the different remedies, and consequently they received no encouragement to indulge in any individuality of action. The prescriptions were written in very much the same manner as are those of to-day; that is, they contained the fundamental or important drugs, certain accessory materials, and something which was intended merely to correct the unpleasant taste of the mixture. In comparison with those commonly written at a somewhat later period these ancient prescriptions were of a very simple character.

Up to the present time the researches of the archaeologists have thrown comparatively little light on the surgery of the ancient Egyptians. The facts already ascertained, however, are sufficient to warrant the statement that they had reached a degree of knowledge and skill in this department of medicine well in advance of that reached by any of their contemporaries. They performed the operations of circumcision and castration, and they removed tumors, and their eye surgeons were especially renowned for the work which they accomplished in their special department. Their skill in manufacturing surgical instruments is amply revealed in the specimens—instruments for cupping, knives, hooks, forceps of different kinds, metal sounds and probes, etc.—which have been dug up at the various sites of ancient ruins. They must also have possessed considerable manual skill, for without it they could not, in embalming a corpse, have removed the entire brain from the skull with a long hook, by way of the nasal passages, and at the same time have left the form of the face undisturbed.

From Joachim's German translation of the papyrus Ebers,[8] as quoted by Neuburger, I copy the following passages:—

If thou findest, in some part of the surface of a patient's body, a tumor due to a collection of pus, and dost observe that at one well-defined spot it rises up into a noticeable prominence, of rounded form, thou should'st say to thyself: This is a collection of pus, which is forming among the tissues; I will treat the disease with the knife. . . . . If thou findest, in the throat of a patient, a small tumor containing pus, and dost observe that it presents at one point a well-defined prominence like a wart, thou may'st conclude that pus is collecting at this point. . . . . If thou findest, in a patient's throat, a fatty growth which resembles an abscess, but which yields a peculiar sensation of softness under the pressure of the finger, say to thyself: this man has a fatty tumor in his throat; I will treat the disease with the knife, but at the same time I will be careful to avoid the blood-vessels.

These short extracts will suffice to show that the Egyptian physicians of that early period—at least 1550 B. C.—reasoned about pathological lesions in very much the same manner as a physician of to-day would reason. In this same ancient papyrus, however, foolish as well as sensible statements appear. Thus, for example, mention is made on the one hand of the fact that, in order to give a certain remedy to an infant, it is sufficient to administer it to the nurse who suckles the child (a proceeding which is not uncommon in our own day); and then, in another part of the text, it is stated that "if, on the day of its birth, the infant does not cry, it will surely live; but, if it says 'ba,' it will die."

In matters relating to personal hygiene the ancient Egyptians often displayed a remarkable degree of common sense. They maintained, for example, that the majority of diseases are due to the taking of food in excessive quantity; and, in harmony with this belief, they introduced the custom of devoting three days out of every thirty to the taking of emetics and clysters. Perhaps it was to this

[8] Papyros Ebers, aus dem Aegyptischen zum ersten Male vollständig übersetzt von H. Joachim, Berlin, 1890.

custom that they owed their good health,—a fact to which both Herodotus and Diodorus testify. In principle this practice agrees with that adopted by modern physicians, who omit the emetics and substitute for the clysters the drinking of certain mineral waters during a limited period of the summer season and under the very agreeable surroundings of a comfortable hotel at Carlsbad, Ems, Wiesbaden or Saratoga. While the monthly plan of purging the system of harmful elements must certainly have been the more effective of the two, it cannot for a moment be doubted that exceedingly few moderns would be willing to subject themselves to such a régime.

In still other ways the ancient Egyptians displayed a most intelligent respect for every measure that tended to promote the general health of the community. They took care, for example, to prevent the entrance of decomposing materials into the soil and the ground water; priests skilled in work of this character made careful inspections of all meats that were to be used for food; stress was laid upon the importance of keeping the dwelling houses clean; the people were taught the value of bathing the body frequently, of cultivating gymnastic exercises, of clothing themselves suitably, and of employing the right sort of diet. At a still later period of their history they adopted the custom of drinking only water that had been either boiled or filtered. A particular kind of beer, the gift of their first king, Osiris, was the favorite beverage of the people. It was made from barley and doubtless possessed intoxicating properties, as is suggested by one of the papyrus texts in which the following charge is brought against a student: "Thou hast abandoned thy books and art devoting thyself to idle pleasures, going from one beer-house to another. Thou smellest so strongly of beer that men avoid thee."

A large proportion of the sources of information regarding the medicine of the ancient Egyptians have been brought to light during recent years, but so many gaps in the series still remain unfilled that it is not possible to furnish more than a disconnected and very imperfect account. Archaeological investigations, however, are being

conducted with vigor and new discoveries are reported almost every month. There are therefore good reasons for hoping that, in the course of the next few years, much additional light will be shed on the mode of life and accomplishments of these pioneers of civilization, who, before they passed out of history, succeeded in attaining the highest degree of cultivation in the science and art of medicine that had up to that time been attained by any other nation. One thing is certain, says Neuburger, they exerted a powerful influence upon the beginning of medicine in Greece and upon the social hygiene of the Jewish people, and therefore upon the human race at large.

CHAPTER III

ORIENTAL MEDICINE (Continued)

The Medicine of the Ancient Persians.—After Cyrus the Great had put an end to Babylon as a power among the nations the Persians became the leaders in all the affairs not merely of Asia Minor but also of the entire country from India to the shores of the Mediterranean; in fact, they eventually also gained control of the land of the Pharaohs. Notwithstanding the completeness of the political power which they possessed over these conquered races, they permitted them to retain their respective religions and even their individual languages; as evidence of the correctness of which last statement the modern discovery of inscriptions written in the three principal tongues may be mentioned. The remarkable degree of general culture which existed at Babylon at the time of the Persian conquest, and which the Sumerians and Semites had originally introduced, was left undisturbed by the political change.

So far as we possess any knowledge regarding the medicine of the ancient Persians, this information has been derived, according to Neuburger, from the Zend-Avesta—one of the ancient religious writings preserved by the Parsees. It furnishes comparatively few facts of special interest to physicians. In the main, the practice of medicine must have differed very little from that employed by the earliest Babylonian physicians, and briefly described on pages 11-16. There are one or two additional matters, however, which deserve to be mentioned here. It was maintained, for example, that the touching of a corpse produced a special contamination, a belief which interfered most seriously with the study of anatomy, and therefore

prevented any real advance in medical knowledge. Then, again, the ancient Persians appear to have taken comparatively little interest in surgery, for it is said that King Darius I. was obliged, when he needed treatment for a badly sprained ankle, to send for a Greek physician. Finally, there may be found in Herodotus the following statement, which shows that the Persians had learned something of value, in practical hygiene, from their neighbors, the Egyptians:—

> The Great King (Cyrus), when he goes to the wars, is always supplied with provisions carefully prepared at home, and with cattle of his own. Water, too, from the river Choaspes, which flows by Susa, is taken with him for his drink, as that is the only water which the kings of Persia taste. Wherever he travels, he is attended by a number of four-wheeled cars drawn by mules, in which the Choaspes water, ready boiled for use, and stored in flagons of silver, is moved with him from place to place.[1]

Neuburger makes the remark that the ancient Persians are entitled to the gratitude of later generations for the valuable service which they rendered the science of medicine, inasmuch as, during the dynasty of the Sassanide princes (fifth century A. D.) and at a time when European culture was hastening to its destruction, they gave shelter both to classical culture in general and to the medical knowledge of the Greeks, and then afterward handed it over to the conquering Arabs, who passed it on to our forefathers.

The Medicine of the Old Testament.—There are no medical writings which give any information concerning the science and art of medicine as possessed by the ancient Israelites, but the Bible contains a number of passages that refer to matters which belong in the domain of medicine, and more particularly in that of social hygiene. The mosaic laws were framed with a view to the good of the Jewish people as a whole, and were directed to such matters as the prevention and suppression of epidemic diseases, the combating venereal affections and prostitution, the care

[1] Book I., p. 96, of George Rawlinson's translation.

of the skin, the systematizing of work, the regulation of sexual life, the intellectual cultivation of the race, the provision of suitable clothing, dwellings and food, the use of baths, etc. Many of these laws—like those, for example, which prescribe rest on the Sabbath day, circumcision, abstinence from eating the flesh of the pig, the isolation of persons affected with leprosy, the observation of hygienic rules in camp life, etc.—testify to a remarkably high degree of the power to reason correctly; and, when considered in the light of modern science, they seem to justify the prediction made in Deuteronomy iv., 6. A similar prediction (supposed to be spoken by God from Mount Sinai) is made in Exodus xix., 6: "And ye shall be unto me a kingdom of priests, and an holy nation." That a large part of the credit given to Moses for the wisdom displayed in these sanitary laws really belongs to the Egyptians is shown by the text of Acts vii., 22: "And Moses was learned in all the wisdom of the Egyptians, and was mighty in words and in deeds."

As regards the manner in which the Israelites treated the diseases which afflicted them the Bible furnishes ample proof of the fact that they placed their chief reliance upon prayers, sacrifices, and offerings at their temples, and made comparatively small use of medicinal agents, dietetic measures, and external applications. The favorable effect of David's harp-playing upon the melancholia of King Saul furnishes the only instance, to be found in the Bible, of the curative value of music in certain mental disorders.

The story of Naaman (2 Kings v.) deserves to be mentioned briefly here. He was captain of the host of the King of Syria (about 894 B. C.) and a man of valor, highly esteemed by his master, but he was—according to the Bible statement—a leper. Learning casually that there was in Samaria a prophet who might be able to cure his disease, he put a large sum of money into his sack and departed for that country. "So Naaman came with his horses and with his chariot, and stood at the door of the house of Elisha. And Elisha sent a messenger unto him, saying, Go and wash in Jordan seven times, and thy flesh shall come again

to thee, and thou shalt be clean." Naaman, at first much displeased with the advice given to him by Elisha, and especially by the very informal manner in which it had been communicated to him, finally decided to follow the prophet's instructions. "Then went he down, and dipped himself seven times in Jordan, ... and his flesh came again like unto the flesh of a little child, and he was clean. And he returned to the man of God, ... and came, and stood before him; and he said, Behold, now I know that there is no God in all the earth, but in Israel: now therefore, I pray thee, take a blessing of thy servant." Elisha, however, refused persistently to accept any reward for the advice which he had given. He simply said to Naaman: "Go in peace." Before he departed, however, Naaman expressed to Elisha the hope that he would be pardoned if he yielded to the necessity of bowing down to the god Rimmon on certain occasions—as, for example, when he accompanied his master, the king, on his visits to the temple of that god for the purposes of worship. From the evidence furnished by this account, as given in the Old Testament, it is fair to assume that both Naaman and the writer of the book of Kings believed that the cure had been effected by supernatural means. The modern physician, however, is not ready to accept such an interpretation of the manner in which Naaman's cure was effected, but prefers to believe that the supposed leprosy was in reality some curable form of skin disease which to the unprofessional eye appeared like the other malady. It might, for example, have been an aggravated general eczema, dependent upon such excesses of eating and drinking as a wealthy captain of the king's host would be likely to indulge in. And if this supposition is correct, one cannot but admire the great practical wisdom of Elisha in advising Naaman to take seven baths—one a day presumably—in the river Jordan, a spot so far removed from his home that it would scarcely be possible for him to obtain any but the simplest kind of diet during this comparatively long period of time.

An interesting case of snake-bite is briefly related in Acts xxviii., 3-6. It is stated that "when Paul (after being

shipwrecked on the Island of Melita) had gathered a bundle of sticks, and laid them on the fire, there came a viper out of the heat, and fastened on his hand. And when the barbarians saw the venomous beast hang on his hand, they said among themselves, No doubt this man is a murderer, whom, though he hath escaped the sea, yet vengeance suffereth not to live. And he shook off the beast into the fire, and felt no harm. Howbeit they looked when he should have swollen, or fallen down dead suddenly: but after they had looked a great while, and saw no harm come to him, they changed their minds, and said that he was a god." This narrative is interesting in several respects, but there is one feature that deserves to receive special mention, viz., the fact that Paul experienced no harm from the bite of a poisonous serpent—a wound which frequently proves fatal. Inasmuch as the account distinctly states that the reptile "fastened on his hand" and that "the barbarians saw the venomous beast hang on his hand," the conclusion is warranted that one or both of the creature's fangs had entered the hand by a curving route, and probably in such a manner that the free end of each fang, from which the poison is ejected, passed completely through the skin from within outward. When the bite of a poisonous snake is of a character such as I have just described,—and not a few of them have this character,—only a very small quantity of the venom is lodged in the subcutaneous tissues, where the larger blood- and lymph-channels lie, and as a consequence the person bitten escapes serious harm. On the other hand, when the fangs enter the flesh in a less decidedly curving direction, thus permitting a greater quantity of the venom to reach and remain in the deep-lying tissues, serious or even fatal results may be anticipated. The point, then, which I desire to make is simply this: Paul's escape from death in this instance may perfectly well be ascribed to natural causes.

The Israelites, at a certain stage of their history, appear to have completely divorced the practice of medicine from the priestly function. In one place, for example, it is stated that King Asa sought relief from his ailment, not from

Jehovah, but from the physicians. Jeremiah expresses astonishment that not a single physician is to be found in Gilead. May this not be interpreted as signifying that regularly established physicians were at that time (595 B. C.) to be found in some parts of Palestine? And, at a much earlier period (1500 B. C.), Job calls his friends "physicians of no value" (Job xiii., iv.). From these and a number of other statements in the Bible it seems permissible to believe that, at a very early period of history, the Jewish physicians occupied an entirely independent position.

It would doubtless appear strange to most readers of this brief sketch of the history of medicine if some reference were not made in this place to Luke, the author of the gospel which bears his name and of the Acts of the Apostles, and who was also the companion of Paul on his journey to Rome and during a portion of the latter's stay in that city. Luke was a native of Antioch, in Syria, and not a Jew. He was a physician and tradition says that he was also a painter. It is not known where he received his medical training, but it is not at all unlikely that he studied at Alexandria, in Egypt, where the greatest facilities for such training, obtainable at that period, were to be found. His style of writing shows plainly that he was a man of considerable cultivation and endowed with a clear and logical mind; and if he had not possessed a genial personality he would hardly have been known as "the beloved physician"; nor could any other motive but those of loyal, self-sacrificing friendship for his friend, and a desire to promote the cause of Christianity, have led him to share with Paul the dangers and discomforts of the journey to Rome.

The Medicine of India, China and Japan.—It would be too much of a departure from the plan which is being followed in the writing of this history to attempt to describe, even in the briefest manner, the mode of development of the science and art of medicine in India, China and Japan. Unquestionably the earlier physicians of these countries made many valuable contributions to

medical knowledge, but they were made at such a period of time, or under such conditions, that they could not have exerted an appreciable influence upon the development of medicine in ancient Greece,—certainly no such influence as was exerted by Assyria and Persia, and especially by Egypt. It therefore seems permissible to speak of the medicine of these more remote countries only incidentally, and not as an integral part of the series of centres of learning which made the medicine of ancient Greece the direct ancestor—if I may use such a term—of European medicine.[2] In conformity with this idea it will be well to mention here briefly a few of the more important facts relating to the achievements of the physicians of the three countries named.

The most celebrated medical authors in India were Caraka, Súsruta and Vagbhata—"The ancient trinity," as they were called. Caraka probably lived during the early part of the Christian era, Súsruta during the fifth century, and Vagbhata not later than during the seventh century A. D. It is apparent, therefore, that none of the treatises written by these authors could have exerted the slightest influence upon the growth of medical knowledge in ancient Greece.

The crudeness of many of the conceptions held by these Hindu physicians concerning pathology is revealed in the following definition: "Health is the expression of the normal composition of the three elementary substances (air, mucus and bile) which play a vital part in the machinery of the human body, and it is also dependent upon the existence of normal quantitative relations between these three substances; and when the latter are damaged, or when they are abnormally increased or diminished, then disease of one kind or another makes its appearance.'"[3]

[2] Neuburger speaks of the growth of medical knowledge in India as a development that ran parallel with that of ancient Greece.

[3] *From Neuburger.*—Equally crude are their ideas respecting the causes of disease, as shown by the following items selected from quite a long list of etiological factors: errors in diet and in the habits of life, climatic influences, psychic factors, heredity, poison, supernatural influences like the anger of the

Great stress was laid by the physicians as well as by the priests of ancient India upon the observance of very elaborate rules respecting the care of the person while in health and, very naturally, when a patient became ill the physician in charge paid quite as much attention to the employment of hygienic and dietetic measures in effecting the desired cure as to the administering of drugs.

The list of the commonly employed hygienic measures is too long for reproduction in its entirety in this brief sketch, but an enumeration of some of the more important items may prove interesting. In estimating the value of these rules the reader should bear in mind that they were intended for people living in a hot climate. Daily bathing heads the list. Then follow: regulation of the bowels; rubbing the teeth with fresh twigs of certain trees which possess astringent properties, and also brushing them twice a day; rinsing the mouth with appropriate washes; rubbing the eyes with salves; anointing the body with perfumed oils; cutting the nails every five days, etc. Two meals a day were prescribed—the first one between nine in the morning and noon, and the second between seven and ten in the evening. "Only a moderate amount of water should be drunk during the meal; drinking water at the beginning of a meal delays digestion, while a copious draught at the end produces obesity. After the meal the mouth should be carefully cleansed and a short walk should be taken." Among the more important articles of food the following deserve to be mentioned: rice, ripe fruit, the ordinary

gods, the evil powers of demons, etc. For purposes of diagnosis the earlier Indian physicians utilized not only inspection, palpation and auscultation, but also the senses of taste and smell. They noted the losses and increases in the weight of the body, changes in the appearance of the skin, the tongue and the excretions, alterations in the configuration of the body, the form and other characteristics of swellings, etc. They also noted changes in the patient's voice, in the character of the breathing, in the noises accompanying movements of the joints and the twistings of the intestines. The crepitus caused by the rubbing together of the roughened ends of a fractured bone did not escape their notice. At a later period, doubtless through the influence of the teachings of foreign physicians, they attached great importance to the examination of the pulse.

vegetables, ginger, garlic, salt, milk, oil, melted butter, honey and sugar cane. If meat is eaten, preference should be given to venison, wild fowl and the flesh of the buffalo. The meat of the pig, and beef, as well as fish, are less conducive to health. Gymnastic exercises in moderation are beneficial. Sleep should be indulged in during the day only after some specially severe exercise; at night it should not be extended beyond one hour before sunrise. Bathing immediately after eating is harmful, and it is not to be indulged in when one is affected with a cold, with a high fever, with diarrhoea, or with some disease of the eyes or ears. A hot bath or washing with warm water may be beneficial for the lower half of the body, but for the upper half it is harmful. Sea bathing and cold baths (preferably in the river Ganges) are beneficial. The clothing worn should be clean; soiled garments are likely to produce skin diseases. It is advisable to wear shoes, and an umbrella or a staff should be carried. The wearing of garlands, finery, and jewels increases the vital powers and keeps away evil spirits. The following are good measures to adopt for the preservation of health: an emetic once a week; a laxative once a month; and a bloodletting twice a year. All the measures enumerated above were subject to modification according to changes in the season, the locality, the weather, and various other circumstances.

In harmony with the extraordinary fruitfulness of the land the pharmacopoeia of India is very rich. It is a remarkable fact that not one of the numerous drugs mentioned in the official list is of European origin. The great majority of them belong to the vegetable kingdom; Caraka stating that he knew of 500 plants that possessed remedial virtues, while Súsruta placed the number at 760. Then, too, the list contains a goodly number of drugs which belong, some to the animal and others to the mineral kingdom. It appears that the physicians of India began using mineral substances, both externally and internally, at a very early period of their history. Among such substances the following may be mentioned: sulphate of copper, sulphate of iron, sulphate of lead, oxide of lead, sulphur,

arsenic, borax, alum, potash, chloride of ammonium, gold, precious stones of different kinds, etc. The people of India were skilled in chemical and pharmaceutical work. The drugs were prepared by them in a great variety of ways—as, for instance, extracts of the juices of plants, infusions, decoctions, electuaries, mixtures, syrups, pills, pastes, powders, suppositories, collyria, salves, etc. Practicing physicians carried with them a sort of portable medicine chest, and they often collected, themselves, the medicinal plants which they required. Súsruta gives instructions as to the spots where certain plants are most likely to be found, and as to the seasons when they should be gathered. Charlatanry and mysticism often played a part in this business. Thus, it was maintained that drugs collected and prepared by persons other than physicians did not produce the desired effects. The fact that cosmetics (especially hair dyes), "elixirs of life," aphrodisiacs, poisons and antidotes for poisons, occupy the most prominent place in the list of pharmaceutic preparations sold, casts a glaring ray of light, as Neuburger states, on the degree of culture among the people of ancient India.

The list of separate maladies recognized by the physicians of the latter country is inordinately long. There were 26 kinds of fevers, 13 species of swellings of the lower abdomen, 20 different diseases due to worms, 20 kinds of urinary diseases, 8 varieties of strangury, 5 kinds of jaundice, 5 varieties of cough or asthma, 18 kinds of "leprosy," 6 kinds of abscesses, 76 different eye diseases, 28 affections of the ear, 65 disorders of the mouth, 31 nasal affections, 18 diseases of the throat, a large number of mental disorders, etc. It seems scarcely necessary to remark that these so-called diseases were in reality only groups of certain types of loosely related symptoms. The term "leprosy," for example, included, besides the disease which modern physicians call by that name, a number of different affections of the skin. It is worth noting here that diabetes mellitus, which is one of the twenty different kinds of urinary diseases enumerated in the classified list mentioned above, was first described by the physicians of

India, whose attention was directed to the disorder by observing that flies and other insects were attracted to the urine of these patients by reason of its sweetness. It is also an interesting fact that occasionally these physicians, who, beyond a doubt, were keen observers of symptoms, paid some attention to the anatomical features of the individual cases. Thus, it is stated that the particular form of swelling of the lower abdomen, to which they applied the name "splenic belly," is dependent upon "an enlarged spleen which distends the left side, is as hard as a stone, and is arched like the back of a turtle"; whereas they spoke of "an enlargement of the liver" when very much the same conditions were observed on the right side of the abdomen. The accuracy of their clinical observations is particularly noticeable in their accounts of cases of consumption, apoplexy, epilepsy, hemicrania, tetanus, rheumatism, venereal diseases, some affections of the skin, and insanity. It was in their surgical technique, however, that the physicians of ancient India were distinguished above all their brethren of the neighboring oriental countries, and this superiority they maintained for a very long time. Among the operations which they performed the following may be mentioned: they removed tumors by excising them, they opened abscesses by the use of the knife, they employed scarifications (in inflammations of the throat) and made punctures (in hydrocele and ascites), they passed probes into fistulae, they extracted foreign bodies, and they employed needles armed with hairs taken from the horse's tail or with thread composed of flax or hemp. According to Súsruta their stock of instruments was composed of 101 blunt and 20 cutting instruments. Among those which were blunt there were forceps of different sizes and forms, hooks, tubes, probes or sounds, catheters, bougies, etc. They made use of the magnet for drawing out foreign bodies of iron, and they applied cups for therapeutic purposes. Their cutting instruments consisted of knives, bistouris, lancets, scissors, trochars, needles, etc. Steel was the metal of which they were made; for the people of India learned at a very early period how

to make steel. In suitable cases cauterization, either with the actual cautery or with caustic potash, was a favorite method of treatment with the surgeons of ancient India. "Burning with the heated iron," they taught, "is more effective than cauterization with potash, inasmuch as it permanently cures diseases which may not be cured by either drugs, surgical instruments, or chemical cauterizing agents." In cases of enlargement of the spleen they plunged red-hot needles into the parenchyma of the organ, presumably through the skin and other overlying tissues. There were fourteen different kinds of surgical dressings; cotton, woolen, linen and silk being the materials used for bandages, and strips of bamboo or some other wood for splints. When the conditions permitted such a proceeding, it was customary to sew up wounds of the head, face and windpipe. Furthermore, it was the rule to perform all surgical operations at a time when the constellations were favorable. Religious ceremonies were performed both before the operation and after it was completed, and it was also considered necessary that the operator should face the west and the patient the east. Intoxication was employed as a means of securing narcosis. Owing to their scrupulous cleanliness and the minute attention which they paid to details, the surgeons of ancient India obtained for a long time a much higher degree of success than did the surgeons of other oriental nations. At the same time they were not lacking in that degree of boldness which enables an operator—in critical cases which probably without such prompt and radical action would terminate fatally—to save life. For example, they did not hesitate to open the abdominal cavity and to sew up a wound in the intestines; they cut for stone in the bladder, employing for this purpose the lateral method of operating; and they performed a great variety of plastic operations.

Some of their hygienic rules concerning pregnant and nursing women are eminently practical; others would hardly be approved by modern accoucheurs. Here are a few of these rules: During the period of a woman's pregnancy close attention should be paid to her diet, and

special care should be exercised by her to avoid excesses or errors of any kind. When the ninth month is reached she should take up her abode in the small cottage in which she is eventually to be confined—a building erected with special religious ceremonies and thoroughly fitted with everything that is likely to conduce to her comfort. At the time of the actual confinement she should have with her four female assistants, and all those measures, of either a religious or a practical character, which have in view the hastening of the birth of the infant, should be scrupulously carried out. If any delay in the delivery of the after-birth occurs, the removal of the mass may be promoted by the employment of well-directed pressure over the lower part of the abdomen, by shaking the body, and also, if necessary, by giving an emetic. The woman in childbed should not be allowed to get up before the tenth day after her confinement, and for a period of six weeks her diet should be most carefully watched. On the third day the child should be put to the mother's breast; up to that time it should be given only honey and butter. If the mother, for any reason, is not able to suckle the infant, a wet-nurse should be employed for the purpose, but not until the physician shall have subjected her to a most thorough examination and shall have instructed her minutely in regard to her own diet. The subsequent care of the child was provided for in the most particular manner: It was restricted to a carefully planned diet; it was not allowed to sit or to lie except in certain prescribed positions; its times for sleeping were strictly ordered; it was permitted to amuse itself only in certain ways;—in brief, everything was done according to strict rules, even special precautions being taken to guard the child, during the first years of life, against dangerous demons. Weaning began after the sixth month, and for a certain length of time the child was fed largely on rice. In cases of difficult labor and in their gynaecological practice the physicians of ancient India did not manifest any special knowledge or skill.

One of the instructions given to young physicians in India when they were about to enter upon the practice of

their profession, may be of interest to the reader. It is worded as follows: "Let thy hair and finger nails be cut short, keep thy body clean, put on white garments, wear shoes on thy feet, and carry a staff or umbrella in thy hand. Thy demeanor should be humble, and thy heart pure and free from deceitfulness." The following proverb, although it originated in India, is well worthy of acceptance in every part of the world: "When you are ill the physician will be to you a father; when you have recovered from your illness you will find him a friend; and when your health is fully re-established he will act as your protector."

On a previous page the statement has been made that the science and art of medicine developed in ancient Greece quite independently of any influence that might have been exerted by the teachings of the physicians of India. This statement should be somewhat modified, for it is reasonable to suppose, although directly confirmatory evidence has not yet been discovered, that, through the channels of trade between the two countries, some knowledge of the doings of the physicians of India must have reached the ears of their Greek brethren. On the other hand, at a later period of history (after Alexander the Great had invaded India), the relations between the two countries became quite close and were kept up without a break for several hundred years. During the earlier part of this later period, as appears from the writings of Hippocrates, Dioscorides and Galen, various drugs and methods of treatment employed by the physicians of India were adopted by the practitioners of Greece.

Medicine of the Chinese and Japanese.—The isolation of China with respect to those countries which were within comparatively easy reach and in which there was a civilization that, already several thousand years before the Christian era, had attained a remarkable degree of development (India, Babylonia and Egypt, for example); her blind belief in authority; her unwillingness to tolerate any influences that seemed to emanate from foreigners; and her complete satisfaction with her own methods of doing things, with her own beliefs, and with her own

natural and manufactured products,—these, it is generally believed, were the most important factors in keeping this remarkable nation in a state of immobility as regards at least some departments of human knowledge and accomplishment. This is particularly true in respect of the science and art of medicine. But China is at last waking up from this lethargic state. A wonderful change has come over her during the past twenty or thirty years, and she is now beginning to realize that, with her millions of population and wonderful natural resources, she has an important part to play in advancing the civilization of the world.

The preceding remarks must not be interpreted as signifying that, during the long ages of the past, China has not been developing and is not able at the present time to show a record of very creditable work accomplished in many departments of human activity. In her early history, many centuries ago, she accomplished great things, and all—so far as we now know—without aid from neighboring nations; but there came a time when all this creative activity ceased, and then, for long periods of years, she appeared to rest satisfied with the advances which she had already made, and to have no further ambition to add to the stock of her possessions.

Among the valuable things which should be credited to the Chinese are the following: the discovery of the compass (about 1100 B. C.), the making of porcelain, the invention of printing, the raising of silkworms, the manufacture of glass and of paper, the successful dyeing with purple, embroidering with gold, working in metals, the artistic cutting of precious stones, enameling, the making of "India ink," etc. Furthermore, it is a fact most creditable to the Chinese that in no other country in the world have scholars been held in such high esteem, or assigned so high a rank, as they have been and still are in China.

Chinese medicine possesses a very rich literature. The first medical treatise, which deals with plants that possess medicinal virtues, is ascribed to the Emperor Schin-Nung, who flourished about 2800 B. C. This is the monarch who

taught his people from which springs they should drink, and who tested all the plants of his vast empire with reference to their healing properties. According to the legend the wall of his stomach was so thin that he could look through it and see everything that was going on in the interior of that organ. In this way he was able to carry on a large series of experiments upon himself in regard to the action of different poisons and their antidotes. It is also related that medical knowledge was still further advanced by the yellow Emperor Hoang-Ti who lived about 2650 B. C., and who is credited by the Chinese with having invented arithmetic and music. The treatise called "Noi-King," which deals with the subject of internal diseases and gives a systematic account of human anatomy, is also credited by the Chinese to this monarch; but Neuburger maintains that this book, which is still in common use in China, is of much more recent origin. There are several other medical treatises which deserve to be mentioned. Such, for example, are the following: the celebrated book on the pulse, written by Wang-Schu-Scho in the third century B. C.; two very important books written by Cho-Chiyu-Kei—one bearing the title "Schang-Han-Lun" (On Fevers) and the other that of "Kin-Kwéi" (Golden Casket);—the different treatises written by Tschang-Ki (tenth century A. D.) and published in the collection called "The Golden Mirror of the Forefathers in Medicine" (I-Tsung-Kin-Kien"); and, finally, the very popular modern work (in forty volumes) entitled "The Trustworthy Guide in the Science and Art of Medicine" ("Ching-Che-Chun-Ching"). Of these forty volumes, seven are devoted to nosology, eight to pharmacy, five to pathology, six to surgery, and the remainder to children's and women's diseases.

Anatomy, it appears, has never played other than a very insignificant part in the Chinese system of medicine. This is not to be wondered at when we remember that their religion makes the dissection of a human body a sin worthy of punishment. No mutilated person, the Chinese believed, would be permitted, upon reaching the domain of the dead,

to rejoin his ancestors. About the year 1700 A. D. the Emperor Kang-Hi made the attempt to incorporate anatomy as a part of the regular study of medicine in the Chinese Empire; his first step being the authorization of P. Perennin, a Jesuit Father, to translate Dionis' work on anatomy into the Chinese. His efforts were, however, unsuccessful, owing to the strong opposition offered by the native physicians. And the attempts made during more recent times to accomplish the desired reform by introducing copies of European anatomical illustrations do not appear, as yet, to have produced any appreciable impression. In very recent years, however, the medical missionaries, sent out, if I am rightly informed, from the United States, are giving excellent instruction in anatomy.

Physiology, as taught by the Chinese, is something beyond the comprehension of modern Europeans. Neuburger explains their views in the following manner: "The cosmos is the product of the combined action of two dissimilar forces—the male (Yâng) and the female (Yin). When these forces work in harmony a state of equilibrium results. . . . . Matter consists of five elements, viz., wood, fire, earth, metal, and water; and all things are composed of these elements. In sympathetic relationship with these five elements stand the five planets (Jupiter, Mars, Saturn, Venus, Mercury), the five different kinds of air (wind, heat, moisture, dryness, cold), the five quarters of the globe (east, south, west, north and the equator), the five periods of the year (in addition to the four which we recognize, the Chinese make a fifth period out of the last eighteen days of spring, summer, autumn and winter), the five times of day, the five colors (green or blue, red, yellow, white and black), the five musical tones, etc. . . . . As in the cosmos, so in man the two primeval forces—Yâng and Yin—underlie all his vital processes. Thus, his body is made up of the five elements of which all matter is composed, and health depends upon the maintenance of a state of equilibrium between the male and the female forces, etc." After this brief exposition it seems unneces-

sary to devote any further space to the consideration of the physiological doctrines of the Chinese.

With respect to the questions of diagnosis and prognosis it may be stated that the Chinese attach great importance to the necessity of making a most careful objective examination of the entire body; but, when one investigates the precise manner in which this examination is to be carried out, it soon appears that most of the details relate to matters of a purely fanciful or mystical nature. The only steps of real importance, according to them, are the examination of the patient's pulse and the inspection of his eyesight and his tongue. From the examination of the pulse alone they believe it possible to diagnose the nature and seat of the disease. To examine the pulse properly is a complicated affair and can scarcely be carried out in actual practice in less time than ten minutes; indeed, in certain cases the physician may find it necessary to devote two or three hours to the business. According to the Chinese scheme there are many different kinds of pulse, and there are no less than thirty-seven different types of condition presented by the tongue, each bearing its own special pathological significance.

Disease, so reads the Chinese doctrine, is a discord, a disturbance of equilibrium, caused by the preponderance of one or the other of the primeval forces (the male or the female). It manifests itself in some disorder of the circulation of the vital air and the blood, and eventually involves the organs of the body. Wind, cold, dryness, moisture, the emotions and passions, poisons, and also evil spirits and imaginary beasts are the causes of disease.

No other nation, says Neuburger, has at its command such a large number of remedial drugs; and it is also a fact, he adds, that the department of therapeutics is that in which Chinese medicine has reached its highest development. The steadfast belief that in nature there exists a remedy for every human ill led the physicians of that country to search diligently in all possible directions for vegetable and animal and also, to some extent, mineral substances which might possess remedial virtues. Although

this search necessarily brought to notice a lot of useless drugs, it cannot be denied that eventually it added a considerable number of remedies which have proved useful to the medical profession of the entire world. In this category belong the following: rhubarb, pomegranate root as a cure for worms, camphor, aconite, cannabis, iron (for the relief of anaemia), arsenic (for malarial and skin diseases), sulphur and mercury (both of these for affections of the skin), sodium sulphate, copper sulphate (as an emetic), alum, sal ammoniac and musk (for nervous affections). Toward the middle of the sixteenth century A. D. there was published, under the title "Pen-Tsao-Kang-Mu," a monumental work (fifty-two volumes) in which are very fully described no fewer than 1800 remedies, mostly of a vegetable nature. Prophylactic Inoculation with the pus from a smallpox pustule was practised by the Chinese as long ago as during the eleventh century A. D., "thus constituting a forerunner of our modern serum therapy." (Neuburger.) Vaccination was not introduced into China until during the nineteenth century of the present era. It is a curious fact that, in the choice of a remedy, the Chinese physicians attach a certain degree of importance to the form and color of the drug, as symbols indicative of the effect which they may be expected to produce. Thus, the red blossoms of the hibiscus plant are believed to be more efficacious than the white as an emmenagogue; saffron, being of a yellow color, possesses the power to relieve jaundice; beans that have the shape of a kidney should be prescribed in cases of renal disease; glow-worms should form a part of all eye-washes, etc.

The doses prescribed are very large, and the medicines are often put up in an attractive form, with labels on which such descriptive titles as these are written: "Powders of the Three very wise Men," or "Powders recommended by Five Distinguished Physicians"—titles which are calculated to work upon the imagination of the patient.

There are two methods of treatment which the Chinese physicians are very fond of employing for the relief of a great variety of diseases—viz., acupuncture and cauteriza-

tion of the skin over the seat of the malady by means of what are termed "moxae"—moxibustion. Moxae are prepared by kneading together into a cone-shaped, tinder-like mass the leaves of the artemisia vulgaris, then drying it thoroughly. Such a mass is attached to the skin at the affected spot by simply moistening the base of the cone, after which the apex is ignited. Some physicians prefer to interpose a thin sheet of metal between the skin and the base of the moxa. The manner in which these contrivances should be used in the different diseases and the proper number to employ are matters subject to fixed rules. In a strong individual, for example, as many as fifty moxae may be used at a time. In affections of the chest they were applied to the patient's back, in diseases of the stomach to the shoulders, and in venereal affections over the spinal column. In acupuncture, which is a procedure invented by the Chinese, slender needles of gold, silver or highly tempered steel, from 5 to 22 centimetres (2 in.-8¼ in.) in length, were forced through the stretched skin to different depths (1¼ in.-1½ in.) and then driven farther inward in a rotary direction by means of a small hammer. The needles, after being allowed to remain *in situ* for a few minutes, were withdrawn, and pressure was made with the hand over the small wounds, or a moxa was burned over the spot. There are in all 388 places where acupuncture may be performed, and a chart of the body, showing where these places are located, has been prepared for the guidance of the Chinese physicians. Neuburger calls attention to the fact that the latter dislike the sight of blood, and that this is one of the reasons why acupuncture and the use of moxae have grown to be such popular remedies. Bloodletting is rarely employed by them; but dry cupping, on the contrary, is a favorite procedure in certain maladies. Massage is generally performed by old or blind women, and much attention is devoted to the "movement cure," which is said to have been invented about 2500 B. C.

As may readily be imagined, the Chinese—owing to their dislike for the sight of blood and also by reason of

their ignorance of anatomy—have not advanced, in surgery, beyond the most primitive state of that art.

The science of public health is quite unknown in China. In a Chinese treatise entitled "Long Life," the following advice is given: "Always rise early in the morning, take some breakfast before you leave your residence, drink a little tea before eating, at the mid-day meal partake of well-cooked but not too highly salted food, eat slowly, take a nap of two hours after the meal, eat lightly at night, and, before going to bed, rinse your mouth with tea and have the soles of your feet rubbed until they are warm." (Neuburger.)

Up to the latter part of the nineteenth century of the present era, Japan, so far as medical matters are concerned, differed in no material respect from China. During the last fifty or sixty years, however,—that is, since the visit of Commodore Perry, of the United States Navy, to that country,—wonderful changes have taken place; and now Japan, as a result of her determination to adopt the methods of education, of utilizing steam and electric power, etc., has already taken a leading place in the council of nations. The physicians, many of whom received their training in the best schools of Europe and the United States, are contributing to-day their full share toward advancing the science of medicine. That China is following in the footsteps of Japan is already plainly evident, and no intelligent observer entertains the slightest doubt of her ultimately—probably at no distant day—possessing a corps of medical men as well educated, as efficient in the treatment of disease, and as practical in public hygiene as their European and American confrères. During thousands of years China has suffered severely from the blighting tyranny of superstition, priestcraft and selfish bureaucracy, and, now that the sunlight of truth and genuine liberty is beginning to search every nook and cranny of that great country, we who have had the advantage of this beneficent influence for so many scores of years truly rejoice over the change that is taking place in China.

CHAPTER IV

GREEK MEDICINE AT THE DAWN OF HISTORY

It is from Greece and from Greece alone, says Daremberg, that our modern medicine derives its origin.

> It has come down to us, in a direct line, through the sheer force of its inherent excellence, and with little or no aid from outside sources. Harvey, Bichat and Broussais are as much the legitimate heirs of Hippocrates, Herophilus, Galen, Berenger de Carpi and Vesalius, as Hippocrates is the heir of Homer, and as this divine singer of the anger of Achilles is himself the product of a civilization that existed before his day and that was in all probability the creation of Hindu influences.

It is to the development of medical knowledge in Greece, therefore, that our attention should next be directed, and more particularly to that period which belongs to the dawn of history—the pre-Homeric period.

The pre-Homeric Period of Medicine in Greece.—The poems of Homer, the Iliad and the Odyssey, furnish us with the earliest and almost the only written evidence of the state of medicine in Greece during that period of time. They were probably written, according to the authority of the Earl of Derby, somewhere about 800 B. C., and modern investigations show that the siege of Troy, the theme of the Iliad, occurred between the years 1194 and 1184 B. C. These investigations also show that in this region, and especially in the Island of Crete and in Mycenae on the neighboring mainland of Asia Minor, at this time and probably several hundred years earlier, there existed a high degree of civilization. Specimens of a written language, for example, were found among the objects recovered from the ruins of the palace of King Minos at

Cnossus in Crete, but hitherto no interpreter of this unknown language has been found. It is reasonable to expect, however, that in due time these Minoan records will be translated, that still other records belonging to this remote age will be discovered, and that much valuable information regarding the condition of medical knowledge in Greece during this long period will then be revealed to us. Strange as it may appear, the classical Greek writers seem to have possessed very little knowledge concerning this highly developed civilization at Cnossus. And yet, if we stop to consider the matter, their silence will appear less strange for the following reasons. Some great calamity (war, an earthquake, or a conflagration) must have destroyed many of the evidences of Minoan civilization besides those which are now being brought to light; then, also, several hundred years elapsed between the occurrence of this disaster and the classical period of Greek culture; and, finally, there is the fact that the knowledge of past historical events, when kept alive simply by tradition, slowly vanishes, until finally it becomes so vague as to possess very little value. The discoveries made in the Island of Crete and at Mycenae were not known to Daremberg when he wrote the lines quoted above, but he felt perfectly sure, from his knowledge of the laws of development in general, that a product so highly cultured as Homer could not have suddenly sprung into existence out of the apparent darkness and ignorance of the centuries immediately preceding his time.

The State of Medical Knowledge at the Time of the Siege of Troy.—It is from Homer's Iliad and Odyssey that our authoritative knowledge of the most ancient Greek medicine is derived. In the former work mention is made of Aesculapius and his two sons, Machaon and Podalirius, both of whom accompanied Agamemnon and the Greek host in their expedition against Troy. According to this author's account they served in the double capacity of surgeons to the army and valiant leaders of troops. In order that the reader may judge for himself just what is the nature of the evidence furnished by Homer with regard

to the medical knowledge of that period, it seems desirable to introduce here a few of the more characteristic references which the poet makes to spear, javelin and arrow wounds, to the injuries caused by fragments of rocks hurled by the assailants, and to various remedial measures, both surgical and medical, employed for the relief of the wounded or sick warriors. There are at least one hundred such passages in the Iliad alone, but the few which are here cited will serve as adequate examples of Homer's familiarity with anatomy and with some of the methods of treating spear and arrow wounds,—a familiarity which indicates that the poet must have had some medical training.

Thus he; and not unmoved Machaon heard:
They through the crowd, and through the wide-spread host,
Together took their way; but when they came
Where fair-hair'd Menelaüs, wounded, stood,
Around him in a ring the best of Greece,
And in the midst the godlike chief himself,
From the close-fitting belt the shaft he drew,
With sharp return of pain; the sparkling belt
He loosen'd, and the doublet underneath,
And coat of mail, the work of Arm'rer's hand.
But when the wound appeared in sight, where struck
The stinging arrow, from the clotted blood
He cleans'd it, and applied with skilful hand
The healing ointments, which, in friendly guise,
The learned Chiron to his father gave.

(Book IV. of the Iliad, Lines 221-259.)

* * * * * * * * *

He said: the spear, by Pallas guided, struck
Beside the nostril, underneath the eye;
Crashed through the teeth, and cutting through the tongue
Beneath the angle of the jaw came forth:
Down from the car he fell; and loudly rang
His glittering arms: aside the startled steeds
Sprang devious: from his limbs the spirit fled.
Down leaped Aeneas, spear and shield in hand,
Against the Greeks to guard the valiant dead;
And like a lion, fearless in his strength,

Around the corpse he stalk'd, this way and that,
His spear and buckler round before him held,
To all who dar'd approach him threatening death,
With fearful shouts; a rocky fragment then
Tydides lifted up, a mighty mass,
Which scarce two men could raise, as men are now:
But he, unaided, lifted it with ease.
With this he smote Aeneas near the groin,
Where the thigh bone, inserted in the hip,
Turns in the socket joint; the rugged mass
The socket crushed, and both the tendons broke,
And tore away the flesh: down on his knees,
Yet resting on his hand, the hero fell;
And o'er his eyes the shades of darkness spread.

(The Iliad, Book V., Lines 333-356.)

* * * * * * * * *

He said, and passing his supporting hand
Beneath his [Eurypylus'] breast, the wounded warrior led
Within the tent; th' attendant saw, and spread
The ox-hide couch; then as he lay reclined,
Patroclus, with his dagger, from the thigh
Cut out the biting shaft; and from the wound
With tepid water cleans'd the clotted blood;
Then, pounded in his hands, a root applied
Astringent, anodyne, which all his pain
Allayed; the wound was dried, and stanch'd the blood.

(The Iliad, Book XI., Lines 958-967.)

* * * * * * * * *

But Jove-born Helen otherwise, meantime,
Employed, into the wine of which they drank
A drug infused, antidote to the pains
Of grief and anger, a most potent charm
For ills of every name.[1] Whoe'er his wine
So medicated drinks, he shall not pour
All day the tears down his wan cheeks, although
His father and his mother both were dead,
Nor even though his brother or his son
Had fallen in battle, and before his eyes.

(Book IV. of the Odyssey, Lines 275-284.)

[1] Nepenthes, believed to be opium, is the word employed in the original.

In former years and down almost to the present time, it was the custom among English medical writers to speak of Aesculapius only as the "God of Medicine," thus conveying to the minds of many readers that he was a mythological character, not a real personage. To-day, and especially since Schliemann has demonstrated, by his excavations at the site of ancient Troy, that Homer's Iliad is not merely a beautiful creation of his poetic fancy, but a narration of events that actually occurred about 1200 B. C., it is quite generally acknowledged that Aesculapius[2] is an historical character, an individual whose memory should receive due honor from the physicians of modern times. Neither Homer nor Pindar speaks of him as a god. In Athens he was publicly deified in 420 B. C.

When Daremberg, as quoted above, expressed the belief that Hippocrates was the product of an earlier civilization, he undoubtedly gave due weight to other circumstances beside those which are narrated in Homer's poems—circumstances, for example, which are referred to casually by several of the classical Greek authors, and to which fresh importance has been given by a number of recent discoveries. Thus, there is an abundance of evidence showing that the Greeks, both before and after Homer's time, held the memory of Aesculapius in the very highest honor. So great, as they believed, was his power over disease, so wonderful were the cures which he accomplished, and so noble and pure was his character, that they made him a god and erected temples in his honor—not mere places where a barren worship might be carried on, but veritable sanatoria—termed Asclepieia—where the extraordinary healing powers of him whom they had made a god might be perpetuated for the benefit of succeeding

[2] Aesculapius was held to be the son of Apollo, the god of medicine, and to have been instructed in the art of healing by Chiron, one of the centaurs. Beside his famous sons, Machaon and Podalirius, he had four daughters whose names—Hygieia, Jaso, Panakeia and Aigle—have come down to us through the ages. His wife's name was Epione, and those of his two younger sons were Telesphorus and Janiscus, but all three of these names are rarely mentioned by the Greek writers.

generations. While, on the one hand, the ancient Greeks may have been full of superstitious beliefs, they were at the same time as kindly disposed toward their fellow men, as generous in their spending of money for this purpose, and as practical in their selection of suitable methods as are the benefactors of to-day all over the world. In course of time these so-called temples became the prototypes of our hospitals, sanatoria and schools of medicine, and it therefore seems only proper that they should here be described somewhat in detail.

The so-called Aesculapian Temples and their Chief Purpose.—The first of these temples, or Asclepieia, were established at Trikka, in Thessaly; at Cnidus, on the coast of Caria in Asia Minor, opposite Cos; at Epidaurus, in Argolis, Greece; at Cyrene on the northern coast of Lybia, Africa, opposite the Island of Crete; at Crotona, on the southeastern coast of Italy; and, finally, at Athens. It is said that traces of as many as eighty of these Asclepieia have been found in different parts of the ancient world. One of them, for example, is known to have existed on the small island (Isola San Bartolommeo) in the Tiber, at Rome. Their management was intrusted, in the earlier years of their existence, to men who were descendants of Aesculapius—*i.e.*, the sons and grandsons of Machaon and Podalirius. They were both priests and physicians, and are mentioned in history as the Asclepiadae. With the progress of time it became necessary, as one may readily understand, to intrust the temple service to individuals who were not members of the family of Aesculapius. The original Asclepiadae guarded as valuable secrets the methods of treatment and the pharmaceutic formulae which had been handed down to them by the head of the family. It was therefore natural, when these newly adopted members were installed in office, that they should be made to promise, under oath, not to "divulge these secrets to any but their own sons, the sons of their teachers, or the pupils who were preparing themselves to become regular physicians." (Neuburger.)

The divulging of these secrets, it may be assumed,

would gradually entail upon the organization of priest-physicians a serious money loss. As will be seen further on, the oath known as "the Hippocratic Oath" omits these mercenary features, and thus places the vocation of physician upon a much higher level.

It is an interesting fact, as noted by Hollaender, of Berlin, that Homer does not make the slightest mention of temples dedicated to Aesculapius; from which circumstance it may be inferred that a long time—perhaps several hundred years—elapsed, after his death, before his countrymen realized fully his greatness and the value of the services which he had rendered in his rôle of physician. Of the temples which were then built in his honor, all have long since fallen into ruins, but in recent years excavations have been made at some of the more important of these sites and under the guidance of competent scholars, and as a result our knowledge of the state of medicine in Greece between the time of Homer and the appearance of the Hippocratic writings has been greatly enlarged. The facts revealed by these excavations and the statements which are to be found in classical Greek literature, but which previously did not receive all the consideration that they deserved, have now been pieced together and we have thus been furnished with a fairly satisfactory picture of the relations of the different chambers and spaces in these temples, and with a more or less complete account of the manner in which affairs were conducted by those in charge. The following short description which is based on the account recently published by Professor Meyer-Steineg of Jena, Germany, will put the reader in possession of all the more important facts.[3]

There were two principal types of Asclepieia—one, like that of Epidaurus, in Argolis, which occupied an inland situation, that had clearly been chosen from religious motives alone, viz., because it was believed, in accordance with an ancient tradition, that at this spot Aesculapius had

[3] "Kranken-Anstalten im griechisch-römischen Altertum," von Dr. med. et jur. Theodor Meyer-Steineg, a. o. Professor an der Universität Jena; Verlag von G. Fischer, 1912.

FIG. 1 VIEW OF THE TEMPLE OF AESCULAPIUS ON THE ISLAND OF COS

As it must have appeared to the traveler, in the third century B C., on his approach by sea to the port of that island.

Reconstitution based upon recent photographs and upon surveys by Herzog (*Koische Forschungen*, 1904)

(Courtesy of Prof. Dr. Meyer-Steineg, of Jena, Germany.)

been born—and a second, like that of Cos, on the island of the same name in the Aegean Sea, which situation without doubt had been chosen chiefly because the locality was exceptionally healthful. Of the first of these two types of temples, the sites of both of which have been most carefully studied, very little need be said in this brief sketch. The purely medical aspects of this Asclepieion, to which at the height of its celebrity crowds flocked from all parts of Greece, are of minor interest. The temple and its accessory buildings, which appear to have been very extensive, were located in a narrow valley, not far distant from the seaside village which still to-day bears the name of Epidaurus. Then, also, the locality is deficient in one important respect—it has an insufficient supply of good drinking water; and, finally, it is only slightly elevated above the sea-level. Dr. Meyer-Steineg remarks that the patients who visited this temple must have owed whatever benefit they derived from the visit to other influences than those of a purely medical or hygienic character. Doubtless suggestion played an important part in any relief which they may have obtained, and the so-called temple-sleep was also doubtless a very effective factor in this direction. The Asclepieion at Cos, on the other hand, occupied a most healthful position on the northern slope of the ridge of mountains which extends throughout the entire length of the island and attains a maximum height of about 3000 feet. (See Fig. 1.)

It now remains for me to describe, as best I may within the limited space which is at my command, the results of the excavations and surveys that have been made in recent years on the Island of Cos. Professor Meyer-Steineg's article on this subject[4] is the source from which I have derived the information contained in the following account.

The temple and its associated buildings stood at an elevation of three hundred feet above the sea-level and at a distance of a little more than two miles from the city of Cos. The heights behind the temple were in former

[4] "Kranken-Anstalten im griechisch-romischen Altertum," in *Jenaer medizin.-historische Beiträge*, Jena, 1912.

times covered with forests and afforded ample protection against the debilitating and much-dreaded south wind. A brook of considerable size and of very pure water passed through the temple grounds; the spring (Burinna) from which it took its origin being located about 300 feet higher up on the side of the mountain. Not far off, in the same neighborhood, is a mineral spring, the water from which contains both iron and sulphur. All the physical conditions of this site were, therefore, very favorable to the restoration of both mental and bodily health. Professor Meyer-Steineg declares that it is scarcely possible to determine accurately the age of the Cos Asclepieion,—*i.e.*, of the structures which the present ruins represent,—but he believes that some of them date no farther back than the third century B. C., at which time extensive structural alterations were made.[5] Then, at a still later date (first century A. D.), in consequence of the damage done by an earthquake, C. Stertinius Xenophon (at the instigation of the Roman Emperor Claudius, whose private physician he was) carried out some very radical changes. Not only were the separate buildings well supplied with running water, but even many of the individual rooms (of which there were a large number) were equipped with the same conveniences. Hydropathy evidently formed an important part of the treatment in the reconstructed temple. (See Fig. 2.)

As has been shown above, the climate, the freedom from disturbing factors of all kinds, the existence at that spot of a plentiful supply of pure water, the character of the structures composing the temple group, and the widespread belief among the people that the Asclepiadae were able, with the assistance of the god Aesculapius, to effect cures which were obtainable nowhere else—all contributed to make the temple at Cos one of the greatest sanatoria of ancient times.

The buildings which constituted what is commonly termed the "Temple of Aesculapius" at Cos were located on three artificially prepared terraces. The principal

[5] All important traces of the earlier structures seem to have disappeared.

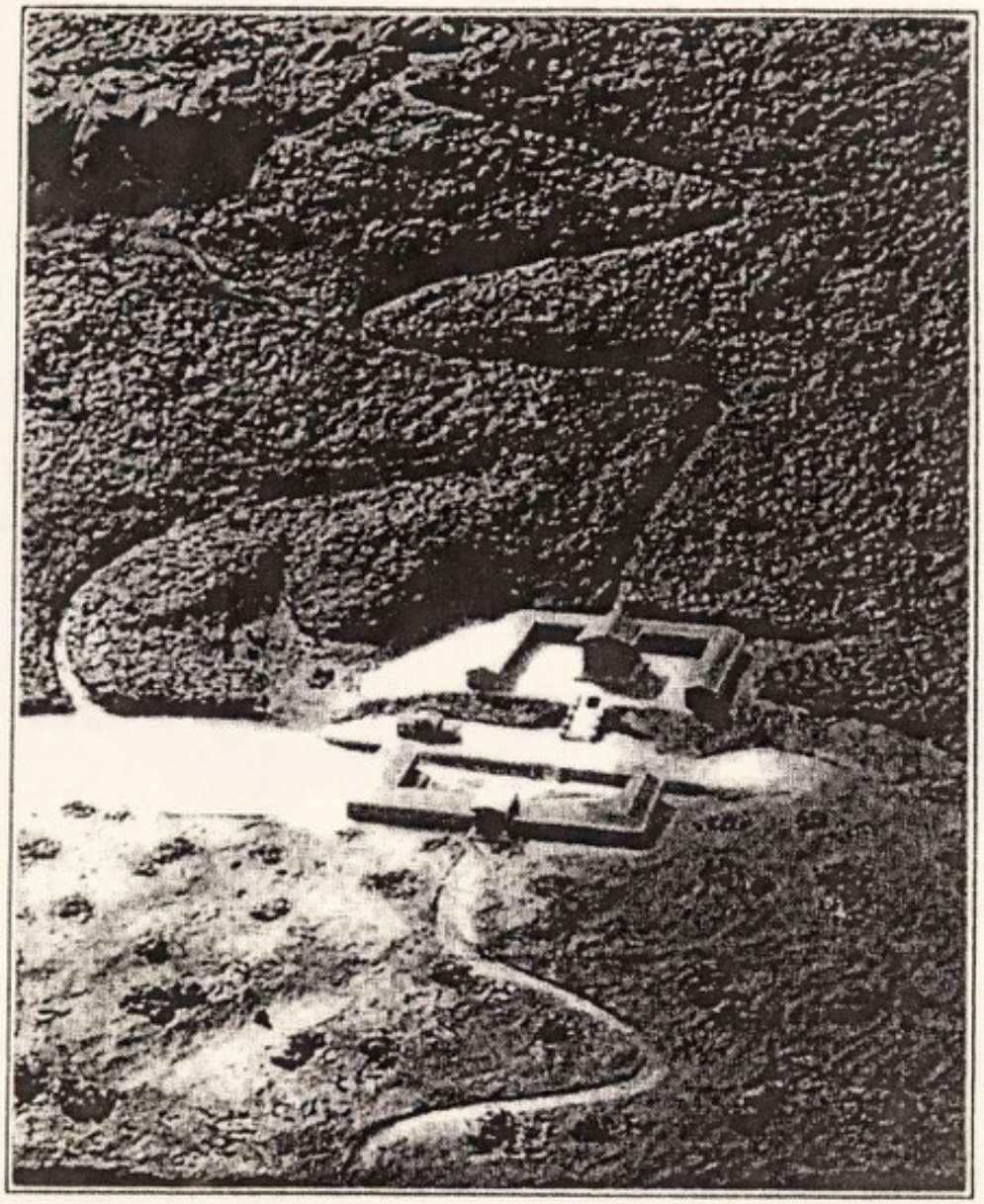

FIG. 2. BIRD'S-EYE VIEW OF THE TEMPLE OF AESCULAPIUS AND ASSOCIATED BUILDINGS ON THE ISLAND OF COS.

As they appeared in the third century B. C.

(Copied by permission from a model made by Prof. Dr. Meyer-Steineg for the Medico-historical Museum of the University of Jena, Germany.)

entrance to the group, as the excavations conducted quite recently by Herzog show, was on the lower terrace, and faced north—that is, toward the sea. From this lower level a broad staircase led to the second or intermediate terrace, which, in turn, was connected with the upper one by means of a very broad and massive series of steps. The southern limit of this upper terrace ended abruptly at the slope of the mountain. The arrangement of the buildings

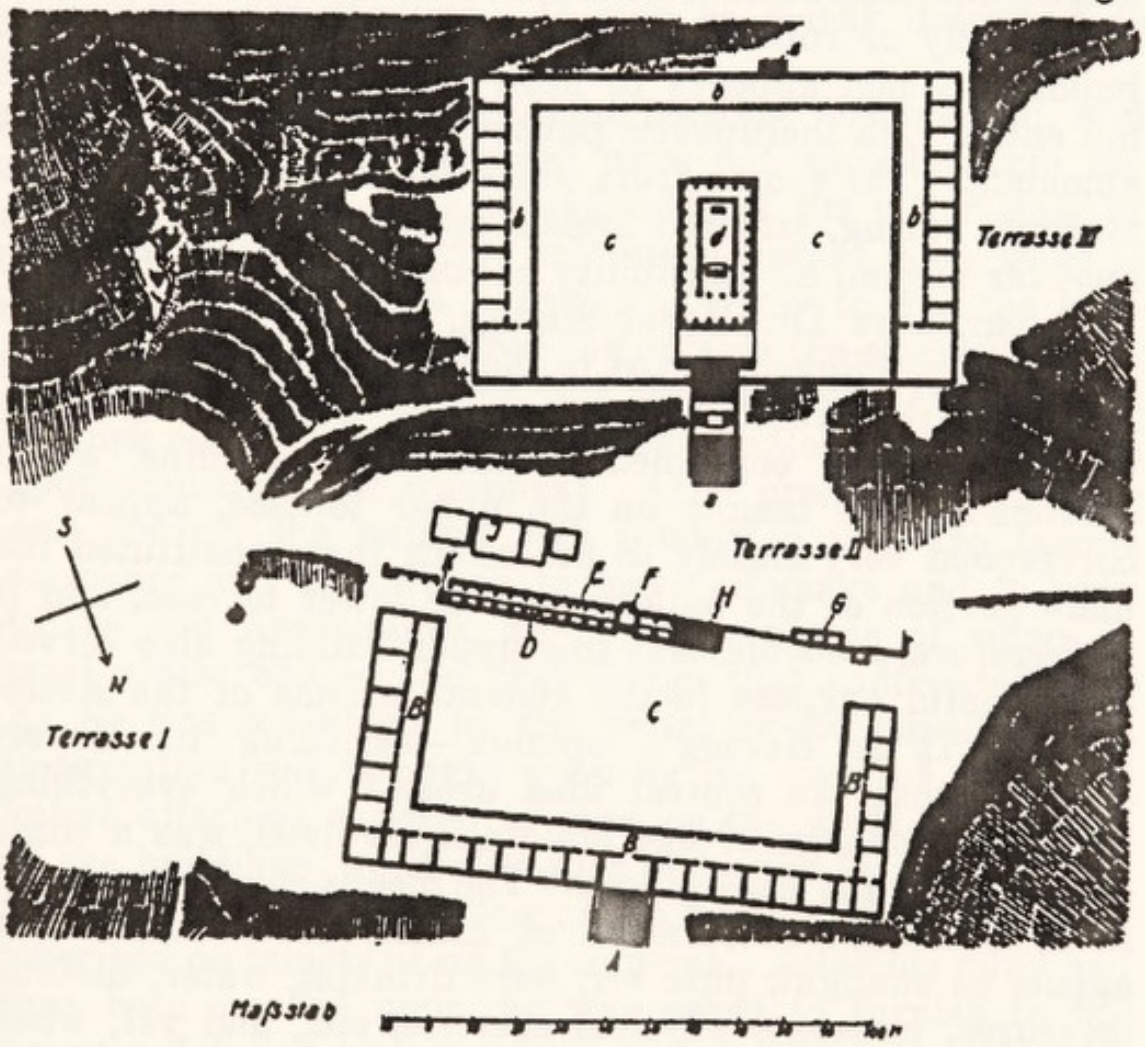

FIG. 3. GROUND PLAN OF THE ASCLEPIEION ON THE ISLAND OF COS.

As Ascertained by the Researches of Dr. Herzog.

The different structures are arranged as nearly as possible in the same positions which they occupied in the third century, B. C.

A, main entrance to Asclepieion: *B*, *B*, *B*, gallery, 6 metres broad, with colonnade on one side; *C*, open space or court, on the southern side of which is a structure composed of recesses provided each with a bathing basin (*D*); *H*, staircase leading to intermediate terrace; *a*, massive series of steps leading to the upper terrace; *b*, *b*, *b*, broad gallery similar to that shown on the lower terrace; *d*, the temple proper.

(From Prof. Dr. Meyer-Steineg's *Medizinisch-historische Beiträge*.)

on the three different terraces may, in harmony with the account given by Professor Meyer-Steineg, be briefly described as follows: That which stood on the lower terrace occupied three sides of a parallelogram (Fig. 3), the open part of which faced south. The longer side of the building measured about 120 metres (390 feet) in length, and the two shorter sides each 55 metres (180 feet). The supply of running water in every part of this great building, which appears to have been devoted mainly, if not entirely, to therapeutic purposes, must have been most abundant. The source from which the water came was the Burinna spring, situated higher up on the mountain at a spot far beyond all possibility of contamination. It is not yet clear, says Dr. Meyer-Steineg, whether or not there were any buildings devoted to therapeutic purposes on the intermediate terrace. (Figs. 2 and 3.) On the other hand, the great halls, contained in the large building which surrounded the temple on the upper terrace, appear to correspond very closely to the rooms that constituted the main portion of the building on the lower terrace, and it is therefore probable that this upper building also served some useful purpose in the general scheme of the Asclepieion. It is Herzog's opinion—according to Meyer-Steineg—that the central idea around which everything in this assemblage of fine buildings revolved, was a clinic conducted by the Asclepiadae. The means chiefly employed at first for the restoration of health were such simple agents as sunlight, pure air, pure drinking water, dietetic measures, massage, physical exercise, etc., and yet, when the patient's condition seemed to require their use, there was no hesitation in resorting to the rational employment of drugs, and even surgical operations were performed. The numerous instruments which Dr. Meyer-Steineg collected at the site of the ruins when he visited Cos in 1910, furnish ample corroborative evidence of the correctness of this last statement.

Not the least important part which this famous Asclepieion played in the history of medicine was the splendid opportunity which it afforded to those who were preparing

themselves to engage in the practice of the healing art, for acquiring the necessary familiarity with the different diseases and for learning how they should be treated.

The manner of conducting the preliminary treatment was probably not the same in every particular in all the different Asclepieia, and yet in the main the plan of procedure followed in Epidaurus, in Cos and in Athens undoubtedly resembled closely that which Pagel furnishes in his *Geschichte der Medizin.* It may be briefly described as follows:—

In the first place, moribund persons, the unclean, and women about to be confined were not admitted into the temple enclosure. The management of the latter class of patients was left entirely to women nurses, and, when it became evident that a person was likely to die, the individual was thereafter cared for outside the enclosure.[6] In short, everything possible was done to keep out of sight all such objects as might produce an unpleasant impression upon applicants for treatment. After preliminary bathing and dieting, the patient was conducted into the temple enclosure and encouraged to make offerings and to pray to the god Aesculapius, an imposing statue of whom in marble was one of the first things that confronted him. As he was led about by the priest or an attendant, his imagination was wrought upon by the sight of numerous votive offerings exposed to view on the walls or columns of the buildings, by the singing of hymns in adoration of the god, and by the reading of the records of earlier cases inscribed on tablets or on the columns. After his mind had thus been worked upon, he was asked to furnish to the priest a detailed history of his own case and to submit to some sort of physical examination. As a final and most important step in this first stage of the treatment he was subjected to what was termed "the temple-sleep," during which the suggestion of the proper remedies to be employed was supposed to be communicated to him by the god himself.

[6] The Emperor Antoninus Pius, in order to provide properly for these patients, erected at Epidaurus a special building in which confinement cases and those likely to end fatally might be lodged.

In our day it is difficult to understand how persons of a fair degree of intelligence could for so long a period have continued to believe in the efficacious interference of the deified Aesculapius in their behalf. But that this belief really did exist is well known, and it was only after the lapse of many centuries that the faith of the public began to weaken, doubtless through the influence of several factors. Perhaps the most important of these was the discovery of an increasing number of instances of humbuggery or trickery, of which the officiating priests, in some of the temples, had been guilty. The satirical writer, Aristophanes, who flourished in Athens about 400 B. C., describes an incident of this nature in his play entitled "Ploutos." The following extracts furnish an account of the doings observed by the slave Karion on the occasion of his passing a night in the temple enclosure at Athens:—

The Scene throughout is laid at Athens, in front of the house of Chremulos.

• • • • • • • • • •

Blepsidemos: Ought n't we then to bring in some doctor?

Chremulos: Prythee, what doctor is there now in the city? For their pay is no longer anything worth, nor their art.

Blep.: Let us cast about.

Chrem.: Nay, there is not one.

Blep.: I believe there is not.

Chrem.: Nay, by Zeus, the best plan is to do what I have been long preparing—(to conduct him [Ploutos]) to the temple of Asklepios [and] make him lie down [there].

• • • • • • • • • •

Chrem.: Karion, my man, you must bring out the bed-clothes and lead Ploutos himself in the usual way, and carry everything else that is ready within.

(*Exeunt omnes.*)

• • • • • • • • • •

Chorus of Farmers. What is the matter, Oh thou best friend of—thyself? For you seem to have come as a messenger of some good news.

Karion.[1] My master has fared most prosperously, or rather Ploutos himself. For, instead of being a blind man, he has been made to see again, and his pupils are clear-sighted, as he has met with a kindly friend in Asklepios the Healer.

Chorus. You give me reason for joy, reason for shouts of triumph.

Karion. Ye have reason to rejoice whether ye wish it or not.

Chorus. I will shout aloud for Asklepios of the goodly children, the great light to mortals.

* * * * * * * * * *

Karion. Well, as soon as ever we came to the god, leading a man then, indeed, most miserable, but now blessed and fortunate, if any other is so, first we led him to the sea, and then we bathed him.

Wife of Chremulos. By Zeus, then the old man was fortunate, bathing in the cold sea.

Karion. Then we went to the sacred enclosure of the god. And when on the altar the cakes and offerings were dedicated by the flame of murky Hephaistos, we laid down Ploutos, as was proper; and each of us made up from little odds and ends a bed for himself.

Wife. Then were there certain others beside yourselves wanting the god?

Karion. Yes, Neokleides, for one, and he is blind; but in stealing has far overshot those who can see; and there were many others with all sorts of ailments. But when the minister of the deity put out the lights and told us to go to sleep and said that we were to keep silent, if any of us perceived a noise, we all lay down in an orderly manner. And I was unable to sleep, for my attention was arrested by a certain pitcher of porridge a little way off from the head of a certain old woman, and I strangely desired to creep over to that pitcher. Then I looked up and saw the priest making a clean sweep of the cakes and dried figs from the sacred table. After this he went round all the altars in a circle to see if any cakes were left anywhere. Then he consecrated them into a certain wallet; and I, believing that there was great holiness in this proceeding, rise up to go to the pitcher of porridge.

Wife. Oh you most miserable of men, were you not afraid of the god?

Karion. Yes; by the gods I was afraid lest he with his fillets should reach the pitcher before me; for the priest had already

[1] The slave of Chremulos.

given me a lesson. But, as soon as ever the old woman perceived the noise I made, she lifted up her hand over the pitcher (to protect it). Then I hissed and seized (her hand) by the teeth as if I were a reddish-brown snake. But she at once drew back her hand again and lay down peacefully, rolling herself up. And then I at once gulped down a lot of the porridge; and then, when I was full, I jumped up again.

Wife. And didn't the god come up to you?

Karion. Not up to that time. After this I at once covered myself up, being afraid; but he made a complete circuit examining all the ailments in a most orderly fashion; and then a slave set by him a little mortar and box of stone.

Wife. Of stone?

Karion. No, by Zeus, certainly not,—at least, not the box.

Wife. To the deuce with you, how did you see since you say you were covered up?

Karion. Through my old cloak; for, by Zeus, it had holes not a few. First of all, he took in hand to pound a plaster for Neokleides, and he threw in three cloves of Tenian garlic. Then he bruised them in the mortar, mixing therewith the acid juice of the fig-tree and squill; then, having diluted it with Sphettian vinegar, he turned his eyelids inside out that he might feel more pain, and then applied the mixture. But he, squalling and bawling, jumped up and was running away, when the god said with a laugh:—"Sit down there now, smeared with thy plaster, that I may stop thee from going to the Assembly, having for once a real excuse."

Wife. What a patriot and sage the god is!

Karion. After that he sat down by the side of Ploutos, and first he touched his head, and then, taking a clean towel, he wiped his eyelids all round, and Panakeia covered his head and all his face with a cloth of purple dye; and the god then whistled. Thereupon two snakes of monstrous size darted forth from the temple.

Wife. Dear Gods!

Karion. And these two (snakes) having quietly glided under the crimson cloth, licked his eyelids all around, methought. And before you could drink ten cups of wine, my mistress, Ploutos stood up and was able to see: and I clapped my hands with delight and awoke my master. And the god suddenly took himself off from our view with the snakes into the temple.

If one examines carefully the facts connected with the Aesculapian temple treatment, so far as they are known

to us, one cannot fail to be impressed with their strong resemblance to what has been the experience of similar semi-religious movements in more recent times, not only in European countries but also in the United States. In all of them there may be found a kernel of true religious belief, and no candid observer can deny the fact that many persons have been benefited thereby both in body and in mind. But, sooner or later, the method has fallen into disrepute, either because it was employed in the vain hope that it might accomplish a cure which surgical means alone could effect, or else because unscrupulous persons, taking advantage of the credulousness of those associated with the movement, utilized it for their own selfish advantage.

CHAPTER V

THE SIGNIFICANCE OF THE SERPENT IN THE STATUES AND VOTIVE OFFERINGS EXPOSED TO VIEW IN THE AESCULAPIAN TEMPLES

Almost every important gallery of sculpture in Europe possesses at least one marble statue of Aesculapius, and in the majority of these the god is represented as a middle-aged or elderly man of powerful frame, having a full head of hair and full beard, and clothed only with the pallium or mantle, which is so placed as to leave the right shoulder and a large part of the chest uncovered. He holds in his right hand a knotted staff around which, in many of the statues, is coiled a serpent whose head approaches very closely to the hand. The expression of the god's countenance is strikingly peaceful and serene, yet without any evidence of weakness. In not a few instances other animals are represented alongside the statue, usually at the god's feet—as, for example, the cock, the owl, the eagle, the hawk or the ram—and occasionally his daughter Hygieia is shown at his side feeding the serpent. The cock is the symbol of watchfulness—a physician should be vigilant; the owl symbolizes his need of clearsightedness and of readiness to care for his patients in the night as well as during the day; the eagle has a penetrating eye and it is the emblem of long life—a benefit which the healing art is capable of procuring; the hawk was the bird consecrated to Isis, Queen of Egypt, who was believed by the Egyptians to have been highly skilled in medicine; and the ram is the symbol of dreams and divination. Pliny says that the patients who were brought to the temple of Aesculapius were made to lie down at night wrapped in the skin of a

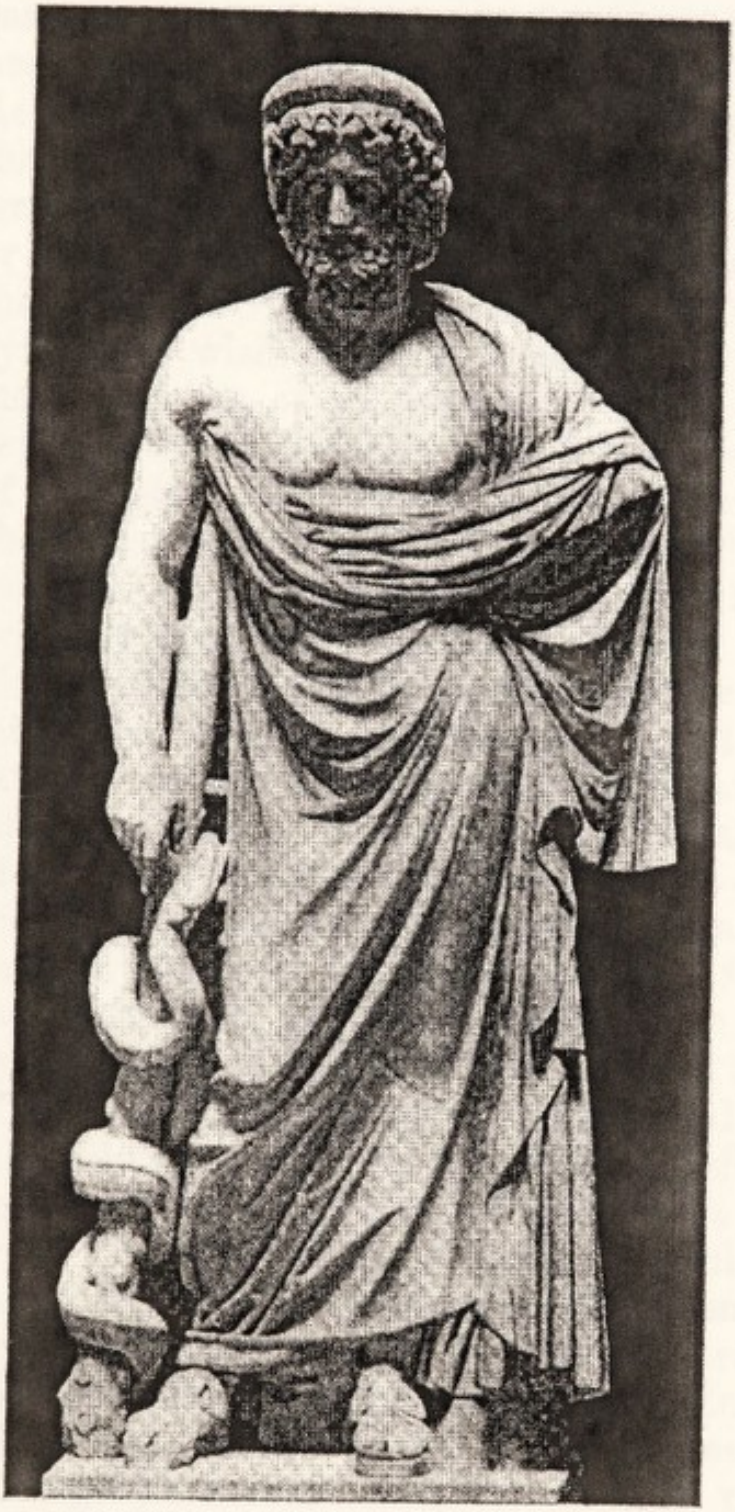

FIG. 4. ANCIENT STATUE OF THE GOD AESCULAPIUS IN THE BERLIN MUSEUM.

(From Holländer's *Plastik und Medizin*, with the author's permission.)

FIG. 5.

HEAD OF THE MARBLE STATUE OF THE GOD AESCULAPIUS IN THE NAPLES MUSEUM

ram, in order that they might have divine dreams. The presence of the serpent in nearly all of the statues of Aesculapius is explained in a variety of ways. Some say that this reptile, which sheds his skin once a year, is emblematic of the sick person's need to acquire a new body, or at least cast off his old skin in the same manner as does the snake. Others consider the serpent as merely the symbol of wisdom, as it is admittedly the shrewdest and most cunning of all animals. In a few instances it is represented as drinking from a receptacle held in the hand of Hygieia. Perhaps the sculptor's intention here was to show that the serpent, although the wisest of all animals, believed that he might add to his stock of wisdom by drinking from the fountain under the control of Aesculapius, thus conveying the impression that the wisdom of the latter was greater than his own. But all these interpretations are too subtle for the uneducated mind to appreciate at a glance. They fail also to satisfy our preconceived ideas of what such a statue should be—viz., a memorial of the godlike character of Aesculapius and of the priceless benefits which he conferred upon his fellow men, and, at the same time, an object which, when first contemplated by one who is ill, would at once evoke in that person feelings of perfect confidence in the ability and the willingness of the god represented by the statue to effect a cure. Some, perhaps even a majority, of the statues thus far recovered from the ruins of the different Aesculapian temples certainly fail to arouse any such sentiments in the minds of ordinary observers; but there are others which do in some measure accomplish this, and among the number the statue which may be seen in the Berlin Museum and of which a photographic copy (Fig. 4) is here reproduced, should certainly be included. The head of the god is less imposing and the expression less kindly than are these features in some of the other statues (see, for example, Fig. 5), but, to offset this, the serpent represented in the latter is of the non-poisonous variety.[1] The addition of such a harmless creature to the figure representing the god contributes

[1] To save space the head of the god alone has been reproduced in Fig. 5.

nothing to the power of the statue as a whole to impress the people—*i.e.*, the uneducated masses, as, for example, the peasants, etc. On the other hand, the significance of the poisonous snake in a statue of this character will be readily appreciated if one considers the fact that in ancient times, as it is even to-day in India, the loss of life caused by the bites of poisonous snakes was enormous. In the presence of such a fact, therefore, it would be difficult for a sculptor who was desirous of emphasizing the extraordinary healing powers of his hero to accomplish this more effectively than by embodying in his statue, along with other impressive features, such characters as would show him to have gained the mastery over that terribly fatal malady—the bite of the viper and of the still more deadly serpents of India and parts of Africa. Although we possess no facts which would warrant the statement that Aesculapius had been particularly successful in the treatment of this form of poisoning, these temple statues furnish indirect proof of a strong character that his healing power in this direction had been very great,—so great, indeed, as to have been largely instrumental in winning for him the appellation of a god. Such a striking object, especially when its more important features were commented upon by the priest who accompanied the patient on his or her first tour of inspection of temple wonders, could scarcely have failed to produce a very deep impression upon the imagination.

In the illustration which has here been reproduced (Fig. 4), a viper, as clearly shown by the shape of his head and neck and by the unusual length of the jaw, has twined himself about the staff and is close to the god's hand, so close that in an instant's time the fatal bite might readily be inflicted. But Aesculapius shows by his countenance, by the unconcerned manner in which he allows his right hand to remain near the serpent's head, and by the easy pose of his whole body, that he is not at all concerned about the danger which appears to threaten his life. In the estimation of the ancient Greeks this fearlessness was undoubtedly attributed to the supernatural power which they

believed Aesculapius to possess over dangerous serpents as well as over diseases of all kinds.

So far as now appears, all the statues of the god that have been dug up in Greece or its nearest colonies represent the serpent as of the size commonly observed in that part of the world. Hollaender, however, furnishes (on page 118 of his work) an illustration which represents—as he believes—the god Aesculapius in the presence of an enormous snake, evidently a python. (Fig. 6.) As this variety of serpent is not to be found in Greece, or indeed at any point further north than the Mediterranean coast of Africa, it is fair to assume that the bas-relief which depicts this scene must have been made for exhibition in an Asclepieion located at Cyrene or at the relatively near city of Alexandria, where patients, who were more or less familiar with this serpent and realized its power of crushing people to death, would have occasion to witness this suggestive work of art. And, furthermore, as if it were for the express purpose of emphasizing the great protective power of the god, the sculptor has introduced, on one side of the scene, the figures of three women, two young children and a lamb. The women nearest to the monster have folded their arms and do not manifest the least sign of fear. The children also appear to be unaware of the presence of a deadly danger. In short, the proximity of the god Aesculapius has instilled into the minds of these human beings the most complete sense of fearlessness; he himself, as in the case of the statue of Aesculapius shown in Fig. 4, exhibiting a complete absence of fear in the presence of the dangerous monster. Neither death by poisoning nor death by constriction has any terrors for him to whom the patient is about to appeal for relief from disease.

That pythons were a terror in former times to the people who inhabited the coast regions near Cyrene is evident from a statement which Aristotle makes in his History of Animals (Book VIII., Chapter xxviii.). It reads as follows:—

In Libya (Africa) the serpents, as has been already remarked, are very large. For some persons say that, as they sailed along

the coast, they saw the bones of many oxen, and that it was evident to them that they had been devoured by the serpents. And, as the ships passed on, the serpents attacked the triremes, and some of them threw themselves upon one of the triremes and overturned it.

CHAPTER VI

THE BEGINNINGS OF A RATIONAL SYSTEM OF MEDICINE IN GREECE

With the lapse of time the religious and mystical features of the treatment carried on at the Asclepieia gave place, more and more, to rational methods, and eventually—it is scarcely possible to mention a date, but probably not many years before the Hippocratic period—these institutions became centres for the spread of medical knowledge of the most practical kind. This is particularly true of the Asclepieion at Cos, where Hippocrates is believed to have received his medical training. It is interesting to note that the mystical features of the temple treatment—features which certainly did not originate with Aesculapius himself or with his sons, Machaon and Podalirius—eventually proved powerless to stay the slow but sure advance of sound medical knowledge. Even during the period when these false elements seemed to be most strongly rooted in the temple methods, there were forces at work which in due time deprived them of much of their pernicious power. This result was inevitable, for an organization which, in order to prosper in its work of doing good to humanity, depended upon the natural superstitiousness of the people, could not possibly thrive for an indefinite length of time. That the evil results did not develop sooner than they did simply shows how powerful and stubborn is the force of superstition. In the absence of trustworthy historical evidence, hypothetical statements only can be brought forward, but there can scarcely be any doubt but that a genuine belief in the power of Aesculapius (deified) to cure disease and restore health persisted for centuries.

The custom of recording the case histories on tablets or

on the columns of the temple,—for at this period writing was in general use,—and also that of dedicating to the god images which represented (sometimes with a remarkable degree of truthfulness) the pathological condition for which the patient sought relief, contributed very greatly to the substitution of sound learning for religious mysticism and poorly concealed humbuggery.

Among the interesting objects which may be seen at the Museum of the History of Medicine in Jena, Germany, there are several of these terra-cotta images (votive offerings) representing pathological conditions; and among them the writer noticed more particularly one which reproduced faithfully, though in diminutive size, the appearances presented by cancer of the female breast. (Fig. 7.) There were also a very carefully modeled statuette of the trunk of a woman affected with ascites, and an admirable representation of a case of facial paralysis. (Fig. 8.) These objects were obtained by Professor Meyer-Steineg on the occasion of a recent visit to the ruins of the temple of Cos and other similar ruins in Greece and Asia Minor. The British Museum possesses many objects of the same character.

It is not known at what precise date the *iatreia,* or small private hospitals, first made their appearance, but it was about the time when the religious character of the therapeutic work done in the Asclepieia gave place to treatment of a more distinctly medical character. Then, in addition to these *iatreia,* there were schools for gladiators and institutions in which gymnastic exercises were zealously cultivated; and in these places there was a frequent demand for advice in regard to questions of diet, and for surgical aid in the setting of broken bones, the reducing of dislocations, and the curing of bruises and sprains. As may readily be understood, the Asclepieia could not furnish the sort of professional aid which these institutions needed, and thus a further stimulus was given to the complete separation of the two kinds of medical practice—that connected with the temple and that conducted by outside physicians.

FIG. 6. BAS-RELIEF OF AESCULAPIUS, ACCOMPANIED BY WOMEN AND CHILDREN, IN THE PRESENCE OF AN ENORMOUS SERPENT.

The original is in the National Museum at Athens.

FIG. 7. FEMALE BUST SHOWING CANCER OF ONE BREAST.

(Courtesy of Prof. Dr. Meyer-Steineg, of Jena, Germany.)

In Plato's "Republic" (Book III., Chapter 15) mention is made of a certain Herodicus (of Selymbria; about 450 B. C.) who effected many cures by a method of treatment which combined athletic exercises with dieting. He gained considerable celebrity in this way, and is undoubtedly entitled to the credit of having been the first to call serious attention to the value of this plan of treating certain maladies. But, unfortunately, he made use of it in not a few instances where it proved harmful rather than beneficial to the patient, and thus brought discredit upon the method.

Already previous to the time at which the changes mentioned above took place, there had occurred still other changes in the character and practice of medicine. The business of cutting for stone in the bladder, for example, had been left entirely in the hands of men who made a specialty of this branch of medicine—men who might truthfully be called medical artisans. Then there was another class of men who devoted their energies to collecting medicinal roots and plants. They were a necessity to physicians, and constituted the first representatives of the modern apothecary. Still another change in the status of the Greek physicians had been slowly developing throughout this pre-Hippocratic period, a change which tended more and more to make them men of self-reliance and of considerable importance in their respective communities, and which indicated very clearly that they were steadily growing in skill and breadth of knowledge. As evidence of the correctness of this statement it is sufficient to mention the fact that Greek physicians had established so good a reputation that they were frequently called to see important cases at a great distance—in Egypt, in Persia, etc. But before further consideration is given to this subject of the development of the Greek physician during the period immediately preceding the appearance of the Hippocratic writings, it seems advisable to say a few words concerning the facilities for medical instruction which were available at that time.

Medical Instruction in Connection with the Asclepieia.—

It does not appear clearly in any of the published descriptions of these ancient Greek sanatoria just what were the relations between the priests and the men who utilized all this rich clinical material—records of all sorts of diseases, and the means (other than religious) employed in treating them, pictures or plastic reproductions of the visible pathological lesions, etc.—for the purpose of instructing the younger men who contemplated engaging in the practice of medicine. The modern teachers of the art know very well how difficult is the task of combining in a satisfactory manner these two things—the safeguarding of the patient's interests and the utilization of their maladies as object lessons for men who are preparing to cure or relieve the bodily ills of those who may at some future moment need their professional services. To them, therefore, it would be a matter of very great interest to learn how this difficult problem had been solved nearly twenty-five hundred years ago. But, unfortunately, no satisfactory data upon which a trustworthy account might be founded are obtainable, and we are obliged to fall back upon such aid as our imagination may furnish. From Puschmann's work on medical teaching in ancient times the following statement relating to the subject has been taken:—

> The priests in the Aesculapian temples were not, as is generally assumed, physicians in the ordinary sense. They may have acquired some knowledge of the art, and they may even in some instances have been regularly trained physicians, but the important fact remains that they wished it to be understood that the treatment carried out in the temple was in accordance with revelations made to them by the god Aesculapius, and not the mere fruit of human knowledge. Consequently the intervention of regular physicians in the temple management of the sick must have appeared to them quite superfluous. For this reason, therefore, it is not likely that there existed, on the part of either the temple priests or the physicians, any feeling of animosity or opposition. It is more likely that the contrary was the case, for the evidence shows that the physicians—the Asclepiadae—paid most humble reverence to the sacred relics of Aesculapius, and placed the most implicit confidence in the opinions which he was supposed to give in desperate cases.

FIG. 8. PARALYSIS OF THE LEFT FACIAL NERVE.

(Courtesy of Prof. Dr. Meyer-Steineg, *Jenaer medizinisch-historische Beiträge*, Heft 2, 1912.)

While Puschmann does not say to what period in the history of these temples his statement applies, it is safe to assume that he had in mind only the earlier stages. When the systematic teachings of medical pupils began, those physicians who gave the instruction—viz., the Asclepiadae who were not at the same time priests—took up their abode somewhere in the neighborhood of the temple. Thus, medical schools were formed at different places, those of Rhodes, Crotone, Cyrene, Cos and Cnidus attaining the greatest celebrity. The pupil paid a fee for his instruction, and when his training was believed to be completed he was admitted into the association or brotherhood of the Asclepiadae upon taking the following oath, which for ages past has been known as "The Hippocratic Oath," but which is now believed to have been formulated long before the time of Hippocrates:—

THE HIPPOCRATIC OATH

I swear by Apollo the Physician and Aesculapius, and Hygieia and Panacea and all the gods and all the goddesses—and I make them my judges—that this mine oath and this my written engagement I will fulfil as far as power and discernment shall be mine.

Him who taught me this art I will esteem even as I do my parents; he shall partake of my livelihood, and, if in want, shall share my goods. I will regard his issue as my brothers and will teach them this art without fee or written engagement if they shall wish to learn it.

I will give instruction by precept, by discourse, and in all other ways, to my own sons, to those of him who taught me, to disciples bound by written engagements and sworn according to medical law, and to no other person.

So far as power and discernment shall be mine, I will carry out regimen for the benefit of the sick and will keep them from harm and wrong. To none will I give a deadly drug even if solicited, nor offer counsel to such an end; likewise to no woman will I give a destructive suppository; but guiltless and hallowed will I keep my life and mine art. I will cut no one whatever for the stone, but will give way to those who work at this practice.

Into whatsoever houses I shall enter I will go for the benefit of the sick, holding aloof from all voluntary wrong and corruption, including venereal acts upon the bodies of females and males

whether free or slaves. Whatsoever in my practice or not in my practice I shall see or hear amid the lives of men which ought not to be noised abroad—as to this I will keep silence, holding such things unfitting to be spoken.

And now if I shall fulfil this oath and break it not, may the fruits of life and of art be mine, may I be honored of all men for all time; the opposite if I shall transgress and be forsworn.

(Translated from the Greek by the late John G. Curtis, M.D., of New York.)

While at first, according to Puschmann, many physicians did not belong to the Aesculapian Brotherhood, there came a time when all were known as Asclepiadae.

Influence of the Schools of Philosophy on the Growth of Medical Knowledge.—About the beginning of the sixth century B. C. there developed, in Greece and its colonies, schools of philosophy which exerted a most excellent influence upon the growth of medicine. The first of these was the one known as the Ionian School, whose founders and chief representatives were Thales, of Miletus in Ionia (born in 640, died in 548 B. C.), and his pupils Anaximander and Anaximenes. The guiding principle of these men was to study natural phenomena and to learn, if possible, their causes and the laws of their action. Physiology, therefore, became one of their special studies, and thus they contributed to the laying of one of the most important foundation-stones of medicine. Thanks to the good quality of the work of instruction that had thus far been carried on at Cos, Cnidus, and other Asclepieia, medicine had by this time reached a sufficient degree of development for its devotees to derive a full measure of benefit from the new teaching of the philosophers. Well grounded in the observation of disease in its different forms and modes of behavior, and also familiarized with the ordinary methods of treatment, these physicians needed to be shown a new route along which they might advance to greater heights of knowledge, and they also needed to be stimulated to further endeavor. The introduction of the new school accomplished both of these purposes. It taught the men of the older organizations that they must make much

greater use of their reasoning powers than they had hitherto done, and at the same time, through the creation of a group of rival physicians, it supplied them with the required stimulus. Another important school of philosophy was that known as the Eleatic School, which flourished at Elea, in Lower Italy, its leaders being natives of that city. The most prominent men connected with this school were Parmenides (born about 540 B. C.) and Xenophanes of Colophon, in Asia Minor, whose contributions to mental science formed the basis of Plato's metaphysics.

The period roughly embraced between the years 500 and 300 B. C. represents the most brilliant age of Greek intellectual and artistic activity. During this time there came into prominence such philosophers, historians, poets, physicians, artists and generals of armies as had never before been marshaled in historic array in so rapid succession. Even at this late day the names of these great men are almost household words—such names, for example, as Pythagoras, Alcmaeon, Anaxagoras, Aristotle, Plato, Socrates, Sophocles, Aeschylus, Euripides, Aristophanes, Pindar, Xenophon, Demosthenes, Democedes, Hippocrates the Great, Phidias, Praxiteles, Zeuxis, Apelles, Darius I., Alexander the Great, and many others of almost equal celebrity. During the centuries immediately preceding this golden age of Greek history, there seem to have been very few men of great merit in any of the branches of learning or in the fields of war or art, but this impression is certainly false. It is doubtless to be explained by the fact that large quantities of documentary evidence relating to these years have been entirely lost. Daniel Le Clerc, for instance, states[1] that, of the separate histories of the descendants of Aesculapius which were written by Eratosthenes, Pherecydes, Apollodorus, Arius of Tarsus and Polyanthus of Cyrene, not one has come down to our time. If, then, in the single department of medicine, the destruction of documentary evidence was as great as is here represented, how enormous must have been the loss of precious historical materials in all the departments

[1] *Histoire de la Médecine*, Amsterdam, 1723.

of human activity taken together. We may, therefore, safely assume that this golden age, which lasted only about two hundred years, represents simply the culmination of an even longer period of slow but steady development, a period of creditable though perhaps less brilliant achievements.

Of the names mentioned above there are several that belong to men who were in various ways connected with the early history of medicine. Pythagoras, for example, is said to have been one of the first among the Greek philosophers to exert a strong and double impression upon the medical teaching of that period. He was born in the Island of Samos, near the coast of Asia Minor, about the year 575 B. C. After spending several years in Egypt for purposes of study, and probably visiting Babylon, at that time a great centre of learning and of artistic cultivation, he established at Crotona, in the south of Italy, a school[1] where natural philosophy, mathematics, acoustics, etc., were taught. He also devoted some attention to anatomy, to embryology, to physiology and to therapeutics. According to his views of what constituted hygienic living a man should accustom himself to a diet of the simplest character, without meat. Pythagoras was a believer in the Chaldean doctrine that the uneven numbers possess a more important significance than the even, and that the number seven in particular has a special relationship to the phenomena of certain diseases; the crisis frequently falling on the seventh, fourteenth, or twenty-first day. Galen, it is said, expressed surprise that a man as sensible and learned as Pythagoras should have paid any attention to such trifles. Not a few of the disciples of Pythagoras were physicians,

[1] The word "school," when employed in the strictly modern sense of that term, means an establishment regularly organized for the purpose of giving instruction. Here, however, it is intended to signify simply that certain places, like Cos, Crotona, Cnidus, etc., had become the rendezvous of men who desired to cultivate—some as teachers, others as disciples or pupils—certain branches of knowledge, or certain doctrines. At a later period (third century B. C.) there was established at Alexandria, Egypt, a well-organized school of medicine closely resembling those of modern times.

and when the brotherhood (if such it may be called) broke up, as it did in the fifth century B. C., these men traveled about from one Grecian city to another; from which fact they were given the name of "periodeuts" or ambulant physicians. Crotona was also celebrated as the birthplace of Milo, the athlete.

Democedes, who was a contemporary of Pythagoras, but not one of his disciples, was a native of Crotona. Dion Cassius, the author of a Roman history, ranks him and Hippocrates as the two most eminent physicians of antiquity. Daremberg, who derived his facts from the works of Herodotus, gives the following account of the adventures of Democedes:—

Being unable to bear any longer the frequent anger and harsh treatment of his father, Calliphon, Democedes left Crotona, and settled in practice at Aegina, on the Saronic Gulf, not far from Athens. Almost from the very start he attained marked success, and already in the second year of his residence in Aegina he was made the recipient of a pension of one talent (equal to about £240. or $1200.) out of the public treasury. During the following year he was induced, by the offer of a larger pension (100 minae, or about $3000.) to settle in Athens; and, a year later, he accepted a still larger remuneration from Polycrates, the tyrant of Samos. Having accompanied the latter on a trip to Sardis, the capital of Lydia, in Asia Minor, he fell a prisoner into the hands of the governor of that city, and was made by him a slave. Not long afterward Darius gained possession of this governor's or satrap's property, including all his slaves; and thus, despite all his efforts to conceal his profession through fear that a knowledge of it on the part of the king might prolong his bondage indefinitely, Democedes was unable to do so. The discovery came about in the following manner. During a hunting trip Darius broke his ankle. He called to his assistance the court physicians, who were esteemed the most skilful that could be found in all Egypt, but they failed to give him relief. By the violence of their manipulations they rather made matters worse. For seven days and nights his sufferings were so great that he was unable to obtain any sleep. Finally, on the eighth day, one of the court attendants having told Darius that there was a Greek physician among the slaves, Democedes was sent for, and he appeared before the king clad in

rags and with chains on his ankles. When asked whether he knew anything about medicine he denied such knowledge, being fearful that the discovery of the truth about himself would stand in the way of his ever getting back to Greece. Darius, perceiving that he was dissimulating, ordered the attendants to fetch the whips and pinchers. Whereupon Democedes made up his mind that he had better confess the truth. He accordingly told the king that, while not possessing a thorough knowledge of the healing art, long association with a physician had familiarized him more or less with the subject. The king then asked him to take charge of the case. Democedes, following the treatment adopted by the Greek physicians in similar conditions, applied soothing remedies and soon succeeded in procuring sleep for the suffering king. Eventually he obtained a complete cure, and Darius, who had made up his mind that he would never again be able to use his limb, was naturally delighted with the result. He loaded Democedes with gifts, and, being charmed with his conversation, made him sit at the royal table and did everything possible to render court life attractive; but liberty was denied him, which was the one thing that Democedes most ardently desired. The only use which the latter made of the great influence which he had obtained over Darius was to save the Egyptian physicians from the death by crucifixion which the king had decided to inflict upon them for their lack of skill.

The means of escape finally presented themselves to Democedes in a most unexpected manner. Atossa, who was the wife of Darius and also the daughter of Cyrus, was afflicted with a swelling of the breast which developed into an abscess and began to burrow into the neighboring tissues. After, for a time, concealing the trouble through a sense of false modesty, she made up her mind to consult Democedes. He had the good fortune to cure her of this malady in a relatively short time. As preparations were then being made to send a number of spies to Greece with instructions to examine the coast carefully for the purpose of determining at what points the defenses were sufficiently weak to render an attack by the Persians reasonably sure of success, Democedes asked permission of Darius to accompany these men as their guide. His request was granted; and, as soon as the expedition reached Tarentum in Calabria, he delivered the Persian spies into the hands of Aristophilides, the king of that country, and then fled in all haste to Crotona, his native city. Shortly afterward these Persians, having been set at liberty by Aristophilides, made the

attempt to capture Democedes and carry him off by main force, but the citizens of Crotona thwarted the attempt and compelled the men to return to Asia. Democedes then married the daughter of Milo, the athlete, and history furnishes no information regarding the subsequent career of this extraordinary man.

Daremberg calls attention to certain excellent proverbs which may be found in the writings of the Greek poets and which are of some interest to physicians. The following may serve as examples of those most widely known:—[3]

Joy is the best physician for fatigue.
(Pindar, 522-442 B. C.)

The good physician is he who knows how to employ the right remedies at the proper time; the poor one, he who, in the presence of a serious illness, loses his courage, becomes flustered, and is unable to devise any helpful method of treatment.
(Aeschylus, 525-456 B. C.)

Physician, heal thyself.
(Euripides, 400-406 B. C.)

Advice given to Phaedra by her nurse:—

If thou hast some ailment which thou dost not care to reveal to men, here are women who are competent to treat the condition properly.
(Euripides.)

Sleep is the physician of pain,
and
Death is the supreme healer of maladies.
(Sophocles, 495-406 B. C.)

In Plato's writings there are to be found a few passages in which this philosopher gives his views in regard to certain matters that are not without interest to modern physicians. The following extracts are of this nature:—

There is not then, my friend, any office among the whole inhabitants of the city peculiar to the woman, considered as a woman,

[3] All of these are translations from the French.

nor to the man, considered as a man; but the geniuses are indiscriminately diffused through both: the woman is naturally fitted for sharing in all offices, and so is the man; but in all the woman is weaker than the man.

Perfectly so.

Shall we then commit everything to the care of the men, and nothing to the care of the women?

How shall we do so?

It is therefore, I imagine, as we say, that one woman, too, is fitted by natural genius for being a physician, and another is not; one is naturally a musician, and another is not.

(From "The Republic" of Plato, translated by Spens.)

But tell me with reference to him who, accurately speaking, is a physician, whom you now mentioned, whether he is a gainer of money or one who taketh care of the sick? and speak of him who is really a physician.

One who taketh care, said he, of the sick.

* * * * * * * * * * *

Why then, said I, no physician as far as he is a physician, considers what is advantageous for the physician, nor enjoins it, but what is advantageous for the sick; for it hath been agreed that the accurate physician is one who taketh care of sick bodies, and not an amasser of wealth. Hath it not been agreed?

He assented.

(Plato, 428-547 B. C., translated by Spens.)

But Plato's knowledge of human anatomy and physiology was very crude and in some instances decidedly fanciful. In corroboration of this statement the following extract from the "Timaeus" may be quoted:—

And on this account, fearing to defile the Divine nature more than was absolutely necessary, they [the junior gods] lodged man's mortal portion separately from the Divine, in a different receptacle of the body; forming the head and breast and placing the neck between, as an isthmus and limit to separate the two extremes.

In the breast, indeed, and what is called the thorax, they seated the mortal part of the soul. And as one part of it was naturally better, and another worse, they formed the cavity of the thorax into two divisions (resembling the separate dwellings of our men and women), placing the midriff as a partition between them. That part of the soul, therefore, which partakes of fortitude and

spirit and loves contention they seated nearer the head between the midriff and the neck; as it is the business of the reason to unite with it in forcibly repressing the desires, whenever they will not obey the mandate and word issuing from the citadel above.

The heart, which is the head and principle of the veins as well as the fountain of the blood that impetuously circulates through all the members, they placed in a kind of sentry-house, that, in case of any outburst of anger, being informed by the reason of any evil committed in its members, owing either to some foreign cause, or else internal passions, it (the heart) might transmit through all its channels the threatenings and exhortations of reason, so as once more to reduce the body to perfect obedience, and so permit what is the best within us to maintain supreme command.

But as the gods foreknew, with respect to the palpitation of the heart under the dread of danger and the excitement of passion, that all such swellings of the inflamed spirit would be produced by fire, they formed the lungs to be a sort of protection thereto; first of all, soft and bloodless, and next internally provided with cavities perforated like a sponge, in order to cool the breath which they receive, and give the heart easy respiration and repose in its excessive heat. On this account, then, they led the channels of the windpipe into the lungs, which they placed like a soft cushion round the heart, in order that when anger rises in it to an extreme height it might fall on some yielding substance, and, so getting cool, yield cheerfully and with less trouble to the authority of reason.

(Plato's "Timaeus," translated by Henry Davis.)

Alcmaeon, Empedocles, Diogenes of Apollonia, Anaxagoras and Pausanias, whose names are mentioned above in the list of eminent men who flourished during the golden age of Greek history, are entitled to further consideration. Alcmaeon of Crotona was a contemporary and disciple of Pythagoras. He was specially devoted to the study of anatomy and physiology, and is credited with the distinction of having been the first person to dissect animals for the purpose of learning the formation of the different parts of their bodies. With the exception of a few fragments that are to be found scattered throughout ancient medical literature, Alcmaeon's writings have all been lost. The discovery of the optic nerve is credited to him, and

Neuburger states that he deserves still greater credit for having been the first to declare that the brain is the central organ of all intellectual activity.

Of all the disciples of Pythagoras, Empedocles attained the greatest celebrity. He flourished about 444 B. C., his residence being at Agrigentum, in Sicily. Much of his reputation appears to have been due to the mystery which surrounded many of his actions. He was even reputed to have brought again to life persons who were believed to be dead. His works were all in verse, but only fragments have come down to us. He placed the seat of hearing in the labyrinth of the temporal bone. His death occurred in Peloponnesus at the age of sixty, as the result of an accident.

Anaxagoras was born at Clazomenae, in Ionia, 500 B. C. He was the teacher of Euripides, the Athenian poet, and Pericles, the greatest of Athenian statesmen. He and his contemporary, Diogenes of Apollonia, in Crete, devoted a great deal of attention to the study of anatomy. They dissected animals and made some genuine discoveries; Anaxagoras noting the existence of the lateral ventricles of the brain, and Diogenes furnishing a description—very erroneous, it is true—of the vascular system of the body. Puschmann says that, according to Aristotle, the philosophers of that period considered the study of man and his diseases the most important one to which they could devote their time and thoughts. Many of them indeed had been educated as physicians, and not a few were actual practitioners of medicine.

CHAPTER VII

HIPPOCRATES THE GREAT

Hippocrates was born in 460 B. C. in the city of Cos, on the island of the same name. Both his father and grandfather were eminent physicians, descendants of Aesculapius. On his mother's side he traced his descent from Hercules. The famous painter, Apelles, also hailed from the city of Cos. To distinguish Hippocrates from an earlier individual of the same name he was called Hippocrates II., or the Great. He is said to have received his first instruction in medicine at the school of the Asclepiadae in his native city, but his frequently repeated and very favorable comments on the teachings of the Cnidian school[1] have led some to believe that he may have received a part of his medical training at the latter institution. At a later period of his life his popularity as a teacher of medicine, in the school of the Asclepiadae at Cos, attracted many pupils to that city. In accordance with a custom which prevailed among the physicians of ancient Greece, Hippocrates, at the beginning of his career, spent quite a long time in Athens, and then traveled about, from one city to another, in the character of a periodeutic or itinerant physician. In this way, as he himself reports in some of his writings, he visited Thessaly, Thrace, the Island of Thasos, Scythia, the countries bordering on the Black Sea, and even Northern Egypt. Owing largely to domestic troubles he left his home in Cos, during the latter part of his career, and removed to Thessaly. He died about 370 B. C. at Larissa, at an

[1] The city of Cnidus was situated very close to the Island of Cos, on a peninsula that projects from the coast of Caria, Asia Minor.

advanced age. Soranus of Ephesus, the celebrated obstetrician, reported that in his time (second century A. D.) the tomb of Hippocrates was still standing, and that it had been taken possession of by a swarm of bees whose honey was far-famed for its efficacy in curing ulcers of the mouth in children.

Among the pupils of Hippocrates were his two sons, Draco and Thessalus, and his son-in-law, Polybus. Thessalus, in the capacity of a military surgeon, accompanied Alcibiades on his expedition to Sicily, and later in his career he served as private physician to Archelaus, King of Macedonia. It is also believed that a number of the writings in the Hippocratic collection are from his pen. On the other hand, it is a well-established fact that Polybus is the author of a few of these treatises. When Hippocrates gave up the work of teaching, his son-in-law, who was at that time engaged in private practice in Cos, was chosen his successor in the school.

Among the many anecdotes which are related of Hippocrates, there is one which may with propriety be repeated here:—

> On the occasion of a visit to Abdera, in the northern part of Thrace, Hippocrates was requested to examine into the mental condition of the philosopher Democritus, who was thought by his narrow-minded countrymen to be insane. Hippocrates found him deeply engrossed in the study of natural philosophy and asked him what he was doing. Democritus replied that he was investigating the foolishness of men. Whereupon Hippocrates reported that he considered Democritus the wisest of men. (Pagel.)

No better evidence of the true greatness of a man can be furnished than that which is afforded by the praise of his contemporaries in the same rank or walk of life; and when the appreciation comes from such men as Plato and Aristotle, it constitutes an absolute guarantee that it is well and honestly earned. To Hippocrates belongs the singular honor of having won unstinted praise from both of these great philosophers, Aristotle giving him the title of "Hippocrates the Great," and Plato comparing him

to those famous sculptors, Polyclytus and Phidias. His writings and those of the members of his family who were associated with him in the work of promoting a knowledge of medicine were most carefully preserved by his successors. When the Ptolemies began to establish libraries at Alexandria, Egypt (285 B. C.), and manifested a decided readiness to purchase the works of the most celebrated authors, copies of the Hippocratic writings were among those which found their way to that city. This eagerness on the part of the Kings of Egypt to purchase books or manuscripts stimulated unscrupulous persons to attribute to celebrated authors not a few of these works which they offered for sale. The librarians, whose duty it was to guard against such frauds, were not sufficiently well informed to prevent them; and thus there were accepted, as genuine productions, a few books which could not possibly have been written by those to whom they were attributed. The collection of Hippocratic writings did not escape this fate, and the evil was also further aggravated by the fact that copyists and incompetent editors made all sorts of emendations and additions on their own responsibility. Thus, it is not surprising that a collection which originally contained only the writings of Hippocrates and his immediate family, should in course of time have become expanded, not only by such alterations as have just been described, but also by the addition of entire works that had been written by others. At the beginning of the third century B. C., the Ptolemies appointed a committee of learned men in Alexandria to examine carefully the treatises reputed to be the work of Hippocrates and to make a collection of those which appeared to them to be genuine. They performed this task to the best of their ability, but the result showed that they lacked the necessary critical powers; and consequently during the past 2000 years repeated attempts have been made to do what they failed to accomplish, but these efforts have only succeeded in part. The French edition prepared by Émile Littré, the distinguished member of the French Academy of Medicine, and published in the years 1839-1861, was, until quite

recently, universally accepted as embodying the best results of modern research and criticism with regard to this difficult question. But since 1861 other scholars have been busily engaged in perfecting the text of the Hippocratic writings, and their criticisms and suggestions have made it possible to publish a German version of this great work which is of more practical value to physicians than that of Littré, which forms a series of ten large volumes and is no longer easy to obtain. On the other hand, the German version by Robert Fuchs (Munich, 1895-1900), in three volumes of moderate size, while in no respect inferior to the famous French translation, is superior to it in several particulars: it is better adapted to the needs of the ordinary practitioner of medicine, it embodies the results of the excellent critical work done since 1861 (*e.g.*, by Ermerins of Utrecht, Daremberg of France, and Ilberg and Kühlewein of Germany), and it costs very much less than its French predecessor and rival.

As regards the question of authenticity of the treatises contained in the work known as "The Hippocratic Writings" the most important thing to be determined is, not whether this or that book or chapter in the collection was really written by Hippocrates, but whether the work in its totality gives a correct and fairly complete picture of the best medical thought and practice of the period during which Hippocrates lived; and to this question a decided answer in the affirmative may be given. As to the broad question of authenticity, Max Neuburger, the distinguished Viennese author of the latest and most authoritative history of medicine, thus expresses himself:—

> Notwithstanding the extremely small quantity of evidence which the so-called "Hippocratic Writings" themselves furnish as to who were the writers of the individual treatises and as to what Hippocrates himself actually did or thought; and although it is true that portions of the collection often contradict one another both in regard to questions of theory and also in regard to methods of treatment, one fact stands out conspicuously, viz., that the peculiar character of these writings both as a collection and taken separately, not only gives them a unique position in medical

literature, but reveals plainly that they owe their origin directly or indirectly to the powerful influence of a single commanding personality.

As to the manner of teaching medicine, the Hippocratic writings show that, at the time which is here under consideration, the mystical features had almost completely disappeared. The science was now taught by regular instructors, who agreed for a stipulated fee to take charge of the pupil's entire training from the beginning to the end of the course. Candidates who were in delicate health were discouraged from entering upon the career of a physician, and those who had completed the regular course of instruction were sent out into the world equipped with certain general principles for their future guidance in actual practice. Some of these bear a close resemblance to the principles of a similar nature which had been established at a much earlier period in India. For example, the importance of cleanliness of the person is strongly emphasized. Reticence, as well as courtesy, is classed as one of the virtues of a good physician.

He who acts hastily and does not take sufficient time for consideration is sure to be criticised unfavorably. If he breaks out too readily into laughter he will be thought uncultivated.

In another of the Hippocratic writings the physician is urged not to indulge in too much small talk, but to confine his conversation as much as possible to matters relating to the treatment of the disorder.

In his business dealings the physician, like a genuine philosopher, should not display a greed for money, he should assume a modest and dignified attitude, he should appear quiet and calm, and his speech should be simple and straightforward and free from all superstition.

For their knowledge of human anatomy the physicians of that period were obliged to depend on the dissection of animals. Specimens of human bones were of course easily accessible, and consequently the descriptions which are

given of these structures are quite accurate, even as regards many of the finer details.

It would be a very difficult matter to furnish here, within a limited space, a reasonably clear exposition of the views held by Hippocrates with regard to human physiology and pathology. Empedocles, a Greek physician and high priest of Agrigentum, in Sicily, who was born about 490 B. C., founded a system of philosophy on the theory that the universe is made up of four elements—fire, air, earth and water; and he maintained that fire is the essence of life, the other elements forming the basis of matter. It was upon this system that Hippocrates founded his own theories of life, death and disease, but he disagreed with Empedocles in regard to the manner in which the four elements are united, his own belief being that they form together a genuine mixture, whereas Empedocles maintains that their union represents merely a mechanical aggregation of separate atoms. He also held that these original four elements, to which he gave the names of heat, cold, dryness and moisture, were represented in the human body by the following four cardinal fluids or "juices": blood, mucus or phlegm, black bile and yellow bile.[1] He maintained, further, that when these elements are mingled harmoniously so as to produce a state of perfect equilibrium, health resulted; but that when some deficiency of one or more of them, or some lack of harmony between them in other respects, occurs, disease is produced. At a later date, a fifth element—wind or air (pneuma)—was added to the other four; and when Hippocrates was unable to account satisfactorily for certain phenomena of disease, he was wont to refer the phenomenon observed to divine interference.

This brief exposition of the physiological and pathological views held by Hippocrates, incomplete and superficial as it is, will have to suffice. Those who wish to acquire a more profound knowledge of the subject should consult some of the larger treatises like those of Darem-

[1] Black bile, it was believed, comes from the spleen, while the yellow variety is a product of the liver.

berg, of Max Neuburger, and of Pagel, as well as the sections devoted to these subjects in the French (Littré) and the German (Fuchs) versions of the Hippocratic writings. At every step in such a study, the modern physician will encounter ideas and individual terms which he will have great difficulty in comprehending; and later on, as he reads the sections which deal with the more practical matters of the medical art, he will be astonished to find that Hippocrates was a most acute and trustworthy observer of the phenomena of disease, a remarkably clear writer, and a standard-bearer of very high aims.

In the examination and treatment of the sick the physicians of ancient Greece were highly trained. They paid very close attention to the patient's account of his symptoms, but it was to the physical examination of the diseased body that they attached the greatest importance. They noted with extreme care the color and other peculiarities of the skin and mucous membranes, the condition of the abdomen, and the shape and movements of the thorax; they tested the patient's temperature by placing the hand upon the body; and all the excretions were subjected to the closest scrutiny. By means of palpation they were able to determine not only the size of the liver and spleen, but also the changes which occur in the form of these organs in the course of certain diseases. They utilized succussion both as an aid to diagnosis and as a means of favoring the breaking through of pus into the bronchial tubes. They were familiar with the pleuritic friction sound and with the finest râles, which they compared to the creaking of leather or "the noise of boiling vinegar." In their descriptions of these sounds it is distinctly stated that the examiner's ear was kept tightly pressed against the patient's chest.

In speaking of the accounts of individual diseases which appear in the Hippocratic writings, Puschmann says that they are evidently based on cases actually observed in practice, and that they are admirably written. It is in the laws which they have laid down with regard to the treatment of disease, however, that the Hippocratic writers have

gained their chief distinction, a distinction which will belong to them through all time.

The physician should be the handy man of Nature, and he should strive to aid and to imitate her efforts to effect a cure. His first care should be to remove, so far as is possible, the causes of the disease; and then, in the conduct of the treatment, he should keep in view at all times the special circumstances of the case, giving closer attention to the patient than to the disease itself. In short, he should aim at being useful, or at least he should be careful not to do any harm.

CHAPTER VIII

BRIEF EXTRACTS FROM SOME OF THE HIPPOCRATIC WRITINGS

The statements which have thus far been made in these pages with regard to Hippocrates are only of a general character, and it may therefore be interesting for the reader to have placed before him a few selected extracts from the writings which have formed the basis of these statements. The English text here used is a translation of the German version of Robert Fuchs, to which reference has already been made. It would have been a pleasure to use for this purpose the admirable English translation of Frederick Adams, published in 1849 under the auspices of the Sydenham Society of Great Britain; but, unfortunately, this version contains only a part of the Hippocratic writings, and, besides, this writer did not at that time have the advantage of consulting the French and German versions which have been published since 1849.

It seems almost unnecessary to state here, by way of preface, that the small amount of space which may properly be devoted to these extracts renders it necessary to present many of them in a very fragmentary and disconnected form, merely enough text being furnished to give the reader some slight idea both of the manner in which Hippocrates and those associated with him handled certain medical topics, and also of the views which they entertained with regard to the same subjects.

BRIEF EXTRACTS FROM SOME OF THE HIPPOCRATIC WRITINGS

Aphorisms.—I.—1. Life is short, art is long, the right moment lasts but an instant,[1] experience is often deceptive, a correct judgment is hard to reach.

[1] Daremberg (*Hist. de la Méd.*) makes the following comments on this

6. For the most serious ills extreme measures cautiously employed are the best.

8. When an illness has reached its acme the lightest diet must be prescribed.

11. During the exacerbations nourishment should be withheld, for at these times the giving of food is harmful; and in illnesses which are characterized by periodic paroxysms it is also best not to give food during the paroxysms.

13. Old people bear fasting very well, and the same is almost true of persons of mature age; but young individuals do not bear abstinence from food so well, and this is particularly the case with children, especially with those of a lively disposition.

24. In acute illnesses laxative remedies should rarely be administered, and then only in the early stage of the malady and with great caution.

II.—2. When sleep puts an end to delirium it is a good sign.

3. When either sleep or wakefulness oversteps the proper limit it is harmful.

5. Causeless depression is an indication of some disorder.

19. In acute diseases the prognosis as regards either death or recovery, is very uncertain.

44. Corpulent persons are more likely than those who are slender to die a quick death.

V.—7. When epileptic attacks occur before the age of puberty, a change for the better may be looked for; but if the disease makes its first appearance when the individual has already reached his twenty-fifth year, he may be expected to carry the affliction with him to the time of his death.

9. Consumption most commonly attacks persons who are between the ages of eighteen and thirty-five.

14. When a consumptive person has attacks of diarrhoea, a fatal issue may be anticipated.

VII.—1. If in the course of an acute illness the extremities grow cold, it is an unfavorable sign.

sentence: "How many are the occasions when we physicians would have it in our power to avert death, or at least to postpone it for a few hours, if we would only engrave upon our memories these words of the old man of Cos! 'What a cruel responsibility rests upon those whose duty it is to summon the doctor at the proper moment! And how great must be the remorse if he fails to arrive in time!' On the other hand, how wise is the remark of Celsus: 'The best practitioner is he who never loses sight of his patients.'"

14. If, after a blow upon the head, stupefaction or delirium manifests itself, the outlook is bad.

[The total number of the aphorisms is 422.]

The Book of Prognoses.—1. I believe that it is best for a physician to acquire a certain degree of practice in the power to predict how the disease is likely to terminate; for if, when he is in the presence of his patient, he is able to state, not only what is going to take place in the future course of the malady, but also certain other facts which relate to the past behavior of the attack, but which were omitted from the account given to him of the previous history of the case, he will impress the patient with the belief that he is thoroughly familiar with the disease from which the latter is suffering, and that consequently he is a physician in whose knowledge and skill he can place entire confidence. Then, besides, he will be the gainer in another respect: his knowledge of what is likely to be the subsequent course of any given disease will enable him to treat it in the most effective manner. The ability to restore all his patients to health would of course be a greater power than that of correctly predicting the future behavior of a malady in any particular case. This ability, however, is clearly unattainable. One patient dies by reason of the severity of the disease itself, even before the physician is called in; a second one, shortly after the latter's visit; and a third lingers on for a day or two after the doctor's arrival, dying before the latter's art has had time to produce a beneficial effect in hindering the advance of the malady. The observation of these different events should enable the physician to become acquainted with the nature of the diseases observed, and—more particularly—to learn to what extent, in individual instances, they manifest a strength greater than the patient's power of resistance. At the same time, he must not forget that in many cases divine interference plays a part in directing the course of the disease. And thus, if he pays heed to all these things, the physician will merit the confidence of his patients and will gain the reputation of being a clever and skilful practitioner.

IV.—It is better when the physician, upon the occasion of his first visit, finds the patient lying upon one side, with his hands, neck and thighs slightly flexed, and the entire body placed in a perfectly natural position, like that which a man assumes in bed when he is in a state of health. It is not so well when the physician finds the patient lying upon his back, with his hands, neck and

thighs extended. But if the latter is found curled up and sliding down toward the foot of the bed, this is an unfavorable sign. Finally, if he is found with rather cold feet projecting from under the bedclothes, and with his arms outstretched and his neck and thighs exposed, his condition may be considered dangerous, for this attitude of the body betokens an agitated state of the mind. If the patient sleeps with his mouth constantly open, lying upon his back and with his thighs strongly flexed and widely separated, it may be assumed that death is near at hand. If he lies upon his belly when it is known that he was not in the habit of sleeping in this manner before he was taken ill, the inference is warranted either that he is delirious or that he is suffering from pain in the lower part of his abdomen. Finally, if the patient shows an inclination to maintain a sitting posture while the malady is still in an active stage, this feature must be looked upon as a grave symptom and especially so in inflammation of the lungs.

XIV.—Pus that has a whitish color and a uniform consistency, that is smooth and free from clumps, and the odor of which is only slightly unpleasant, is the least harmful. On the other hand, a pus which possesses the opposite characteristics is very dangerous.

XL.—Severe pain in the ear, if associated with a persistent fever is dangerous, for the patient may become delirious and die.

[There are 47 chapters in the Book of Prognoses; in addition, there are 740 separate sections in the Coan Prognoses (*Praenotiones Coacae*).]

The Epidemic Diseases.—VI.—4. The wife of Agasis had already as a young girl been troubled with shortness of breath. After she had reached womanhood, and soon after she had given birth to a child, she lifted a heavy weight. Immediately she heard, as she believed, a noise in her chest, and on the following day she experienced some difficulty in breathing and a certain amount of pain in her right hip. These two symptoms were so related to each other that, whenever the pain in the hip made its appearance, she immediately became conscious that she was short of breath, and, *vice versa,* whenever the pain ceased, she found that her breathing became easier. Her expectoration was of a foamy character and of a rather bright color, but, after it had been allowed to stand for a short time, it looked like diluted biliary matter that had been vomited. The pain in the hip troubled her chiefly when she performed manual work. She was advised to

abstain from eating garlic, pork, mutton, and beef, and not to call loudly or to get excited while she was engaged in work.

VII.—7. The wife of Polycrates became feverish during the summer season, and about the time of the dog star. In the morning her breathing was somewhat embarrassed, but after mid-day it became more difficult and at the same time more rapid. From the very beginning of the illness she had a cough and expectorated purulent masses. In the throat and along the course of the trachea one could hear a hoarse whistling sound. The patient's face had a healthy color, and over the two halves of the jaw there was some redness, not of a deep hue but rather fresh and bright. A little later her voice also became hoarse, she began to show some emaciation, raw spots developed over the fleshy parts of her hips, and the surface of the body grew more moist than it had been before. On the seventieth day the outward evidences of fever became much less noticeable, but the respiration grew more rapid; and from that day to the time of her death, five or six days later, she was obliged to remain in a sitting posture. Toward the end the tracheal râle grew louder, and dangerous sweats occurred, but the patient never lost her expression of intelligence.

Fracturcs.—II.—9. In the human body the foot, like the hand, is composed of a number of small bones. As they are not easily broken it may safely be assumed, when such a case of fracture comes under observation, that some pointed or unusually heavy object had caused the lesion, and that the surrounding soft parts must necessarily have been injured at the same time. (Injuries of this nature will be discussed in a later section.) But if any part of this bony framework is pushed out of its natural position—whether this take place in one of the toes, or in one of the tarsal bones, it makes no difference—the dislocated part should be forced back into position in the manner recommended in section XXIV. In its essential features the treatment consists in the employment of wax plaster, compresses, and bandages, exactly the same as is done in the treatment of fractures of the long bones, but without splints. The same rules hold good with regard to the degree of pressure to be applied, and every third day the dressings should be renewed. On each occasion of such renewal the patient should be questioned with regard to the sensations which he feels after the bandages have been applied, and if necessary they should be readjusted in accordance with the nature of the answers which he gives. The great majority of these injuries heal completely in twenty days. The exceptional cases are those in which the fracture

involves a bone that stands in immediate relation with the bones of the leg. It is advisable, however, that the patient should remain in bed during the period mentioned; for, in not a few instances, the persons thus affected, failing to appreciate the gravity of the injury, walk about before the parts have really healed; and then, for an indefinite period of time, they are frequently reminded in a painful manner of the injury which they received. There is nothing astonishing in this when the fact is recalled to mind that the feet support the entire weight of the body.

[Forty-eight chapters or sections, some of them of considerable length, are devoted to the subject of fractures. The authorities are almost unanimous in stating that this portion of the so-called Hippocratic writings was written by Hippocrates himself. Malgaigne and Petrequin, two of the most competent French writers on questions relating to surgery, declare that the treatises written by Hippocrates on fractures and dislocations (the two forming in reality one continuous treatise) are the best and most complete books ever written by a physician.]

Wounds of the Head.—10. The physician should, first of all, before touching the patient's head, inspect carefully the wound and surrounding parts. After noting whether the injury has been inflicted upon a strong or a weak portion of the head, he should ascertain whether the hair has been cut by the fall or the blow, and whether portions of it have penetrated into the wound. In the latter event he should express his fear that the skull at this point has been laid bare and has perhaps even received some material injury. He should make this statement before he has touched or probed the wound. Then afterward he should proceed to a physical examination of the injured parts, in order that he may learn positively whether the overlying soft tissues have or have not been separated from the bone. If simple inspection reveals the fact that the skull has been laid bare, well and good; but, if the real condition is not thus revealed, he should not hesitate to employ the probe. If he finds that the soft parts have been separated from the bone and that the latter has been more or less injured, he should continue this more minute exploration until he shall have ascertained to just what extent and in what manner the skull has been injured, and what measures are required to remedy the damage; in brief, he should make the diagnosis. At the

same time, however, he should not neglect to question the patient very closely about the manner in which the wound was inflicted, for in this way he may be able to infer the existence of a contusion, or even a fracture of the skull, of which no material evidences are discoverable. Important information may also be gathered by passing the hand over the seat of injury in the bone,—information which the employment of the probe is not competent to convey.

[Twenty-one additional chapters are devoted to wounds of the head, every possible phase of the subject being handled by Hippocrates in the most careful and thorough manner.]

CHAPTER IX

THE STATE OF GREEK MEDICINE AFTER THE EVENTS OF THE PELOPONNESIAN WAR; THE FOUNDING OF ALEXANDRIA IN EGYPT, AT THE MOUTH OF THE NILE; AND THE DEVELOPMENT OF DIFFERENT SECTS IN MEDICINE

Up to the time when war broke out between Sparta and Athens (431 B. C.), the latter city had for many years easily held the supremacy, not merely in everything relating to the science and art of medicine, but also in all other branches of learning and especially in the arts of sculpture, painting and architecture. At the time named above came the beginning of her downfall. For a period of about twenty-one years she struggled against disasters of all sorts.

The Plague at Athens, the first Recorded in History.—Shortly after the war began—a war engendered by the bitter jealousy of Sparta over the ever increasing ascendancy of her rival—the latter city was visited by a devastating plague, the first European pestilence that has been recorded in history. Thucydides, who wrote the history of the Peloponnesian War, gives a most lucid description of this plague of Athens, from which I shall copy certain portions.

It first began, it is said, in the parts of Ethiopia above Egypt, and thence descended into Egypt and Libya and into most of the King's country. Suddenly falling upon Athens, it first attacked the population in Piraeus,—which was the occasion of their saying that the Peloponnesians had poisoned the reservoirs, there being as yet no wells there,—and afterward appeared in the upper city, when the deaths became much more frequent. All speculation

as to its origin and its causes, if causes can be found adequate to produce so great a disturbance, I leave to other writers, whether lay or professional; for myself, I shall simply set down its nature, and explain the symptoms by which perhaps it may be recognized by the student, if it should ever break out again. This I can the better do, as I had the disease myself, and watched its operation in the case of others. . . . . People in good health were all of a sudden attacked by violent heats in the head and redness and inflammation in the eyes, the inward parts, such as the throat or tongue, becoming bloody and emitting an unnatural and fetid breath. These symptoms were followed by sneezing and hoarseness, after which the pain soon reached the chest, and produced a hard cough. When it fixed in the stomach, it upset it; and discharges of bile of every kind named by physicians ensued, accompanied by very great distress. In most cases, also, an ineffectual retching followed, producing violent spasms, which in some cases ceased soon after, in others much later. Externally the body was not very hot to the touch, nor pale in its appearance, but reddish, livid, and breaking out into small pustules and ulcers. But internally it burned so that the patient could not bear to have on him clothing or linen even of the very lightest description; or indeed to be otherwise than stark naked. What they would have liked best would have been to throw themselves into cold water; as indeed was done by some of the neglected sick, who plunged into the rain-tanks in their agonies of unquenchable thirst; though it made no difference whether they drank little or much. Besides this, the miserable feeling of not being able to rest or sleep never ceased to torment them. The body meanwhile did not waste away so long as the distemper was at its height, but held out to a marvel against its ravages; so that when they succumbed, as in most cases, on the seventh or eighth day to the internal inflammation, they had still some strength in them. But if they passed this stage, and the disease descended further into the bowels, inducing a violent ulceration there accompanied by severe diarrhoea, this brought on a weakness which was generally fatal. For the disorder first settled in the head, ran its course from thence through the whole of the body, and, even where it did not prove mortal, it still left its mark on the extremities; . . . . . some, too, escaped with the loss of their eyes. . . . . Some died in neglect, others in the midst of every attention. No remedy was found that could be used as a specific; for what did good in one case, did harm in another. . . . . Such was the nature of the

calamity, and heavily did it weigh on the Athenians; death raging within the city and devastation without.

(Translation of Richard Crawley; Dent & Sons, London.)

Athens Ceases to be the Centre of Medical Learning.—It is safe to assume that one by one the more prominent of the physicians who had survived the events which have just been narrated, must have left Athens and taken up their abode in the various cities of Asia Minor and the neighboring islands, in Sicily, in Italy, etc. Hippocrates, who was thirty years old at the time when the plague broke out in Athens, appears not to have witnessed it. He practiced his profession and taught medicine in his native city; then he spent a certain number of years in traveling about as a peripatetic physician; and finally settled for the remainder of his life in Thessaly. But the length of each of these periods of his professional life is not mentioned by any of the authorities. About forty years after the death of Hippocrates, Alexander the Great had already nearly completed his series of brilliant conquests, and was taking steps to found a city, or rather, a university, in which medicine was to take an organized shape as one of the great departments of human learning.

It may be well at this point, however, to interrupt this narrative of the regular course of events for the purpose of considering very briefly how far the physicians of that period had advanced toward gaining a permanent and honorable position in their respective communities.

The Degree of Esteem in which Physicians Were Held by Their Fellow Citizens and by the Governing Authorities During the Centuries Immediately Preceding the Christian Era.—We have at our command very little direct evidence bearing upon the question of the esteem in which physicians were held three hundred years B. C. by the communities in which they practiced their profession. We know positively that the kings and princes of that period fully appreciated the value of the services which were rendered to them by the physicians (commonly Greeks) whom they employed. In the event of war they took with them men who were skilled both in surgery and in the treatment of

the ordinary ills of the body. One of the sons of Hippocrates, for example, served for some time in this capacity, and he is credited with the statement that "the physician who wishes to obtain the best training in surgery should enter the service of the army." There were eight surgeons officially connected with the "ten thousand" whom Xenophon led back to Greece after the famous campaign in Asia Minor. The army of Alexander the Great was accompanied by the most celebrated surgeons of that period. Upon a bronze tablet found at Idalium, on the Island of Cyprus, there is an inscription which dates back to the fifth century B. C., and which commemorates the merits of a physician named Onasilos, who, aided by his pupils, rendered valuable services, without any remuneration, during one of the wars of the Greeks; and in recognition of these services, the Government had bestowed upon him a stipend and had exempted him from taxation. It is further known that the Athenians lavishly heaped honors upon Hippocrates, initiating him at public expense into the mysteries of the Eleusinia, giving him a crown of gold, and distinguishing him in still other ways. These facts show how highly the rulers of that day appreciated the services of a competent physician; but, up to a comparatively recent date, it has not been so easy to demonstrate what was his position in the esteem of the community at large. The discovery, not many years ago, of two inscriptions in Greek throw a certain amount of light upon this very point. One of these, which bears the date of 388 B. C., states that its purpose is to commemorate the fact that the physician Euenor, who had been intrusted by the people with the work of supervising the preparation of all the drugs intended for use in the public hospital, had not only fulfilled his duty but had in addition spent large sums of his own money in the accomplishment of this work. Another inscription, which was unearthed in the Island of Carpathus, between Crete and Rhodes, and which is believed to date back to the end of the fourth or the beginning of the third century B. C., reads (in a somewhat abbreviated form) as follows: "In view of the fact

that, for more than twenty years, Menocritus, the son of Metrodorus of Samos, has devoted himself with much zeal and self-sacrifice to the duties of his position as parish physician, living all this time in rather narrow circumstances and not asking any pay for his services, we, the citizens of Brycontium, have resolved to erect in his honor, in the temple of Neptune, a marble column bearing an inscription that shall set forth these facts, to crown him with a wreath of gold, and to announce publicly, at the Aesculapian games, this our decision." As apropos of this subject I may be permitted to quote the following words from Plato's "The Republic" (Book 1, Chap. 18): "Will you call the medicinal the mercenary art, if, in performing a cure, one earns a reward? No, said he."

The Founding of Alexandria.—Alexander the Great, after subduing the Persians and the cities of Phoenicia, marched into Egypt and founded (331 B. C.), at the mouth of the Nile, the city of Alexandria. In October of the same year he crossed the Euphrates and the Tigris and defeated, for the second time, the Persian hosts under Darius. Alexander was now the conqueror of Asia. During the following eight years he laid his plans most carefully for the consolidation of his great empire, the capital of which was to have been Babylon; but, while he was thus making provision for the welfare of his numerous subjects, who were of widely different tastes and aspirations, he succumbed (323 B. C.) to a severe attack of malarial fever, aggravated by an excessive indulgence in wine on the occasion of some festivity. In the meantime Alexandria was developing rapidly into a great centre of learning in all the departments of human knowledge. The Ptolemies, beginning with Ptolemy Soter, who reigned over Egypt from 323 to 285 B. C., contributed greatly to this result. For a period of about 250 years Alexandria remained the centre around which revolved all that was best in the domains of medicine, philosophy, geometry, mathematics, history, etc. Money was spent lavishly in collecting the writings of all those authors who had distinguished themselves in these different fields of learning, and no pains

were spared to secure correct versions of the different works; the septuagint version of the books of the Old Testament of the Bible being a conspicuous example of what the Ptolemies accomplished in this direction during the third century B. C. Every possible facility was offered at the same time for the giving and receiving of instruction; and thus, with the immense library as a foundation of priceless value, the Museum at Alexandria became in every material respect a great university, the first one of which history gives us any fairly satisfactory information. Several years after the Museum library was established a second one of somewhat smaller proportions was organized in the Serapeum (Temple of Serapis). The example set by the Ptolemies was followed by Attalus, King of Pergamum in Mysia, Asia Minor (241 B. C.), and, before many years had elapsed, the great library of that city almost rivaled those of the Museum and Serapeum at Alexandria. It was the competition between these two royal collectors of books that led to the issuing of a decree that no more papyrus was to be exported from Egypt, and thus there was provided the stimulus which led to the discovery or invention of a new and better material on which books might be written—viz., Pergamentum (our parchment), a word coined from the name of the city in which it was invented.

The Development of Different Sects or Schools of Medicine.—Up to the time of the death of Hippocrates medicine maintained the character of a single organized and harmonious body; but, when this great physician had disappeared from the scene and was no longer there to guide the further development of medical science and to keep his followers working shoulder to shoulder with a single spirit and purpose, this hitherto homogeneous body split up into sects or schools, each of which had some favorite doctrine the promulgation of which seemed to each group of adherents to be of great importance. There were at first two such principal groups, viz., the Dogmatics and the Empirics. The former was composed of those who laid great stress upon speculation or theorizing,—that is,

upon the use of the reasoning power,—and the latter of men who maintained that actual experience was the only thing of any serious value. The respective leaders of these two groups or sects were Plato and Aristotle.

In Raphael's celebrated painting, "The School of Athens," these two heroes of philosophy are represented standing side by side—Plato with his right hand elevated and pointing toward heaven, while Aristotle is looking distinctly at the earth. Pictorially, the tendencies of the two schools of philosophy could not have been better represented. Plato's genius had taken its flight heavenward and was contemplating earthly things from this point of vantage; his method being to ignore system and to look at everything with the eyes of purest love. "Delightfully poetic, but thoroughly unprofitable speculation as to what constitutes scientific truth and perfected morality!" (Friedlaender.)

Aristotle, whose father was a physician and a descendant of Aesculapius, was the hero and guiding spirit of those who based their philosophy on experience, on ascertained facts. Like his celebrated pupil, Alexander the Great, who brought whole nations under his sway, he too was a conqueror in every field of human knowledge. His ideas ruled supreme over the minds of men for thousands of years and to-day, although many of them are no longer accepted as valid, Aristotle himself is universally held to have been the greatest thinker and investigator who has ever lived upon this earth. (In chapter XIII. I shall have occasion to say something further regarding the Dogmatics and the Empirics.)

Out of the teachings of Plato and Aristotle developed two schools of philosophy that exerted, in course of time, a great influence upon the minds of men and upon the growth of medical science. The schools referred to are the Epicureans and the Stoics. Epicurus (242-270 B. C.), who gave his name to the first of these, taught that the highest good was happiness.

The happiness he taught his followers to seek was not sensual enjoyment, but peace of mind as the result of the cultivation of

all the virtues. According to the teaching of his school virtue should be practiced *because* it leads to happiness; whereas the Stoics taught that virtue should be cultivated for her own sake, irrespective of the happiness it will ensure. Zeno (circa 370-260 B. C.), the founder of the Stoic philosophy, taught an ethical system according to which virtue consists in absolute judgment, absolute mastery of desire, absolute control of the soul over pain, and absolute justice. The keynote of the system is *duty*, as that of Epicureanism is pleasure. (Sir William Smith.)

In addition to the sects named above, there was still another known as the Older Dogmatic School, which was composed of men who had been the direct followers of the great master, but who, forgetting altogether the practical teachings of Hippocrates with regard to the importance of experience, gave themselves up to all sorts of hypotheses and theories. Among the names of the earliest followers of this school one is astonished to find those of Thessalus and Draco, the sons of Hippocrates, as well as the name of Polybus, the latter's son-in-law. Diocles of Carystos and Praxagoras of Cos, two of the most distinguished men of that period, were also among the earliest members of this dogmatic school. Diocles, who was one of the Asclepiadae, owed his celebrity in part to his contributions to our knowledge of anatomy and in part to the work which he had done in other departments of medicine. Unfortunately, all of these writings have been lost with the exception of a few fragments which came to light toward the middle of the nineteenth century. Praxagoras was also one of the Asclepiadae. He was distinguished, as has already been stated on an earlier page, by the fact that he—and not Aristotle, as is sometimes stated—was first to recognize the difference between arteries and veins, and also by the further fact that he called attention to the practical value of the pulse as an indication, in certain diseases, of the tone of the patient's bodily condition or vitality.

CHAPTER X

ERASISTRATUS AND HEROPHILUS, THE TWO GREAT LEADERS IN MEDICINE AT ALEXANDRIA; THE FOUNDING OF NEW SECTS

Two of the most celebrated physicians of that period (305-280 B. C.) were Erasistratus and Herophilus, both of whom were distinguished as the founders of schools or sects of medicine at Alexandria. They had received their early training as physicians from Chrysippus, a widely known Stoic philosopher, who, according to Albert von Haller, had taught at the school of Cnidus and had also written on medical topics; and, among the other teachers, it is stated that Anaxagoras of Cos had instructed Herophilus, and that Metrodorus, the son-in-law of Aristotle, had performed the same service for Erasistratus. So far as fundamental principles are concerned, the schools founded by these two physicians at Alexandria differed very little from each other, and the men themselves also gained their distinction in very much the same branches of medical knowledge, both of them having made a number of original discoveries in anatomy and both of them having become eminent practitioners.

Herophilus was born at Chalcedon, a Greek city on the Propontus, nearly opposite to Byzantium. We possess no knowledge whatever regarding the earlier years of his career, notwithstanding the fact that no fewer than four different men devoted their energies to the writing of his biography. The books themselves have been either lost or destroyed. Herophilus showed a decided leaning toward the study of anatomy, and his contributions to this branch of medicine are among the earliest which we possess.

Herophilus strove to supply one of the most conspicuous deficiencies in the Hippocratic system of medicine, viz., inadequate knowledge of the nervous system; and to this end he conducted a series of the most careful investigations, as a result of which he was successful in establishing several facts previously unknown. He described the membranes of the brain, the choroid plexus, the venous sinuses, the structure which bears his name,—the torcular Herophili,—the cerebral ventricles, and the calamus scriptorius; he traced the course of the nerve trunks for some distance from their origin in the brain and spinal cord; and it was he who established the fact that two different sets of nerves exist—one for conveying sensations to the brain and the other for producing motion. In addition, he investigated the corpus vitreum, the retina, the optic nerve, etc. He also called attention to the peculiar mode of construction of the duodenum, and to the fact that the walls of the arteries are thicker than those of the veins. Some idea of the accurate manner in which he carried on his anatomical researches may be gained from the fact that he noted the circumstance that the left vena spermatica occasionally originates in the vena renalis.

Herophilus also gained distinction in the practical branches of medicine. According to Puschmann he laid the foundations for a scientific sphygmography. Thus he distinguished several varieties of pulse in accordance with the differences which he noted in its strength, regularity, degree of fulness, and rate of speed. He also must have had considerable experience in surgery, as is shown by his remark that a dislocation of the thigh, owing to the tearing of the ligamentum teres which necessarily accompanies such a dislocation, is likely to occur again in the same individual. In his writings relating to the practice of medicine, Herophilus upheld the principle that experience alone should be our guide, as theoretical considerations are not to be trusted. He is also credited with having said, in response to the question, Whom do you consider the best physician? "Him who knows how to distinguish what is attainable from what is unattainable."

Erasistratus, the contemporary of Herophilus and his associate in the work of establishing at Alexandria a great anatomical and clinical medical school, was a native of Julis, in the Island of Ceos, not far from the coast of Attica. In the earlier part of his professional career he spent some time at the Court of Seleucus, the founder of the Syrian monarchy (312-280 B. C.). This monarch, who had been one of Alexander the Great's distinguished generals, consigned the government of the eastern part of his vast kingdom to his son Antiochus. The latter fell ill about this time, and the most distinguished physicians of the Court were then called in to determine what was the nature of his malady and to decide upon the proper treatment. The patient grew more and more languid, showed complete indifference to all that took place about him, and steadily lost flesh. Erasistratus, who was one of the physicians summoned, observed his behavior very closely and soon noted the fact that, whenever Stratonice, his young and attractive stepmother, entered the sick room, Antiochus became agitated; his face being flushed, his voice subdued, his pulse more rapid, and his eyes brighter, all of which signs of excitement disappeared when Stratonice left the room. From these phenomena this shrewd observer drew the inference that the patient was deeply but hopelessly in love with his father's second wife. Accordingly he informed Seleucus that his son's illness was simply the result of having lost his heart to one who was unable to return his affection. Seleucus, who was much astonished, asked with deep interest who was the lady. "My wife," replied Erasistratus, without an instant's hesitation. "But tell me then," asked Seleucus, "would you be willing to cause the death of my son, who is so very dear to me, by refusing to give up your wife to him?" "Would you, yourself, my lord, under similar circumstances," replied the physician, "be willing to give up Stratonice to the Prince, if it had been she with whom he had fallen in love?" Seleucus having already vowed that he would not hesitate for a moment to do so, Erasistratus declared the whole truth to him, and of course there was nothing left for the

King but to keep his word. History fails to state whether or not the lady made any objection to the transfer. As Antiochus lived to reign for many years after the murder of his father, it is safe to assume that he recovered his health.

This brief tale, the truth of which is not disputed by any of the authorities, reveals Erasistratus to have been a clever diagnostician, to have possessed a profound knowledge of human nature, and to have been a man of exceptional courage; in short, he was a physician admirably fitted to act as the founder and leader of one of the two great medical schools of Alexandria. The following account may suffice to convey some idea of his career after he became established at the latter city.

At the beginning of his residence in Alexandria, Erasistratus, like his great rival Herophilus, devoted his energies to anatomical and physiological researches. These two men evidently realized to the full how important it was to medicine, if it were to make a substantial advance beyond the point to which Hippocrates and his followers had already carried it, that a more complete understanding of the structure and working of the human body should be obtained; and their efforts in this direction were greatly aided by the enlightened views of the kings of Egypt, the Ptolemies, who did everything in their power to furnish these two investigators with all the human dissecting material they could use to advantage. They even went so far as to allow them the privilege of utilizing, for scientific purposes, the living bodies of imprisoned criminals, "in order that they might in this way learn the location, color, shape, size, construction, hardness, softness, smoothness, nature of external surface, protuberances and recesses of the individual organs during life." The defense which they offered for permitting such vivisections was this: "It is permissible to sacrifice the lives of a few criminals if many worthy persons may thereby be permanently benefited in health, or have their lives prolonged." (Puschmann.) Those who were opposed to such examinations upon human beings expressed their disapproval in

the following terms: "This practice is not only cruel, but useless, and at the same time it derogates from the dignity of the healing art, which is intended to be a blessing and not a source of pain to man; for those in whom the abdominal cavity is first opened and then the diaphragm divided, die before it is possible to make the scientific examination 'during life' which constitutes, as it is claimed, the justification for the entire procedure." (Puschmann.)

As regards the work done by Erasistratus in the departments of anatomy and physiology, the following statement may be made: He threw a great deal of additional light upon the structure of the lacteals, the valves of the heart, the brain, the nerves, and several other portions of the body; and he assigned to the pneuma, or breath,—of which he assumed that two kinds exist,—the most important rôle in the mechanism of life. According to the description given by Galen and reported by Le Clerc, the phenomena to which Erasistratus refers take place somewhat as follows: "When the thorax or chest expands, the lungs also undergo dilatation and fill themselves with air. This air, entering first by way of the trachea, ultimately reaches the anastomosing terminals of the bronchial tubes, from which locality the heart, by the act of dilatation, draws it into itself, and then, immediately afterward contracting, sends it, by way of the great artery (the Aorta), to every part of the body." When it is considered that at this remote period of time nothing was known about oxygen and carbon dioxide, nor about the power of these elements to pass freely through a thin membrane (exosmosis and endosmosis), no surprise will be felt that Erasistratus carried the physiology of respiration no farther than he did. On the contrary, it is remarkable that he was able to describe so correctly this complicated process. In fact, none of his successors, up to the time when Harvey's great discovery was announced, was able to furnish a better description. The physiology of gastric digestion was another of the problems concerning which Erasistratus held views that were different from those commonly accepted by the physicians of that time. The stomach, he

maintained, first retracts when portions of food are introduced and then contracts in such a manner as to break them up into smaller and smaller fragments; this process taking the place of that of "coction," as taught by Hippocrates. The resulting chyle passes from the stomach into the liver and is deposited in those spots where the finer branches of the vena cava and the terminal twigs of the channels which lead into the gall-bladder come together. Here the chyle breaks up into two portions, one of which—viz., that which contains biliary elements—gains an entrance into the channels that lead to the gall-bladder, while the other, which is composed of elements suitable for making pure blood, finds its way into the ramifications of the vena cava. While holding these views about the mode of transformation of gastric chyle into the bile and pure blood, Erasistratus did not hesitate to confess that he was unable to say whether bile was produced within the body or whether it already existed in the food that was taken into the stomach.

As regards the treatment of disease Erasistratus held certain views which were decidedly at variance with those maintained by the majority of his associates. Thus, for example, Straton, a distinguished disciple of this master, praises him for having banished bloodletting from the list of remedial measures, and adds that he can testify to the fact that Erasistratus had, by other means, cured all the diseases in which the ancients commonly employed bloodletting as the chief remedial agent. His favorite substitutes for the latter procedure were fasting, dieting, physical exercise, and—in cases of hemorrhage—placing ligatures around the arms and legs. Caelius Aurelianus is authority for the statement that, in certain very exceptional cases, Erasistratus did resort to bloodletting. Another of the latter's tenets was his strong objection to the employment of purgatives and composite remedies. On the other hand, he appears to have attached considerable importance to the employment of chicory in the treatment of all disorders of the abdominal organs. One of the evidences of his preference for this drug is to be found in the care which

he takes in describing how the plant should be prepared for remedial purposes. "Boil a bunch of the plant in water until the mass is thoroughly cooked; then cast it into a fresh supply of boiling water (to drive out still more of its bitter quality); and finally, upon removing it from the boiling water, place it for conservation in a receptacle containing oil. When it is required for use add a small quantity of weak vinegar." Galen, in commenting jocosely upon the stress which Erasistratus lays upon these details, makes the remark: "As if our domestics did not know how to cook a bunch of chicory!"

Speaking of the effects produced by venom when one is bitten by a poisonous snake, Erasistratus remarks that "from the effects which the poison introduced in this manner produces, we may derive a general indication as to how a cure may be obtained. The poison, it will be noted, destroys very quickly the parts with which it comes in contact, and then, by spreading throughout the body, causes death. The thing to do, therefore, is to draw it as quickly as possible out of the body and thus arrest its further spread. To this end the wound should first be enlarged and its sides scarified; then, after it has been sucked, a cupping glass should be applied over it; and, finally, it should be cauterized."

Erasistratus cultivated surgery as well as the other branches of medicine. He was a bold operator, as may be inferred from the fact that, in cases of scirrhus or other variety of tumor of the liver, he did not hesitate to incise the skin and overlying integuments, and then, after the peritoneal cavity had been opened, to apply directly to the seat of the disease such medicaments as seemed to him appropriate. On the other hand, he did not approve of *paracentesis abdominis* in cases of dropsical effusion, as a means of evacuating the fluid accumulated in the peritoneal cavity.

It appears that the disciples and successors of Herophilus and Erasistratus soon abandoned the exact methods which these two great masters had inaugurated and which, in a comparatively short time, had produced such admirable

results, and then they fell back into the less arduous, the easy-going ways of speculation. Only a very few had sufficient strength of character to walk in the older pathway, and among the number were some who left Alexandria and established schools in the other cities—as, for example, Zeuxis, who organized a new centre of medical teaching at Laodicea, in the interior of Asia Minor, and Hikesios, who founded another school at Smyrna, on the seacoast of Lydia. It is not strange, therefore, that before many years had elapsed the two original schools at Alexandria died a natural death. As Pliny aptly writes, "It was so much more comfortable to sit on the benches of the schools and have learning poured into your ears than to wander daily through the desert outside in search of other nourishing plants." As a further result of this deadness of the schools at Alexandria (that is, of the sect of the Dogmatics) the more serious-minded physicians espoused with eagerness the side of the Empirics—a sect which developed about this time, but which did not, it must be confessed, hold out much hope of solving the physiological and pathological problems of the day, but which nevertheless satisfied in some measure their needs as practitioners.

Philinus of Cos (286 B. C.) was looked upon as the founder of the school of the Empirics, and among its most distinguished disciples were: Serapion of Alexandria (279 B. C.), Glaucias, Apollonius Biblas, and—perhaps the most celebrated of them all—Herakleides of Tarentum (242 B. C.), who did such excellent work in the department of pharmacology. It was he, for example, who defined more precisely than had been done by any one of his predecessors the proper manner of employing opium. In addition, he wrote a commentary on the Hippocratic works and also separate treatises on medical, surgical and pharmaceutical topics. In the latter category belongs his book entitled "A Military Pharmacopoeia." Last of all, Apollonius Mus, a distinguished follower of Herophilus, deserves to be mentioned because it was he who perfected the preparation of castor oil. At a still later date (158 B. C.) Zopyrus proved himself to be a most worthy suc-

cessor to Herakleides. It was he who first classified drugs according to the effects which they produce, and he also invented or discovered the preparation named "ambrosia," a general antidote for poisons of all kinds. Kings and princes were, at that period, in constant fear of being poisoned, and so it came about that those who were skilled in the knowledge and preparation of drugs were greatly stimulated by their royal patrons to find efficient antidotes. It is narrated that Attalus Philometer, King of Pergamum, the native city of the famous physician Galen, and Mithridates Eupator, King of Pontus, cultivated poisonous plants in their gardens and tried the effects of the poisons distilled from them on criminals. They also encouraged in every possible way the preparation of antidotes; and thus was compounded a mixture which even to-day is still known by the name of "*Mithridaticum.*" For centuries it was a very popular remedy for poisoning by snake-bite. Le Clerc states that one of the first things that the great Roman general Pompey did, after conquering Mithridates and gaining possession of his palace (about 64 B. C.), was to have a careful search made for the recipe of this famous antidote. Upon finding it he was surprised to learn what simple ingredients it was composed of—viz., "20 leaves of rue, a pinch of salt, two nuts, and two dried figs." The theriacum, which one hundred years later was modeled after the Mithridaticum, contained a great deal of honey and a large number of unimportant drugs, introduced—as Pliny claims—"to magnify the importance of the apothecary's art, rather than to increase the curative effects of the remedy."

The scepticism which already at that period had begun to take possession of many of the best minds manifested itself in the form of a disbelief in the possibility of discovering full scientific truth, and men therefore taught the doctrine that the human understanding is not capable of attaining anything higher than probability. The acceptance of such a doctrine naturally acted as a powerful hindrance to all further original research. And so the Empirics neglected the study of anatomy and physiology

as something quite superfluous and unprofitable. They gave no further thought to the causes of disease, and were quite satisfied simply to observe its manifestations, to investigate the factors which appeared to bring it into a state of activity, and to search for the means of effecting a cure. In carrying on work of this character, they of course derived help, not only from their own experience, but also from that of others—which latter became in time a matter of history. When they encountered new experiences and were unable to supply a satisfactory explanation they resorted to a third method—that of reasoning by analogy. Upon this triple support—one's own individual experience, the experience of others stored up in the form of history, and reasoning by analogy—rested the entire structure of empiricism.

Strange as it may at first appear, the science of medicine from this time onward made no further conspicuous progress until the middle of the seventeenth century of the present era. In certain branches of practical medicine—as, for example, pharmacology, obstetrics and general surgery, and also in certain special departments—the Empirics made a number of material additions to our knowledge; but in all essential particulars the medical science taught throughout this period of about two thousand years varied but little from that taught at Alexandria one hundred or two hundred years before the birth of Christ. This extraordinary phenomenon of almost complete arrest of development for so long a period of time should not excite surprise, for something of a similar nature has certainly occurred in other departments of human knowledge.

The further history of the medical sects which flourished under the Ptolemies and for a short time afterward, when Alexandria became a colony of the Roman Empire, need not detain us long. Daremberg furnishes a chronological chart of the physicians who played a more or less prominent part in the work of these sects, and from this it appears that they numbered thirty-four in all—ten followers of Herophilus, fourteen of Erasistratus, and ten Empirics.

Callamachur and Bacchius, who belonged to the first of these groups, deserve to be mentioned because they were its most distinguished members and because they were the first physicians who wrote commentaries on the writings of Hippocrates. In the sect of the Empirics the next in importance after Philinus of Cos is Serapion of Alexandria. Mantias, another disciple of Herophilus, gained considerable reputation from the fact that he was the first to collect together into a single treatise the different pharmaceutical formulae that were then in general use. He was also an authoritative writer on surgical topics.

Certain Branches of Medical Work Begin to Assume more Distinctly the Character of Specialties.—At the time of Hippocrates there were no specialists, or at least none who received any sort of official recognition from the general body of physicians; and yet, there were, even then, a few practitioners who devoted themselves preferably to the treatment of certain maladies, like the affections of the eye and the teeth; and, beside these, there were undoubtedly, in the larger communities, men who were ready and competent to undertake the more serious surgical operations. But even these men, as appears from the language of the so-called Hippocratic oath, could not honorably perform an operation for stone in the bladder; this particular work having been left from time immemorial entirely in the hands of the lithotomists, a class of men who performed no other kind of surgery and who, in fact, were considered outside the pale of the medical profession—merely surgical artisans.

During the Alexandrian period the attitude of the best physicians with reference to specialization in medical practice evidently underwent a change,—not a very marked one, it is true, but yet sufficient in degree to attract some attention. We read, for example, that a certain Demetrius of Apamea, a follower of Herophilus, was skilled as an obstetrician and was also a clever diagnostician; that Andreas of Carystus, another disciple of Herophilus and the physician upon whose authority the incredible story of the burning of the Cnidian archives by Hippocrates was

spread abroad, was considered at this time an expert in the science of obstetrics; that, toward the end of the period (first century B. C.), Alexander Philalethes, a disciple of Herophilus and well known as an author of treatises on the pulse and on the doctrines taught by different physicians of that period, acquired widespread celebrity as a gynaecologist; that Straton, a disciple of Erasistratus, had gained considerable distinction as a gynaecologist; and, finally, that two physicians—Gaius of Naples and Demosthenes of Marseilles (Massilia)—were widely celebrated for their skilfulness in the treatment of eye diseases. The latter was also a successful author, for his treatise on ophthalmology retained its popularity down to the Middle Ages. All these men, it should be noted, were directly and indirectly connected with the work at Alexandria, and were physicians of some degree of prominence. It is fair to assume, therefore, that specialization in medical practice had by this time become an accepted fact and was certainly not frowned upon by those in authority. The result is entirely in accord with what might be expected from a body of physicians as enlightened as were the men gathered together at Alexandria during the centuries immediately preceding and that immediately following the birth of Christ; but many additional centuries were yet to elapse before anything like the well-defined specialism of modern times was to become an established fact.

CHAPTER XI

ASCLEPIADES, THE INTRODUCER OF GREEK MEDICINE INTO ROME

The seventh Ptolemy, Ptolemy Euergetes or Physcon, whose reign lasted from 146 to 117 B. C., drove all men of learning away from Alexandria and closed the famous schools in that city. It was only a few years after these events, and at a time when that city was fast losing its supremacy as the great centre of medical learning,[1] that there appeared at Rome a Greek philosopher and physician who was destined to become the founder of a new set of medical ideas and of a new kind of medical practice. Being

[1] After Alexandria first came under Roman rule (about 30 B. C.) membership in the Museum was granted to athletes and other men of no education, and it is said that even before that time Ptolemy Euergetes, who had reopened the schools during the latter part of his reign, bestowed some of the important positions upon men who were simply his favorites. The library of the Museum was seriously damaged by fire at the time when Julius Caesar was being besieged in Alexandria by the inhabitants of that city, and was at last wholly destroyed by Amrou, the Lieutenant of the Caliph Omar, in A. D. 651. The truth of this extraordinary tale regarding the burning of books belonging to the library at Alexandria in the seventh century is seriously doubted by Sismondi (*Histoire de la Chute de l'Empire Romain*, Vol. II., p. 57). "It was," he says, "published for the first time, by Abulpharagius, about six centuries after the event is supposed to have occurred. And yet the contemporaneous national historians, Entychius and Elmacin, make no mention of it whatever. An act of this nature, furthermore, would be in direct conflict with the precepts of the Koran and with the profound respect which the Mohammedans habitually entertain for every scrap of paper on which the name of God happens to be written."

Under the later rule of the Romans, Alexandria regained a good deal of its literary importance and also became a chief seat of Christianity and theological learning; but as a centre of medical influence its glory had long since departed.

a man of general cultivation and attractive personality, and not afraid to encounter the prejudices and ill will which almost always greet a foreigner when he first establishes himself in a strange country and among a people of a different race, he soon overcame those obstacles and was eventually successful in making Rome the starting-point and centre of the best medical thought and practice of that period of the world's history. To understand clearly, however, the character of the work which Asclepiades accomplished in the city which was soon to be the capital of the world as then known, it is desirable that a brief account should be given of the condition of medical affairs in Rome at the time of his arrival.

The Practice of Medicine at Rome During the Century Immediately Preceding the Christian Era.—Foreigners were not encouraged to settle in Rome until toward the latter part of the second century B. C., and consequently the treatment of the sick in that city maintained its distinctly Roman character for an unusually long time. In the households of the better classes the head of the family commonly prescribed for any illness which might befall its members. In not a few instances one of the slaves—who was known as a *servus medicus,* and who might perfectly well have been a regularly educated Greek physician—took charge of the patient in place of the master of the house. A book of domestic remedies was the usual source of information from which the latter derived his knowledge of therapeutics. Marcus Porcius Cato, the distinguished Roman censor (234-149 B. C.), was the author of one of the most popular of these books of recipes. The text of this work has come down to our time. There were, at this period, no regularly established physicians and no such thing as a medical practice. For several hundred years the Romans were almost constantly at war with the neighboring tribes or nations, and this life of outdoor exposure and active exercise kept them free from the numerous and very varied bodily ills of the later generations. This state of society alone was quite sufficient to prevent the thoroughly trained physicians of Greece and

Alexandria from settling in Rome. But there were still other forces at work which greatly delayed their taking such a step, viz., the unwillingness on the part of the authorities to grant to foreigners the rights of citizenship, and the very strong prejudice which the Roman aristocracy cherished with regard to the Greek nation. Some idea of the strength of the latter feeling may be gathered from the letter which Cato the Censor, perhaps the most influential citizen of Rome at that time, wrote to his son Marcus. Daremberg gives the following quotation from this epistle: "The Greeks are a perverse and unteachable race. Believe that an oracle is speaking to you when I say—Every time that the Greeks bring to us some branch of knowledge they will not fail to corrupt our manners; and it will be far worse for us if they should send us their physicians, for they have bound themselves by an oath to kill all Barbarians by the aid of medicine—and they have the insolence to reckon us also as Barbarians. Remember that I have forbidden you to call in a physician." Daremberg adds: "The old man Cato must have been very simple-minded to believe for a moment that physicians would be such egregious fools as willingly to kill the patients from whom they derive their support." But even this strong prejudice on the part of the Roman aristocracy had to give way in course of time to forces of a much stronger character. During the second century B. C., the Romans, no longer fearing the encroachments of their warlike neighbors and having overcome all danger of an invasion on the part of their once powerful Carthaginian foe, entered upon a career of conquest. The capture of an ever increasing number of cities and towns in Greece, Asia Minor, Egypt and Africa brought great wealth to Rome, and, with it, increasing luxury, an increase in the prevalence and variety of diseases, and an increased need of men who were competent to deal successfully with such diseases. The physicians who first attempted to meet this need were men of an inferior stamp, to whom the situation appeared simply to afford an excellent opportunity for making money; and very naturally they failed to gain the respect and confidence

of the better citizens. At a later date Julius Caesar, who was, at that time, Consul (about 90 B. C.), extended the right of citizenship to all foreign physicians who were practicing in Rome, and thus was removed one of the greatest obstacles which prevented the better class of Greek medical men from settling in that city.

More than a hundred years before the time of which I am speaking (*i.e.*, about 218 B. C.), a Greek physician named Archagathus had the courage to take up his abode in Rome. He was the son of Lysanias, a native of Peloponnesus. At first he appeared to gain the favor of the community in which he practiced, for they bought and placed at his disposal a shop, or office, in the cross-way of Acilius, and gave him the name of *vulnerarius*—healer of wounds. Later, however, they disliked his rather too free use of the knife and the actual cautery, and thereafter he was spoken of as the *carnifex,* or executioner. Medicine was thus brought into disrepute and we hear nothing further about physicians in Rome for more than a century—that is, until about 90 B. C., when Asclepiades,[1] a native of the city of Prusa, Bithynia (northwest part of Asia Minor), made his appearance in that city. At first he taught rhetoric, but, finding this occupation unprofitable, he began the practice of medicine. Pliny says that he acquired a knowledge of this art through the studies which he carried on after his arrival in the city of Rome, but Neuburger makes the statement that he began the study of rhetoric, philosophy and medicine in his youth and then spent some time in perfecting his knowledge at Parion, a city of Mysia on the Hellespont, at Athens, and probably also at Alexandria.

As a practitioner Asclepiades appears to have met with unusual success. He was well educated and possessed of agreeable manners, and was the friend as well as the physician of Cicero, one of the most polished men of whom history furnishes us any knowledge. He was also on terms of intimacy with Atticus and other eminent citizens of

[1] Asclepiades was not a descendant of Aesculapius, as one would naturally infer from the name which he bore.

Rome. The possession of such friends was more than sufficient to render him one of the favored and prosperous physicians of his day in that city. As Meyer-Steineg aptly says, "he owed not a little of his success to the happy manner in which the scientist, the clever physician, and—to a slight degree—the charlatan were combined in his character." The following anecdote which is told of him by Lucius Apuleius shows, on the one hand, that he possessed remarkably keen powers of observation, and, on the other, that there were some grounds for the charge that his behavior was at times somewhat theatrical in character:—

> One day, as Asclepiades was returning to the city, from his place in the country, he observed the approach of a long funeral procession. Desiring to learn whether the deceased was a person of his acquaintance, and also in the hope of perhaps gaining other information of a professional nature, he approached as nearly as possible to the bier. The face of the corpse was anointed with sweet-smelling ointments over which spices had been sprinkled; but, notwithstanding this, he was able to detect certain signs which led him to suspect that the man might not yet be dead; and accordingly he examined the body very closely and thus satisfied himself that such was indeed the fact. Whereupon he called aloud that the man was still alive, and told the bearers to extinguish the torches, to carry away the materials for the pyre, and to remove the funeral feast from the grave to a table. Some at once objected to the carrying out of these measures and made sarcastic remarks about the healing art—probably because they were already in possession of the man's estate, and were afraid that they might have to give it up. The more influential ones, however, insisted that the physician's words should be heeded. Then Asclepiades, notwithstanding the opposition which was made by the relatives, succeeded in securing a brief delay, during which he had the supposed corpse removed to his own house. Restorative measures were employed, respiration was re-established, and the man was brought back to life. At the succeeding festivities unlimited praise was bestowed upon the wise physician.

Whether this tale, which I have copied from Neuburger, is true or not, it seems to fit in well with the bold and

independent character of Asclepiades as it is revealed to us by the different writers of the history of medicine. In his comment upon this narrative the distinguished Viennese historian makes the remark that Asclepiades was very conceited, and—like most reformers—showed a disposition to ignore the work accomplished by his predecessors. He also expresses the belief that Asclepiades possessed a leaning toward the methods of the charlatan; the episode just narrated revealing a love for theatrical display in his professional activity. On the other hand, in the further course of the chapter which he devotes to this famous Roman physician, Neuburger gives fuller recognition to the value of the services which he rendered to medicine, and thus, in the light of these services, one is justified in overlooking any little weaknesses of character which he may have displayed. Perhaps the most important of the services which Asclepiades rendered was that of having introduced Greek medicine into Rome—an important connecting link in the transmission of medical knowledge from Greece to Modern Europe.

The Views of Asclepiades with Regard to Physiology and Pathology.—The human body, according to the philosophy of Asclepiades, is composed of atoms—that is, small bodies which are invisible, have no definable quality, are in continual motion, through mutual pressure undergo modifications in form, and break up into innumerable smaller fragments or particles that differ both in size and in shape. The arrangement of these small bodies is such that intercommunicating spaces or pores are left between them, and through these channels flows a sap or juice containing larger and smaller particles; the larger ones composed of blood, and the smaller of vapor or heat. Health, according to Asclepiades, is that state in which the primitive atoms are properly distributed or placed and the flow of the juices in the pores takes place normally. When, however, the flow is arrested and the primitive atoms are disordered in their relations to each other and to the pores, or when the elements composing the fluid contents of the latter become mixed, disease results. Alterations in the

pores themselves, as contradistinguished from the fluid contained within them, may also cause disease. Farther on, when the proper time arrives for considering the sect of the Methodists, I shall have occasion to discuss this subject again, and particularly that part of it which relates to pathology. In the meantime, however, I cannot resist the impulse to say a few words about the remarkable insight possessed by Asclepiades into the manner of construction of the human body, as manifested by this very brief but very significant anatomical and physiological description. Upon a first reading one might easily get the impression that Asclepiades has reference to only one kind or system of "pores" or channels—viz., such as serve for the circulation of tissue juices alone. But, upon a closer scrutiny of the text, one finds some warrant for suspecting that he had in mind more than one system of such channels; for he states distinctly that the fluid circulating in these pores contains larger particles composed of blood and smaller ones which consist of vapor (*spiritus*) or heat. The question suggests itself: Could a man who had no knowledge of Harvey's discovery, who did not possess a microscope, and who at the same time believed—as did all the ancients—that air circulated in the arteries and blood in the veins, come any nearer to the actual truth than did Asclepiades? His description needs very few alterations and additions to make it fit correctly the system of terminal arterio-venous channels known to-day as arterioles and capillaries.

Methods of Treatment Adopted by Asclepiades.—The prevailing methods of treating diseases in Rome were not approved by Asclepiades, and he lost no opportunity of giving expression to this disapproval. In the first place, he protested vigorously against the practice of prescribing on every possible occasion purgatives and remedies capable of producing vomiting. He had a decided preference for gentler measures, his idea being that a physician should cure his patients *tuto, celeriter, et jucunde*—safely, quickly and agreeably. Le Clerc adds that this is a fine sentiment, but that its realization in actual practice is something

which most physicians find it very difficult to attain. Asclepiades condemned strongly the employment of magical remedies, a practice which was still much in use at that time in Rome, although it was already less common than it had previously been. Cato's collection of household remedies contains a short list of some of these appeals to man's superstition.[1] In addition to the remedial measures mentioned above, Asclepiades placed his chief dependence on the following: abstinence from meat; the employment of wine under certain well-defined circumstances; massage and frictions; baths of different kinds (it is said that he devised a great variety); walking; driving and being carried about in the open air in a litter or in a boat on a quiet river or in the protected harbor. One of his remedies in the case of sleeplessness consisted in having the patient placed in a suspended couch which could easily be rocked from side to side. As all these measures were agreeable and could at the same time easily be employed by almost everybody, they met with general favor, and in consequence Asclepiades was looked upon by the Romans as "a person sent from heaven." As a rule, he recommended the drinking of simple water, but in certain cases (to be mentioned farther on) he did not hesitate to advise the taking of wine in moderation. He advocated tracheotomy, in cases of inflammation of the throat, in preference to the then prevailing practice—both very painful and quite difficult to carry out—of introducing a tube of some kind as a means of opening a passage for the entrance of air into the lungs.

Le Clerc quotes Galen as authority for the statement that Asclepiades, who never hesitated for an instant to criticise the different therapeutic procedures of his predecessors,

[1] It would not be easy to fix, even approximately, the date when remedies of this character ceased to find acceptance in the popular mind of Europeans, but there can be no doubt that they were employed rather frequently even as late as during the eighteenth century;—indeed, measures that strongly smack of superstition are now and then looked upon with favor by the well-educated members of our modern society. For many centuries, however, they have been abandoned by all physicians excepting those who are unworthy to bear that honored title.

did not go so far as to condemn wholly the practice of bloodletting. Indeed, he was quite ready to employ it in the treatment of painful affections because, as he claimed, the pain was caused "by the retention of the larger particles or atoms in the pores or channels of the tissues, and hence—as these particles were composed of blood—bloodletting was the only remedy capable of setting them free." Thus, he resorted to bleeding in pleurisy, because this affection is characterized by pain; but he abstained from employing the remedy in "peripneumonia" or "inflammation of the lung," because in most cases it is not accompanied by pain; and he also did not approve of its employment in inflammation of the brain (*phrenitis*). On the other hand, he advocated bleeding in epilepsy and all forms of disease in which convulsions occurred, and he also advocated it in cases of hemorrhage of every description. Quinsy sore throat was another malady in which he drew blood freely from the veins of the arm, of the temple and even of the tongue; and in addition, when the disease was severe, he scarified the skin at suitable spots and applied cups to the part. In all these measures his purpose was "to open the pores"; and when this treatment failed he incised the tonsils or the uvula, and even, as a last resort, performed laryngotomy or tracheotomy. In cases of dropsy he employed *paracentesis abdominis,*—that is, he made a very small opening in the abdominal wall to serve as an outlet for the fluid contained in the peritoneal cavity. From these facts it is evident that Asclepiades did not always abide by his rule not to use any but very gentle remedies.

Asclepiades showed, in his manner of treating still other pathological conditions, how different was his practice from that of his predecessors. In the first place, he was very partial, as has already been stated, to such extremely mild forms of physical exercise in the open air as one can obtain from driving or from being carried in a litter or a boat. He prescribed these measures, not merely for convalescents but also for those, for example, who were still in the midst of an active fever. His idea was, that by means of such

very gentle forms of exercise the pores would become less clogged and would permit the juices of the body to flow more freely. In cases of dropsy, also, he was in the habit of employing friction for precisely the same purpose. He even used this remedy in cases of inflammation of the brain, in the expectation that he might thereby induce sleep for these patients. Indeed, this subject of frictions was one on which Asclepiades wrote at greater length than on any other remedial agent.

It is a surprising fact that, in common with Erasistratus, he taught the doctrine that physical exercise was not at all necessary to persons in normal health. At the same time he approved of it, when carefully graded, for those who were affected with bodily ills of a certain nature.

Wine was another remedy which Asclepiades was fond of prescribing in all sorts of maladies, but his rules in regard to the manner in which it should be employed were quite different from those adopted by his contemporaries. A few illustrations will suffice to show the different conditions for which he was wont to advocate the taking of wine: He gave it, for example,—though probably much diluted with water—to patients affected with fever, but only after the stage of greatest activity had been passed. Strange as it may appear to-day, he was rather in favor of giving to patients ill with inflammation of the brain (*phrenitis*) wine in sufficient quantity to produce intoxication; his belief being that he could in this way induce drowsiness and eventually sleep—a thing so desirable for those affected with that disease. Further, he instructed sufferers from catarrh to drink twice or three times as much wine as they usually drank, in consequence of which instructions the patients found it necessary to dilute their wine with water to a less degree than usual—that is, to such a degree that the proportion would be one-half of each; thus showing, as Le Clerc remarks, how sober the ancients must have been when they were in perfect health. They probably—he adds—drank their wine ordinarily in the proportion of five-sixths water to one-sixth wine, or, at most, three-quarters water to one-quarter wine.

In some cases Asclepiades prescribed the drinking of wine (particularly the wine of Cos) to which sea-water had been added; his idea being that the addition of salt would enable the wine to penetrate farther into the tissues and thus open the pores more freely. This idea of added salt was not original with him, for Pliny states that in certain parts of Greece it was customary to place casks filled with new wine in the sea and to leave them there for some time. The wine, it was claimed, was rendered by this procedure mature and pleasanter to drink. They called wine thus treated "Thalassite wine" (from the Greek word "thalassa," sea). In cases of jaundice he occasionally recommended the drinking of plain sea-water, whereby the bowels were stimulated to act more freely. Under ordinary circumstances he employed, for the relief of constipation, clysters, but he was sparing in their use.

The remedial measures enumerated above, together with dieting, are those upon which Asclepiades chiefly relied in his practice. In acute diseases he made very little use of drugs that were to be taken internally, but in maladies of a chronic character he employed them quite freely. Gargles, poultices and inunctions are mentioned among the external remedies which he often prescribed.

Further Particulars Regarding the Life and Career of Asclepiades.—Le Clerc furnishes a number of details which throw additional light upon the career of Asclepiades. During the latter's lifetime his professional reputation was very great. Lucius Apuleius, the famous Roman satirist and rhetorician, and a contemporary of Asclepiades, calls him the Prince of Physicians, second only to Hippocrates the Great; Scribonius Largus, a Roman physician and writer, who flourished during the reigns of the Roman emperors Tiberius and Claudius (37-54 A. D.), speaks of him as a great medical author; Sextus Empiricus, a writer remarkable for his learning and acumen, who lived in the first half of the third century A. D., calls him a physician of unrivaled skill; and Celsus, who is termed the Cicero of physicians, on account of the purity of his Latin, holds him in high esteem as a medical authority. His fame as a

physician had spread to Asia Minor, for we are told that Mithridates, King of Pontus, who reigned from 120 B. C. to 63 B. C., and who was a man of great ability and great energy, invited him to take up his residence at his court; but Asclepiades refused. Perhaps a still stronger evidence of his real worth as a man is to be found in the fact that he was the physician and personal friend of Cicero.

Notwithstanding these strongly favorable estimates of the ability of Asclepiades there were not a few men, and they too men of great authority, who were indisposed to give him so conspicuous a place in the temple of fame. Galen, for example, while admitting that he was a very eloquent physician, maintained that he was a sophist, given to quibbling, and disposed to contradict everybody. Caelius Aurelianus, a contemporary of Galen and the author of the most important practical treatise on Methodism that has come down to our time, appears to have held the same opinion as Galen with regard to Asclepiades. The complete disappearance of all the writings of the latter author makes it impossible for us at the present time to form an independent judgment as to the merits of these conflicting estimates of the man's character. Galen was a great admirer of Hippocrates and it is very likely that he took offense at the failure of Asclepiades to accept all the teachings and therapeutic methods of his hero. As to the reasons which led Caelius Aurelianus to agree with the estimate made by Galen, we know absolutely nothing.

Toward the middle of the seventeenth century there was discovered at Rome, not far from the Capena gate, a portrait bust in white marble of Asclepiades. It was probably executed by a Greek sculptor residing in Rome, for, if the work had been done in Greece, the face would have been represented with a beard, as are the heads of Hippocrates, Soranus and other celebrated physicians of antiquity. The absence of the beard, furthermore, shows—according to the opinion of antiquarian experts—that the bust must have been sculptured before the time of the Emperor Claudius (41-54 A. D.), as he was the first of the Caesars to wear a beard. This bust, which is a little larger

than life size, is at present—if I am rightly informed—in the Capitoline Museum at Rome.

Asclepiades lived to a great age. In descending, one day, a flight of steps he fell and received injuries from which he died.

CHAPTER XII

THE STATE OF MEDICINE AT ROME AFTER THE DEATH OF ASCLEPIADES; THE FOUNDING OF THE SCHOOL OF THE METHODISTS

In summing up the effects which were produced by the teaching and practice of Asclepiades upon the science and art of medicine, Dr. Meyer-Steineg makes the remark that the wide and ready acceptance of both depended largely upon the personal character of the man, upon the manner in which he carried out the measures which he advocated, and upon the fact that the Romans happened at that period of their history to be ready to respond favorably to such new doctrines and therapeutic methods; but that, as soon as his strong personality had ceased to exert its influence, as it did after he had passed the active period of his life, and also because Rome did not at that moment possess any physicians who were sufficiently endowed with his medical gifts and sagacity to perpetuate his art, both it and his doctrines began to lose ground. Nevertheless, as this writer states, Asclepiades had already succeeded admirably in preparing the way for a further development of the healing art, and for this valuable service full credit should be given him.

Not long after the death of Asclepiades, Antonius Musa,[1] the personal physician of the Emperor Augustus, succeeded, by means of hydrotherapy, in curing his royal patient of a protracted gouty or rheumatic affection from which he had been a sufferer; and, as a mark of gratitude for the cure which he had effected, the Emperor raised him

[1] Neither Haller nor Dezeimeris furnishes any biographical information with regard to Musa.

to the rank of a noble (about the year 10 A. D.), erected a statue in his honor in the temple of Aesculapius, and at the same time issued a decree that from that time forward the physicians who practiced in Rome should be exempted from taxation and from certain other civic burdens. These privileges, which were afterward confirmed by Vespasian (70-79 A. D.) and also by Antoninus Pius (138-161 A. D.),[2] were of great advantage to the medical profession as a whole. Julius Caesar (100-44 B. C.), it will be remembered, had already (about half a century earlier) bestowed Roman Citizenship upon the physicians who practiced their profession in that city. Thus, at the time of which we are now speaking, the medical men of Rome occupied the enviable position of being on an equality with their fellow citizens of the better class, a position which made it attractive for young men of ability and of good social standing to enter the profession.

Among the numerous followers of Asclepiades the most distinguished was undoubtedly Themison of Laodicea, a city of Phrygia, Asia Minor, who flourished about the middle of the first century B. C. When he was well advanced in years he wrote a medical treatise in which he developed a system of pathology and therapeutics that was accepted as the professional creed of the sect known as "Methodists." Starting from the doctrine of pores and primitive atoms taught by Asclepiades, he laid great stress upon the idea that in disease all the alterations which take place in the tissues may be classed in one or the other of these two categories—a relaxation (*laxum*) or a contraction (*strictum*) of the parts. To these two categories, which the Methodists termed "communities," and which were the only ones at first accepted as a part of their creed, a third was soon added, viz., that condition in which both relaxed and contracted states appear side by side, although not necessarily both of them developed to the same degree;

[2] Antoninus Pius, however, established the rule that these privileges were not to be granted to all physicians indiscriminately, but only to a limited number; and, later still, it was decided that only the parish physicians were entitled to receive them.

and to this third category or "community" they applied the term "*mixtum.*" The ideas which are here stated in a somewhat crude and imperfect manner owing to my lack of knowledge of all the facts, constitute the basis of the pathology of the "Methodists"—a pathology which held its own in the domain of medicine during a period of four hundred years, and which—in contradistinction to the humoral pathology of Hippocrates—is justly entitled to the name of "solidist pathology." This doctrine, as might be expected, underwent certain modifications during this long period of time, but they were not serious enough to alter materially the fundamental form of the teaching as it has here been described.

Themison and his followers, like their distinguished predecessor, Asclepiades, possessed something more than a mere glimmering of the truth in pathology as we know it to-day; and this idea suggests the further thought that Morgagni, Rokitansky, Lebert, Virchow and perhaps others whose names do not now occur to me, could scarcely have developed a better pathology if they had lived during these first centuries of the Christian era—a period of time when public sentiment did not permit postmortem examinations, when Harvey's discovery was not even dreamed of, when the microscope was unknown, and when experimental pathology was an impossibility. Many centuries had still to elapse before medicine could gain that freedom of action, that rich equipment of tools, and that stock of accumulated knowledge which enable her in these days to make such giant strides forward as we have witnessed during the past twenty or thirty years.

The question will naturally arise, How did the Methodists decide, in the presence of an actual case of illness, which one of these abnormal states (the laxum, the strictum, or the mixtum) was the condition that called for medical treatment? The answer which they gave to this question was, that the condition of the different secretions and the dejections furnished the principal indication as to what particular part or organ of the body was ailing, and also as to what was the nature of the morbid change or process

that produced the malady. When, for example, the secretion from an organ or part was excessive, they inferred that the pores of such a part were relaxed and distended, thus permitting an increased flow; and when the secretion was less than it should be, they decided that the pores were contracted. The *status mixtus* had reference to those cases in which a condition of relaxation was observed in one part of the body, while that of contraction was noted in another.

Neuburger mentions the fact that the Methodists were somewhat arbitrary in their classification of the different diseases, most of the acute maladies being placed by them under the heading *Status strictus*, while they assigned the majority of the chronic affections to the category of *Status laxus*.

The effect of the tendency of the Methodists to classify and simplify all the departments of medicine was not wholly beneficial. It conveyed to many the impression that medicine might readily be learned in the course of a few months, and thus offered the temptation to inferior men to choose the career of physician; and yet, on the other hand, it infused into the art the essentially Roman characteristics of orderliness, simplicity and efficiency. Anatomy, for example, was studied only so far as a knowledge of this department of medicine was necessary to render the physician familiar with the location, general character and relations of the different organs. There was one field, however, in which the adherents of this school displayed a high degree of excellence, viz., in their descriptions of disease; and this is especially true of those written by Caelius Aurelianus (fourth century A. D.), whose manner of handling the subject of differential diagnosis is far more thorough and satisfactory than that of any of the medical authors who preceded him.

In their treatment of disease, the Methodists were largely guided by the principle of *contraria contrariis,—i.e.,* in those cases in which, to the best of their belief, a *status laxus* existed, they administered astringents, in the hope of thereby bringing the parts back more nearly to a contracted condition; and, *vice versa,* when the diagnosis

of *status strictus* was made, they gave a relaxing medicine. The terms "laxatives" and "astringents," which are still applied to many drugs, were originated by the Methodists. Bloodletting, for example, was one of the remedies which they used for producing relaxation, and an astringent was employed when a contrary effect was desired. In the list of relaxing remedial agents (aside from bloodletting) were placed the following: warm baths, poultices, inunctions with warm oil, vapor baths, fasting and a restricted diet, diuretics (very carefully watched and employed only in exceptional cases), emetics, diaphoretics and laxatives. The following agents, on the other hand, were classed as contracting, astringent and tonic remedies: washing with cold water, cold baths, the application of cloths dipped in cold water, living in cold air, strengthening diet, wine, vinegar, alum, narcotics, etc. Themison, it should be added, is the first one among the ancient writers to mention the use of leeches as a means of extracting blood. It does not follow from this, however, that he was the discoverer of this method of local bloodletting; for it is highly probable that this procedure had been in common use for many years previous to his time.

Themison, as I have before stated, was an old man when he laid the foundations for Methodism, and it is not probable that it attained much importance as a sect until several years after his death. Then Thessalus, a native of Tralles, a flourishing commercial city of Asia Minor, and a man who had received his medical training in one of the Greek schools, materially added to the body of doctrines held by this sect, and at the same time rendered them more acceptable to physicians generally. He was of humble birth, the son of a wool carder, and his education had been rather neglected; but he nevertheless managed, by his own efforts and in no small degree by the unlimited self-confidence (Galen calls it impudence) which he possessed, to push his way to the top of the ladder.[3] He acquired a

[3] It seems almost unnecessary to call attention to the fact that the subject of these remarks is not to be confounded with Thessalus, the son of Hippocrates.

large fortune during the reign of Nero (54-68 A. D.) and apparently succeeded in persuading this monarch that he was a great physician. Here are some facts which appear to justify Galen's dislike for Thessalus: In a letter to Nero the latter writes: "I have founded a new medical sect, the only genuine one in existence. I was forced to do so because the physicians who preceded me had failed to discover anything that is likely to promote health or to drive away disease; even Hippocrates himself having laid down doctrines which are positively harmful." His vanity, according to Le Clerc, reached such a pitch that he called himself the "conqueror of physicians."[4] Pliny corroborates the latter statement in the following words: "When he assumed the title of 'conqueror of physicians,' a title which was engraved, according to his instructions, on his tomb in the Appian Way." Notwithstanding his unbounded conceit, Thessalus appears to have made several important improvements in the doctrines of the Methodists. He is also, as it appears, entitled to the credit of having been the first to inaugurate the practice of giving systematic instruction at the bedside; thus establishing for all time a most valuable precedent for the guidance of his successors.

"He was an excellent practitioner and an original thinker. . . . . He was also a prolific writer, as is shown by the number and variety of treatises which—as we are assured by Caelius Aurelianus—were composed by him." The same authority speaks of him as "a leader among our chiefs," thus affording good evidence of the degree of esteem in which he was held by the members of his own school. The fact that pupils came in throngs to be taught by him shows clearly how thoroughly he understood the needs of the physicians of Rome. (Meyer-Steineg.)

Thessalus, notwithstanding his declaration that medicine might readily be taught in six months, wrote a larger number of treatises on professional topics than any student of medicine could possibly read and digest in the course of

[4] Ιατρονίκης is the word employed in the original Greek.

two or three years. They filled several large volumes, but not one of them is known to exist to-day. He wrote at great length, as we are assured, on the subject of surgery, a subject in which he took an active interest. He taught that ulcers, no matter in what part of the body they may be located, require the same kind of treatment.

> If an ulcer is excavated, it is necessary to bring about a filling-up of the excavation; if its surface is on a level with the surrounding skin, the aim should be to make it cicatrize; if the growth of new tissue is excessive, the redundant portion should be destroyed by burning with caustic; and, finally, if the ulcer is of recent development and bleeds readily, the attempt should be made, by approximating the edges, to effect an immediate healing.

In the treatment of chronic ulcers which show little or no disposition to heal, and which, when they do finally heal, are very prone to break open afresh, Thessalus urges the great importance of ascertaining, if possible, the cause or causes of this behavior. If it be found that the trouble is due to some weakness or abnormal predisposition of the part in which the ulcer is located, or that the condition of the entire body is probably the real cause of the trouble, he recommends the employment of "metasyncritic remedies"—that is, remedial measures which effect a marked change in the individual's vital processes throughout the body, and also such as exert an alterative effect upon the ulcer itself. Among the measures of the first class he enumerates the following: Various forms of physical exercise; alternately increasing and diminishing the amount of nourishment taken; and perhaps the taking of an emetic at the very commencement of the treatment. As to the second class of measures—those needed to bring about a change in the ulcer itself—he makes the following recommendations: Remove from the diseased tissues as much as will restore the parts, as nearly as possible, to the condition of a healthy wound, and then adopt the treatment suited for the latter condition. In cases in which the ulcer heals and then subsequently breaks open again, it will

sometimes be found beneficial to apply in the neighborhood a plaster containing an irritating substance like mustard, the effect of which is often to change the disposition of the parts. In actual practice he recommends that the local measures should be employed first, and then, if they fail to accomplish the desired purpose, the physician should have recourse to those enumerated in the first class—the strictly metasyncritic remedies.

It is rather difficult to believe that a man so full of conceit and so unjust in his criticisms of his predecessors as Thessalus clearly was, could be capable of formulating such a concise statement of the nature of chronic ulcers and such a practical rule for their proper treatment. His development of the idea of "metasyncrisis"—or renovation of the body (*recorporatio*), as Caelius Aurelianus translates the word—seems to have been original with Thessalus.[5] The Methodists, it should be added, deserve special credit for having been the first to introduce and carry into effect the systematic treatment of chronic diseases; and, as a general proposition, it may be said that their treatment of all forms of disease was thoroughly practical, free from all tendency to resort to magical methods, and based largely on the employment of such hygienic measures as the use of baths of different kinds (hydrotherapy), massage, moderate outdoor exercise, passive movements, sea voyages, fasting, regulation of the diet, etc. One of the favorite practices—of which Thessalus was said to have been the originator—was to begin the treatment of almost all maladies by prescribing an abstinence from all food for a period of three full days. When I come to speak of Soranus and Caelius Aurelianus I shall probably have occasion to give further details regarding the methods of treatment employed by the Methodists.

As a system, says Neuburger, Methodism was not capable of inaugurating any fundamental advances in medicine; the most that it was able to accomplish was to broaden and

[5] The word "metasyncrisis," as we are assured by Le Clerc, was employed first by Cassius, one of the earlier disciples of Methodism, and then, long after the time of Thessalus, by Galen, Oribasius, Aëtius and Paulus Aegineta.

otherwise improve the domain of therapeutics, and some of its wiser members were diligent in collecting and sifting critically a large number of valuable experiences, which were then courteously registered by them to the credit of the sect.

CHAPTER XIII

THE FURTHER HISTORY OF METHODISM AT ROME, AND THE DEVELOPMENT OF TWO NEW SECTS, VIZ., THE PNEUMATISTS AND THE ECLECTICS.—A GENERAL SURVEY OF THE SUBJECT OF SECTS IN MEDICINE

Among the Methodists there were many physicians who attained more or less distinction during their professional career, but only two of them, beside those whose contributions to medical knowledge have already been mentioned in these pages, gained sufficient celebrity to justify me in devoting some additional space to the description of the work which they accomplished. Soranus, of Ephesus on the coast of Asia Minor, and Caelius Aurelianus, of Sicca in the north of Africa, are the physicians to whom I have reference.

It was Soranus, says Le Clerc, who gave the finishing touches to the system of the Methodists, and the work which he did was of such excellence that he may with justice be called the ablest and most skilful of all the members of that school. Caelius calls him "a chief among the leaders of our sect." He received his medical training at Alexandria and came to Rome about the year 100 A. D. His professional career covered the period corresponding to the reigns of Trajan and Hadrian (98-138 A. D.). He is known to posterity chiefly through his two treatises—one on obstetrics and gynaecology and the other on acute and chronic diseases. The first of these treatises, in the original Greek, was rediscovered in 1838 by Reinhold Dietz, Professor of Medicine in the University of Königs-

berg, Prussia, and a German translation of the work (by Lüneberg and Huber) was published in Munich in 1894. Moschion, who was probably a pupil of Soranus, wrote a popular treatise on the same subject for the use of midwives, and in this book he has reproduced much of the material which is to be found in the work of his master. The treatise written by Caelius Aurelianus on acute and chronic diseases is admitted by him to be founded on that which Soranus wrote on the same subject. In fact, as Daremberg states, the work of the former represents almost a translation (into Latin) of Soranus' treatise. The sources just named are the principal ones from which our knowledge of this author is derived.

Soranus was a prolific writer; the treatises which he wrote and which deal with a great variety of subjects, number thirty in all. The majority of these works, however, have been lost. He had many followers and his influence upon medical science was very great, not simply during his lifetime, but also for several centuries after his death. He commanded the respect and confidence of the opponents of Methodism as well as of the members of his own sect. One of his most pronounced traits of character was his readiness to condemn, on every possible occasion, superstitious practices, such as the employment of amulets, magnets, etc. He was also a very persistent and earnest advocate of the gentler and more rational obstetric methods. For example, he disapproved of the reckless employment of remedies for hastening the expulsion of the foetus, of the practice of succussion (which was carried out by the aid of a ladder), of making the pregnant woman run up and down stairs, of a resort to rough mechanical procedures for extracting the placenta, etc. The following quotation from one of Soranus' treatises (Gynaeciorum, Lib. I., cap. 19) reveals clearly what sort of a man and physician he was:—

> There is a disagreement; for some reject destructive practices, calling to witness Hippocrates, who says, "I will give nothing whatever destructive" and deeming it the special province of medicine to guard and preserve what nature generates. Another

party maintains the same view, but makes this distinction, viz.: that the fruit of conception is not to be destroyed at will because of adultery or of care for beauty, but is to be destroyed to avert danger impending at parturition, if the uterus be small and cannot subserve the perfecting of the fruit, or have hard swellings and cracks at its mouth, or if some similar condition prevail. This party says the same thing about preventing conception, and with it I agree.

(Translated from the Greek by the late John G. Curtis, M.D., of New York.)

Soranus was not only a great obstetrician,—admitted by all the authorities to have been the greatest in ancient times,—he was also in high repute for the work which he did in other departments of medicine—in gynaecology, for example, in the instruction of midwives, in the management of children's diseases, in the diagnosis and treatment of both acute and chronic diseases, in surgery, etc. While in general he adhered to the fundamental teachings of the Methodists, he did not hesitate to depart from the beaten pathway of that sect in his explanations of certain pathological conditions; for he was more of a clinical observer than a sectarian, and it was probably his independent manner of thinking that gave the sect new vigor and thus enabled it to live on through such a long period of time. Galen, who was not at all disposed to speak favorably of the Methodists, says that he tried a number of the remedies recommended by Soranus and found them good.

Caelius Aurelianus probably flourished during the third century A. D. The different authorities, however, do not agree as to the limits of the period during which he lived; some saying that his career antedated that of Galen, while others claim that he came upon the scene after the death of the latter, which occurred early in the third century A. D. His chief merit appears to have been that, through his translation of the writings of Soranus into Latin, he placed within reach of the physicians of Rome the teachings of that admirable diagnostician and therapeutist; for it must be remembered that the great majority of the Roman

medical men were not able to read Greek. On the other hand, Caelius Aurelianus, who was himself a thoroughly practical physician, deserves considerable credit for having enriched the text of his book with many very appropriate examples (chiefly with regard to questions of diagnosis) drawn from his own personal experience, which must have been extensive. During the Middle Ages, as we are informed by Friedlaender, this work furnished the chief source from which the monks derived their knowledge about diseases and their proper treatment. The Latin in which the book is written is described by nearly all the authorities as barbaric.

The Pneumatists.—Methodism had been established only a very few years when Athenaeus of Attalia, a city on the coast of Pamphylia, Asia Minor, founded (about 50 A. D.) a new sect—that of "Pneumatism." He was not the discoverer of the "pneuma" or "vital spirit," for that had already been admitted by the earlier schools of philosophy as a fifth primary creative element, supplementary to the four well-known substances—fire, air, earth and water. He believed that heat, cold, moisture and dryness (the primary qualities of these four bodies) were not the veritable elements of living beings. Heat and cold, he maintained, were "efficient causes" and moisture and dryness "material causes." To these he added "spirit" as a fifth element; and he taught that this spirit enters into the formation of all bodies and preserves them in what may be termed their natural state. It was from the Stoics, more particularly, that Athenaeus borrowed this belief, and it was the latter fact, as Le Clerc says, which led Galen to speak of Chrysippus—one of the most famous of the Stoics—as "the Father of the Sect of the Pneumatists."

In his application of the doctrine of Pneumatism to the science of medicine, Athenaeus maintained that the majority of diseases owed their origin to some disturbance or disorder of the spirit; but it is almost impossible to understand, from the scanty data which have come down to us, what Athenaeus really meant by the term "spirit," and by the expression "disorder of the spirit."

From the definition which he gives of the word "pulse" one is justified in drawing the conclusion that he considered the spirit to be an actual substance, capable of undergoing, to a greater or less degree, such changes as expansion and contraction. The same obscurity of meaning is encountered when one endeavors to discover how the new doctrine affected the practice of medicine. (Le Clerc.)

In view of all these circumstances it is not at all surprising that Pneumatism was not very popular with the physicians of Rome, and that, after a brief period had elapsed, many of the adherents of this doctrine abandoned it and gave their preference to the more practical teachings of the Methodists. Meyer-Steineg goes so far as to remark that, to all intents and purposes, such a thing as a sect of Pneumatists did not exist.

The most prominent of the disciples of Athenaeus were Theodorus, Agathinus, Herodotus, Magnus and Archigenes.

Haller speaks of Theodorus as the inventor of a remedy which, as he claimed, cures all cases of poisoning.

The Eclectics.—Agathinus, a native of Sparta, was the teacher of Herodotus and Archigenes. His chief distinction is to be found in the fact that he gave to the offshoot from the school of the Pneumatists the name of "Eclectics,"[1] his object being, as we are assured by Neuburger, to bring the three sects (Pneumatists, Empirics and Methodists) into closer union.

Herodotus—who, it is perhaps desirable to state, is a different person from the famous historical writer of the same name—lived during the latter part of the first century A. D., and was more closely allied to the Methodists than to the Pneumatists. It appears from the text of a fragment of one of his treatises that he wrote a description of the disease now called small-pox and directed attention to its contagious character.

Magnus, a native of Ephesus in Asia Minor, is reported

[1] Le Clerc calls attention to the incorrectness—etymologically speaking—of the use of the word "Eclectics" in connection with a school or sect. The members of such a body are not, he says, "the chosen ones" as the term signifies, but "the choosers."

to have been the writer of a collection of letters on medical topics and also of a history of the discoveries made in medicine subsequently to the time of Themison.

Archigenes, the fifth member of this group of Pneumatists, was born in Apamea, Syria, and lived in Rome under the reigns of Trajan (98-117 A. D.) and Hadrian (117-138 A. D.). Le Clerc speaks of him as belonging to the Eclectics rather than to the Pneumatists. This is a matter, however, of small importance, as the sects were, at that period, very much mixed. The poet Juvenal, who was a contemporary of Archigenes, refers to him briefly as a physician who had a large practice; and the historian Suidas says that he wrote a great deal about physics as well as about medicine. That he was esteemed highly as an authority in practical surgery is shown by the fact that Galen, when he discusses surgical topics, makes frequent quotations from the writings of Archigenes. Only fragments of the latter, however, have come down to our time. His popularity as a practitioner was very great; notwithstanding which he managed to write several treatises on a variety of topics—on the pulse, on feverish diseases, on the different types of fevers, on local affections, on the diagnosis and treatment of acute and chronic maladies, on the right moment when surgical operations should be performed, on drugs, and on therapeutic procedures in general. He applied ligatures to blood-vessels and also arrested further bleeding from them by passing needles through the adjacent parts in such a manner as to exert pressure upon the vessel (a procedure which is termed "acupressure"); he operated for the removal of both mammary and uterine cancers; he employed the red-hot cautery iron for the arrest of hemorrhage and also for the relief of coxalgia, and he was familiar with the use of the vaginal speculum.

Antyllus, another prominent surgeon of that period, joined the Methodists at a considerably later date. He was also the author of an excellent treatise on surgery, the greater part of which, unfortunately, has been lost or destroyed.

Aretaeus of Cappadocia, a district of Asia Minor, lived during the second century A. D. He was a man of very broad culture. From the fact that he assigned an important rôle to the pneuma, he is usually classed among the Pneumatists. He does not appear, however, to have taken a very active interest in the doctrines of that school, and both Le Clerc and Daremberg seem disposed to call him an Eclectic, and we may therefore rank him as one of the independent physicians of that period. It is doubtful whether he ever practiced in Rome. His two treatises—one on the causes and means of identifying acute and chronic diseases, and the other on the treatment of these diseases—are written in Greek, and are characterized by the clearness and simplicity of his descriptions, which very closely resemble those of Hippocrates, and by the soundness of the advice which he gives in regard to the methods of treatment.[2] In his conceptions of what a physician should aim to be, Aretaeus maintained a very high standard. Some of his views regarding human physiology and pathology are given here very briefly: Respiration serves the purpose of cooling the warmth of the heart, and the lungs are therefore prompted by the latter organ to draw cool air into their cavities; digestion takes place not only in the stomach but also in the intestinal canal, and owes its origin to warmth; the cerebral nerves, close to the spot from which they originate, cross from one side to the other, and by the aid of this fact paralysis on one side of the body may be explained. Aretaeus has gained considerable fame, says Puschmann, from his description of the "Syriac ulcer," the picture of which he draws agreeing perfectly with what is known to-day as pharyngeal diphtheria. In various places throughout his writings he displays a thorough knowledge of normal anatomy—as, for example, when he describes the ramifications of the vena portae and gall-ducts of the liver. He was also well informed in matters belonging to the domain of pathology, for he gives

[2] Boerhaave, the famous clinician of Leyden, Holland (eighteenth century), was instrumental in having an excellent Latin translation made of this work; and in 1858 a German translation by A. Mann was published in Halle.

admirable descriptions of many of the diseases—for example, pleurisy with empyema, pneumonia, pulmonary consumption, cerebral apoplexy, paraplegia, tetanus, epilepsy, diabetes mellitus, gout, etc. From the character of these descriptions one is strongly tempted to believe that he must have made a certain number of postmortem examinations.

According to Neuburger, Aretaeus enters very fully into details when he discusses the subject of diagnosis; his statements in one place warranting the belief that he even auscultated the heart. His methods of treatment were based largely upon his own experience and were generally of a simple character. He attached great importance, for example, to a very careful regulation of the diet, muscular exercise, massage, etc., and his employment of remedies was confined to a very small number of such drugs as exert a mild action. When the case, however, was of such a character as to call for more vigorous interference, he did not hesitate to resort to the use of opium, emetics, cathartics, venesection, blistering, the red-hot cautery iron, etc.

Rufus, a native of Ephesus, a city of Asia Minor, about thirty-five miles from Smyrna, is reckoned by most authorities among the Eclectics; in other words, he was an independent, or one who adopted from the teachings of the different sects such doctrines as met with his approval, but who, at the same time, did not care to pose as the disciple of any one of them. He received his medical training at Alexandria, but it is not known where he practiced his profession. Almost no details concerning his life or his professional career have come down to our time. It is simply known that he flourished during the reign of the Emperor Trajan (98-117 A. D.). Ebn Ali, an Arabian physician and author, says that he was the leading medical authority of his time and that his works were highly esteemed by Galen. His treatise on anatomy (entitled "The Names of the Different Parts of the Human Body"), which is one of the few that have escaped destruction, is described as a treatise which was written for students, and

which possesses great value for the history of anatomical nomenclature. The same authority says that Rufus was the first to describe the chiasma, that he came very near establishing the existence of two different kinds of nerves—motor and sensory—and that he attributed the control of all bodily functions to the nervous system. He also states that he was one of the first to furnish a description of the oriental bubonic plague. Some idea of Rufus' style of writing may be gathered from the following quotations which have been taken from his short treatise entitled "The Questioning of Patients":—[3]

It is necessary to question the patient, for by so doing one may gather more exact information concerning the nature of the malady, and will then be able to treat it more intelligently. In this way also one may learn whether the patient's mind is in a normal or an excited state, and whether any change has taken place in his physical strength. Some idea regarding the nature and seat of the disease is usually obtained from such questioning. If, for example, the patient answers clearly and to the point, and does not hesitate; if his memory does not play him false; if his speech is not thick or indistinct; if, being a well-bred man, he gives his responses in a polite and cultivated manner; or if, in the case of a person who is naturally timid, the answers reflect this timidity, then you may feel confident that your patient's mind is not affected. But if, on the other hand, you ask him about one thing and he gives you a reply about something entirely different; if, as he talks, he appears to forget what he was talking about; if he has a trembling tongue the movements of which are also uncertain; and, finally, if from a certain state of mind he passes rapidly to one of a totally different character,—all these changes are evidences that the brain is beginning to be affected. . . . . If the patient speaks distinctly and with a fairly strong voice, and is able to tell his story without stopping from time to time in order to rest, the inference is warranted that his physical strength is not materially affected. . . . . .

The following quotation is from his treatise on gout:—

If the patient complains that one of his joints is painful, he should be asked whether or not the part has received a blow. If

[3] Translated from *Oeuvres de Rufus d'Éphèse;* édition Grecque et Française, par Daremberg et Ruelle, Paris, 1879.

he replies that it has not, then (you may infer that the pain is due to gout and) you should forthwith put him on a suitable diet, order a clyster and bleed him at a spot not far (from the seat of the pain). . . . . The withdrawal of nourishment is ordered for the purpose of arresting any further formation of new blood and thus preventing the joints from growing more sluggish in their movements. The clyster is ordered because we believe that it is beneficial (in this condition) to evacuate the bowels. The bleeding will be found useful, but to a less degree in the lower than in the upper limbs. . . . . One must be careful not to assume that the patient is cured when he has been entirely relieved of his pain, because with the lapse of time fresh attacks are liable to occur; this disease, like certain other affections, possesses a periodic character. . . . . Therefore it is well, immediately after the blood-letting, to employ friction, to get rid of the excess of moisture in the body by some laborious form of exercise, to take such articles of food as are easily digested,—in brief, to aim chiefly at reducing as much as possible the moisture of the body.

One cannot but feel a keen regret that so few of the writings of this thoroughly practical and highly educated physician should have come down to our time. So far as I am able to learn, Rufus wrote no fewer than 102 treatises, all of which, with the exception of the seven about to be mentioned (together with a number of fragments preserved by different writers of antiquity) have either disappeared or been destroyed. The titles of the treatises which have been preserved are as follows: (1) Diseases of the Kidneys and Bladder; (2) On Satyriasis and Gonorrhoea; (3) Purgatives; (4) The Names of the Different Parts of the Human Body; (5) On the Questioning of Patients; (6) On the Pulse; (7) On Gout.

A General Survey of the Subject of Sects in Medicine.—During the sixth century B. C.,—that is, about two hundred years before the formation of the more distinctly medical sects of which mention was made in Chapter IX.,—Pythagoras of Samos and his disciples put forward certain beliefs or doctrines with regard to the mode of action of some of the functions or vital processes of the human body, and all those who accepted these teachings as affording a true and satisfactory explanation of the

phenomena in question constituted what is generally termed a school or sect. Some of these individuals were physicians—that is, men who undertook to cure or at least to relieve those who were ill; but probably the majority were simply philosophers, mere "lovers of wisdom," who by studying problems of this nature sought to satisfy their longing for a more perfect knowledge of the truth respecting the various phenomena of life.

A few years later, Heraclitus of Ephesus, who, like Pythagoras, was both a philosopher and a practicing physician, taught the doctrine that all things owe their origin to fire. One is not at all surprised to learn that he had relatively few followers, for history tells us that he was both a misanthrope and a slanderer of the medical profession, as shown by the following saying which is attributed to him: "Next to physicians the grammarians are the biggest fools in the world."

Hippocrates attached much importance to the value of experience and to the necessity of studying disease at the bedside; at the same time he upheld what is commonly known by the name of humoral pathology—a doctrine which refers all maladies to some abnormal change in the humors or fluid portions of the body. His writings also show that he made full use of the reasoning power. The followers of this great physician did not form a sect in the ordinary sense of the term; they were his adherents simply because he was an able diagnostician, a successful teacher, an excellent therapeutist, a skilful surgeon, a man of very high moral character,—in short, a great physician. Every sect which developed in the centuries following his death contained a goodly proportion of Hippocratists.

Nearly two centuries after the active period of the professional life of Hippocrates, Erasistratus and Herophilus gathered about themselves in Alexandria (about 280 B. C.) large groups of followers, who held for their respective teachers a degree of esteem which amounted, according to Galen, almost to veneration. As there was little or no antagonism or lack of harmony between the doctrines taught by these physicians, the two groups can-

not properly be classified among the sects. In fact, it would be more correct to say that Erasistratus and Herophilus contributed facts of permanent value to our stock of knowledge rather than doctrines which might prove highly popular for a few scores of years, but which would probably in due course of time be set aside as no longer of value.

The four most characteristic types of sects in medicine were the following: the Dogmatists—or Rationalists, as Daremberg calls them in one place; their great rivals, the Empirics; the Methodists; and the Eclectics. The oldest sect, the Dogmatists, did not come into prominence until after the medical schools at Alexandria had already been in operation for a long time. The development of the rival sect of the Empirics at this late period brought with it endless discussions regarding the merits of their respective teachings, and thus both of them gained a degree of prominence which seems to us moderns to have been out of all proportion to the importance of the subject-matters discussed. The Dogmatists, says one writer, insisted that it is just as necessary to be acquainted with the "hidden causes" of disease as with those which are plainly recognizable, and that it is only by aid of the reasoning power that we gain some knowledge of this class of causes. They claimed that, while a knowledge of anatomy is of very great service to the surgeon, it usually renders this service through the aid of the reasoning power; as when, in the performance of a lithotomy, the operator selects the fleshy (*i.e.*, vascular) neck of the bladder as the spot in which to make the opening with the knife, in preference to the base of the organ, which is chiefly membranous in structure and therefore less likely to heal solidly.

The plausible but rather shallow response made by the Empirics to the arguments advanced by their rivals consisted in quoting certain maxims, as, for example: "The farmer and the helmsman do not acquire knowledge of their respective occupations from discussions, but from actual practice"; "It is not of vital importance to know what are the causes of the different diseases, but what

remedies are competent to cure them"; and "Diseases are not cured by eloquence, but by remedial agents."

Among the comments made by Celsus with regard to the differences which distinguished the Dogmatists from the Empirics we find the following statement: "The two sects employed the same remedies and pursued very much the same course of treatment, but their reasonings about such matters were different."

Modern physicians will, at first thought, be disposed to wonder how men as clever as many of these physicians were could have split up into separate and more or less antagonistic sects because of such apparently trivial differences of opinion. It must be remembered, however, that these men were groping in comparative darkness whenever they tried to advance their knowledge of pathology, and that in this imperfect light many things seemed of much greater importance than they appeared to be in the brighter light of later centuries. It is only fair, therefore, to withhold criticism and to ask ourselves whether this strong desire on the part of those men to advance their knowledge of pathology—a desire which manifested itself in the formation of sects—was not in reality an evidence of the great vitality of Greek medicine on Roman soil in those early centuries.

The remarks made above with regard to the Dogmatists and the Empirics apply in a general manner to the sects known as the Methodists and the Eclectics, a sufficiently full account of which has been given in the preceding chapter.[4]

[4] The term "dogmatists" is also employed by some authorities to designate those physicians who laid great stress upon the importance of following the teachings of Hippocrates and Galen.

CHAPTER XIV

WELL-KNOWN MEDICAL AUTHORS OF THE EARLY CENTURIES OF THE CHRISTIAN ERA

There were four men who were not especially identified with any of the sects described in the preceding chapters, and yet who occupied, as authors of medical treatises, very prominent places in the history of medicine of the period or epoch which we have just been considering. They are Celsus, Scribonius Largus, Pliny the Elder and Dioscorides. These men lived during the first and second centuries A. D. and they therefore all belong strictly to the period which is designated in our scheme as the fourth epoch. I shall give here brief sketches of all of these writers and of their works. While Caelius Aurelianus, another important medical author, belonged to a much later period, I shall, for reasons of convenience, describe in the same chapter with the others the part which he played in the evolution of medicine.

Aulus Cornelius Celsus, called by some the Latin Hippocrates and by others the Cicero of physicians because of the correctness and elegance of his Latin and the clear manner in which he puts his thoughts into words, flourished during the reign of the Emperor Augustus (27 B. C.-14 A. D.). The date and place of his birth are not known, but it is generally believed that he was born and received his education at Rome. The great work which he wrote and upon which he must have been engaged the larger part of his lifetime was a sort of cyclopaedia, which bore the title "*Artium libri,*" and in which each department of knowledge was represented by a separate treatise. It is said that five books were devoted to agriculture, seven to rhetoric, eight to medicine, etc.; but all of these treatises,

excepting those relating to the latter science, have been lost or destroyed. It is not certainly known to which of the professions Celsus belonged, but the very skilful and judicious manner in which he has culled all that is best from the medical treatises published before his time, the remarkable knowledge of technical details which he displays in every part of his own work, and the fine tone of medical thought which pervades these eight books, almost compel the conclusion that the author was a very clever clinician, although probably not a physician who practiced for a money reward. In no other published treatise is a more perfect picture of the medical practice of antiquity to be found than that which Celsus gives us in his work "*De arte medica libri octo.*"

It is not an easy matter to select, from a treatise of several hundred pages in length, one or two passages of such a character that they may be accepted as fairly representing the author's manner of dealing with medical and surgical questions of practical interest. The two given below are translations from Védrènes' version (Paris, 1876), and they deal, the one with venesection and the other with the proper manner of arresting hemorrhage from a wound. Both the passages quoted represent only fragments, as sufficient space for more extensive extracts is not available.

Book II., Chapter X.—Bloodletting from a Vein.—Incising a vein for the purpose of drawing blood from it, is not a new procedure; but it is certainly a new thing to resort to bloodletting in almost all diseases. Again, it is an ancient custom to employ bloodletting in young subjects and in women who are not pregnant, but it is a new thing to perform this operation on infants and aged individuals, and on women approaching the period of confinement. It was the idea of the ancients that persons at the two extremes of life were not able to support this sort of treatment, and they were convinced that a pregnant woman, if subjected to the operation of bloodletting, would almost surely be confined before the completion of her time. Since then, however, experience has shown that there is no fixed rule about this matter, and that a physician should preferably regulate his course in accordance with observations of a different nature. The determining factor,

for instance, is neither the age nor the pregnant state of the patient, but rather the degree of physical strength. In the case of a youth who is feeble, or of a delicate woman (aside from the question of pregnancy), it would be wrong to draw blood, for it would be robbing them of what little strength they possessed. But, in the case of a vigorous child, a robust old man, or a pregnant woman who is in good health, one need not hesitate to resort to this procedure. Nevertheless, there may arise, in connection with the operation of venesection, a number of questions which are quite likely to puzzle an inexperienced physician and perhaps lead him into error. For example, infants and old people possess as a rule diminished vigor, and the woman who is about to be confined needs all her strength for the period following delivery, both for herself and for the nourishing of the child. But the mere fact that one must give some thought to questions of this nature and must exercise prudence does not justify the immediate rejection of a method of treatment like that of venesection. For is it not the very essence of our art, not merely to consider the factors of age and the pregnant state, but also to form an estimate of that other and more important factor, viz., the patient's strength,—be that patient an infant, an aged person, or a woman advanced in pregnancy,—and then to decide whether it is, or is not, great enough to bear the loss of blood? In deciding a question of this kind it will be necessary to distinguish between real vigor and obesity, between thinness and feebleness, etc.

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Venesection is an easy operation for a physician who has already familiarized himself with the manner of performing it, but for one who is ignorant of these details it may prove very difficult. It is necessary, for example, to bear in mind that the artery and vein are united and that they are accompanied by nerves; and, further, that the injuring of the latter will induce spasms and violent pains. On the other hand, it must also not be forgotten that an artery once opened has no disposition to close, nor does it heal, and that sometimes the blood escapes in an impetuous manner. If, perchance, the vein is cut transversely, the edges of the opening contract and no more blood escapes. Again, if the scalpel is plunged into the parts timidly, the skin alone will be divided and the vein will not be opened. In some cases this vessel is so hidden from sight that the physician may experience difficulty in bringing it into view. Thus it will be seen that there are several circumstances which may render this operation difficult for an ignorant or inex-

perienced physician. The vein should be incised in a longitudinal direction, midway between its two sides. The moment the blood gushes from the opening its color and general appearance should be carefully noted, etc.

Book V., Chapter XXVI.—The Proper Manner of Arresting Hemorrhage from a Wound.—If there is fear that there may be bleeding, one should fill the wound with dry lint, place over it a sponge wrung out of cold water, and press upon it with the hand. If the bleeding still continues, it is advisable to change the stuffing of lint somewhat frequently; and, if this step proves ineffective, then lint moistened with vinegar may be tried, for this liquid acts energetically in arresting hemorrhage. Some physicians, indeed, actually pour it into the wound. There is a strong objection, however, to the use of an agent which, like vinegar, arrests the bleeding too completely—viz., that it is apt to set up afterwards an intense inflammation of the parts. The same reasoning applies with even greater force to the employment of corrosives and caustics, which produce an eschar. Despite the effectiveness of most of these in arresting hemorrhage, their use should be discouraged. . . . . Finally, if the bleeding continues it will be necessary to grasp the vessel from which the blood is escaping, to ligature it in two places close to the wound, and then to divide the vessel between the two ligatures, in order that it may retract (both of the new orifices having already been closed by the ligatures). If the circumstances are such that the plan just recommended cannot be carried out, it will then be advisable to apply the red-hot cautery to the bleeding vessel. When a rather free hemorrhage occurs at a part of the body where there are no nerve trunks and no muscles,—as on the forehead or at the top of the head,—the simplest plan is to apply a cup at some little distance from the source of the bleeding and thus divert the current of the blood from the spot affected.

And to these two longer extracts may be added a third:—

From these considerations the inference is warranted that a physician cannot possibly give proper attention to a large number of patients. (Book III., Chapter IV.)

Celsus' treatise was ignored by physicians for many centuries, but it was considered by the monks, in the Middle Ages, a valuable guide in the treatment of disease; and it was probably owing to this circumstance, says Védrènes,

that the book did not altogether disappear. It was not until the year 1443 that Thomas de Sazanne, afterward Pope Nicholas V., discovered a copy of the work in the church of Saint Ambrosius, at Milan, but it was only in 1478 that the book was printed for the first time (at Florence). Then, as if to make up for the long neglect to which it had been subjected, no fewer than sixty Latin editions were issued during the two succeeding centuries; and, in addition, it was eventually translated into every modern European language.

Scribonius Largus, a Roman physician who lived during the reigns of Tiberius and Claudius (14-54 A. D.), owes his celebrity to the fact that he wrote and published (in 47 A. D.) a book containing a collection of the best medical formulae and popular recipes known at that time. He appears to have had a large private practice and to have spent a considerable portion of his professional life in the service of the army. He accompanied the Emperor Claudius, for example, in his campaign against Britain (43 A. D.), and the book which he wrote, and which has just been mentioned, was dedicated by him to that emperor. According to Neuburger, Scribonius is to be credited with having been the first to describe correctly the proper manner of obtaining the drug known as opium, and also the first to recommend, in the treatment of severe headaches, the employment of electric shocks as communicated by the fish called the "electric ray."

Medical practice at that period, says Le Clerc, was divided among three kinds of practitioners—those who treated their cases exclusively by dietetic measures, those who effected cures by surgical means, and those who took charge only of such patients as required chiefly the employment of external remedies. But Scribonius Largus insists that such a division was more theoretical than real, as no one of these classes could get along without the cooperation of the others.

C. Plinius Secundus, commonly called Pliny the Elder, was born near the beginning of the first century of the Christian era, either at Verona or at Como in the north

of Italy, and settled in Rome at an early period of his life. At the beginning of his career he served for some time in the army in Germany, and upon his return to Rome practiced as a pleader. Subsequently he held various official positions which gave him the opportunity of visiting other countries of Europe. He perished at Stabiae (near the modern Castellamare, on the Gulf of Naples) in 79 A. D., at the age of fifty-six years, while watching the eruption of Vesuvius, which overwhelmed Herculaneum and Pompeii. He was in command of the Roman fleet at the time.

Pliny was indefatigable as a writer and as a gatherer of knowledge of all sorts, and he and Celsus are well named the Encyclopaedists. He is said to have written twenty books on the war with the Germans, an unknown number on rhetoric and grammar, and thirty-seven on natural history. The latter books alone have come down to our time. Pliny's nephew, who is known as Pliny the Younger, and who edited the great work of his uncle on natural history, furnishes us, in a letter addressed to the historian Tacitus, with some interesting details regarding the elder Pliny's manner of life. It appears from this account, that the latter read almost incessantly. During his meals and while he was taking his bath, an attendant read aloud to him. He also took his books with him on his travels and was always accompanied by a person who could write rapidly under dictation. He continued this practice upon his return to Rome and dictated to his amanuensis even while he was being carried about in a sedan chair. Books 20-27 of his great work on natural history are devoted to the subject of remedial agents belonging to the vegetable kingdom, books 28-32 deal with those which belong to the animal kingdom, and books 33-37 treat of mineralogy with special reference to medicine, painting and sculpture. Pliny was a compiler and not an original investigator. Some idea of the popularity of his treatise on natural history may be gathered from the fact that it was the second book to be printed after the invention of printing, the Bible being the first. Another interesting fact connected with Pliny's treatise is mentioned by Neuburger, viz., that the

use of hyoscyamus and belladonna as agents capable of dilating the pupils, owed its origin to the discovery (by C. Himly, in 1800) of a place in the text (Book XXV., 92) where it is stated that the juice of the plant Anagallis was rubbed into the eyes before the operation for cataract was undertaken.

According to Pliny (Book XXXI., Chapter VI.), the ancients employed mineral waters extensively in the form of baths, and they also occasionally used them as internal remedies. Galen, too, mentions the fact that these waters were in demand in the spring or autumn for purgative purposes.

In Book XXXIX., 8, 3, Pliny—as quoted by Védrènes—makes the following remarks:—

> Very few Romans have shown an active interest in medical affairs, and those few speedily found it necessary to pass themselves off as Greeks. For it is a well-known fact that those physicians who, without being able to speak Greek, attempted to build up a practice in Rome, failed to gain the confidence of their patients, even of those who were not at all familiar with that language. . . . . When one's health is the question at issue the readiness to place confidence in a medical adviser is apt to diminish in proportion as one's knowledge of the man increases. Indeed, medicine is the only art in which one is quite ready at first to put faith in almost anybody who calls himself a physician, and that too, despite the acknowledged fact that in no other circumstances of life is an imposture more fraught with danger.

English versions of Pliny's Natural History and of Pliny the Younger's Letters have been published in what is known as Bohn's Libraries.

Pedanius Dioscorides, a native of Anazarba, a small Greek town near Tarsus in Cilicia, lived about the middle of the first century A. D. (during the reigns of Nero and Vespasian). From his earliest youth he took a great interest in botany, and, after reaching manhood, traveled extensively in the wake of different Roman armies, for the sole purpose of studying by direct observation the plants of different countries and of verifying the medicinal virtues which each one was reputed to possess. In this

way he visited, in turn, Greece, Italy, Asia Minor and perhaps also the southern portion of France (the Narbonaise). He collected great quantities of specimens of every kind of drug—animal and mineral substances as well as objects belonging to the vegetable kingdom; and, wherever it was possible to do so, he wrote memoranda of the traditions of the natives with regard to the uses and medicinal effects of these different drugs. After he had completed all these researches and had gathered together all this vast mass of materials, he wrote his famous treatise on materia medica—"the most complete, the best considered, and the most useful work of its kind to be found anywhere to-day." (Galen.) It is from this treatise, therefore, says Dezeimeris, that one can derive the most satisfactory idea of the early Greek materia medica; but at the same time, he adds, it is not a book in which will be found a detailed account of the manner in which the practitioners of that period employed the remedies which he describes. The same authority calls attention to the great difficulty which modern physicians often experience in their attempts to identify the drugs which Dioscorides describes. Le Clerc calls attention to the fact that the physicians who were contemporaries of Dioscorides were not in the habit of employing either iron or antimony (called by them *stibium*) internally. Apparently they had not yet learned that these substances possess properties which exert a curative action in certain diseases. On the other hand, he mentions the manner of extracting quicksilver, by chemical means, from cinnabar [red sulphide of mercury], the steps required for preparing acetate of lead, and the proper way of making lime water.

The work to which reference has been made above was published by Dioscorides about the year 77 A. D. It is the earliest pharmacological treatise that has come down to our time, and for many succeeding centuries it served as the authoritative guide in all questions relating to drugs. The first printed edition of the Greek original appeared in Venice in 1499, but a still earlier Latin version was issued in 1478. According to Pagel the best edition (in Latin and

fully illustrated) is that of Pietro Andrea Mattioli, which was printed in Venice in 1554. Neuburger commends highly the German version by J. Berendes. (Stuttgart, 1902.)

Of Caelius Aurelianus we possess no biographical details beyond the facts that he was a native of Sicca in Numidia, Africa, and that he lived toward the end of the fourth or during the first part of the fifth century of the present era. He was the author of several works, all but one of which, however, have been lost. The single treatise which has come down to our time treats of acute and chronic diseases, and is spoken of by Daremberg as being virtually a translation of one of the lost writings of Soranus. This book, says Haeser in his History of Medicine, is the most important source from which our knowledge of Methodism is derived; and Neuburger not only agrees with this statement, but adds that the treatise of Caelius Aurelianus played a most important part, toward the end of the Middle Ages, in the evolution of medicine. Up to the present time no translation of this work into any modern language has been published, but Neuburger furnishes a very full analysis of its important parts. In two places, as appears from this analysis, Caelius Aurelianus mentions—among the signs and symptoms of certain affections of the respiratory apparatus—phenomena which show beyond a doubt that he (or Soranus) was familiar with auscultation of the chest. The words which he uses are these:—

"Stridor vel sonitus interius resonans aut sibilans in ea parte quae patitur," and "sibilatus vehemens atque asper in ultimo etiam pectoris resonans stridor."

CHAPTER XV

CLAUDIUS GALEN

During the centuries immediately preceding the Christian era, Greek medicine was represented by a collection of treatises which had been written by Hippocrates and his followers on anatomical, physiological, pathological, therapeutical and ethical subjects, and which constituted a fairly complete but not always easily intelligible system. As time went on, however, and especially as new and useful facts were constantly being added to the existing stock of medical knowledge, the more thoughtful physicians began to feel that the system, which up to that day had proved acceptable, needed to be perfected in a number of respects; and accordingly, as a result of this feeling of dissatisfaction, and also as an expression of the prevailing desire for a more perfect knowledge of the truth, there developed, as has been stated in the preceding chapters, a number of different medical sects. When Galen first appeared in the field as a physician of unusual promise, these various sects were all still in a thriving condition. The Methodists, in particular, were very popular. Galen did not favor any special sect, but in his writings he made it manifest that he attached more importance to the teachings of Hippocrates than to those of any other author. "It was Hippocrates," he said, "who laid the real foundations of the science of medicine." It is therefore not surprising that Galen should have devoted so much time to the writing of elaborate commentaries on the works of Hippocrates. The service which he thus rendered to medicine, says Daremberg, was of very great value. But Galen, notwithstanding his great admiration for Hippocrates, did not hesitate to

criticise a number of his teachings, and especially those which, as he believed, were not stated with sufficient clearness. Valuable as was the service rendered to medicine by the writing of these commentaries, there still remained an urgent need for a service of a different and much more difficult kind, viz., that of welding together into a single clearly written and easily intelligible system of medicine, all that was good in the Hippocratic writings and in the disconnected and at times antagonistic teachings of the sects. To accomplish this successfully required the services of a man endowed with mental gifts of a most exceptional character—complete knowledge of medicine in all its departments, a mind thoroughly trained in philosophy, the power to express his thoughts in simple language, and an independence and fairness of judgment which would render him indifferent to the petty interests of the sects. Claudius Galen, as subsequent events showed, possessed these very gifts in a high degree, and he devoted the better part of his reasonably long lifetime to the accomplishment of this much-needed work. How greatly it was needed at that particular period of time, nobody then knew or could even suspect. It soon appeared, however, that all the vaunted civilization of the Graeco-Roman world—much of it of the purest gold and a great deal of the basest alloy—was to be swept so completely off the face of the earth that, for thirteen hundred or more years, almost no thought whatever could possibly be given to the science and art of medicine. Fortunate, most fortunate it was, therefore, that, before this wave of destruction reached Rome, all the best part of Greek medical literature—for such it was in truth—had been gathered together and carefully systematized by Galen and stowed away in the recesses and chambers of remotely situated monasteries and churches by clear-sighted monks for the benefit of later generations of physicians.

Brief Biographical Sketch.—Claudius Galen was born in Pergamum, an important Greek city of Asia Minor, about the year 131 A. D., under the reign of the Emperor Hadrian. His father, whose name was Nicon, was a man

of ample means, well informed in philosophy, astronomy and geometry, and most liberal in providing for the thorough education of his son in every branch of useful knowledge. In two or three places in his writings Galen speaks of his father in terms of affection. On the other hand, he does not hesitate to state in the plainest language possible that his mother was a veritable Xanthippe. In her moments of bad temper she would not only shout and scream in a violent manner, but would sometimes go so far as to bite her serving-maids. Pergamum, at the time of which I am writing, offered unusually good opportunities for studying disease. Its Asclepieion, which was built during Galen's boyhood, had already become one of the famous temples of Asia Minor, and the sick and maimed flocked to it in large numbers. Then, in addition, the city was well equipped with able physicians, who appear, according to Neuburger, to have been on very friendly terms with the priests of the temple. It was under the guidance of such men that Galen—at the early age of seventeen, and after a careful training in philosophy, mathematics, etc.—began the study of medicine. He speaks with special interest and respect of one of his instructors, a certain Quintus, who had the reputation of being an excellent anatomist and at the same time one of the most distinguished practitioners of that day. Another anatomist, Styrus, was also one of Galen's teachers.

On the death of his father Galen left his home and devoted the succeeding nine years to visiting all the different cities in which he believed he might gain some additional knowledge in medicine and surgery. A large part of this long period was spent in Alexandria, which still retained much of its importance as a home of all the sciences. On attaining his twenty-eighth year he left that city and returned to Pergamum, evidently with the purpose of establishing himself there in the regular practice of his profession. Through the influence of the temple officials, and especially of the High Priest, Galen received the appointment of physician to the gladiators, a position which he held with credit for a period of four years, and

which afforded him excellent opportunities for cultivating his knowledge of surgery. It was while he was serving in this capacity that he devised and put into practice a method of saturating the dressings (in cases of severe wounds) with red wine, for the purpose of preventing the development of inflammation in the parts affected; and the success which he thus obtained was so great that not one of the gladiators intrusted to his care died from his wounds. History does not state the precise manner in which Galen carried out his method of utilizing wine in the dressing of wounds, and we are therefore unable to determine just how much credit he was entitled to receive for this crude but apparently effective means of securing local antisepsis. It is clear, however, that Galen's treatment could only have been a modification of a much older method, for Jesus, in his answer to a question put to him by a lawyer, said: "But a certain Samaritan, as he journeyed, came where he (the injured man) was: and when he saw him, he had compassion on him, and went to him, and bound up his wounds, pouring in oil and wine, and set him on his own beast, ..." (St. Luke x., 33, 34).

At the end of four years there broke out in Pergamum a riot which rendered residence there, at least for a certain length of time, undesirable. Accordingly Galen, who was now thirty-two years old, and who was probably glad of an excuse for leaving a place where a physician of his education and talents had so few opportunities for gaining distinction, decided to visit Rome, and—if circumstances appeared to favor the plan—to settle there. His first impressions after arriving in that metropolis were favorable to the plan of establishing himself there permanently, but at the end of a few years he became conscious of the growing hostility of those practitioners who had been for a longer time than he well established in that city. This hostility increased as he rose in favor and esteem with people of position and influence. He had treated skilfully and with success Eudemus, a peripatetic philosopher of great celebrity, for a quartan fever. He had also cured the wife of Boëthus (a patrician who belonged to the consular class)

of a serious illness and had received as an expression of appreciation a gift of four hundred pieces of gold. He had won the friendship and esteem of such men as Sergius Paulus, the Praetor; of Barbarus, the uncle of the Emperor Lucius; and of Severus, who was at that time Consul, but who later became Emperor. These very influential men took an active interest in Galen's scientific work, having been invited by him on more than one occasion to witness his dissections of apes,—dissections which he made for the particular purpose of demonstrating the organs of respiration and of the voice. All these facts soon became known to Galen's rivals and probably helped to fan the spark of their envy into a flame; but it is very doubtful whether he was justified in saying that the ill feeling thus engendered threatened to end in some act of personal violence, for which reason he decided to leave Rome and return to Pergamum. His secret manner of departure, without taking leave of anybody, and the fact that the Plague was just at that time rapidly approaching Rome, justify the belief, says Neuburger, that it was not fear of personal violence at the hands of his jealous rivals that drove Galen away so mysteriously from the city in which, in the short space of four or five years, he had won so great professional success, but an unwillingness to face his duty, which was, to remain and aid in the approaching fight against the great destroyer—the Plague. If Galen had been a simple physician, one of the great body of medical practitioners in Rome, no one would be disposed to question the justice of the criticism which the distinguished Viennese historian makes of his decision to abandon that city at the moment of her distress and peril. But, as a matter of fact, Galen was not a practitioner of medicine in the full sense of that term. He treated cases of illness because in no other way would it be possible for him to acquire the necessary familiarity with disease; but, almost from the very beginning, he seems to have fully realized that he was destined to devote his time and his energies to a very different kind of professional work,—work which was urgently needed, which promised to be of very great

value to medical science, and which probably no other physician then living was competent to do effectively. Furthermore, he was himself profoundly conscious that the work in question constituted the main object of his life. His own words (see his statement with reference to Archigenes, on page 174) show this plainly, and the huge mass of medical treatises which he wrote reveal in the most unmistakable manner with what untiring persistency he pursued the path which he believed it was his duty to follow. It being assumed, then, that such were the motives which actuated Galen, was it a mistake on his part to conclude that duty did not require him to remain in Rome? The question is a difficult one to answer, and I do not feel called upon to decide it. We do not, however, brand a general in the army a coward because he endeavors to protect himself as much as possible from danger during a battle, that he may be able, to the very end, to direct the soldiers under his command. Similarly, was not Galen justified in avoiding every risk which was likely to imperil the performance of duties which were of far greater value to medicine and to humanity at large than that of acting as a mere soldier in the ranks of medical men?

It seems a great pity that one of the most inspiring figures in the history of medicine should be represented to posterity with such a blemish upon his character, and I have therefore ventured to suggest a possible defense of Galen's action.

Not very long after he had returned to Pergamum, Galen was summoned by the Emperors Marcus Aurelius and Lucius Verus, who were then with the army at Aquileia, a few miles north of the present Trieste, to join them at that city; and he was, of course, obliged to obey. A fresh outbreak of the Plague had occurred and there had already been many fatal cases among the troops. It was therefore decided by the emperors, almost immediately after Galen's arrival, to return to Rome with a part of the army. A start was accordingly made, and the company had already advanced some distance on their way, when Lucius Verus died. This unexpected event greatly in-

creased the difficulties of the return journey, as it was deemed necessary to carry the remains of the deceased Emperor back to the imperial city. Thus Galen found himself once more settled in Rome, this time in the capacity of private physician to the Emperor Marcus Aurelius and his sons Commodus and Sextus. The position was extremely well adapted to the needs of Galen, who, from that time forward, for a period of several years, had at his disposal ample time for writing and for conducting his experimental work in anatomy and physiology, a privilege of which he appears to have made excellent use. He lived to be seventy years of age, his death occurring during the latter part of the reign of Severus, or at the beginning of that of Caracalla (about 201 A. D.).

All Galen's critics agree that he possessed his full share of peculiarities,—not to call them by the harsher name of faults. He was constantly ready, for example, to praise his own doings and sayings, and he rarely lost an opportunity of holding up the physicians of Rome to ridicule and contempt. He was specially bitter in his criticisms of Methodism and its adherents—"the donkeys of Thessalus," as he called them. At the same time, no other physician of ancient or modern times has manifested to an equal degree such extraordinary industry as a writer and original investigator in a great variety of departments of knowledge. Although many of his works have been lost,[1] those which have come down to our time are still very numerous—"a sufficient number," says Neuburger, "to constitute a library by themselves." I give here a few of the titles of these works, in order that the reader may get at least some idea of the great variety of medical topics which Galen has discussed in his writings. The more complete list furnished by Daniel Le Clerc contains nearly two hundred titles, and yet even this is believed to fall short of the actual number.

[1] The majority of the writings of Galen are reported to have been kept, for safe preservation, in the Temple of Peace, near the Forum; and the destruction of this building by fire, during the latter half of the second century, entailed the loss of all these valuable works.

SELECTED LIST OF THE WORKS OF GALEN RELATING TO MEDICINE. (FROM LE CLERC.)

Explanation of some of the Ancient Terms Employed by Hippocrates.

On the Establishment of the Art of Medicine.

Definitions of Medical Terms.

On the Different Sects in Medicine.

Discourse against the Empirics.

On the Importance, for a Physician, of a Thorough training in Philosophy.

The Physician; or Introduction to Medicine.

The Elements, as taught by Hippocrates. (2 books.)

The Different Temperaments. (3 books.)

On the Nature of Man; Commentaries on two Books of Hippocrates. (2 books.)

The Humors.

Do the Arteries Normally contain Blood?

On Black Bile.

On the Bones. (For Students in anatomy.)

Dissection of the Vocal Organs.

The Anatomy of the Eyes.

Dissection of the Veins and Arteries.

Dissection of the Nerves.

On the Utility of the Different parts of the Body. (17 books.)

On the Natural Faculties. (3 books.)

The Sentiments of Hippocrates and of Plato. (9 books.)

The Organ of Smell.

The Movements of the Muscles. (2 books.)

The Physiology of Respiration.

On Obesity.

On the Maintenance of Health. (6 books.)

The Characteristics of Different Foods. (3 books.)

Precepts regarding the Diet best suited to the Four Different Seasons and to Each of the Twelve Months of the Year.

On the Manner of Living best suited to those who Wish to Preserve their Health. (3 books.)

On Habit.

On the Differences between Diseases.

On the Causes of Diseases.

On Marasmus or Consumption.

On the Different Kinds of Fevers. (2 books.)

On Thirst.

On the Parts of the Body Affected. (6 books.)
The Diseases of Women.
The Different Kinds of Pulse. (16 books.)
The Different Kinds of Urine.
On Critical Days. (3 books.)
Commentaries on the Treatises of Hippocrates. (39 books.)
On the Manner of Treating Different Maladies. (17 books.)
On Venesection. (3 books.)
On the Use of Cups, Leeches and Scarifications.
On Purgatives. (3 books.)
On Colic.
On Jaundice.
On Gout.
On Stone in the Bladder.
Etc.

The numerous works of Galen, says Pagel, constitute a complete and very satisfactory encyclopaedia of medicine. The most available edition of his works in Greek is that of Karl Gottlob Kühn of Leipzig (1821-1828; 22 Vols. of about 1000 pages each). There is scarcely a department which this great physician has not treated quite fully. But, unfortunately, the translations into modern languages are relatively few, and they cover only small portions of the entire work. That of Daremberg, entitled "*Oeuvres anatomiques, physiologiques et médicales de Galien, etc.*" (Paris, 1854-1857; 2 Vols.), is in every way most satisfactory, and it is from this source that I have made a few extracts—just sufficient to give the reader some idea of Galen's style of writing and of his competency to deal with such subjects as human anatomy and physiology. To attempt anything like a complete exposition of his views regarding pathology, therapeutics, hygiene, etc., would necessitate my devoting more space to this part of the history of medicine than I can afford to give. To those who desire to obtain more ample information about Galen's views regarding pathology and therapeutics I would recommend a study of Daremberg's admirable work and a perusal of the careful analysis made by Neuburger of certain portions of Galen's text.

Galen's Contributions to Anatomy and Physiology.—At

the period of time about which I am now writing, and for many centuries afterward, there existed among all classes of the community a very strong prejudice against dissecting human corpses. And even Galen himself appears to have shared this prejudice, for, in spite of his intense eagerness to gain a more perfect knowledge of human anatomy, he apparently did not dare to undertake any such investigation, even when a favorable opportunity for so doing presented itself, as it did on the occasion to which he refers in the following brief extract taken from one of his treatises:—

> A carelessly constructed sepulchre on the banks of a river had been undermined during a season of flood, and the corpse thus set free had floated down stream a short distance, until it finally lodged on the shore of a small cove. Passing near by I had the opportunity of inspecting this corpse. The fleshy parts had already disappeared to a great extent through the process of decomposition, but the bones were still held together by their fibrous connections. The picture presented to the eye was that of a human skeleton specially prepared for the instruction of young physicians. On another occasion, a few steps from the main road, I came across the dead body of a robber who had been killed by the traveler whose money he had attempted to steal. The peasants of that neighborhood were not willing to bury the corpse of such a bad man, and they accordingly allowed it to remain at the spot where it was first discovered. In the course of the following two days, as might be expected, the vultures removed every particle of flesh from the bones, so that, when I saw what remained of the body, the only thing visible was a nicely cleaned skeleton.
>
> (Le Clerc: *Histoire de la Médecine*, p. 711.)

Here were two excellent opportunities for gaining the additional knowledge of human anatomy which Galen so much desired, but he evidently was not at all disposed to avail himself of them—doubtless because his mind was deeply imbued with the feeling that any such interference on his part would be a sacrilegious act. Under the circumstances, therefore, there was nothing left for him to do but to utilize animals for purposes of dissection, and more particularly apes, whose anatomy very closely resembles

that of the human being. Several of Galen's books on anatomy have come down to our time, but quite a number of others have been lost. From those which we possess, and especially from the one entitled "Anatomical Administrations," it is permissible to conclude that he was a most skilful dissector and an extremely close and careful observer, and that he was very particular to set down the results of his observations in admirably clear language. Indeed, Le Clerc assures us that Vesalius, the great Flemish anatomist of the sixteenth century, bestowed high praise upon Galen's anatomical descriptions; and that, too, notwithstanding the fact that the latter sometimes erred in his statements regarding the similarity between certain parts observed in dissections of an animal and the corresponding parts in man. In one of his treatises[2] Galen states distinctly that the arteries contain blood. In another he gives a remarkably full and accurate description of the nervous system, including the brain, spinal cord, and many of the nerves.

He describes the optic nerve, the oculo-motorius and trochlearis, the different ramifications of the trigeminus, the acusticus and facialis, the vagus and glossopharyngeus, the nerves of the pharynx and larynx, the sympatheticus (with the accompanying ganglia), and the radial, ulnar, median, crural and ischiatic nerves. (Puschmann.)

Although it is true that certain important anatomical and physiological facts are found recorded for the first time in the works of Galen, this must not be accepted as evidence that Galen himself is the real discoverer of these facts. The most that can be claimed for him is that he is the first writer to bring the facts in question to the knowledge of us moderns. When the ancient books that have been lost are once more brought to light, as they very well may be at any time, we shall be able, perhaps, to give credit where credit is due. But there is one department in which Galen did experimental work of an entirely original character and for which he deserves unstinted praise. I refer to the experiments which he made concerning the physiology of

[2] Book VI., Chapter XVII. (page 441 of Vol. I. of Daremberg's version).

the brain and spinal cord. They are related in the following extract, which has been translated from the account given by Neuburger (*op. cit.*, Vol. I., p. 380):—

> The brain itself is not sensitive; it expands and contracts synchronously with the respiratory movements, the purpose of which action is to drive the *pneuma* from the cavities of that organ into the nerves. The function of the meninges is to hold the parts firmly together and to unite the blood-vessels. Pressure upon the brain causes stupor. An injury of the tissues surrounding the fourth ventricle or of those which constitute the beginning of the spinal cord produces death. The seat of the soul is in the substance of the brain, and not in its membranes. The spinal cord serves as a conductor of sensation and of motor impulses, and it also plays the part of a brain for those structures of the body which lie below the head. It gives off nerves like streamlets. Division of the spinal cord longitudinally in its median axis does not give rise to paralysis. Transverse division, on the other hand, causes symmetrical paralyses. If the cord is divided between the third and fourth cervical vertebrae, respiration is arrested, and if the division is made between the cervical and the thoracic portions of the spinal column, the animal breathes with the aid only of its diaphragm and of the upper muscles of the trunk of the body. Division of the recurrent nerves produces aphonia; if the fifth cervical nerve is divided, the scapular muscles on the corresponding side will be paralyzed. Galen considers the ganglia to be organs for reinforcing the energy of the nerves. The fact that both cerebral and spinal-cord nerve-filaments enter into the composition of the sympathetic nerve explains the extraordinary sensitiveness of the abdominal organs.

When we consider that these experiments are the first of their kind of which history makes mention, that they were carried out nearly seventeen hundred years ago, and that—so far as we know—they sprang entirely from the brain of the experimenter, we may well express unlimited admiration for Claudius Galen.

Daniel Le Clerc says that Galen's principal treatise on human physiology, entitled "Utility of the Different Parts of the Human Body," constitutes a *chef-d'oeuvre* which has challenged the admiration of physicians and philosophers in all ages. Christians, however, he adds, are

particularly gratified to learn from this work that "Galen, although classed as a Pagan, unhesitatingly recognizes that it was an all-wise, an all-powerful, an all-good God who created man and all the other animals." Further on, Le Clerc refers to another statement which was made by Galen and which will be found on page 261 of Daremberg's version. It reads as follows:—

> If I were to spend any more time in talking about such brutes—by which term he designates men who cannot appreciate the wisdom of God in distributing the different parts of the body in the manner in which He has done this—I should justly incur the blame of sensible persons. They would accuse me of desecrating the account which I am writing, an account which is intended as a hymn of sincere praise of the Creator of man. I believe that true piety consists, not in sacrificing numberless hecatombs nor in burning unlimited quantities of incense and a thousand perfumes, but in first searching out and then making known to my fellow men how great are the wisdom, the power, and the goodness of the Creator.

Galen's work on "The Utility of the Different Parts of the Human Body" is composed of seventeen books, all of which exist to-day in a complete state. Taken together they form, as may be seen by the following list of contents, a remarkably complete treatise on physiology. Books I. and II. are devoted to the hand, forearm and arm (105 pages); Book III. to the thigh, leg and foot (62 pages); Books IV. and V. to the alimentary organs and their accessories (101 pages); Book VI. to the respiratory organs (78 pages); Book VII. to the organs of the voice (67 pages); Book VIII. to the head, the encephalon and the organs of special sense (45 pages); Book IX. to the cranium, the encephalon and the cranial nerves (38 pages); Book X. to the eyes and their accessories (45 pages); Book XI. to the face and more particularly the jaws (55 pages); Book XII. to the neck and the rest of the spinal column (46 pages); Book XIII. to the shoulder and the structure of the spinal column in detail (40 pages); Books XIV. and XV. to the genital organs and the parts in which the foetus develops (70 pages); Book XVI. to the nerves, arteries and veins (43 pages); and Book XVII. Epilogue (11 pages).

There are very few modern text books in which the author treats the subject in as exhaustive a manner as Galen has done in these seventeen books. As may readily be imagined from the great number and length of his writings, he often wanders off into side issues and thus lays himself open to the charge of being a diffuse writer. At the same time he cannot be accused of dullness, for in reading Daremberg's version one is seldom tempted to omit any of the text, and his style is interesting. The following brief extracts, to which should be added that given on a previous page, may be taken as fair samples of his manner of treating questions in the department of physiology:—

Reasons why the Alae Nasi are Cartilaginous and why they may be Moved by Voluntary Muscular Action.—We have already explained in some measure the reasons why the alae nasi should be composed of cartilage and why it should be possible for the animal to move them at will.[1] It is an established fact that the movements of these parts are competent to aid in no small degree the somewhat forcible inspirations and expirations. This is the reason why the alae are constructed in such a manner as to be easily movable. They are made of cartilage because this substance is hard to fracture or to tear apart. The placing of these alar movements under the control of the will, and not under that of some other bodily force (like the arterial impulse, for example), is certainly an excellent arrangement; and, if one does not appreciate this without any further explanation, it must be because my previous reasonings about such matters have fallen upon inattentive ears.

(Translated from Book XI., Chapter XVII., of Daremberg's French version of Galen's works.)

Another brief extract may be given here. It forms a part of the chapter relating to the action of the sigmoid valves of the pulmonary artery, etc., and merits special attention because it furnishes additional evidence of the

[1] In his Commentaries on the works of Hippocrates (Epidemic Diseases, III., t. XVII. B. § 4) Galen states that he has often observed this to-and-fro movement of the alae nasi in certain cases of illness and that he has interpreted it as indicating the existence of some serious disorder of the respiratory tract. (Daremberg.)

correctness of Daremberg's statement that Galen was the leader of the most advanced school of experimentation:—

The more strongly the thorax, in its exertion of a compressing force, tends to drive the blood (out of the heart), the more tightly do these membranes (the sigmoid valves) close the opening. Invested in a circular manner from within outward, extending throughout the entire circumference of the interior of the vessel, these membranous valves are, each one of them, so accurately patterned and so perfectly fitted that when they are put upon the stretch by the column of blood, they constitute a single large membrane which closes (watertight) the orifice. Pushed back by the return flow of the blood, they fall back against the inner surface of the vein, and permit an easy passage of the blood through the amply dilated orifice (which they, an instant before, closed so perfectly).

(Translated from Book VI., Chapter XI., of Daremberg's French version of the works of Galen.)

In his comments upon the account of the sigmoid valves which I have just quoted, Daremberg says that the description of these structures given by Erasistratus at least four hundred years earlier is admitted by Galen to be so correct that it would scarcely be possible to furnish a better one.

Galen's Remarks upon the Subject of Diagnosis.—In the treatise entitled "On the parts of the Body Affected" (Book II., Chapter X.) Galen gives the following advice with regard to the method which it is desirable to adopt when one wishes to ascertain which part or organ is affected, what is the nature of the disease there located, and whether it is primary in its nature or secondary to some affection of earlier development:—

It should have been the special duty of Archigenes, who appeared on the scene next in order after a series of the most illustrious physicians,[4] to infuse more light into medical teaching. Unfortu-

[4] Hippocrates, Herophilus, Erasistratus, Asclepiades, Themison, Celsus, Soranus and Athenaeus. Daremberg calls attention to the fact that, although we possess to-day only a few fragments of the writings of Archigenes, those few are of such a degree of excellence that we may well ask ourselves whether Galen was not perfectly justified in placing such a high estimate as he appears to have done upon the merits of this writer,—and that, too, notwith-

nately, he did the very opposite; for we who have grown old in the exercise of the art (and should therefore find it easy to comprehend what is written about medicine), are at times unable to understand what he says. Such being the true state of affairs, I now propose to undertake what Archigenes failed to accomplish. I shall commence by indicating in a general way what is the proper method to adopt when one wishes to ascertain in what part or organ the disease is located and how one should proceed when it is proposed to teach the method to others. This method may be stated in the following terms:—

In the first place, the part should be carefully examined in order that we may ascertain whether it presents any signs of special value as indicating the nature of the disease. In the next place, it is important in such an examination to know beforehand what are the particular signs which belong to each of the diseases that may affect the part or organ in question, and also whether these signs vary according to the particular section of the organ involved. In inflammation of the lung, for example, there are: difficulty in breathing (dyspnoea) and great general distress (malaise), the patient being obliged to remain in a sitting posture (orthopnoea)—all of which are signs indicating the possibility of suffocation. Furthermore, the air expired from the infected lung is sensibly hot, especially if the inflammation is of the erysipelatous variety, and, as a consequence, the patient shows a disposition to draw long breaths, knowing that the cold air which he thus draws into his lungs will afford him some measure of relief. The sputa expectorated when he coughs are differently colored; some being red, yellowish, or of a rusty appearance, while others are almost black, livid, or frothy. The patient also often experiences the sensation of a heavy weight in his chest, together with more or less pain, which seems to be located deep down in that region and which shoots backward into his spinal column or forward toward the sternum. Add to these manifestations a high fever and a pulse such as we have already described on another page, and you will have . . . . .

(Translated from Daremberg's French version of Galen's works.)

It has been said that Galen possessed more than the ordinary share of vanity with regard to his cleverness as

standing the unfavorable criticism which he makes in the present paragraph about the author's failure at times to write with sufficient clearness on medical subjects.

a diagnostician; and certainly some of the accounts which he gives, in his clinical and scientific treatises, of his own experiences, seem to bear out this accusation. One hesitates to expose the weak spots in the character of one of the really great men of antiquity lest such exposure may convey a wrong impression; at the same time it would be an error to represent him as a man entirely free from the foibles common to humanity,—even to the best and wisest of men. I therefore repeat here Galen's own account of a professional visit which he made to a brother physician whose malady presented to himself and to his friends many obscure features.

Upon the occasion of my first visit to Rome I completely won the admiration of the philosopher Glaucon by the diagnosis which I made in the case of one of his friends. Meeting me one day in the street he shook hands with me and said: "I have just come from the house of a sick man, and I wish that you would visit him with me. He is a Sicilian physician, the same person with whom I was walking when you met me the other day." "What is the matter with him?" I asked. Then coming nearer to me he said, in the frankest manner possible: "Gorgias and Apelas told me yesterday that you had made some diagnoses and prognoses which looked to them more like acts of divination than products of the medical art pure and simple. I would therefore like very much to see some proof, not of your knowledge but of this extraordinary art which you are said to possess." At this very moment we reached the entrance of the patient's house, and so, to my regret, I was prevented from having any further conversation with him on the subject and from explaining to him how the element of good luck often renders it possible for a physician to give, as it were off-hand, diagnoses and prognoses of this exceptional character. Just as we were approaching the first door, after entering the house, we met a servant who had in his hand a basin which he had brought from the sick room and which he was on his way to empty upon the dung heap. As we passed him I appeared not to pay any attention to the contents of the basin, but at a mere glance I perceived that they consisted of a thin sanio-sanguinolent fluid, in which floated excrementitious masses that resembled shreds of flesh—an unmistakable evidence of disease of the liver. Glaucon and I, not a word having been spoken by either of us, passed on into the patient's room. When I put out my hand to feel of the

latter's pulse, he called my attention to the fact that he had just had a stool, and that, owing to the circumstance of his having gotten out of bed, his pulse might be accelerated. It was in fact somewhat more rapid than it should be, but I attributed this to the existence of an inflammation. Then, observing upon the window sill a vessel containing a mixture of hyssop and honey and water, I made up my mind that the patient, who was himself a physician, believed that the malady from which he was suffering was a pleurisy; the pain which he experienced on the right side in the region of the false ribs (and which is also associated with inflammation of the liver) confirming him in this belief, and thus inducing him to order for the relief of the slight accompanying cough the mixture to which I have just called attention. It was then that the idea came into my mind that, as fortune had thrown the opportunity in my way, I would avail myself of it to enhance my reputation in Glaucon's estimation. Accordingly, placing my hand on the patient's right side over the false rib, I remarked: "This is the spot where the disease is located." He, supposing that I must have gained this knowledge by simply feeling his pulse, replied with a look which plainly expressed admiration mingled with astonishment, that I was entirely right. "And"—I added simply to increase his astonishment—"you will doubtless admit that at long intervals you feel impelled to indulge in a shallow, dry cough, unaccompanied by any expectoration." As luck would have it, he coughed in just this manner almost before I had got the words out of my mouth. At this Glaucon, who had hitherto not spoken a word, broke out into a volley of praises. "Do not imagine," I replied, "that what you have observed represents the utmost of which medical art is capable in the matter of fathoming the mysteries of disease in a living person. There still remain one or two other symptoms to which I will direct your attention." Turning then to the patient I remarked: "When you draw a longer breath you feel a more marked pain, do you not, in the region which I indicated; and with this pain there is associated a sense of weight in the hypochondrium?" At these words the patient expressed his astonishment and admiration in the strongest possible terms. I wanted to go a step farther and announce to my audience still another symptom which is sometimes observed in the more serious maladies of the liver (scirrhus, for example), but I was afraid that I might compromise the laudation which had been bestowed upon me. It then occurred to me that I might safely make the announcement if I put it somewhat in the form

of a prognosis. So I remarked to the patient: "You will probably soon experience, if you have not already done so, a sensation of something pulling upon the right clavicle." He admitted that he had already noticed this symptom. "Then I will give just one more evidence of this power of divination which you believe that I possess. You, yourself, before I arrived on the scene, had made up your mind that your ailment was an attack of pleurisy, etc."

Glaucon's confidence in me and in the medical art, after this episode, was unbounded.

Thirty or forty years elapsed after Galen's death before the Profession began to realize how great an authority he had become in all matters relating to medicine; not perhaps among the majority of physicians, but among the better educated and those more given to reasoning about the various problems in physiology and pathology. Then came the invasion of Rome by the Barbarians, and with it the scattering of nearly all those who were at the time practicing medicine in that great city. This was the beginning of the long period known as the Middle Ages, a period during which, so far as Italy and Gaul were concerned, the science of medicine made no advance whatever. The physicians living in a precarious manner in the towns, and the monks who practiced medicine in the country districts, took very little interest, as may readily be imagined, in the achievements of Galen. Through all those years they clung to the doctrines of the Methodists, as revealed to them in the work of Caelius Aurelianus, the favorite medical treatise of that period. It was only during the latter part of the Middle Ages that Galen's teachings began once more to be appreciated at their true value; and, as time went on, they gained a stronger and stronger hold on the minds of medical men, until finally they held undisputed sway. Friedlaender, speaking of medicine in those dark times, uses these words: "Galen's colossal personality loomed up throughout that long night as a brilliant guiding star to light the intricate pathways of medicine."

CHAPTER XVI

THE INFLUENCE OF CHRISTIANITY UPON THE EVOLUTION OF MEDICINE

The religion established by Jesus Christ in Judea during the early part of the first century remained confined within the limits of that region for a number of years, but already during the latter half of that period groups of Christians were to be found in every part of the Roman Empire, and in certain localities the membership of the new church had increased so greatly in numbers as to excite the alarm and hostility of the temple priests and of the governing officials. Persecutions, especially in the city of Rome and at the instigation of Nero, became more and more frequent and more and more pitiless, but they failed utterly to destroy the new religion, so firmly was it rooted in the followers of Jesus Christ. As a matter of fact its spread was checked for only a few years, and then its adherents increased in numbers more rapidly than ever. Neuburger, in his "History of Medicine," makes the following quotation from the account which Dionysius of Alexandria gives of the great plague that occurred during the third century A. D.:

> The majority of our brethren in their love for their neighbors did not spare themselves, but acted as a unit in their efforts to assist. They visited the sick without the slightest fear and gave them the very best of care, for the sake of Christ. . . . . Among the non-Christians, however, the very opposite was true. As soon as any of their number fell ill they pushed them to one side, even those who were dearest to them, and, before they were more than half-dead, they threw them out into the street and took no care to bury the dead bodies.

Such an example of self-sacrifice and humanity—and there must have been very many similar examples—could not possibly have failed to make a profound impression upon the community at large. Daniel Le Clerc says that three physicians suffered martyrdom for their Christian faith during the reigns of the Emperors Marcus Aurelius, Lucius Verus and Commodus. They were Papila (of Pergamum), Alexander (of Lyons) and Sanctus (a contemporary of Galen), whose death was of a particularly cruel character. Credit should also be given to Christianity, says the same writer, for having established the rule that every community should assume the expense and responsibility of caring for its own poor and sick. This was a step of the greatest importance; and, at a still later period, when Christianity became largely an affair of the state, a complete hospital organization was effected, with the bishop as the chief officer and, under him, deacons and deaconesses. Such well-organized institutions proved to be of the greatest possible benefit to the advance of medical science. They were the worthy successors of those more ancient hospitals, the Aesculapian temples, which were first established by the Greeks in the pre-Hippocratic age, and they have continued in an unbroken chain from the institutions of those primitive times to the thoroughly well-equipped hospitals of the present day.

In 330 A. D. the new capital of the Roman Empire was established in Byzantium, afterward called Constantinople, and Rome, which for hundreds of years had been the metropolis of the world and the source from which a large part of Roman history had emanated, was given a subordinate position. Then followed, in 410 A. D., the conquest of the latter city by the Visigoths, a horde of uneducated Barbarians who had felt the might of Rome in previous years, and who now doubtless took immense satisfaction in humiliating her and in destroying her valuable possessions. There are good reasons for believing that, when the Emperor Constantine established his residence in Byzantium, the leading physicians of Rome followed him; and it is not likely that many of those who,

for one reason or another, preferred to remain in the old capital, continued to do so after it became known that the Barbarians were approaching the city. But the migration of these physicians to the new capital did not mean a renewal there of the scientific activity which had characterized the growth of Greek medicine in Rome during the first two centuries of the Christian Era. It is probable that the fugitives, being obliged to travel with the smallest amount of baggage possible, left the major part of their books and papyrus rolls behind, hoping, no doubt, that they might be able at some later date to recover them. But the favorable occasion never arrived, and thus a great deal of valuable medical literature entirely disappeared. The loss, however, might have been even more serious than it was if the Christian church had not already (during the third century) begun to establish monasteries in secluded and inaccessible spots. It was to these institutions that not only books of a religious character, but also those relating to the science of medicine, were transported for safe keeping during the early Middle Ages. Farther on, I shall have occasion to refer to this subject again and to discuss more fully certain other benefits which accrued to medical science from these monastic institutions.

But while, on the one hand, the Christian church through the instrumentality of the monasteries was lending its aid to the preservation of the sources of medical knowledge, it was, on the other, doing its best to arrest all further evolution of that branch of science; not consciously, it must be admitted, but through a mistaken sense of its duty to God. Thus it came about that the Emperor Justinian I. (527-567 A. D.), acting under the narrow-minded advice of his ecclesiastical counsellors, closed the medical schools at Athens and Alexandria and at the same time withdrew the regular allowance of money which up to that time had been paid to the state physicians and to special scholars. A few years later, however (*i.e.*, in the early part of the seventh century A. D.), some of the more highly educated physicians of Alexandria got together and made the attempt to organize a school of medicine in that city. A

course of lectures was planned and sixteen of Galen's works, carefully chosen for the purpose, were made the basis of the new course of instruction. The books selected were first carefully edited and simplified, and then commentaries were added in order that in their final shape these treatises might be better suited to the uses of students. The invasion of Alexandria by the Arabs, however, soon put an effectual stop to this promising attempt to revive Greek medicine.

In this brief sketch I have thus far mentioned only the more direct effects produced by the new religion upon the evolution of medicine. The indirect effects, however, were also in some cases of very great importance. At the beginning of her history there developed in the Christian church, among her chief men, a strong disposition to quarrel over dogmas. To apply the term quarrelsomeness to this tendency may easily convey a wrong impression. It was, more strictly speaking, a highly developed conscientiousness on the part of men whose minds were deeply imbued with the idea that they were rendering God a service by keeping what they believed to be the true and only religion free from errors of all kinds. It took many centuries to impress the leaders of the church with the fact that the religion of Jesus Christ, like the science of medicine or the natural sciences, was capable of development to an almost indefinite extent; and it is owing to our appreciation of this important fact that we moderns look with so much more lenient eyes upon the distressing, not to say cruel, events of mediaeval ecclesiastical history. At the time of which I am now writing, however, it was considered highly unchristian—especially for one holding authority in the church—to believe otherwise than as her doctrines taught; and accordingly, in the early part of the fifth century A. D., Nestorius, the Patriarch of Constantinople, was deposed from his high office by a Council of the church and imprisoned because he was unwilling to teach the doctrine of the miraculous birth of Jesus Christ. Those who accepted the view held by Nestorius—and they eventually became a very numerous and a very influential

body of Christians—were driven out of Constantinople and compelled to seek homes in distant places. This affords, perhaps, an explanation of the fact that, during the eighth century A. D., many Nestorian Christians were found living in the eastern part of Syria and in Persia; and it seems fair to assume that these Christian communities represented to some extent the direct successors of those Nestorians who had taken refuge in this remote corner of Asia Minor three hundred years earlier. Furthermore, it is highly probable that there were Christian communities in this region several centuries before the Nestorians arrived, for it is believed that the Apostles James and Thomas visited Persia and the northeastern part of Syria in the course of their work as evangelists. It is not known, though, how many of the descendants of these earlier Christians adopted the peculiar beliefs of the Nestorian refugees.

And here it should be stated that the facts which have thus far been mentioned are not the only ones that throw some light upon the relationship subsisting between Christianity and the spread of medical knowledge to Western Europe. Those which remain to be considered are of two kinds, viz., facts relating to the origin of the Arabic Renaissance, and facts which show that the Christian church, from the fourth century onward, was contributing not a little, through the establishment of the great monastic orders, such as the Benedictines, the Dominicans, and the Franciscans, to the preservation if not to the further evolution of Graeco-Roman medical knowledge. I shall reserve for consideration in a later chapter this particular part of the history of medicine; and in the meantime I shall endeavor to describe the events which preceded and rendered possible the active study of Greek medicine on the part of the followers of Mohammed.

So far as history furnishes us with any information on the subject, the Nestorians who lived in Persia, Syria and Mesopotamia were Christians of a remarkably liberal type. They appear to have been an unusually peaceable people, for not only were they kindly disposed toward one another,

but they seem to have been on the best of terms with their Jewish neighbors, who, like themselves, were eager after knowledge. Already at a very early period there existed at Djondisabour—a town which had been founded in the Province of Khorassan, in the northeastern part of Persia, about the year 260 A. D., by Sapor II., King of that country—a school in which the medicine of Hippocrates was taught. Freind, in his "History of Physick" (London, 1727), says that about the year 272 A. D. the Emperor Aurelian (Lucius Domitius Aurelianus), as a compliment to his daughter, who was the wife of the King of Persia, sent to Djondisabour, the city in which she resided, several Greek physicians; and Abulpharagius, the Arab historian (thirteenth century), intimates that these were the men who conducted the teaching in the newly established medical school. Another possibility suggests itself. After the death of Alexander the Great in Babylon (323 B. C.), from malarial fever, it is not unlikely that some of the numerous Greek physicians who accompanied the army in an official character, and who, we are warranted in believing, were exceptionally well educated, decided not to remain in that unhealthy district, but to settle in some of the neighboring towns (*e.g.*, Nisibis in the hill country to the north of Babylon, or Sura to the east of the river Tigris); and that these men also contributed their share toward the planting and perpetuation of Greek medicine in this district of the Orient. However, the salient fact in this period of the history of medicine is this: When Almansur, the Caliph of Bagdad (712 to 775 A. D.), made up his mind to introduce Greek medicine into his kingdom and looked around for the ways and means of accomplishing this, he found at the city of Djondisabour men who were not only well versed in Greek medicine, but who at the same time were so thoroughly grounded in all departments of scholarship that they could at once begin the work of translating the writings of Hippocrates and other classical medical authors into Arabic, the language of the Mohammedans. But at this stage of affairs the existence of a serious obstacle was discovered. The writings which it was proposed to trans-

late were not immediately obtainable, and it therefore became necessary to institute without delay a vigorous search for the books required. In order that the reader may appreciate fully the difficulties which Almansur had to overcome, in this matter of a scarcity of Greek originals, it seems best to pause at this point, and to review briefly some of the facts which bear upon the question at issue.

The Wholesale Destruction of Medical Literature during the Early Centuries of the Christian Era.—The invasion of Rome in 410 A. D. was one of the first events which entailed a serious loss of the Greek medical books that had been accumulating for several centuries in that city. Fortunately, not a few of these works were rescued in time by the church authorities and deposited for safe keeping in the various monasteries scattered all over the Roman Empire. A still more serious destruction of books occurred about the year 638 A. D., when Amrou, a famous Arabian warrior, captured Alexandria and—under the instructions of his master, Omar ben Khattab—destroyed the greater part of the contents of the famous libraries located in that city. The narrative of this event, as told by Lucien Le Clerc, is as follows:—

John the Grammarian,[1] who was living at that time in Alexandria, held the following conversation with Amrou on a certain occasion: "You have inspected all the edifices of Alexandria, and have sequestrated all their contents. I have no objections to your appropriating everything that may be of use to you; there are certain things, however, which you may not wish to possess, but which are highly prized by us."

"What are those objects?" inquired Amrou.

[1] John the Grammarian, whose nativity is not stated by Le Clerc, was at first a simple boatman who ferried back and forth those who attended a school which was located on one of the islands at Alexandria. As a result of his frequent talks with these men, he became enamored with philosophy and decided, notwithstanding his age (forty years), to devote himself entirely to the study of the subject. Accordingly, he sold his boat and attended the lectures regularly, becoming at last an expert in philosophy. He wrote several important treatises and commentaries, some of them dealing with medical topics, and he also made a number of translations from the Greek into Arabic.

"The works on philosophy, which are contained in the public libraries," John replied.

"I can do nothing about them without a special order from the Prince of Believers, Omar ben Khattab," was the answer given by Amrou.

John's wish having in the meantime been conveyed by the General to Omar, the latter sent this reply:—

"As to the books of which you speak, I have this to say. If their contents agree with what is written in the word of God, the books are of no use to us, the Holy Writ being sufficient for our guidance. But if they are at variance with God's word, then surely they should be destroyed."

Amrou therefore ordered all the books to be sent to the bathing establishments of Alexandria, to be used as fuel in heating the baths. So great was the number of books contained in the libraries that it took six months to consume them all. (Sismondi questions the correctness of this account.)

While the invasion of Rome by the Barbarians in the fifth century and the capture of Alexandria by the Arabs in the early part of the seventh gave rise to an enormous loss of valuable books relating to medicine and philosophy in general, these were by no means the only occasions when books were probably destroyed in great quantities. Wars were frequent in those days and towns were constantly being sacked. Everywhere throughout the East the modern traveler encounters the ruins of large cities, and in those cities—the centres, as they were, of wealth and culture—there must have been large collections of books. It is not at all strange, therefore, that when the Caliph Almansur made a serious beginning of the work which was to convert the Arabs into rivals of the ancient Greeks, he should have found a great scarcity of medical works which, after being translated, were to serve as manuals of instruction. However, his ambition was very great, his wealth almost inexhaustible, and his associates eager to aid him in realizing the *renaissance* which he had planned for his people; and, as will appear later on, he and those who aided him eventually succeeded in overcoming this apparently insurmountable obstacle.

Among the medical books which, upon the approach of the Goths, were carried from Rome and other cities to different monasteries for safe keeping there must have been very few that were written in Latin, and yet these were the only ones from which the monks individually could derive any benefit. Several centuries later, when all the monasteries of Italy and the East were visited by those who were searching eagerly for original manuscript-copies of the Greek medical writers,—Hippocrates, Soranus, Rufus of Ephesus, Aretaeus, Dioscorides, Galen,—it was found that such copies existed in a number of these institutions, thus showing that the monks had been actuated by unselfish and far-seeing loyalty to the best interests of mankind when they rescued these particular treasures from the hands of the enemy. They themselves could make no use of them, being unable to read Greek, but they knew their priceless value to medical science.

The Latin treatises which they had also rescued, and of which they made excellent use during the succeeding centuries, were those of Celsus, Scribonius Largus, Pliny the Elder (to a slight degree only) and Caelius Aurelianus.

PART II

MEDIAEVAL MEDICINE

CHAPTER XVII

THE CONDITION OF MEDICINE AT BYZANTIUM DURING THE EARLY PART OF THE MIDDLE AGES

The Byzantine period of the history of medicine begins about the middle of the fourth century A. D. and retains some degree of importance up to or perhaps a little beyond the beginning of the eighth century. During this period of nearly four centuries there appeared on the scene five physicians whose writings form a very creditable part of the late Greek medical literature. The names of these authors are: Oribasius, Aëtius, Alexander of Tralles, Theodore Priscianus and Paulus Aegineta.

Oribasius.—The first physician named in this list, Oribasius, was born about the year 325 A. D. in Pergamum, an important city of Asia Minor and the birthplace of Galen. He received his medical training at Alexandria, settled in Constantinople (the new name given to Byzantium), and soon afterward became the personal physician of the Emperor Julian the Apostate, the nephew of Constantine the Great. Subsequently he was appointed Quaestor of Constantinople, but, upon the death of Julian (363 A. D.) and the accession of Valens and Valentinianus to power, his property was confiscated and he himself was obliged to take refuge among the Ostrogoths, who dwelt on the shores of the Black Sea. These people received him with open arms, and he soon acquired great influence among them. After a time, however, he was recalled to Constantinople and all his former privileges were once more granted to him. He died about the year 403 A. D.

Despite his duties as a practicing physician of the very highest rank—duties which he could not wholly set aside when he accepted the office of Quaestor of Constantinople—and despite the necessity of devoting considerable time to the work which this non-medical official position entailed, Oribasius, like Pliny, appears to have been a most energetic contributor to medical literature. We possess to-day, for example, a large part of the medical cyclopaedia (72 books) which he prepared at the command of the Emperor Julian, and which—even in its incomplete state—contains very full information regarding anatomy, physiology, surgery, pathology and pharmacology. Although the work is simply a compilation, its present value is great, for it contains numerous extracts from earlier and contemporary treatises, many of which have entirely disappeared,—treatises of which we should have had no knowledge whatever if Oribasius had not introduced numerous extracts from them into his cyclopaedia.

About the year 390 A. D., when Oribasius was already an old man, he published (in nine books) a "Synopsis" of the larger work, chiefly for the benefit of his son Eustathios, who was at that time studying medicine. Surgery is omitted from this work, as that branch of medicine was assumed to belong entirely to specialists. At a still later date (about 395 A. D.), Oribasius published a third work (in four books) entitled "Euporista," which was intended chiefly for the use of laymen. The subject-matter of this treatise consists of diet, hygiene and general therapeutics. Neuburger speaks well of all three of the published works of Oribasius, and furnishes a fairly full analysis of the contents of each one.

Bussemaker and Daremberg have published, in six volumes (Paris, 1856-1876), an excellent French version of the works of Oribasius.

Priscianus.—Theodorus Priscianus lived during the latter part of the fourth and the first part of the fifth century of the present era. Very little is known about his professional career beyond the facts that he was a pupil of Vindicianus, a distinguished physician who lived during

the reign of the Emperor Valentinianus I. at Constantinople (364-375 A. D.), and that subsequently he was chosen the private physician of the Emperor Gratianus (375-383 A. D.). The treatise which he composed, and which bore the title of "Euporiston," was originally written in Greek, but was afterward translated by its author into Latin. An excellent German version of the work by Meyer-Steineg was published in Jena in 1909. As the book was intended by Priscianus to serve chiefly as a guide to practitioners of the art, it contains practically nothing about anatomy and physiology. In his pathology he follows closely the teachings of the Methodists; his first question, in the presence of a case of illness, being: "Do the symptoms point to a condition of *strictum* rather than to one of *laxum*, or *vice versa*?" "In his treatment," says Meyer-Steineg, "Priscianus follows very closely the rule that every patient, no matter what may be the disease with which he is affected, should first undergo a certain amount of general treatment." In his choice of remedies Priscianus invariably gives the preference to those agents which are of a simple character and easy to obtain. On the other hand, he does not hesitate to admit that he sometimes employs certain magical remedies, as is shown by the following quotation taken from Book IV., Chapter I., section 4:—

> If a person wears, during the waning of the moon, a wreath of polygonum on his head, he will obtain relief from his headache. . . . . If one drinks of the water from which an ox has just drank, he will be relieved of the pain in his head. . . . . If a loadstone be held upon the head it will draw out the hidden pain, and the same effect may be obtained by rubbing over the forehead a swallow's nest thoroughly mixed with vinegar.

In Book I., paragraph 2, Priscianus draws a picture of the rude and uncivilized behavior of the practitioners of his day in the sick-room. The following are his words as translated from the German of Meyer-Steineg:—

> As the patient lies on his bed prostrated by the severity of the disease, there quickly comes into the room a crowd of us physicians. No feeling of sympathy for the sick man have we, nor do

we realize how impotent we all are in the presence of these forces of nature. Instead, we struggle to the utmost of our ability to obtain charge of the case; one depending for success on his powers of persuasion, a second on the strength of the arguments which he is able to bring forward, a third on his readiness to agree with everything that is said, and the fourth on his skill in contradicting the opinion of everybody else. And, as this quarrel goes on, the patient continues to lie there in a state of exhaustion. "For shame!" Nature seems to say, "you men are an ungrateful lot! You do not even permit the patient to die quietly; you simply kill him. And then, moreover, you accuse me of not furnishing sufficient means of effecting a cure. Illness is certainly a painful affair, but I have provided plenty of remedies. Poisons, I admit, are hidden in some of the plants, but the healing agents which may be extracted from them are much more numerous. Away, then, with your angry disputes and your self-glorifying chatter; for in these are not to be found the remedial agents which I have bestowed upon man, but rather in the powerful forces which reside in the seeds, fruits, plants and other objects which I have created in his interests."

Aëtius.—Aëtius was a native of Amida, in Mesopotamia, and he lived during the early part of the sixth century A. D., under the Emperor Justinian I. He studied medicine at Alexandria and then settled in Constantinople, where he was appointed to the double office of private physician to the emperor and commanding officer of his body-guard (*Comes obsequii*),—an arrangement which made it practicable for the emperor to have his physician near his person on all possible occasions. Almost nothing is known about the subsequent private life and professional career of Aëtius beyond the facts that he was a Christian and that he wrote a treatise on medicine in sixteen books, which together form a large volume. The work, says Le Clerc, is almost entirely a compilation from the treatises of earlier writers on medicine and surgery; the best parts of the book being those which relate to the pathology and treatment of internal diseases, to materia medica, and to ophthalmology. The Christianity of Aëtius, like that of Alexander of Tralles, and other physicians of a later period, appears to have permitted a belief in magical

remedies. For example, Aëtius gives formulae containing the names of the Saviour and the Holy Martyrs for exorcising certain maladies, and he recommends the employment of amulets. The subject of baths is treated by him quite thoroughly, and he lays stress upon the importance of physical exercise as a means of maintaining one's health. Freind, the author of an English history of medicine which was very popular in its day,[1] quotes the following remedy for gout from the treatise of Aëtius:—

> In September to drink milk;
> in October to eat garlick;
> in November to abstain from bathing;
> in December not to eat cabbage;
> in January to take a glass of pure wine in the morning;
> in February to eat no beet;
> in March to mix sweet things both in eatables and drinkables;
> in April not to eat horseradish;
> nor in May the fish called Polypus;
> in June to drink cold water;—and so on through the remainder of the year.

At the end of the French version of "*Les Oeuvres de Rufus d' Éphèse*" (translated from the Greek by Daremberg and Ruelle) will be found fragments of some of the books of Aëtius; in 1899 J. Hirschberg translated into German Book VII. (eye diseases) of the same author; and, two years later (1901) Max Wegscheider published a German version of Book XVI. (obstetrics and gynaecology). No other translations of the writings of Aëtius into either French, German or English are—so far as I am able to learn—available.

Alexander of Tralles.—Alexander of Tralles, a city of Lydia, in Asia Minor, was born about 525 A. D. His father Stephanus was highly esteemed as a practicing physician, and his four brothers, all of them older than himself, were men of distinction in their several callings; Anthemius, the oldest, being one of the greatest mathematicians and mechanicians of his day and the man to

[1] Third edition, London, 1726.

whom the Emperor Justinian intrusted the rebuilding of the church of St. Sophia in Constantinople;[2] Metrodorus, a celebrated grammarian and the honored teacher of the youth belonging to the highest circles of that metropolis; Olympius, a leading authority in jurisprudence; and Dioscorus, a prominent physician in his native city. Alexander received his first instruction in medicine from his father, but he obtained his real training from a physician who was the father of his most intimate friend Cosmas, and who, throughout Alexander's entire subsequent career, proved most helpful in advancing his interests. At first he traveled extensively, visiting in succession—probably in the capacity of a military surgeon—Italy, Northern Africa, Gaul and Spain. Afterward, he settled permanently at Rome and practiced medicine there during the remainder of a long life. Puschmann, the translator of his writings, seems disposed to believe that he was both a teacher and a practitioner of medicine during his residence in that city. When he became too old to bear the heavy burdens of medical practice, he wrote an account of his life,—a life which was rich in professional experience,—and thus built for himself "a monument more striking and more durable than the splendid temple erected by his eldest brother." (Meyer, quoted by Puschmann.)

Various circumstances justify the conclusion that Alexander of Tralles was a Christian. His style of writing is simple and direct, and he states his views with a degree of modesty which wins for him at once the sympathy and confidence of his readers. He gives full and generous recognition to the great physicians who lived and wrote before his time, and more especially to Hippocrates. On the other hand, he does not hesitate, when he believes that he is right, to put forward views which are in direct antagonism with those of even so great an authority as Galen. In the domain of therapeutics, says Puschmann, Alexander was decidedly superior to Galen. His teachings

[2] Anthemius is also credited with being the inventor of the principle of dome construction in architecture.

are based on experience gained in actual practice, whereas Galen was very often disposed to trust to considerations of a theoretical nature; for he was chiefly interested in establishing the pathology of the different diseases and in opening up new territories in medicine in which the human mind might display its activity.

The twelve books of which the treatise of Alexander of Tralles consists, were printed in the original Greek for the first time in 1548, by Robert Étienne, the celebrated printer of Francis I., King of France. The last and most perfect edition of the Greek text is that of the late Dr. Theodore Puschmann, which was published in Vienna in 1878 (two Vols.). It contains, in addition to the Greek version, a careful analysis of the twelve individual books, and an admirable German translation of the entire work. It is from the latter that the following brief extracts (translated into English) are taken:—

Introduction to the writings of Alexander of Tralles.—Upon a certain occasion, my dearest Cosmas, thou didst urge me to publish my rich experiences in the domain of practical medicine, and I am now gladly complying with thy wish, for I feel under deep obligations to both thyself and thy father for the kindness which you have shown to me on every possible occasion in the past. Thy father was always a most helpful patron to me, not only in my practice, but also in all other relations of life. And thou also, even when thou wert living abroad, stood staunchly by me through all the trials which I experienced and the severe blows dealt me by Fate. For these reasons I will now in my old age, when it is no longer possible for me to endure the labor and worries of practice, do as thou desirest, and will write a book in which shall be set forth the experience which I have gained during my long service in the treatment of disease. I hope that many of those who read what is here written, with minds free from jealousy, will experience real pleasure in noting the well-founded and scientific character of the rules which I have laid down and the brevity and preciseness of my descriptions. For I have done my very best always to employ simple words, in order that everybody may find it easy to understand my book.

Some Magical Remedies or Amulets Recommended by Alexander of Tralles, as Effective in the Treatment of Colic.—The

Thracians remove the heart from a lark while the bird is still alive, and wear it, prepared as an amulet, on the left thigh.

Procure a little of the dung of a wolf, preferably some which contains small bits of bone, and pack it in a tube which the patient may easily wear as an amulet on his right arm, thigh, or hip during the attack. He must be very careful, however, not to allow the parts around the seat of the pain to come in contact with the earth or with the water of a bath. This amulet is, in my experience, an unfailing remedy, and almost all physicians of any celebrity have commended its virtues.

Remove the nipple-like projection from the caecum of a young pig, mix myrrh with it, wrap it in the skin of a wolf or dog, and instruct the patient to wear it as an amulet during the waning of the moon. Striking effects may be looked for from this remedy.

Let the design of Hercules throttling a lion be engraved upon a Median stone, and then instruct the patient to wear it on his finger after it has been properly set in a ring of gold.

Take an iron ring and have the hoop made eight-sided. Then engrave upon the eighth side these words: "Flee, flee, oh Gaul! the lark has sought thee out." On the under surface of the head or seal of the ring engrave the letters J. C., thus: ℋ I have often made use of this amulet; and, while I should consider it wrong to keep silence about a remedial agent of such extraordinary efficacy in cases of colic, I feel bound to say that it should not be recommended to the first comer, but only to believers and to those individuals who know how to guard it carefully. The Great Hippocrates, with remarkable insight, gave the advice that things which are holy should be intrusted only to those who are of a religious character, and should be withheld from the profane. As regards the ring, however, the patient must be careful, before wearing it, to have a sketch made of it on either the seventeenth or the twenty-first day of the moon.

Alexander has been severely criticised for his advocacy of the employment of amulets in the treatment of diseases; but he defends himself against such criticism by saying that physicians owe it as a duty to their patients to study carefully what he calls the hidden forces of nature, and to pay unprejudiced attention to the effects produced by amulets and other magical remedies. He reminds his critics that Galen and other eminent medical authorities have insisted that a place be given to this class of agents in the list of

authorized remedies; and he adds that Galen further emphasizes the duty of the physician to employ them when other measures fail, or when the patients themselves frankly confess that they have faith in their efficacy and therefore wish them to be tried. Alexander also makes the statement that Galen, after treating for a long time all reports about the beneficial results obtained from the employment of magical measures as old women's tales, had finally decided that these benefits were at times marvelous and should be accepted as genuine by physicians even if they are unable to explain them.

How much Alexander of Tralles really believed in these supernatural agents, or to what extent he relied upon their effect in influencing the imagination, we may not know; but his was an age of superstition, and the conditions governing society at that time were very different from those which control the world at the present day.

Paulus Aegineta.—Paulus Aegineta[1] was born in the Island of Aegina, not far from Athens, in the early part of the seventh century A. D., and practiced medicine in Alexandria, Egypt. He is known to us as the author of a compend of medicine which was very popular during a long period of time, especially among the Arabs, who, as early as two hundred years after his death, translated his work from the Greek into their own language. At a still later period it was also translated into Latin, the two best versions in this language which we now possess being those of Guintherus Andernacus (Paris, 1532) and of J. Cornarius (Basel, 1556). There is also an English translation by F. Adams ("The Seven Books of Paulus Aegineta," London, 1845-1847), which is favorably spoken of by Neuburger, and which is apparently at the present time the only existing version of the work of Paulus of Aegina in a modern European language; for the French translation by René Briau ("*La Chirurgie de Paul d'Égine,*" Paris, 1855) comprises only Book VI.

The contents of the entire work are as follows: *Book I.*—Dietetics of Pregnant Women and of Children;

[1] Also written Paulus Aeginetes.

Children's Diseases; Massage, Gymnastics, Sexual Hygiene, Bathing, etc.; *Book II.*—General Pathology, the Doctrine of Fevers, Semeiology; *Book III.*—Diseases of the Hair, Diseases of the Brain and Nerves, Diseases of the Eyes, Ears, Nose, Mouth, Teeth and Face; *Book IV.*—Leprosy, Skin Diseases, Inflammations, Swellings, Tumors, Wounds, Ulcers, Fistulae, Hemorrhage, Worms, Affections of the Joints, etc.; *Book V.*—Toxicology; *Book VI.*—Surgery; *Book VII.*—Materia Medica.

To furnish even a very superficial analysis of the contents of this treatise would call for more space than can well be given up here to such a purpose. I shall therefore simply mention a few points of special interest to which Neuburger calls attention in the course of his very full analysis of the work. He states, for example, that Paulus mentions several instances in which patients affected with lung disease, coughed up calculi or small stone-like masses. He also states that the same author was familiar with the fact that in the course of "phthisis," the pus may find its way into the bladder and there cause ulceration [in other words, that pus containing tubercle baccilli may flow down by way of the ureters and cause tuberculous ulceration of the bladder]. Paulus' theory regarding the origin of gout, adds Neuburger, is quite remarkable for that early period. He maintains, for example, that in persons who lead a rather inactive life and who are often affected with digestive disorders, there is produced, through the inadequate power of the tissues of the body to assimilate the excess of nutriment brought to them, a *materies morbi* which is drawn first to the parts that are weakest or least capable of resistance (the joints, for example) and then also to other structures, as the liver, spleen, throat, ears and teeth. These ideas—let it be remembered—were set down in writing in 650 A. D.

At the beginning of his analysis of Book VI., Neuburger makes this remark: "Although the description given by Paulus of the surgery of the ancients is based upon the writings of Hippocrates and Galen, as well as upon those of Leonides, Soranus and Antyllus, one finds at every step

ample evidence that the writer possessed both independence of judgment and the manual skill which belongs to a physician who is familiar with surgical work." He calls particular attention to the section (No. 88) which deals with the manner of removing the heads of arrows from wounds, and he gives special praise to Paulus for his most instructive account of the diagnostic signs to be looked for in a case of suspected wounding of a vital organ. He is extremely thorough, says Neuburger, in his teachings about fractures and dislocations, and he not infrequently differs from the views expressed by his predecessors.

In the section devoted to gynaecological operations Paulus makes it perfectly clear that he was in the habit of using a speculum of a very practical form. Here are his words:—

> . . . . . and, while the operator is holding the instrument in position, an assistant turns the screw until the blades of the instrument have been separated to the distance desired.

In other chapters of Book VI., Paulus furnishes most interesting and minute descriptions of a great variety of operations in general surgery and also in obstetrics, ophthalmology, otology and rhinology. Those who desire to learn further details about these surgical matters should consult the English version mentioned on a previous page.

It is not at all unlikely that at some future day it will be found desirable—by reason of the discovery of the treatises which they are known to have written, but which have been lost—to add to this short list of ancient medical authors the names of the following men who are frequently quoted by them in their works: Antyllus, who made some really valuable additions to our knowledge of the proper manner of treating aneurysms, and who must have been a surgeon of great resourcefulness; Leonides, the Alexandrian, who lived about the time of Galen, and who appears to have been highly considered for his practical common sense in the choice of surgical measures; Hesychios of Byzantium and his distinguished son, Jacobus Psychrestus, who was highly spoken of by his contemporaries

(fifth century A. D.), in whose honor a public statue was erected (Haller), and to whom is attributed the saying: "A good physician should either decline at the start to take charge of a patient, or else he should not leave him until he shall have brought about some measure of improvement"; finally, Heliodorus, and perhaps a few others who are less well known.

CHAPTER XVIII

BEGINNING OF THE ARAB RENAISSANCE UNDER THE CALIPHS OF BAGDAD

Toward the end of the sixth century A. D. the prospects for the perpetuation and further evolution of Greek medicine looked decidedly dark. In Rome and in the larger Italian towns of the Roman Empire, physicians were doubtless still to be found, but they must have led very precarious lives and they certainly could not have had any leisure or opportunity for scientific work. In these earlier years of the Middle Ages the monks conducted the larger part of whatever medical practice was required in the districts in which the monasteries were located. In Byzantium, also, the outlook at this period of Roman history was very unfavorable; and nowhere else, as a matter of fact, would it have been possible for the casual observer to discover any signs that indicated the approach of a revival in the study of the sciences. And yet, even at that seemingly darkest moment in the history of medicine, there were forces at work which would soon revive these precious seeds of Greek knowledge, and, after transplanting them to a richer soil, cause them to produce even better fruit and in larger quantities than ever before.

The rulers under whose auspices the first steps in the great Arab Renaissance were taken, belonged to what is known as the Abbaside Dynasty, the founder of which was Abbas (566-652 A. D.), the uncle of Mohammed. His descendants ruled as Caliphs of Bagdad, on the eastern bank of the Tigris, for many centuries (from 750 A. D. onward).[1] Almansur, the second Caliph of this dynasty,

[1] The account which is given in this and the following chapters is based largely on Dr. Lucien Le Clerc's *Histoire de la Médecine Arabe*, Paris, 1876.

felt a very strong desire that his people, the Arabs, should acquire knowledge of all the useful branches of learning, and more especially of medicine and philosophy; and accordingly, as the Greeks were then universally admitted to be the only nation which possessed that knowledge, and as scarcely any scientific books written in the Arabic language existed at that early date, he directed all his efforts to the finding of Greek originals and of the men qualified to translate them into Arabic. Already as early as the sixth century A. D., Sergius, a Christian of Ras el Ain, had translated a considerable number of Greek treatises into the Syrian tongue, but his work was found to be of an inferior character, and for this reason could not be utilized to any great extent in the present undertaking. Honein (ninth century), one of the most eminent scholars of the Arabic Renaissance, revised a few of these translations and thus rendered them of some service; but by far the larger part of this gigantic task of creating Arabic versions of the classical works of Greek literature, was performed during the ninth century, a period during which the reign of the Arabs extended from the Ganges on the east to the Atlantic on the west. By the end of the eighth century the work of translating had advanced only to the point of producing a single treatise on medicine and a few relating to alchemy; but before the ninth was completed, the Arabs had in their possession, in the form of translations, nearly all the scientific literature of Greece, and, more than this, they could boast that not a few men belonging to their own nation had already become celebrated as scientists of the very first rank.

The medical school at Djondisabour[2] at the time (765 A. D.) when the Caliph Almansur decided to carry out the ambitious scheme which he had been meditating, was practically under the control of a family of Nestorian Christians. A large hospital formed the nucleus of the institution and furnished all the material needed for familiarizing the student with the different diseases and

[2] Le Clerc and Freind mention both Nishapur and Djondisabour as the name of the capital of the Province of Khorassan in northeast Persia.

injuries commonly encountered in that part of the world and with the methods of treatment which, as long experience had shown, offered the best chances of affording relief or effecting a cure. It was a clinical school of a most practical type, and at the head of it was George Bakhtichou, who had been recommended to Almansur as the physician best fitted to take responsible charge of the new work which was then about to begin. George Bakhtichou was not the organizer of the school at Djondisabour, but simply its head at the time of which I am now speaking. Medicine had been taught there, it appears, since the early part of the seventh century A. D. The languages commonly spoken in that town were the Syrian, the Arabian and the Persian, and probably only a few persons understood Greek. The Caliph believed that, as the first and most important step in the new work, medical text books, translations of the works of the best Greek physicians, should be provided with as little loss of time as possible, and George Bakhtichou agreed with this opinion entirely. The latter, therefore, upon the urgent invitation of the Caliph, left the hospital at Djondisabour in the charge of his son, Bakhtichou ben Djordis, and went to Bagdad in company with two of his pupils, Ibrahim and Issa ben Chalata. He was well received at Court, partly because he displayed a readiness to further the Caliph's educational plans, and partly also because he was promptly successful in relieving him of a distressing dyspepsia. Not long after he had arrived in Bagdad, however, he was himself taken ill and was obliged to return to Djondisabour. Before his departure the Caliph presented him with a gift of 10,000 pieces of gold. Issa ben Chalata, one of the two pupils whom George Bakhtichou had brought with him to Bagdad, was left behind to look after the Caliph's health. He proved faithless to his trust, however; and, as soon as it was discovered that he was selling his supposed influence with the Caliph, he was not only dismissed in disgrace but all his property was confiscated. After this disagreeable experience the Caliph did his best to induce George to return to Court, but the latter was then unable to travel,

owing to the injuries which he had received from an accidental fall. His pupil Ibrahim went to Bagdad in his place.

It is known that George Bakhtichou personally took an active part in the work of translating Greek medical treatises into Arabic, but it has not yet been ascertained which books in particular were assigned to his care in the distribution of the different tasks. Ossaibiah, the Arabian historian, makes the statement that the work of translating Greek medical treatises was entirely under the control and guidance of George Bakhtichou; and in the "Continens" of Rhazes frequent mention is made of the latter's name. All of which confirms the belief that, at the beginning of the Arabic Renaissance, George Bakhtichou was in reality the head and front of the movement, so far at least as medicine was concerned. When he became too old and infirm to continue his attendance at the Djondisabour hospital, he intrusted the management of that institution to Issa ben Thaherbakht, who was one of his best pupils. He died in 771 A. D.

In 786 A. D., Haroun Alraschid succeeded to the caliphate; and not long afterward, on the occasion of some temporary illness, he requested Bakhtichou ben Djordis, the son of George and his successor in the work of translating from the Greek, to consult with the regularly appointed physicians of the Court in regard to the nature and proper treatment of his malady. The consultation took place at the appointed time, and one of the Caliph's physicians, thinking that he might catch Bakhtichou in a trap, submitted to him a specimen of urine which purported to come from the Caliph, but which in reality had been obtained from a beast of burden. Alraschid, who knew of the deception, asked:—

"What remedy would you administer to the person from whom this urine came?"

Bakhtichou, who had been clever enough to recognize the true character of the specimen, replied promptly: "Some oats, your Majesty."

The Caliph laughed heartily over the episode, loaded

George's son with presents, and appointed him the chief of all his physicians,—the first instance among the Arabians, it is said, of the appointment of an Archiater.

Bakhtichou ben Djordis was the author of a collection of short medical treatises, and he also wrote, for the special use of his son Gabriel, a medical "remembrancer." He was as highly esteemed by the Arabs as his father had been before him. The date of his death is not known.

Gabriel, the son of Bakhtichou and a grandson of the famous George Bakhtichou, was the most distinguished member of this remarkable family of physicians. In the year 792 A. D., five years after the consultation mentioned above had taken place, Gabriel was sent by his father to give medical advice to Jafar, the son of the Grand Vizier. The treatment which he recommended proved to be entirely successful, and, pleased with the result, Jafar soon afterward had an opportunity to speak to Haroun Alraschid of Gabriel as the physician best fitted to effect a cure in the case of his own favorite wife, who, in a fit of yawning, had dislocated her shoulder. The Arabian physician had tried friction, different sorts of ointments, and manipulations of every imaginable kind, but all in vain. The dislocation still persisted. When Gabriel arrived on the scene he told the Caliph that he could bring the shoulder back into place provided no offense would be taken at the means which he was about to employ. Alraschid gave the desired promise and Gabriel made a movement as if he were about to lift up the bed-clothes. Instantly the patient, through a natural sense of modesty, stretched out her dislocated arm to keep the bed-covering in place. "There! she is cured!" exclaimed Gabriel, and such indeed was the truth. The sudden movement of the limb had reduced the dislocation.—It only remains for me to add that the sum of 500,000 drachmae[3] was paid to Gabriel by Haroun Alraschid for his successful treatment.

Some surprise having been expressed by the Caliph's

[3] The drachma was a silver coin worth about 9¾ pence English money. The fee paid to Gabriel for his surgical services amounted, therefore, to a little less than £2000 or $10,000.

relatives that he should display such extravagant generosity toward a Christian, he replied: "The fate of the empire is bound up in my fate, and my life is in the hands of Gabriel."

Gabriel Bakhtichou died in the early part of the ninth century, not long after the Caliph El Mâmoun had started on his expedition against the Greeks (828 A. D.). He was the author of several medical treatises, and, like his famous grandfather, George Bakhtichou, he did everything in his power to promote the work of translating from the Greek into the Arabic. Gabriel's brother, also named George, and his son Bakhtichou ben Djabriel were both of them physicians of considerable distinction. The latter accompanied El Mâmoun on his expedition against the Greeks. It is a fact worth noting here, that throughout this war the Caliph never for a moment lost sight of the great national scheme of education which his predecessor Almansur had inaugurated and which was still engaging the time and best efforts of many scholars and copyists in Bagdad. Whenever he captured a city he insisted upon the delivery to him of whatever copies of scientific treatises its citizens might possess. But even these extraordinary methods of securing the books which they needed did not satisfy the Arabs, their eagerness to accumulate as many text books as possible being insatiable. Accordingly, from time to time, one of the translators—some member of the Bakhtichou family, for example—would be sent to the different cities of Syria and Persia to search out and get possession of as many Greek manuscripts as possible. Thus, Honein is reported to have said: "I have not been able to procure a complete copy of Galen's 'Demonstration.' Gabriel endeavored to find a copy, but did not succeed; and I myself hunted through Irak, Syria, Palestine and Egypt, but was at last only partially successful. I found one-half of the text in Damascus."

The work of translation was kept up with unremitting zeal until the middle of the ninth century (reigns of El Ouatocq and of Moutaouakkel).

Among the physicians who received their training at the

Djondisabour medical school the Bakhtichous were not the only ones who attained considerable distinction. John Mesué the Elder,[4] for example, who was a Nestorian Christian and the son of an apothecary, became more famous than any member of that family. He not only did his full share of the translating, but he was also a prolific author and a very faithful and efficient teacher, Galen's writings furnishing the basis of his lectures. He lived to be about eighty years of age, his death occurring in 857 A. D. Most of his writings have been lost. Of the twenty or more which have come down to our time those bearing the following titles deserve to receive special mention:—

Book of Fevers.
On the Different kinds of Food and Drink.
On Venesection and Scarifications.
On Tubercular Leprosy.
On Abnormal Prominence of the Abdomen.
On Purgative Remedies.
On Baths.
On the Regulation of Diet.
On Poisons and Poisoning.
On Vertigo.
On the Treatment of Sterility.
On Dentifrices and Gargles.

Sabour ben Sahl, whose death occurred in 869 A. D., was also connected with the hospital at Djondisabour. He was distinguished on account of his special knowledge of the properties of simple drugs and their combinations. He was also the author of the exhaustive formulary known as *Acrabadin Kebir*—probably the first one of its kind, says Le Clerc, of which history makes any mention. This formulary or dispensatory—of which a large and a small edition existed—was in general use in all the hospitals, physicians' offices, etc., of that time.

Still another most distinguished physician and author of medical treatises received his training at the Djondisabour

[4] To distinguish him from Mesué the Younger, who lived at Cairo, Egypt, about one hundred years later, and who attained considerable celebrity on account of the treatises which he wrote on materia medica.

school—viz., John, son of Serapion (or Serapion the Elder, as he is commonly called). He lived about the middle of the ninth century of the Christian era and wrote entirely in the Syrian language, but at a later date his works were all translated into Arabic. The smaller of his two most important treatises, and at the same time the one which appears to have attracted the most attention, was called the Kounnach. About the middle of the twelfth century A. D. it was translated into Latin by Gerard of Cremona, and named by him *Breviarium;* a still later translation received the name of *Practica.* The first part of this smaller treatise (the Breviarium or the Practica) is divided into six books, the titles of which are as follows:—

1. On Nodosities, Ophiasis, and Alopecia.
2. On the Falling Out of the Eyelashes.
3. On the Mild Form of Tinea, the form which resembles Favus.
4. Scaly Affections of the Head and of Other Parts of the Skin.
5. Lice of the Head and of the Body.
6. Headache caused by Exposure to the Sun; and other forms of Cephalalgia.

Salmouïh ben Bayan, a Christian, was the last one of the pupils of the Djondisabour school who attained considerable celebrity as a physician. When the Caliph Motassem came to the throne in 833 A. D., he appointed Salmouïh his personal physician and soon became very much attached to him; leaning upon him more and more for advice in all sorts of troubles. Salmouïh was the author of several medical treatises, but they have all been lost, not even their titles are now known to us. When dying (early in 840 A. D.), he sent word to the Caliph not to put his entire trust in the medical judgment of Mesué if he should find it necessary to call upon the latter for advice in the event of a serious attack of illness. This celebrated physician was universally admitted to be most learned in everything relating to medicine, but there were many of his professional brethren—and Salmouïh was among the number—who did not esteem him so highly as a practitioner. "The most important thing in medicine," said the latter,

"is to appreciate correctly the intensity of the disease, and that is something which Mesué, with all his learning, is not able to do." However, despite the death-bed warning given by Salmouïh to Motassem, this ruler died less than two years later from the effects of the treatment which Mesué the Elder, who had been called in to prescribe for his Highness, had ordered.

In addition to the pupils already mentioned there are a few others who, according to the testimony of Le Clerc, reflected some credit upon the institution in which they acquired their medical training. But enough has already been said, I believe, to establish the fact that, in this remote Persian province of Khorassan (to the west of the country known to-day as Afghanistan), there existed during the eighth and ninth centuries of the present era a most efficient medical school, which was entirely managed by Nestorian Christians, and which sent out into the world trained physicians of the very highest type.

CHAPTER XIX

FURTHER ADVANCE OF THE ARAB RENAISSANCE DURING THE NINTH AND SUCCEEDING CENTURIES OF THE CHRISTIAN ERA

During the latter part of the eighth century the Arab Renaissance, so far at least as the science of medicine was concerned, was controlled and kept in vigorous life almost entirely by physicians who were connected with the school at Djondisabour—one might almost say, by physicians who were members of the Bakhtichou family. To this family, therefore, belongs the chief credit for the admirable results attained during this, the first stage of the Renaissance. But during the ninth century A. D. men who had not received their professional training at this famous school came to the fore and gave a fresh and a more vigorous impulse to the work than their predecessors had given. Under the Bakhtichous the translating had been well started, and in addition a few original medical treatises had been written in the Arabic language. During the period which followed, however, the translating and copying became more active than before, and, in addition, several really valuable treatises were produced by men who wrote in Arabic, and who were—if not racially Arabs—at least the adopted sons of that nation. Of these men none stands out more prominently than Honein, who, according to Le Clerc, "accomplished a marvellous amount of work of the most varied character and of a very high degree of excellence, and that too despite many obstacles. While he was not the originator of the Renaissance in the East, he took the most active part in keeping it up."

Honein, who may rightly be considered as having at least inaugurated the second stage of the Arab Renais-

sance, was born in 809 A. D. at Hira, where his father Isaac, a Christian Arab, conducted a pharmacy. The inhabitants of this town were known to be somewhat lacking in cultivation, and it was therefore not surprising that, when Honein went to Bagdad and presented himself to John, the son of Mesué, as one who wished to become his pupil, his request was promptly declined on the general ground that the people of Hira had not received sufficient education to warrant any one of their number in undertaking the study of medicine. This decision was of course a great disappointment to Honein, but it disturbed him only for a short time. Soon afterward he went to Greece where he worked hard to perfect himself in the knowledge of the Greek language. Then, after a residence of two years in that country, he returned to Bagdad, taking with him a considerable supply of Greek books. His next step was directed toward gaining a better knowledge of Arabic, and with this object in view he spent some time in Bassora, a town which was situated not far to the south of Bagdad, and which possessed good educational facilities. While residing there he devoted a certain portion of his time to the translation of Galen's treatise on anatomy; and he was accordingly prepared, upon his return to Bagdad, to submit to John, the son of Mesué, and to Gabriel, the son of Bakhtichou (who by that time was well advanced in years), a specimen of the work upon which he had been engaged. Both of these men were greatly pleased with the excellence of the translation, and encouraged Honein to go on with the work. El Mâmoun (the second son of Haroun Alraschid), who was the then reigning Caliph, engaged his services both as a translator of Greek writings (into Syriac as well as Arabic) and as a reviser of the translations which had been made by others, and he paid him most generously for these services. According to Le Clerc, the amount of literary work done by Honein was simply prodigious. He translated large portions of the treatises of Galen, Oribasius and Paulus Aegineta, as well as several of the works of Aristotle and of Plato, of the mathematicians and astronomers, and also of the philosophers; and

in addition he wrote a large number of original treatises—such, for example, as a complete set of commentaries on the writings of Hippocrates, a practical work on the diseases of the eyes, etc.

The following account of Honein's experience at the Court of the Caliph Moutaouakkel (middle of the ninth century A. D.) furnishes some insight into his character:—

The Caliph, who had heard of the great learning, ability, and industry of Honein, but who had at the same time feared that he might be in secret communication with the Greeks, decided to subject him to a test that would reveal how far he was venal. Accordingly he sent for him, clothed him in robes of honor, gave him 50,000 drachmae, and then said:

"I wish that thou wouldst prepare for me a secret combination of drugs which will enable me to get rid of one of my enemies."

Honein replied: "I have no knowledge of any but salutary remedies, and it never occurred to me that the Prince of Believers might ask me to furnish those of a different kind. However, if it be the wish of your Majesty, I will see what I can do; but I shall require plenty of time."

After waiting in vain for the desired preparation and finding that even threats failed to accomplish anything, the Caliph put Honein in prison. Then, at the end of a year, which interval the latter had employed diligently in the work of translating, Moutaouakkel gave orders for the prisoner to be brought into his presence. Before this was done, however, a heap of objects of value was placed on one side of the room and instruments of torture on the other. When Honein was brought in, the Caliph said to him: "Time is passing, and my wishes have not yet been gratified. If thou art now ready to obey my behest, these treasures and many others in addition shall be thine. But, if thou continuest to refuse, I will subject thee to tortures and will finally put thee to death."

"I have already told the Prince of Believers," replied Honein, "that my knowledge is limited to the preparation of salutary remedies."

Whereupon the Caliph said: "Have no fear! I simply wished to test thee! But tell me, what are the reasons upon which thy refusal is based?"

"There are two reasons," replied Honein: "my religion and my profession. The first teaches us to do good to our enemies; and

the second, not to do any harm to the human race. Every physician has registered an oath that he will never administer a poison."

"Those are two excellent laws," remarked the Caliph; and he proceeded to load Honein with presents.

Among those who were associated with Honein in his work of translating Greek medical books into Arabic there are three whose names also deserve to be remembered. They are: his son Isaac; his nephew Hobeïch; and a Christian Greek named Costa ben Luca, whose residence was at Baalbek. To men of the present time all these names of oriental physicians are, as a rule, mere meaningless words, conveying no idea of an important relationship to the evolution of medicine. During the ninth and tenth centuries of the present era, however, and indeed for many years subsequent to that time, they were accorded by the physicians of that period almost as much honor for the part which they took in furthering the revival of medicine among the Arabs as was given to Honein himself. It seems therefore appropriate that at least a brief account of the lives of these men and of the work which they did should be given here.

Isaac received his education from his father Honein, and soon after reaching manhood he was set to work translating from the Greek into both Syrian and Arabic—two sister languages. He was a man of great intelligence, and was thought by many to be the equal of his father in the knowledge of Greek, Syriac and Arabic. He also had, like his father, the good fortune to find favor with the rulers of that period. He died in 912 A. D. as the result of a stroke of cerebral apoplexy. In addition to his translations he wrote original treatises on the following topics:—

Simple Medicaments.
Origins of Medicine.
Correctives of Purgative Remedies.
Treatment by Cutting Instruments.
The means of Preserving the Health and the Memory.

Hobeïch was the son of Honein's sister. The date of his birth is not known. He received his training in the lan-

guages from his uncle, and in the course of time became associated with the latter in the work of translating. Eventually he reached his uncle's high standard of scholarship, and the text of his translations was from that time forth accepted without any revision. The Caliph Moutaouakkel appointed him Court Physician, and the immediate successors of this Caliph retained him in the same position. His death occurred during the second half of the ninth century of the Christian era.

Hobeïch translated the "Oath of Hippocrates" and a large number of the more important of Galen's treatises. In addition, he left to posterity several original writings. Quotations from these are to be found in the works of Rhazes, of Ebn el Beithar, and of Serapion the Younger, and they reveal two important facts: first, that Hobeïch was an excellent practicing physician; and, second, that the Arabs had already at this comparatively early date begun to gather their medical information from other sources than the Greek treatises. The following drugs, for example, are described by Hobeïch in the quotations just mentioned, and yet they do not appear to have been known to the Greek medical writers: Turbith, Convolvulus of the Nile, Nux Vomica, Colocynth, Croton Tiglium, Aloes and Myrobolans.

Costa, the son of Luca, was a Christian Greek from Baalbek, in Syria. The dates of his birth and death are not known, but it is believed that he lived during the first half of the tenth century of the present era. He was an excellent Greek and Arabic scholar and was also familiar with the Syriac language. His translations were esteemed equal to those of Honein. After spending some time in Greece he settled in Irak, a province of Persia, and devoted himself to the translation of the books which he had brought with him from Greece. At a later period of his life he removed to Armenia, a country which lies to the north of Irak, between it and the Black Sea, and it was during his residence there that he wrote a number of treatises. It was in Armenia, also, so far as may be judged from the accounts which we possess, that his death took

place. As an evidence of the fact that he was highly esteemed by his contemporaries, his biographer states that a cupola was built over his tomb.

Among the medical works which he translated from the Greek the following are the only ones of special importance: The Aphorisms of Hippocrates, and Galen's commentaries upon them.

The ninth century, the period during which the major portion of the work described in the preceding part of this chapter was accomplished, is considered by Lucien Le Clerc the most remarkable in the world's history. He speaks of it in the following terms:—

> Its greatness is emphasized by the fact that, except in this one corner of the globe, everything was in a state of decadence. . . . . Great as is the credit due the Abbaside Dynasty and its ministers, still greater is our admiration for the Arab nation on account of the eagerness with which it met the wishes of its rulers and also because it pursued resolutely, and despite all the obstacles (political and religious) which were placed in its way, the course laid down for it to follow. . . . . The Arabs also knew how to choose men who were really eminent and to rescue them from lives which otherwise would probably have been sterile; they claimed the inheritance of Greek science; and they revealed to the world that they were worthy of this inheritance.

Some idea of the completeness of the list of Greek medical works which the Arabs translated may be gained from the fact that Galen's writings are more complete in the Arabic than they are in the Greek, the language in which they were originally composed.

With Costa the second stage in the Arab Renaissance came to an end. All the work accomplished at Bagdad up to this period in our history received its inspiration from the different Caliphs belonging to the Abbaside Dynasty. But now the political conditions in the East underwent a change, and other Arabian dynasties, each in its turn, gained control of the power previously wielded by Almansur, Haroun Alraschid and their successors. Fortunately, all of these new rulers seem to have been favorably inclined toward the revival of literature, and

consequently the Arabs continued to take an active part in the advance of medical knowledge during the tenth and eleventh centuries. Bagdad, however, ceased to be the centre of all this intellectual activity, and eventually Cordova in Spain almost rivaled the capital of ancient Greece in the eagerness with which she sought to increase her stores of books, and in her readiness to honor scholars. By this time the Arabs controlled, not only Persia and Arabia, but also Egypt, Palestine, Syria, Marseilles, the coast of Asia Minor, Greece, Sicily, the northern part of Africa and Spain. Owing to the limited space at my command I shall be obliged to confine my account to the more salient features of the progress made during this later or third stage of the Arab Renaissance.

Already as early as toward the end of the ninth century the number of physicians in the East had increased so greatly, and the territory where well-educated medical men were to be found had broadened to such an extent, that I shall now be obliged, in order to maintain some approach to chronological order in my account of the evolution of medical science, to treat the subject according to countries. If the men who stand out foremost in this third stage of the scientific renaissance are not in every instance Arabs or Persians or Syrians, I may at least claim that they are the product, directly or indirectly, of the great Arab movement. The countries in which their best work was done are the following: Persia (apart from Bagdad and its immediate neighborhood), Egypt, Magreb (the modern Algiers and Tunis), Fez and Spain. But, before I consider the progress of medicine in these different parts of the Orient, I should say at least a few words about the events which characterized the cessation of literary work at Bagdad. As might be expected, that city, after the Greek medical and scientific treatises had all been translated into Arabic, gradually lost its pre-eminence as a centre of learning, and new centres developed in other cities throughout the vast Musulman Empire. It must not be inferred, however, that this change was wholly or even largely due to the cessation of literary work. Other factors contributed

to this result, viz.: the decadence of the caliphate and the fact that the caliphs themselves appeared to lose their interest in promoting the sciences actively. It was not until during the tenth century that any further interest in the advancement of medical science was taken by those in authority at Bagdad. Then the Emir Adhad Eddoula built a splendid hospital, and organized it on the basis of several separate services—one for fever cases, another for accidental injuries, a third for ophthalmic cases, and so on. Twenty-four physicians, who had been selected because of their special aptitude for some particular class of medical work, were appointed to take charge of the different services; and it is interesting to note that nearly all of these men bear Arab names. Nevertheless, for a still further period of many years, says Le Clerc, there continued to be as many Christian as Mohammedan physicians in Bagdad.

In the tenth century other hospitals were established in Bagdad. Thus, in 914 A. D., the Vizir Ali ben Issa founded one which he endowed in the most liberal manner. This Vizir must have been a most humane person, for, when the physician-in-charge wrote to him for further instructions regarding the course which he should pursue with respect to people of different religions, the Vizir replied: "Use the fund for the benefit of all classes alike, and be sure to remember the animals."

Persia.—Rhazes, whose full name is Abou Beer Mohammed ben Zakarya, is generally admitted to have been the most illustrious of Persia's physicians, and probably the most distinguished representative of Arab medical learning. He was born at Raj, in the Province of Khorassan, about 850 A. D. After he had received his professional training at Bagdad, he settled at Raj and was soon afterward appointed director of the local hospital. At a later date he was placed in charge of the hospital at Bagdad, but before many months had elapsed he returned to Raj, his native town, and here he spent most of the remaining years of his long life. The date of his death is stated by Haeser as either 923 or 932 A. D., but Le Clerc mentions only the latter date.

Rhazes was a very hard worker and was highly esteemed by his fellow countrymen, who called him the Arabian Galen. The total number of writings which he left behind him at the time of his death was 237, most of them dealing with medical subjects. A few of them, however, were devoted to the discussion of chemical, anatomical and philosophical questions. To-day we possess only 36 of the treatises written by Rhazes, and of this number only six have been printed in Latin. His greatest work, as all critics admit, is that which is commonly known as the "Continens" (or "El Haouy"). In this work, which is divided into twenty-two books, Rhazes gives in a condensed form the views entertained by all his predecessors regarding the more important questions in medical science, and then adds thereto the conclusions which his own experience has led him to form.

He also wrote a second treatise (in ten books) which was esteemed by the physicians of that and later periods almost as highly as the Continens. It was called the "Mansoury," and its contents are distributed as follows: I., Anatomy; II., the Different Temperaments; III., Alimentary Substances and Drugs; IV., Hygiene; V., Cosmetics; VI., the Regimen to be adopted in Traveling; VII., Surgery; VIII., Poisons; IX., Maladies in General; X., Fevers.

A third treatise of considerable importance is that which is devoted by Rhazes to the description and treatment of small-pox and measles. So far as is known at the present time this is the first treatise that has been written on these diseases, and its celebrity rests, not only upon this circumstance, but also upon the facts that its author is evidently familiar with the different types of small-pox and with the characteristic features which distinguish this disease from measles. Freind, in commenting upon this treatise, says that Rhazes assigned for small-pox a cause "entirely new in physick, a sort of an *innate contagion*. This is a *ferment* in the blood, like that in must, which purifies itself sooner or later by throwing off the peccant matter at the glands of the skin; an hypothesis since applied, though upon very slight grounds, to feavers in gen-

eral by many moderns." From this account it is fair to conclude that Rhazes, in the tenth century of the Christian era, as clearly suspected the germ origin of certain febrile diseases as Liebermeister did toward the end of the nineteenth, or as Fracastoro did in the sixteenth. And one cannot help exclaiming: How many centuries had to elapse, and what an immense amount of other facts had still to be discovered—facts in anatomy, in physiology, in chemistry, in optics, etc.—before it became possible to convert this suspicion, this simple product of the reasoning faculty, into an actual demonstration of the truth in pathology!

Among the Arabian physicians of the eleventh century Avicenna is certainly one who should be placed in the first rank. He was born in 980 A. D. at Afschena, a village in the Province of Khorassan, Persia, and spent his youth in Bokhara, where his father held some high office under the Government. His great intellectual capacity was revealed at an early age. It is said, for example, that already before he was ten years old he had committed the entire Koran to memory; and it is added, further, that when he was only seventeen years old he had already acquired such knowledge of medicine that he was invited to take part in a consultation regarding some malady with which the Emir Nuch ben Mansur was affected. The advice which he gave on this occasion was followed, and in the sequel it proved so good that he was granted, as a reward, unrestricted access to the royal library,—a privilege which he utilized to the very best advantage. When his father died Avicenna came into possession of a large fortune, which enabled him to indulge in a great deal of traveling. In this way he visited one Persian Court after another throughout a period of several years. Finally, during a residence at Hamadan, the Prince Schems ed-Daula, whom Avicenna had successfully treated for some malady, made him his Vizir. While he held this office he managed, without neglecting his official duties, to continue his scientific studies; but he was not able entirely to keep out of political intrigues, and as a consequence his life was for a short time in some danger. He was confined for several months

in a fortress, from which, however, he managed eventually to make his escape to the Court of Ibn Kakujah, in Ispahan. He resided in that city during the following fourteen years, and it was there that he wrote his two principal works—the famous medical treatise known as the "Canon," and the equally celebrated cyclopaedic work on philosophy. Worn out by his incessant and most exhausting literary labors and by his excesses in other directions, Avicenna died in June, 1037 A. D., while he was accompanying the Emir on his expedition to Hamadan. His tomb may still be seen in the latter city.

Neuburger, from whose excellent History of Medicine the preceding details have been gleaned, makes the statement that the treatise in which Avicenna's clinical experience was recorded has not come down to our time, and that, consequently, we lack the means of estimating just how great a physician—just how close a clinical observer and how wise a practitioner—he really was. So far, however, as may be judged from the evidence furnished by the Canon, Avicenna was not the equal, in all practical matters relating to medicine, of Haly Abbas and of Rhazes. He was perhaps too much inclined to "look at bedside phenomena through the spectacles of preconceived theories." In brief, he was, first and foremost, a philosopher, and only in a subordinate degree a physician, although a most excellent one. In Book III., where he discusses certain surgical procedures, statements are made which justify the belief that Avicenna was acquainted with intubation of the larynx.

Le Clerc mentions six other Persians who, during the tenth century of the present era, gained more or less distinction as physicians. In the following paragraphs brief notices are given of each of these men.

Eben el Khammar, born in 942 A. D., was a Christian and an excellent practitioner. He was well versed in the science of medicine and a writer of some importance. Date of death unknown.

Abou Sahl el Messihy, who was also a Christian, was a contemporary and intimate friend of Avicenna. He died in 1000 A. D. He was the author of a complete and very

useful summary of medicine, entitled "Kitab el Meya"; and the Arab historian Ossaibiah speaks in terms of admiration of another treatise which he wrote and which bears the title, "Exposition of God's wisdom as Manifested in the Creation of Man."

Abou Soleiman Essedjestany, commonly called "El Mantaky." The dates of his birth and death are not known. He wrote a number of treatises, and—among others—one on "The Organization of the Human Faculties."

Aboul Hassan Ahmed Etthabary, a native of Thabaristan, in the Province of Khorassan. He was employed as a physician by the Emir Rokn eddoula ben Bouïh, and is known as the author of a compendium of medicine entitled: "Hippocratic Methods of Treatment." He died in 970 A. D.

El Comry was one of the most eminent medical practitioners of his time, and was in high favor with the royal household. He wrote a compendium of medicine which bears the title "R'any ou Many," and he was also the author of a treatise on the causes of disease. His death occurred toward the end of the tenth century of the Christian era.

Alfaraby, who is highly commended by Avicenna, should be classed among the philosophers rather than among the physicians. He died in 950 A. D.

The sixth Persian physician of some distinction mentioned by Le Clerc is Ali ben el Abbas—usually spoken of as Haly Abbas. The dates of his birth and death are not stated by any of the authorities, but it is known that he was a native of Ahouaz, a small town on the Karun river, to the southeast of Bagdad, and that he was still living in 994 A. D. Haly Abbas, it is claimed, was the first medical writer who ventured to prepare a complete and systematically arranged Practice of Medicine. He gave it the title of Al-Maleky—"The Royal Book,"—and dedicated it to the Emir Adhad-ad-Daula, whose private physician he was. It is a much smaller treatise than the "Continens" of Rhazes, and somewhat more complete than the same

author's shorter work—the "Mansoury." It covers the entire field of medicine and is distinguished by its very practical character. It was first translated into Latin in 1127 A. D.

Haly Abbas, in one of his treatises, speaks of Hippocrates in the following terms: "Hippocrates, who is the prince of the medical art and the first physician who ever wrote a book on this art, is the author of many treatises on all sorts of medical topics . . . . But he writes in such a very concise manner that much of what he says is obscure, and as a consequence the reader, if he wishes to understand him, is obliged to seek the aid of a commentary."

Egypt.—The dynasty of the Fatimides—the descendants of Fatima (the daughter of Mohammed) and of Ismael, a great-grandson of Ali, the fourth of Mohammed's successors—reigned over Egypt for nearly two centuries (10th to 12th of the present era), and they showed toward the scientists the same spirit of generosity that had been manifested toward them by the Abbasides in the earlier part of their reign. In 970 A. D. Moëz Eddoula drove out the reigning family, assumed the title of Caliph, and founded the city of Cairo. In 972 he built the celebrated mosque Al Azhar and constructed, as a sort of annex to it, a school, a veritable university, where ultimately all the sciences were taught. It throve vigorously, and students flocked to it in great numbers from all quarters of the Moslem empire. During the eleventh and twelfth centuries Egypt was once more, as it had been in the palmy days of Alexandria, the home of many excellent and vigorous institutions of learning. Among the physicians, however, who received their education in medicine at Cairo during this long period, there was not one who attained great eminence.

At the end of the eleventh century the Crusaders, under the leadership of Godfrey de Bouillon and others, made their first serious attack on Palestine and Syria, and from that time onward, for about two centuries, they and the different armies sent out successively from Europe carried on almost constant warfare, which Michaud the distin-

guished French historian (about 1800 A. D.) calls the product of a pious delirium. Wars of religion are the most savage and pitiless of all wars, says Le Clerc, and this was emphatically true of those waged by the Crusaders. On the other hand, says the same writer, "the tolerance exhibited at that period by the Arabs in religious matters is a well-attested fact, and it owes its origin to the circumstance that their scientific education was conducted by Christians. Of Saladin's fifteen physicians two-thirds were either Jews or Christians. Cultivation and good training were the characteristics of the Arabs at that period of their history, whereas fanaticism and brute force were the distinguishing features of the European soldiers. Several hundred thousand adventurers first ravaged Europe and then pounced upon Asia. At Antioch Godfrey de Bouillon committed all sorts of excesses, and then, when he had taken Jerusalem, he massacred 70,000 of its inhabitants—Jews and Musulmans. Eighty years later, Saladin retook Jerusalem; and, with the exception of a comparatively small number, he allowed all of his captives to go free. His brother, Malek el Adel, paid the ransom of 2000 of the prisoners. Contrast these fruits of civilization with the barbarism of the European conquerors under Godfrey de Bouillon. Another result of the Crusades was this: The Franks lost a good deal of their savagery through contact with the Arabs. At a still later period Western Europe drew a large part of her supplies of knowledge from Spain—*i.e.*, from the Musulmans."

Syria.—In the thirteenth century Damascus, the capital of Syria, assumed considerable importance as a centre of medical activity. Bagdad and Cairo had by this time lost the greater part of their attractiveness for those who wished to perfect their knowledge of the healing art, and the vandalism of the so-called Soldiers of the Cross had put an end for many years to come to all hopes of making Constantinople once more the home of scientific or artistic effort. There was one branch of medical practice, however, in which the Cairo physicians excelled all others—that, namely, of ophthalmology. This is explained by the well-

known fact that at all periods of her history Egypt has been afflicted with ophthalmias to a much greater degree than any of the other countries of the Mediterranean basin. The great wealth accumulated in Damascus, the large number of hospitals which were located in the city, and the attractiveness of the town as a place of residence undoubtedly had much to do with the fact that it attained at this period so great popularity as a centre of medical activity.

Spain.—During the tenth century of the present era the Moslem reign in Spain flourished greatly under the two enlightened rulers of the Ommiade Dynasty—Abdurrahman Ennasser and Hakem, and medicine shared fully in this prosperity. During Abdurrahman's reign the Emperor Romanus at Constantinople sent an embassy to Cordova in Spain, and among the gifts which they took with them for the Prince, was a copy of the treatise of Dioscorides in the original Greek, illustrated by marvelously beautiful paintings of the different medicinal plants. But there was nobody in Cordova at that time who could read Greek. Accordingly, Abdurrahman begged the Emperor to send him a man who was familiar with both the Greek and the Latin tongues, and it was in answer to this request that the monk Nicholas was sent to Cordova (951 A. D.). Working in conjunction with several of the most distinguished physicians of that city he succeeded in identifying nearly all of the plants mentioned by Dioscorides.

Among the physicians of Arab, Persian or Jewish extraction who, during the eleventh and twelfth centuries, practiced their profession in Spain and attained considerable celebrity, the following deserve to receive special mention here: Abulcasis, Avenzoar, Averroes and Maimonides.

Abulcasis.—Abulcasis is universally credited with being the greatest surgeon of whom the Arabs may rightfully boast. He was born at Zahra near Cordova in 936 A. D., and his death occurred 1013 A. D. Quite early in his professional career (before he had reached his twenty-fifth year) he was appointed one of Abdurrahman's private

physicians. Although he owes his reputation chiefly to the treatises which he wrote on surgery Abulcasis was also the author of several medical works. He published a collection of all his writings under the title of "The Tesrif," which is divided into thirty parts or books, and which—according to Lucien Le Clerc—constitutes a veritable encyclopaedia. During the course of the twelfth century Gerard of Cremona translated into Latin the part relating to surgery; it is not known at what time or by whom the remainder of the collection was translated. The author's name in the Latin edition is given, not as Abulcasis, but as Alsaharavius.

During the lifetime of Abulcasis his writings, and especially his work on surgery, were not very highly appreciated in Spain. This was largely due to the fact that the Mohammedan inhabitants of that country did not look upon surgery with any degree of favor. The Arabs of the East held Abulcasis in much greater honor. Guy de Chauliac, the famous French surgeon of the fourteenth century, in his treatise on surgery, quotes Abulcasis no less than two hundred times. Le Clerc, in the course of his remarks upon the value of the surgical treatise written by Abulcasis, says: "This book will always be considered, in the history of medicine, to represent the first formal and distinct scientific treatise on surgery." At the same time, the prevailing testimony makes it appear that the book contains only a small portion of original matter, a large part of its substance having been borrowed from the work of the Greek author, Paulus Aegineta. Its chief merit consists in the orderly and very clear manner in which the facts are presented, and doubtless the popularity of the book was materially increased by the fact that many of the instruments required for the different operations were illustrated pictorially.

Lucien Le Clerc has published (Paris, 1861) a French translation of Abulcasis' Treatise on Surgery, and on page 71 of this version the following statement will be found:—

> . . . . . you may also introduce into the cannula a specially adapted piston in copper, or a stylet the end of which is armed

with cotton. Then fill the cannula with oil or some other suitable fluid, introduce into one end the stylet armed with cotton, and push it onward until the liquid enters the ear.

Edouard Nicaise, commenting on these words in his version of Guy de Chauliac's *La Grande Chirurgie* (page 690), says that they constitute the first reference, thus far discovered in medical literature, to the use of the instrument known as a syringe.

Avenzoar.—Avenzoar was born in Seville, in the southern part of Spain, during the latter part of the eleventh century. The exact date is not known. His father was a physician of some distinction, and his son also attained considerable eminence in the same profession. According to Neuburger, Avenzoar died, at an advanced age, in 1162 A. D., and was buried in Seville.

It is said that in actual practice Avenzoar, who was a man of some wealth, confined himself to consultation work. He considered it beneath the dignity of a physician to prepare drugs, to apply leeches, or to perform certain surgical operations—as, for example, lithotomy; but Le Clerc seems disposed to believe that Avenzoar did not adopt this view until after he had become somewhat celebrated and had accumulated a fortune. Neuburger ranks him next to Rhazes as a clinical observer and a practitioner of sound common sense, and he speaks of his great medical work, the Teïssir, as a treatise that abounds in most interesting histories of cases of disease. Among these will be found the account of an attack of mediastinitis which occurred in his own person, and which ended in suppuration that found a vent for its products by way of one of the bronchi.[1] As this disease is of rare occurrence, and as Freind's account of the attack is presumably a translation of the original report in Arabic made by Avenzoar, its reproduction here may be interesting. I shall take the liberty of modernizing the text very slightly and of abbreviating it in one or two places.

[1] For further remarks concerning the origin of the Teïssir see page 229.

I felt some pain in the region of the mediastinum (the membrane which divides the thorax in the middle) while I was on a journey. As it increased a cough developed, and I observed that my pulse was very hard and that I had an acute fever. On the fourth night I took away a pint of blood, but this gave me very little relief. Being obliged to travel all day I was much fatigued when I retired at night, and I fell asleep. During my sleep the bandage on the arm came off, and when I awoke I found the bed deluged with blood and my strength greatly exhausted. The next day I began to cough up a sanious matter, and my mind wandered at times. Gradually all the symptoms subsided and I recovered my health. Although I partook of large quantities of barley water, I believe that my recovery was not due to this, but rather to the great loss of blood which I had experienced.

Freind adds that "Avenzoar not only takes notice of an abscess in the mediastinum, but in the pericardium likewise; which I don't find had been described or even observed by any of the Greeks or Arabians: and there is no doubt but this membrane and the mediastinum to which it is contiguous, are subject, as well as the pleura and lungs, to an inflammation."

It is one of the distinguishing features of Avenzoar's character that, in his writings, he does not hesitate to differ from his predecessors whenever he believes that their views are erroneous.

Averroes.—Averroes was one of Avenzoar's most distinguished pupils. Indeed, the latter's famous work, the Teïssir, is dedicated to Averroes. Thanks to the distinguished French historian and philosopher, Ernest Renan, our knowledge of Averroes has been greatly expanded since 1852. Averroes was born at Cordova in 1126 A. D. His father and his grandfather had both held the office of Cadhi (Alcalde, in Spanish), and were therefore people of importance in that city. His studies were confined at first largely to philosophy, and when he reached mature age he gained a great reputation as the commentator and interpreter of the writings of Aristotle. Still later in life much of his attention was devoted to medicine, and he wrote a book which bears the title "Kitab al-kullidschat"

(General principles of Medicine). Among the physicians of the later Middle Ages this work was commonly spoken of as the "Colliget" (from kullidschat), and was almost as highly esteemed as the Canon of Avicenna. The idea of writing a treatise on the individual diseases was first entertained, among Arabian physicians, by Averroes; but on reflection he abandoned the idea, and, instead, urged Avenzoar, his friend and former instructor, to undertake the work in his place. It was in this way that the Teïssir—the finest work on the practice of medicine produced by an Arab writer—came to be written.

The topics treated in the "Colliget" are distributed throughout the seven books in the following manner:—

Book I.	Anatomy.
Book II.	Health (Physiology).
Book III.	Diseases.
Book IV.	Signs or Symptoms.
Book V.	Remedial agents and Foods.
Book VI.	The Preservation of Health.
Book VII.	The Treatment of Diseases.

Neuburger speaks of the "Colliget" as a fine piece of philosophical writing, but adds that it is not at all suited to the needs of the practical physician. Indeed, he doubts whether any person who has not received a thorough training in natural philosophy—the philosophy of Aristotle—would be able to follow the author intelligently.

Maimonides.—Maimonides, who is ranked by Le Clerc as the greatest Jew, after Moses, of whom the history of that nation makes mention, was born at Cordova, Spain, in 1135 A. D. In early youth his teachers were his father and a disciple of Ebn Badja. At the age of thirteen, and from that time until he had reached his thirtieth year, he was obliged under the pressure of circumstances, to profess, at least outwardly, the faith of Islam. Death or banishment was the only alternative. During the intervening period of seventeen years he devoted himself exclusively to his studies. In 1160 A. D. he accompanied his family to Fez, Morocco, and five years later he settled

at Fostath, near Cairo, Egypt. As a means of gaining his livelihood he engaged in the business of trafficking in precious stones, continuing his studies at the same time and carrying on a certain amount of medical practice. Not long afterward he gained the favor of the Vizir El Fadhl Beissâny, the friend of Saladin, Sultan of Egypt and Syria, and was by him appointed one of the Court physicians. This enabled him to give up entirely his commercial business. He prospered in the practice of medicine and was very highly esteemed in the community in which he lived. His death occurred in 1204 A. D.

Among the books which he wrote (generally in Arabic) on medical subjects, the following deserve to receive special mention:—

I. Commentary on the Aphorisms of Hippocrates.
II. A work known as "Aphorisms of Maimonides" (borrowed partly from Hippocrates and partly from Galen).
III. Résumé of the writings of Galen.
IV. A letter relating to the subject of personal hygiene.
V.-IX. Treatises on asthma; on hemorrhoids; on venoms and poisons in general; on drugs; and on forbidden articles of diet.
X. A translation of one of Avicenna's works.

Neuburger speaks in very favorable terms of the medical writings of Maimonides, and adds that he also wrote a treatise which bears the title: "Guide to Those in Perplexity"—a work which aims to reconcile reason and faith. The book has been translated into French by Munk; and the treatise on poisons has also been translated into the same language by J. M. Rabbinowicz (Paris, 1867).

Speaking of the remarkable manner in which philosophy and medicine had flourished in Spain during the tenth and eleventh centuries, under the reigns of Haken II. and his successors, Ernest Renan says:

> The love of science and of things beautiful had established, in that privileged corner of the world, a degree of tolerance that can scarcely be matched in modern times. Christians, Jews, Musulmans all spoke the same language, sang the same poems, and took

part in the same literary and scientific studies. All the barriers which commonly separate men were thrown down, and all worked with equal zeal in behalf of our common civilization.

With the death of Averroes (1198 A. D.), however, Arab philosophy lost its last representative, and the Koran resumed its full authority over freedom of thought. In the succeeding period of decadence (thirteenth century of the Christian era) there were no physicians of first importance, at least in Spain and Persia; and even in Egypt and Syria, over which reigned at this time the enlightened family of Saladin, the leading physicians were not of the same calibre as the men whose names I have just mentioned. Bagdad and Cordova had by this time become cities of less importance than Damascus, and botany and ophthalmology were esteemed of greater value in the scheme of medical education than at any previous time. It will not appear strange, however, that medicine should have stood still during this later part of the Middle Ages if we bear in mind the fact that warfare was then such a frequently occurring event that nobody had either time or inclination for scientific studies. The invasions of the Mongolians and the Crusaders were most disturbing factors.

During the twelfth century of the present era there were—so we are assured by Le Clerc—women physicians among the Arabs in Spain. It is said, for example, that Abou Bekr, a distinguished medical practitioner of that period, had a sister who was well trained in medicine, and that it was she who acted as midwife at all the confinements of the wives of the Caliph Almansur. After her death her niece officiated in the same capacity in her place. There can scarcely be any reasonable doubt that, almost from time immemorial, women as well as men have taken active part in the practice of medicine.

According to Puschmann, Spain possessed, during the twelfth century of the Christian era, seventy public libraries and seventeen institutions for instruction in the higher branches of learning. Among the residents of the city of Cordova there were, during the same period, no fewer than one hundred and fifty authors; and the smaller cities of

Almeria, Murcia and Malaga could each claim proportionally an equally large number, viz., fifty-two, sixty-one and fifty-three.

The Effects of the Arab Renaissance as a Whole upon the Evolution of Medicine.—Although the series of events which I have endeavored to sketch here in brief outlines reveals an extraordinary degree of zeal and persistence on the part of the Arab rulers and their subjects to endow the nation with the knowledge and skill of their models, the Greeks, the final results gained, at least so far as they relate to the evolution of medicine as a whole, were not very great. The movement lasted for five or six centuries, but nevertheless only a few relatively unimportant facts were added by the Arabs to the stock of knowledge which was possessed at the time of Galen's death. Alhazen's brilliant researches in the eleventh century of our era in optics (more particularly with reference to refraction) paved the way for a more perfect knowledge, in modern times, of the physiology of vision; Geber, who lived during the eighth century of the Christian era, and who is spoken of by Le Clerc as "occupying the same place in the history of chemistry that Hippocrates does in the history of medicine," laid the foundations of that important branch of science; Abulcasis discovered the Medina worm (*dracunculus Medinensis*) and wrote an excellent description of the pathological effects which it produces when it lodges under the skin of a man's leg; and, finally, our pharmacopoeia was enriched, during these centuries, by the addition to it of a number of new drugs and pharmaceutical preparations. These are among the more important contributions which the Arabs made to the general stock of medical knowledge. On the other hand, they contributed, in an indirect manner, to the advance of the science of medicine. From the thirteenth century onward, for a long period, the Latin language was destined to serve as the vehicle by means of which all scientific knowledge was to be spread abroad in the countries which are now known as Italy, Spain, France, Switzerland, Germany, Belgium and Holland, and therefore an immense amount of translating

had to be done before the works of Hippocrates, Galen and other Greek medical authors could be brought within reach of the physicians of these different countries. At that late date it was by no means always feasible to get possession of an original copy of one of these classical treatises, and consequently in such cases it became necessary to employ an Arabic version in the place of the Greek original. It was in this indirect manner, therefore, that the Mohammedan Renaissance contributed most effectively in advancing the development of medical science in general.

One cannot dismiss the subject of Arabic medicine without calling attention once more to the spectacle which this remarkable Renaissance offers—that of an entire nation deliberately working to educate itself up to the level of such intellectual and artistic giants as the ancient Greeks; a work which continued with unabated zeal throughout several centuries in spite of obstacles and discouragements, and which never ceased for a moment. It is a spectacle without parallel in the world's history.

CHAPTER XX

HOSPITALS AND MONASTERIES IN THE MIDDLE AGES

Long before the Christian era it was the practice among the Greeks to make suitable provision for those who, by reason of poverty or illness, were unable to provide for their own wants or to secure the services of a physician. Their slaves, for example, were sent, when overtaken with illness, or when they had become too feeble to work, to what was termed *Xenodochia*—institutions where they received kindly care and such medical treatment as was necessary. (Mommsen.) In strong contrast with this humane practice stands the action of those wealthy Roman property owners who, adopting the course recommended by Cato, the famous censor (96-46 B. C.), "sold their slaves when they became old and feeble or ill, as they would old iron, or oxen that can no longer be utilized for work." This cruel practice not only continued throughout a period of nearly three centuries, but apparently became more and more common, for we are told that the Emperor Claudius (268-270 A. D.) was obliged, in order to mitigate the evil, to issue a decree that, when a slave was driven out of the house by his owner, he should be declared free.

Hospitals and Other Kindred Institutions.—Toward the end of the fourth century of the present era the first hospital was established in Rome by the widow Fabiola, a member of the distinguished Fabian family, and her example induced other wealthy Roman ladies to found similar institutions. But already several years before this time the influence of Christianity had made itself felt so strongly in the eastern branch of the Roman Empire that

the Emperor Julian, who had previously been among its most bitter opponents, was forced to say, in one of his letters:—

> Now we can see what it is that makes these Christians such powerful enemies of our gods; it is the brotherly love which they manifest toward strangers and toward the sick and the poor, the thoughtful manner in which they care for the dead, and the purity of their own lives.

Moved by these considerations, he decided forthwith to erect hospitals in all the cities of the empire. We do not know whether he acted upon this resolution or not, but it is a matter of record that St. Basil, Bishop of Caesarea (370-379 A. D.), founded in that city, which is about thirty miles distant from Jerusalem, a settlement composed of numerous dwellings that were devoted to the use of the poor and the sick. This institution was managed in an admirable manner, a special corps of physicians and nurses being assigned to the duty of caring for its inmates. At Edessa, the capital of Northern Mesopotamia, another hospital was founded in 375 A. D. The date of the establishment of the celebrated hospital at Djondisabour in Persia, of which mention is made elsewhere (see page 204 *et seq.*), is not known. About the middle of the sixth century of the present era, Childebert I., King of the Franks and son of Clovis, founded at Lyons, France, the Hôtel-Dieu, a hospital which has afforded shelter and comfort to thousands of human beings during the past fourteen hundred years, and which is in active operation at the present time; a hospital, too, which has served as a training school for a long line of distinguished physicians, surgeons and gynaecologists. It is an interesting fact that Childebert intrusted the management of this great institution to laymen (instead of the ecclesiastical powers). Finally, toward the end of the sixth century, Bishop Masona founded in Merida, Spain, a hospital in which Jews, slaves and freemen were received and treated on the same footing; and he laid down the rule that one-half of the moneys and other gifts received by the church was to be devoted to

the maintenance of this institution. The list of hospitals and other charitable organizations which were established in these early centuries is very long, and it reveals the fact that in every known land there existed, throughout these years, a strong wish to give aid and comfort to the poor, the sick and the helpless. The Musulmans appear to have been as zealous as the Christians in promoting works of this kind; for the records show that in Bagdad, Cairo, Damascus, Cordova and many of the other cities which were under their control, they provided ample hospital accommodations. Indeed, one of the largest and most perfectly equipped institutions of this character of which the history of the Middle Ages furnishes any record, was that planned and constructed at Cairo, Egypt, in 1283 A. D., by the Sultan El Mansur Gilavun. While it was building, the workmen employed were not permitted to engage in any undertaking for private citizens, and the Sultan himself never failed to visit the spot every day during the progress of the work. The site chosen was that of one of the royal palaces, and in tearing down this structure, in order to make room for the new building, the workmen brought to light a large chest filled with gold and precious stones, the value of which was sufficient to pay the entire expense of erecting the hospital. Upon the completion of the building and the equipment of its spacious wards in the most perfect manner possible, the Sultan expressed himself in the following terms:—

> I have founded this institution for people of my own class and for those who occupy an humbler station in life—for the king and for the servant, for the common soldier and for the Emir, for the rich man and for the poor, for the freeman and for the slave, for men and also for women. I have made ample provision for all the remedial agents that may be required, for physicians, and for everything else that may prove useful in any form of illness. . . . .

One of the characteristic features in the management of this hospital, says Le Clerc, was the custom of giving to each of the poorer inmates, when he left the institution, five pieces of gold, in order that he might be spared the

necessity of undertaking immediately work of an exhausting character.

Monasteries in Their Relation to Medicine.—While at first these institutions were designed chiefly as places of refuge from the turmoil of the world and from the violence of frequent warfare, it became evident in the course of time that the evils incident to such a secluded and self-centered life hindered rather than promoted the development of those particular virtues which Jesus Christ urged his followers to cultivate. This experience led to the adoption of a different kind of cloister life; and so it came about, as stated by Neuburger, that in 529 A. D. Benedictus of Nursia founded, at an isolated spot high up on the slope of Monte Cassino, in Campania, Italy, the now famous parent monastery of the Benedictine Order. According to the original regulations of this order, the monks were obliged to perform every day a certain amount of manual labor as well as devotional exercises. Nine years later Cassiodorus, who had for a long period been a sort of Secretary of State under Theodoric the Great and his successors, became a monk, and, from that time to the day of his death, "devoted all his energies to the service of God and the advancement of science." He secured a house not far from the Benedictine monastery on Monte Cassino, gathered together there a considerable library, and made it a rule of the place that the copying of original codices (the majority of them theological) constituted the most useful and honorable form of manual labor. A few years later, this smaller establishment was made a part of the monastery at Monte Cassino, and the rule just mentioned was thereafter adopted by the enlarged institution. But the care of the sick, the feeble, and children was the particular work which Benedictus, the founder of this institution, had most at heart. Cassiodorus went even farther and urged upon the brethren the desirability of studying the healing art and of utilizing, for this purpose, the works of ancient medical authors.

Learn all you can, he said, about the characteristics of different plants and about the methods of preparing medicinal mixtures,

but set all your hopes upon the Lord who is the preserver of our lives. In your search for knowledge about drugs consult the herbarium of Dioscorides, who has described and pictured the different herbs with great accuracy. Afterward read Latin translations of the works written by Hippocrates and by Galen, particularly the latter's treatise on therapeutics, the one which he addresses to the philosopher Glaucon; and, in addition, study the work of Caelius Aurelianus on the practice of medicine, that of Hippocrates on medicinal plants and methods of treatment, and some of the other writings on medicine which you will find in my library and which I have left behind me for the benefit of my brethren in this institution.

The advice given by Cassiodorus was heeded, not only by those to whom it was addressed, but also by many succeeding generations of monks. Even at the present time, says Neuburger, the books which Cassiodorus recommended are still to be found, either in the form of original manuscript copies or in that of translations, in the library of the parent institution. Furthermore, when it is remembered how large a number of affiliated Benedictine monasteries were established in different parts of Europe, it will readily be appreciated that the good accomplished by the advice which Cassiodorus gave must have been very great.

Among the later abbots of Monte Cassino there were three who attained considerable distinction as physicians. They were Bertharius, who wrote two treatises on medical topics; Alphanus II., Archbishop of Salerno, who was celebrated both as a physician and as a poet; and Desiderius (1027-1087 A. D.), who was skilled, not only in medicine, but also in jurisprudence, and who was elected Pope under the title of Victor III. The monastery attained the height of its celebrity at the time when Constantinus the African became one of its regular members. Although Constantinus was a native Arab (born at Carthage about 1018 A. D.), he became converted to Christianity quite early in life. It is said that he was a great traveler as well as a great scholar, and that he devoted several years to visiting foreign lands—Babylonia, India, Egypt and Ethiopia. It was in this way that he became so well versed in the lan-

guages of the East. Upon visiting Spain as a fugitive from his native city, he took with him several of the works of Hippocrates and Galen, and in course of time translated them into Latin. Finally, he accepted the position of secretary to Robert Guiscard, the first Norman Duke of Calabria and Apulia, who appears to have selected Salerno as his place of residence. At the same time he became one of the teachers at the medical school of that city, and served in this capacity for a certain length of time; but, at the end of a few years, he was formally accepted by the Abbot Desiderius as a member of the Monte Cassino community, and it was here that he did the larger part of his literary work. His death occurred in 1087 A. D., the same year in which the Abbot Desiderius—or, rather, Pope Victor III.—died.

Constantinus was a prodigious worker, but it is doubtful whether he did anything of an original character. Not a few of the treatises which were, at that time, credited to him as original productions, are now known—thanks largely to the researches of the great French historian and linguist, Daremberg—to be simply translations from the Arabic.

It is believed by some authorities that at Monte Cassino medicine was taught to laymen as well as to those who were preparing to become members of the Benedictine Order of monks. It is not likely, however, that this was done to any great extent, as much better facilities for acquiring knowledge of medicine were available at Salerno in the near neighborhood.

In some parts of Gaul, in the early Middle Ages, physicians received very little consideration; indeed, to us moderns it seems strange that any one should have possessed sufficient courage to accept the responsibility of prescribing for a member of one of the royal families. It is related by Neuburger, on the authority of Gregory of Tours' History of the Franks, that when Austrichildis, the wife of King Guntram (sixth century A. D.), was ill with the plague and perceived that her death was near at hand, she sent for her husband and extracted from him a

promise that he would behead the two physicians, Nicolaus and Donatus, who had treated her and whose prescriptions had failed to effect a cure. Her wish was carried out, in order—as the statement reads—"that her Majesty might not enter the Realm of the Dead entirely alone." Many centuries later, however, when civilization had certainly advanced far beyond the stage which it had reached in Gaul in the sixth century of the present era, there were instances in which able and conscientious physicians were subjected to equally cruel treatment for their failure to effect a cure.

It was at about this same period, as is amply verified by the statements made by Bishop Gregory of Tours, that faith in the power of saintly relics to heal diseases became almost universal. So great was the effect produced upon the minds of the people by the public display of these objects—bones of saints, portions of their grave-stones, etc.—that a large number of marvelous cures were reported as the result of such displays; and doubtless—so great is the power of suggestion over the human mind—many of these reports were true. A century later (673-735 A. D.), the Venerable Bede, author of the famous work entitled "Ecclesiastical History of the English Nation," gave, in the course of his narrative, an account of a case of aphasia in which "a remarkable cure was effected"; and, although he mentions a course of "systematic exercises in speaking" as the means used to effect that cure, he attributes it to supernatural causes and not to the practical treatment adopted. He also describes some of the epidemics of his time, and gives most interesting though brief accounts of the methods of treatment employed by the priests and the monks.

During the ninth and tenth centuries, as we learn from the very full descriptions given by Neuburger in his History of Medicine, much zeal was manifested by the monks at St. Gall in Switzerland, at Reichenau in Saxony, and at Fulda, in Hesse Nassau, in the study of the different branches of knowledge, medicine included. The following are the names of those monks who attained the greatest distinction in this work: Hrabanus Maurus, Abbot of the

Fulda Monastery, afterward Archbishop of Mayence, and the author of an encyclopaedia in which the science of medicine receives quite full consideration; and Walahfrid Strabo, a pupil of Maurus, Abbot of Reichenau, and the author of a treatise in verse on medicinal plants.

CHAPTER XXI

MEDICAL INSTRUCTION AT SALERNO, ITALY, IN THE MIDDLE AGES

The date of origin of the Medical School at Salerno is not known, but such evidence as we possess shows without a doubt that already in the earliest part of the Middle Ages some sort of facilities for studying medicine were provided in that little town—the *Civitas Hippocratica,* as it was called at a later period. It seems to be the general impression, says Daremberg, that during those early centuries only ignorance and superstition prevailed in Italy and Gaul; in other words, that all desire for scientific research had vanished, and that there no longer existed such a thing as the regular practice of medicine. This impression, he adds, is erroneous. History shows that schools modeled after those established by the Merovingian and Carlovingian kings (448-639 A. D.), existed up to as recent a date as the middle of the seventh century, and that subsequently the bishops organized the teaching in such a manner that it should be entirely under their control. As time went on, however, the schools assumed a more public character, although the actual teaching was still carried on in the cloisters and church edifices. It is well known, furthermore, that the chief of the Ostrogoths, Visigoths and Lombards—the so-called Barbarians, who at that time occupied these parts of Europe as conquerors—showed themselves on many an occasion to be the enlightened protectors of public instruction and the enthusiastic admirers of classical literature and science.

At Milan there is preserved a manuscript which furnishes satisfactory proof that the writings of Hippocrates and Galen were

made the subject of public teaching at Ravenna toward the end of the eighth century of the present era. . . . . And the transcribing of medical manuscripts was known to be carried on at the Monastery of St. Gall, in Switzerland, during the eighth century. . . . . It is plain, therefore, that throughout those extensive regions which previously had formed a part of the Roman Empire, but which during the Middle Ages were under the dominion of Barbarian kings, there was never an entire lack of physicians, or of medical knowledge, or of facilities for teaching medicine. (Daremberg.)

In the light of these statements it is easy to believe that the original development of the Medical School at Salerno was a perfectly natural event like that of the founding of any of the medical schools of a more recent date. The remarkably healthy and singularly attractive character of the spot where the town of Salerno is located; the proximity of mineral springs; the comparatively short distance which separated it from such important centres of population as Naples and the cities of the Island of Sicily, and from the famous Benedictine Monasteries at La Cava, Beneventum and Monte Cassino; and the circumstance that a Ducal Court was established there—all these are facts which amply explain both why a medical school was founded here rather than at some other spot, and why physicians of exceptional ability were easily induced to make the place their home. At no time in the history of the school, it is important to state, do the church authorities appear to have been in control of its affairs. At most, one or two of the monks seem to have taken part in the teaching for limited periods of time; but in its main characteristics the school may truthfully be described as an institution created and managed by physicians for the advancement of medical science and the best interests of the profession as a whole.*

The organization of hospitals and their utilization for purposes of clinical instruction must have been the most important events which followed next in order. It is only

* According to tradition the medical school at Salerno was founded by four physicians—Adela, an Arab; Helinus, a Jew; Pontus, a Greek; and Salernus, a Latin.

upon this assumption that we can satisfactorily explain why, for many years in succession, physicians traveled all the way from France, Germany and England to Salerno. They were eager to gain additional knowledge of medicine, and clinical instruction afforded the only sure way of obtaining it; but instruction of this kind was nowhere else to be obtained at that remote period, and consequently men of this earnest and ambitious stamp were compelled to make the long journey and to incur the expense and the risk incident to such a trip. As a further evidence of the value which the physicians of the later Middle Ages set upon the writings of the teachers at Salerno, the fact deserves to be mentioned that, toward the end of the twelfth century and all through the thirteenth and fourteenth centuries, these works were frequently quoted.

But the ability and learning of the Salerno physicians were highly appreciated by the public at large as well as by their confrères in other lands; for many people of wealth and of high social standing visited Salerno for the purpose of consulting them. Among the number were Adalberon, Bishop of Verdun, France, who journeyed thither in 984 A. D., but failed to obtain the relief which he required; Desiderius, the Abbot of Monte Cassino; Bohemund, the son of Duke Robert Guiscard; and William the Conqueror, afterward King of England. The two last named remained for some time in Salerno, in order to secure needed treatment for the wounds which they had received in battle.

Toward the end of the tenth, or at the beginning of the eleventh, century the teaching of medicine at Salerno began to assume the character of regularly organized work. The names of the men and women who conducted it—for there were women as well as men in the corps of teachers—are mentioned in various contemporaneous documents which have come down to our time. They are as follows: Petroncellus, Gariopuntus, Alphanus, Bartholomaeus, Cophon, Trotula, John and Matthew Platearius, Abella, Mercuriade, Costanza Calenda, Rebecca Guarna, Afflacius, Maurus, Musandinus and many others. According to Puschmann, the list of physicians who, during the exist-

ence of the Medical School at Salerno,—a period of nearly one thousand years,—acted as teachers in the institution, comprised no less than 340 names. The presence of several women among the instructors of this school, and the great esteem in which they were held by the men of that time, both for their ability as practitioners and for the excellence of the treatises which they wrote, furnish strong confirmation of the statement which Plato makes in his work entitled "The Republic," and which I have already quoted in one of the earlier chapters, viz.: "For women have as pronounced an aptitude as men for the profession of medicine." And, if further evidence of the correctness of Plato's opinion were needed, the success attained by women physicians during the past thirty or forty years in the United States of America might be cited.

To the general statement made above I may with advantage add a few details regarding both the individual physicians at Salerno and the books which they wrote. During recent years, thanks to the researches of Henschel, de Renzi and Piero Giacosa, our knowledge of these matters has been greatly enlarged. In 1837 Henschel found, in the library at Breslau, Germany, a manuscript collection of Salerno medical treatises ("Compendium Salernitanum") dating back as far as the latter part of the twelfth century of the present era. De Renzi, working in association with Daremberg and Baudry de Balzac, succeeded in collecting from the different libraries of Italy quite a large number of additional Salerno treatises, all of which have since been published under the title "*Collectio Salernitana, ossia documenti inediti e trattati di medicina appartenenti alla scuola medica Salernitana*" (5 vols., Naples, 1852-1859). Finally, Piero Giacosa has added to this stock of Salerno writings by the publication (Turin, 1901) of a work which bears the title "*Magistri Salernitani nondum editi etc.*" Beside the treatises to be found in these three collections there is one other which, according to Neuburger, contributed more than all the others combined to the fame of the Medical School of Salerno. The title of this extraordinary work is: "*Regimen sanitatis Salernitanum.*"

The Salernian writings, it appears, may readily be divided into two groups—those of the earlier and those of the later epoch of this famous school. The treatises which belong to the older epoch are written in the degraded Latin of the Middle Ages, and seem to have been composed entirely for didactic purposes. In the main they are compilations of still earlier Graeco-Latin works, but here and there, especially in the parts which relate to therapeutics, evidences of a certain measure of originality are discoverable. The pathology adopted shows a hodge-podge of the humoral doctrine and that of the Methodists.

The chief representative of this early epoch is Gariopontus (first half of the eleventh century), whose treatise on special pathology and therapeutics—entitled "*Passionarius*"—was very popular for a long period of years. Next in order comes Petroncellus, whose "*Practica*" calls for no special comment. Of the works of Alphanus, John Platearius (the elder) and Cophon (the elder), we possess only fragments. Trotula, who lived about 1059 A. D. and was believed to be the wife of John Platearius I., attained greater celebrity than any of those just mentioned. She was related to Roger I., Count of Sicily, and was therefore probably of Norman extraction, and she was considered by her contemporaries to be very learned ("*sapiens matrona*").[1] Her writings, which are quite numerous, are frequently quoted by later authors, this being especially true of her work on diseases of women. The four other women who took an active and creditable part in the work of the Salerno Medical School also wrote treatises on various subjects: Abella, on "Black Bile" (written in verse); Mercuriade, on "Pestilential Fever," and also on "The Treatment of Wounds"; and Rebecca Guarna, on "Fevers." In the case of Costanza Calenda, the daughter of the Dean of the medical school and a woman remarkable for her wisdom as well as for her great beauty, no record of the treatises which she wrote appears to have been preserved.

The later epoch of the literature created by the Medical School of Salerno begins about the year 1100 of the present

[1] Perhaps the French title "sage-femme" originated from this.

era, after the Latin translations and compilations made by Constantinus the African had taught the physicians who were then at the head of affairs something about the medicine of the Arabs, and had, at the same time, through the latter medium, brought to their attention afresh the teachings and practice of the ancient Greeks.[2] Among the works of the latter character—works which in their Latin dress proved most valuable to the Salerno physicians—are the following: "The Aphorisms of Hippocrates"; "Galen's *Ars Parva*" (*Mikrotechne*); and the same author's "Commentaries on the Hippocratic Writings."

John Afflacius, a monk who lived during the latter half of the eleventh century of the present era, was one of the pupils of Constantinus. His treatise "On Fevers," according to Neuburger, contains ample evidence of the author's ability as a clinical observer.

Something still remains to be said concerning Bartholomaeus, Cophon the Younger, John Platearius the Younger and Archimathaeus. They have already been mentioned in the list of authors whose writings contributed materially to the celebrity of the Medical School of Salerno, and it is now only necessary to furnish a few particulars with regard to their lives and the nature of the work which they accomplished.

Bartholomaeus wrote a treatise (entitled "*Practica*") on the practice of medicine as taught by Hippocrates, Galen, Constantinus and the Greek physicians. Its enduring popularity is evidenced by the facts that it was translated at an early period into several languages and that portions of its text are often quoted by later authors. The book contains ample evidence that its author was a very

[2] There can be no question, says Neuburger (in agreement with Daremberg), about the truth of the statement that Constantinus allowed the authorship of several of the treatises issued at Salerno under his name to be attributed to himself—as, for example, the "*Liber Pantegni*" (*Pantechni*), which is in reality the "*Liber Regalis*" of Haly Abbas; the "*Pieticum,*" which is fundamentally the work of Ibn-al-Dschezzar; the "*De Oculis,*" which is based upon Honein ben Ischak's treatise on opthalmology; and still other works which it is not necessary to specify.

close observer and a physician who strove to make accurate diagnoses.

Cophon the Younger (about 1100 A. D.) was the author of two works: a treatise on anatomy which bore the title "*Anatomia Porci,*" and one on the practice of medicine ("*Practica*"). The ancients, it is stated, selected a pig for purposes of anatomical study "because its internal organs present a very close resemblance to those of the human being." Both books are written in a clear and simple style.

John Platearius the Younger was the author of a work on internal medicine ("*Practica Brevis*") and also of one on the subject of urine ("*Regulae Urinarum*").

Archimathaeus wrote and published three treatises: one on "Urines," another on practical medicine ("*Practica*"), and the third on "The Demeanor which a Physician should Observe when he Visits a Sick Person" ("*De Aventu Medici*"). The latter treatise, says Neuburger, is "a mixture of piety, artlessness, and slyness; but it furnishes a capital picture of the carefully regulated behavior of the mediaeval physician at the patient's bedside, of the manner in which he conducted his examination of the case, and of his intercourse with the household as well as with the sick person."

In addition to the treatises referred to above,—treatises which are known to have been written by the authors to whom I have credited them,—the *Collectio Salernitana* contains several of which the authorship is not known. One of these, which bears the title "*De Aegritudinum Curatione,*" is reputed to furnish a better account of the special pathology and therapeutics taught at the Medical School of Salerno during the height of its celebrity than is to be found in any of the other treatises. In one part of the book—that, namely, in which local affections are discussed—the anonymous author gives in succession the opinions held by the seven leading teachers of the school (Platearius II., Cophon II., Petronius, Afflacius, Bartholomaeus, Ferrarius and Trotula) with regard to each one of

a certain number of local diseases; thus enabling the reader to obtain a very fair idea of what was the condition of medical science at Salerno during the twelfth century of the present era.

The famous didactic poem known as the "School of Salerno" (*Schola Salernitana*) and also as the "Code of Health of the School of Salerno" (*Regimen Sanitatis Salernitanum*), was composed originally about 1100 A. D. It was clearly intended in the first instance for the guidance of laymen in matters relating to diet, the conservation of health and the prevention of disease; but from time to time, as the years rolled on, there were added to it several sections which changed materially the character of the poem. From a mere code of health it became eventually a fairly complete cyclopaedia of medicine in versified form; the number of the verses having increased fully tenfold during this long period. The poem, in its latest state, is arranged in ten principal sections, as follows: Hygiene (8 chapters); materia medica (4 chapters); anatomy (4 chapters); physiology (9 chapters); etiology (3 chapters); significance of different signs (24 chapters); pathology (8 chapters); therapeutics (22 chapters); nosology (20 chapters); and the practice of medicine as actually experienced (5 chapters).

The work has been translated into nearly every modern language, and, according to an estimate which was made in 1857, there are in existence no fewer than 240 different editions. The most recent of these is the French translation made by Meaux Saint-Marc and published by him (2d edition) in Paris in 1880. There are two English versions—that by A. Croke (Oxford, 1830), and the more recent one by John Ordronaux (Philadelphia, 1871).

Some authorities make the statement that the poem was written originally for the guidance of Robert, the son of William the Conqueror; but Neuburger says that the dedication of the work to this prince is lacking in many of the original manuscript copies and that in some instances the word "Francorum" is to be found in the place of

"Anglorum"; for which reason he believes that the introduction of a dedication was made long after the poem had been written. It will probably appear strange to most readers that the author of the "*Regimen Sanitatis*" (or "*Flos Medicinae,*" as it was sometimes called) should have written his text in the form of verse rather than in that of prose. He himself states briefly, at the end of the poem,[3] some of the reasons why he preferred to adopt this course. Rhythm, he maintains, makes it easy to say a great deal in a few words; besides which, it facilitates by its novelty the memorizing of new facts, and also enables one quickly to recall to mind those which have been learned at some previous time. His judgment seems to have been entirely correct, for the book proved to be immensely popular, and retained its popularity throughout an extraordinarily long period of time. Furthermore, as already stated, it accomplished a great deal toward enhancing the reputation of the Salerno School of Medicine. When we consider how difficult it must have been in those days for students of medicine to memorize facts which were stored in books that were very costly and oftentimes not obtainable at any price, we cease to wonder at the great popularity of this miniature cyclopaedia in leonine verse.[4] Here were to be found, at one-fourth or one-tenth the price of any similar book written in prose, all the essentials (anatomy, physiology, pathology, etc.) required by the candidate for medical honors; and if, perchance, he possessed a good memory, he might, without a very great mental effort, transfer the entire poem to his own private storehouse of facts.

A few extracts from this remarkable piece of medical literature are given below, in the belief that many of our readers will find them of interest.

[3] Under the heading "*Epilogus*" on pages 268 and 269 of Meaux Saint-Marc's version.

[4] Examples of leonine versification: "Contra vim *mortis*, nulla est herba in *hortis*"; (p. 155 of Saint-Marc's version) and (from Shelley's *Cloud*) "I am the *daughter* of the earth and *water*."

ORIGINAL TEXT

Si vis incolumen, si vis te vivere sanum,
Curas tolle graves, irasci crede profanum,
Parce mero, coenato parum; non sit tibi vanum
Surgere post epulas; somnum fuge meridianum;
Ne mictum retine, ne comprime fortiter anum.
Haec bene si serves, tu longo tempore vives.

DR. JOHN ORDRONAUX'S TRANSLATION

If thou to health and vigor wouldst attain,
Shun weighty cares—all anger deem profane,
From heavy suppers and much wine abstain.
Nor trivial count it, after pompous fare,
To rise from table and to take the air.
Shun idle, noonday slumber, nor delay
The urgent calls of Nature to obey.

Conditiones Necessariae Medico.

Clemens accedat medicus cum vesta polita;
Luceat in digitis splendida gemma suis.
Si fieri valeat, quadrupes sibi sit pretiosus;
Ejus et ornatus splendidus atque decens.
Ornatu nitido conabere carior esse,
Splendidus ornatus plurima dona dabit
Viliter inductus munus sibi vile parabit,
Nam pauper medicus vilia dona capit.

Demeanor Necessary For the Physician.

Let doctors call in clothing fine arrayed,
With sparkling jewels on their hands displayed;
And, if their means allow, let there be had,
To ride, a showy, rich-attired pad.
For when well dressed and looking over-nice,
You may presume to charge a higher price,
Since patients always pay those doctors best,
Who make their calls in finest clothing dressed,
While such as go about in simple frieze,
Must put up with the meanest grade of fees;
For thus it is, poor doctors everywhere
Get but the smallest pittance for their share.

At Salerno the anatomical demonstration made, apparently only once a year, for the benefit of the students, consisted in exposing to view the abdominal viscera of the pig and commenting upon the features which distinguish them from the same organs in the human body. In the "*Regimen Sanitatis*" only eight lines of text are devoted to anatomy.

In section IV., which relates to physiology, the text is more instructive and entertaining, but still—as compared with the splendid work accomplished by Galen—extremely incomplete and superficial.

In the early part of the twelfth century, Nicolaus Praepositus[8] composed, at the request of his colleagues in the school of Salerno, an "Antidotarium"—that is, a collection of formulae for combining together, in a single pharmaceutical preparation, various drugs, both those commonly employed in that part of Europe and others which were then known only to the Arabian physicians. This book of formulae, containing as it did descriptions of the effects which might be expected from the different preparations, and furnishing instructions with regard to the proper mode of employing them, served its purpose admirably, not only in Salerno but throughout Europe, at least during the Middle Ages. All the pharmacopoeias of a later date were based upon his "Antidotarium," and indirectly upon the still earlier celebrated treatises written by Matthew Platearius and bearing the titles "*Glossae*" and "*Circa instans*" (also that of "*De simplici medicina*"). The most remarkable item, however, which is to be found in the Antidotarium is that in which mention is made of the use of soporific sponges ("*spongia soporifera*"), for anaesthetizing purposes by means of inhalations, in certain surgical procedures. (Neuburger.) They were made by impregnating the sponges thoroughly with the juices of narcotic plants (opium, hyoscyamus, mandragora, lactuca, cicuta, etc.), drying them, and putting them aside until they were actually needed. Then the sponge was saturated for

[8] The term "praepositus" means the president or the dean of the school with which the person named is connected.

about an hour with hot water or steamed, after which it was applied over the patient's nostrils and held there until the inhalation of the fumes had induced sleep.

Another Salernian treatise worth mentioning is that written by Peter Musandinus, under the title "On Foods and Beverages suitable for Persons affected with a Fever." This writer, who was one of the teachers at the school of Salerno about the middle of the twelfth century, says that great attention was paid in his time to the preparation of foods in such a manner as to tempt the appetite of people who were ill. He speaks of a meat extract which is prepared from the flesh of the chicken, and also recommends that a soup made by boiling a fowl in rose water be given to patients who are affected with diarrhoea. He even goes so far as to lay stress upon the importance of serving food to a sick person in dishes which are pleasing to the eye. Apropos of the subject of foods that are easily digestible and therefore suitable for invalids I may mention how Meaux Saint-Marc translates or interprets the line in the "Regimen Sanitatis Salernitanum" which reads *O fluvialis anas, quanta dulcedine manas!* His version may be rendered into English thus:

"Oh wood-duck, how gently doth thy soft flesh glide over the internal surface of the stomach!"

Toward the end of the twelfth century (1180 A. D.) there was published at Salerno a work on surgery—the oldest treatise on this subject that is known to have been written in Italy during the Middle Ages. It is now called "Roger's Practice of Surgery," but originally it was spoken of (in accordance with a custom quite common in those days) as "*Post mundi fabricam,*" which are the first three words of the text. This book is of a very practical character and is written in a simple, straightforward style. While it contains the usual amount of traditional knowledge about surgical matters, it gives at the same time the results of the personal experience of Roger, of his teachers, and of his associates. As published in the "*Collectio Salernitana*" the work represents, not the treatise as it was originally written, but a revision made by Rolando of Parma. It is

divided into four parts or books, the topics treated in which comprise most of those usually discussed in works on surgery. Under the heading "Wounds of the Intestine," in Book III., there occurs this most remarkable piece of advice, viz., "to insert into the intestinal canal a small tubular piece of elder and then to stitch the raw edges of the bowel together over it."

Another treatise on surgery, entitled "*Chirurgia Jamati,*" was published at Salerno before the end of the twelfth century. Its authorship is attributed to Jamerius, and in many respects it resembles closely the treatise of Roger.

The "*Regimen Sanitatis*" was not, it appears, the only treatise on medicine which was published at that period in the form of a poem. Gilles de Corbeil (Petrus Aegidius Corboliensis), who had received his professional training at the school of Salerno and was afterward appointed the personal physician of King Philip Augustus in Paris (1180-1223 A. D.), wrote versified treatises on these two groups of topics—"The pulse, the urine, and the beneficial characteristics of composite remedies," and "The signs and symptoms of the different maladies." Both of these treatises were received everywhere throughout Europe with great favor and they maintained their popularity for a period of over four centuries. A French translation (by C. Vieillard) of the treatise on urology was published in Paris in 1903. An edition of the "*De signis et symptomatibus aegritudinum*" was printed in Leipzig in 1907. The following five lines are quoted by Neuburger; and they certainly display the remarkable gift possessed by Aegidius for condensing a large amount of information into a very small space:—

DE CONDITIONIBUS URINAE

Quale, quid, aut quid in hoc, quantum, quotiens, ubi, quando,
Aetas, natura, sexus, labor, ira, diacta,
Cura, fames, motus, lavacrum, cibus, unctio, potus,
Debent artifici certa ratione notari,
Si cupit urinae judex consultus haberi.

To translate this into easily comprehensible English prose would certainly require the employment of at least five times as many words.

Another physician who received a part of his training at Salerno and who is mentioned by Neuburger as "The greatest eye surgeon of the Middle Ages," is Benevenutus Grapheus (twelfth century), a native of Jerusalem, and probably of Jewish parentage. He wrote a practical treatise ("*Practica oculorum*") which had a wide circulation, and which has been translated into Provençal, French and English.

Toward the end of the thirteenth century the famous Medical School of Salerno began to show signs of decadence. Various circumstances were responsible for this change. In the first place, its career of great usefulness had already covered a period of about seven hundred years, and—according to the law affecting all things human—its time of decrepitude was already more than due. Then, in the next place, vigorous rivals were beginning to appear in different parts of Europe,—at Bologna, at Montpellier and at Paris,—and these new schools must have attracted large numbers of students who otherwise would have frequented the University of Salerno for the educational facilities which they required. Commercialism—if such a term may be employed to characterize the action of those who were not willing to undergo the entire course of training required for obtaining the full privileges belonging to a physician—may perhaps also be named as one of the influences which contributed to the slow breaking up of the school. That this force had already begun to exert some effect upon the management of the institution may be inferred from the fact that in 1140 A. D., Roger, King of Sicily and Naples, promulgated the law that nobody would be permitted to practice medicine in his kingdom until he should have satisfied the royal authorities that he was properly qualified to undertake such practice. The establishment of such a law surely indicated that the number of those who were incompetent to assume the responsibilities of a practitioner of medicine was alarm-

ingly on the increase; and, after it had gone into effect, many must have been deterred from choosing a medical career, and perhaps others have been diverted to schools which were located in countries where the laws were more lax. In 1240 A. D. the Roman Emperor Frederic II., who was also King of Sicily, made it a law that the course of medical studies at Salerno should cover a period of five years. All these factors taken together would seem to have been sufficient slowly to diminish the popularity of this celebrated school. But to these there were added, in the latter half of the thirteenth century,—if we may believe Puschmann,—two new factors, which exerted a powerful influence in destroying all hope of further regeneration, viz., the establishment of a university at Naples, in 1258 A. D., by Manfred, King of Sicily, and the narrow and illiberal spirit in which the Church, by this time in almost full control of the education at Salerno, managed the medical school.

During the following four centuries the University of Salerno—for during the thirteenth century it became a university in fact, if not in name—retrograded steadily, until finally the French Government, on November 29, 1811, officially put an end to its existence. The traveler who to-day visits Salerno, in the hope of seeing some remains of the oldest medical school in Europe, will find there only a collection of squalid buildings which serve as dwellings for the poorer classes, a dirty and uncomfortable inn, and shops of nearly the same dimensions as those which once lined the narrow streets of Pompeii. As he gazes, however, at the superb view presented by the Gulf of Salerno he may readily, by an effort of the imagination, reconstruct the picture of the famous "Hippocratic City" as it was when William the Conqueror and other distinguished persons visited it nearly a thousand years ago.

Neuburger, in his review of the career of the Salerno Medical School, sums up its contributions to the science of medicine in about these terms: Those who taught at Salerno were the first physicians in the Christian part of Western Europe who procured for medicine a home in

which scientific considerations alone prevailed, where the Church exercised no control whatever, and where all the different branches of the science were favored to an equal degree. They devoted their best energies, by oral teaching and by their writings, to the single object of communicating practical knowledge of the healing art to all who desired to obtain it; and, by the admirable example of their own lives, they furnished a high standard for the guidance of those who wished to reflect honor upon the name of physician.

CHAPTER XXII

EARLY EVIDENCES OF THE INFLUENCE OF THE RENAISSANCE UPON THE PROGRESS OF MEDICINE IN WESTERN EUROPE

In previous chapters we have seen how the Arabs, inspired with an extraordinary zeal for acquiring knowledge of the different sciences, devoted time and money freely, throughout a period of several centuries, to the accomplishment of this purpose. They were fired with ambition to become a great nation, and their studies of the world's history taught them that the ancient Greeks had accumulated in their literature vast stores of the very knowledge which they were so anxious to acquire. Accordingly all their energies were directed toward converting these stores from the Greek into their own language, the Arabic. This widespread eagerness of the nation, at a given period of its history, to improve itself intellectually is spoken of as the Arabic Renaissance, and, at the time which I am now about to consider, the movement had practically come to a standstill. A short time, however, before this occurred, the physicians of Italy and of the more northerly countries of Western Europe began to show a similar desire to add to their medical literature; and their first step, like that of the Arabs four or five centuries earlier, was directed to the work of translating Arabic medical treatises into debased Latin, which was the language commonly employed by the learned during the Middle Ages. The knowledge which they desired to acquire could not at that time be obtained in any other way, for nobody was acquainted with the Greek language, and, besides, Greek originals had not yet been brought into Western

Europe. These first evidences of the Renaissance in that part of the world were not confined to physicians; they were to be found in every walk of life. The development of the movement reminds one of what takes place near the sea coast, where a period of heat and calm is suddenly broken by the appearance of a few gentle puffs of wind, which are quickly succeeded by the full force of a steady and refreshing sea-breeze. In like manner feeble indications of the coming movement appeared in Italy, France, Germany and even England, and these were soon followed by unmistakable evidences that a genuine Renaissance of widespread proportions had begun. It was as if a great awakening had taken place among the nations which had for centuries lain dormant; an awakening which was followed by a desire to lay aside the trivial pursuits in which they had so far been engaged, and to attain those results which were, later on, to excite the wonder and admiration of the world. Such were, for example, the development of the art of printing with movable types; the discovery of America; the production of such clever painters, sculptors, engravers, workers in metal, etc., as Michael Angelo, Raphael, Albrecht Dürer, Benvenuto Cellini, Rembrandt, and literally scores of others of nearly equal merit; the development of a Shakespeare, a Milton and a Dante in the field of literature; the production of a Luther, a man who had the courage to protest against evil practices which had crept into the Christian church. And medicine, as I have already stated, felt the influence of the approaching Renaissance, and responded to it by efforts which had for their object the acquisition of such knowledge as might be furnished by translations from Arabic treatises. Constantinus, the African, of whom mention has been made on a previous page, seems to have been the first person (toward the end of the eleventh century) who did any work of this kind; but his associates in Salerno do not appear to have valued these translations very highly, or else, perhaps, they were not yet prepared to give serious consideration to works which were new to them. In the twelfth century, as will now be seen, the

attitude of the physicians of Western Europe underwent a change.

The city of Toledo, in Spain, was richly stocked with the manuscript treasures of Arabic literature at the time (1085 A. D.) when it fell into the hands of the Christians. One of the earliest scholars to engage in the work of translating these treasures into Latin was Gerard of Cremona, in Lombardy, who lived during the twelfth century (1114-1187 A. D.). He spent most of his lifetime in Toledo, "learning and teaching, reading and translating." (Neuburger.) Among the medical works which he translated from the Arabic the most important are the following: Several of the writings of Hippocrates and Galen; the Breviarium of Serapion; several of the writings of Rhazes and of Isaac Judaeus; the treatise on surgery by Abulcasis; the Canon of Avicenna, etc. This stimulated many others to follow in the footsteps of Gerard of Cremona; and thus, during the thirteenth century, a number of works of importance were translated in addition to those already mentioned. Such, for example, were the "Colliget" of Averroes by Bonacosa, a Jew (1255) of Padua; the "*Teïssir*" of Avenzoar, and the "Dietetics" of Maimonides by John of Capua, a Jewish convert to Christianity (1262-1278); the "*De veribus cordis*" of Avicenna by Arnaldus of Villanova (about 1282); the treatise "*De simplicibus*" of Serapion the Younger, and the "*Liber servitoris*" of Abulcasis, by Simon Januensis; and many others. This wave of keen interest in the writings of Arabic physicians and in the Arabic versions of Greek medical authors soon reached Languedoc in France, and then passed over from there into Italy. For a long time the Salerno physicians resisted its influence, but they finally yielded to it, as the leaders in the schools of Bologna, Naples, Montpellier and Paris had already done. It was at Palermo, in Sicily, however, that the movement received its greatest impetus. Frederick II., at that time King of Sicily, and a ruler who was most tolerant in religious matters, had at his Court an entire staff of Arabic physicians, philosophers, astrologers and poets; and, in addition, he kept a number of

learned Christians and Jews constantly busy translating Arabic works into Latin. The most widely known member of the latter group was Michael Scotus (or Scottus), who at one time had been a teacher in the Medical School of Salerno. Among the books which he translated while he was at Palermo there were several of Aristotle's treatises, more particularly those which dealt with psychological topics and with natural history. Frederick not only did everything in his power to promote the work of translating, he also took pains to distribute copies of the Latin versions, when completed, among the universities of Western Europe. His son, Manfred, who succeeded him on the throne, seems to have been almost as much interested in the work as his father had been. It was from him, for example, that the University of Paris received a set of the Aristotle volumes in Latin. When Charles I., King of Naples (1265-1285 A. D.), conquered Sicily he manifested considerable interest in continuing the work of his predecessors, particularly as regards treatises relating to medicine. Among the translators whom he employed for this work was Farragut (in Arabic, Faradsch ben Salem), from Girgenti, a small town on the south coast of Sicily, about sixty miles from Palermo. In addition to several treatises of minor importance he translated into Latin the colossal work of Rhazes—the "Continens." Charles I. kept at his Court not only expert translators, but also skilled illuminators; and it was by them that the celebrated manuscript copy of this work which is to-day in the *Bibliothèque Nationale* at Paris, was illustrated with miniatures, three of which are portraits of Farragut. This particular copy of the "Continens" was completed in 1282 A. D. Not a few of the translations made during this period, it should be stated, are now very difficult to understand. In the first place, the Latin in which they are written is of the barbaric type (neo-Latin), something quite different from that employed by Cicero, Tacitus and other Roman authors of the classical period; and, in the next, it is not infrequently evident that the translator himself did not clearly apprehend the meaning of the original Arabic text. Despite all

these drawbacks, however, the placing of Latin versions of Arabic writings within the reach of European physicians accomplished much good. Even the imperfections to which reference has just been made probably served to increase the eagerness of these men to gain access to the real sources of Arabic learning—viz., the writings in the original Greek. To anticipate a little, I may say here that this object was not attained until after the lapse of about two more centuries—that is, not until the scholars of Western Europe had learned to read the Greek, and had also brought out from their hiding places in churches and monasteries of the East the needed originals. At that period of the world's history centuries corresponded to decades as modern events are recorded.

One may gain some idea of the extent to which these Latin translations of Arabic original treatises and of Arabic versions of Greek medical works influenced the physicians of Western Europe, by consulting one of the important medical treatises of the fourteenth century—that, for example, of Guy de Chauliac (written 1363 A. D.). Edouard Nicaise, the accomplished editor of this and several other mediaeval medical treatises, has printed in his preface Joubert's table showing just how often Guy quotes each one of about four score earlier authors, and from this analysis it appears that Abulcasis was quoted 175 times, Aristotle 62 times, Avicenna 661 times, Galen 890 times, Haly Abbas 149 times, Mesué 61 times, Hippocrates 120 times, and Rhazes 161 times; or, to state the facts somewhat differently, the quotations from treatises introduced into Western Europe by the Arabs represent, in the present instance, 70 per cent of all the quotations (2279 of a total of 3243) made by this author. Another equally strong piece of evidence is that afforded by Vincent de Beauvais' encyclopaedia,—a work published in Paris toward the middle of the thirteenth century,—in which the parts relating to medicine appear to have been taken very largely from treatises written by Arabic authors. (See statement on page 270.) There can therefore be no reasonable doubt that the Arabs played a most important part

in the renaissance of medical learning which began a century or two earlier, which already in the thirteenth century had made great progress, and which very soon—as time is reckoned in the calendar of all important world movements—was to culminate in that still greater renaissance called "modern medicine."

During the later portion of the Middle Ages (thirteenth and fourteenth centuries) there were four universities which possessed medical schools of considerable importance—viz., those of Bologna and Padua in Italy, and those of Montpellier and Paris in France. All of these seats of learning, like the famous school at Salerno, developed so gradually and from such modest beginnings that it is scarcely possible to assign to any of them a date of origin. Medicine was taught at several other places—as, for instance, at Oxford, England; at Naples, Vicenza, Siena, Rome, Florence, Ferrara, Pisa and Pavia, in Italy; at Salamanca and Lerida, in Spain; at Prague, in Bohemia; at Cologne, in Germany; at Vienna, in Austria, etc. But the part which these smaller schools played in the work of advancing our knowledge of medicine was certainly of far less importance than that which fell to the lot of the four institutions just mentioned.

The University of Montpellier, if not the oldest of the four schools mentioned, was apparently the first to attain some degree of celebrity. It is known, for example, that the Archbishop of Lyons, who was suffering at the time from some malady which the physicians of that city were not able to cure, visited Montpellier 1153 A. D. in the belief that he might there obtain the desired relief. John of Salisbury, who lived during the latter half of the twelfth century and who was considered one of the greatest scholars of his time, declared that those who wished to acquire a satisfactory knowledge of medicine, found that Salerno and Montpellier were the only places where the desired instruction might be obtained. Gilles de Corbeil (mentioned in the last chapter), Von der Aue, and other eminent men of the same period spoke in equally favorable terms of the merits of Montpellier. The celebrated monk,

Caesarius of Heisterbach, calls the university of that city "the headquarters of medical wisdom"; but at the same time he expresses regret that the physicians of that school not only do not believe in miraculous cures, but speak of them ironically. It was one of the characteristics of the institution that the teachers, both the medical and the philosophical, were, at a very early period, allowed great freedom of thought and speech; but, as time went on, this liberty became very much curtailed. During the thirteenth and fourteenth centuries there were, it appears, many Jews among the students at Montpellier, not merely in the department of medicine, but also in the other departments of the university.

The medical schools of Salerno and Montpellier seemed, at this early period (thirteenth century), to possess more individuality than did the similar organizations at Bologna, Padua and Paris; for limited periods of time each of them in turn enjoyed a certain amount of fame by reason of the fact that some teacher or writer of special distinction happened then to be officially connected with the school. In other words, it was the fame of the man and not of the school, that induced students to visit Bologna or Padua, or Paris, during the thirteenth and fourteenth centuries. At a somewhat later period (fifteenth and sixteenth centuries) all three of these institutions stood out prominently before the world as celebrated medical schools, with distinctive characteristics. To be invited to occupy a chair in one of these institutions conferred honorable distinction upon the incumbent selected, and when I reach that period, farther on in this history, I shall describe each one of the more important schools separately. In dealing with the earlier epoch, however, it seems best to devote our attention more particularly to individual physicians than to the schools with which they may happen to be connected.

Among the physicians belonging to the latter half of the thirteenth and the first quarter of the fourteenth century there is one whose proper place in the history of medicine is by no means easy to determine, and who yet played a part of no small importance. This man was Pietro

d'Abano, or Petrus Aponensis, who was born at Abano, a small village near Padua, 1250 A. D. Very little is known about his early youth, but from this little we are warranted in drawing the conclusion that his father, a notary, must have taken great pains to afford him every possible educational advantage. He gave his son, for example, the opportunity of studying Greek in Constantinople,—a thing of rare occurrence in those early days,—and allowed him to remain there until he had so far mastered the language that he was able to translate the "*Problemata*" of Aristotle from the original text. Then, upon his return home from Constantinople, he was sent to Paris for the purpose of perfecting his knowledge of philosophy, mathematics and medicine. After this thorough training for his life work, Pietro d'Abano began teaching philosophy in Padua, and almost immediately he gained such success that people spoke of him as "the great Lombard." However, like most of the men of that time who became conspicuous through their intellectual attainments, Pietro d'Abano was soon accused by the Dominicans of being a heretic and of cultivating the magician's art. He was able to parry this blow by making a journey to Rome and obtaining from Pope Boniface VIII. a decree of absolution. About the same time he began writing his two great works—the "*Conciliator*" and the "Commentaries on Aristotle's *Problemata.*" He did not begin to teach medicine at the University of Padua until 1306, when he was already fifty-six years of age. But his lectures, reflecting as they did the depth and extent of his learning and the keenness of his powers of analysis, were a source of great astonishment to his contemporaries. It is reported by Neuburger, for example, that Gentile da Foligno, one of the most distinguished professors in the Medical School of Padua, happening to pass near the auditorium while Pietro d'Abano was delivering his lecture, listened for a short time and then exclaimed: "*Salve o santo tempio*"—"Hail to this time which has brought forth such wonders!" With the increase of Pietro's fame came also a decided increase in the bitterness of the persecution carried on against him

by his ecclesiastical foes, largely due perhaps to his open and courageous defense of the Averroism which they so much hated. There is very little doubt that he would have been burned at the stake about this time if the friendly disposition of the Popes and the mighty influence possessed by the city of Padua had not shielded him from this danger. In 1314 the newly founded school of Treviso invited Pietro d'Abano to occupy the Chair of Medicine and Physics, and he accepted; but he was taken ill and died during the following year. Shortly before the occurrence of this event he was placed on trial for heresy by the Inquisition, and the proceedings were continued even after his death. Indeed, according to one account of this famous trial, not only was the charge sustained, but the prescribed penalty was inflicted either upon the disinterred corpse or upon an effigy of the condemned man. One century later, the city of Padua erected a permanent memorial in Pietro d'Abano's honor.

The principal work of this remarkable physician—viz., the "*Conciliator differentiarium philosophorum et praecipue medicorum*"—was first printed at Venice in 1471. (It is said to be one of the earliest printed books known.) It was a most popular treatise, as is shown by the fact that between the year last mentioned and 1621 it passed through a number of editions. Of the other treatises which he wrote—some seven or eight in all—it will be sufficient to mention here that one alone to which reference has already been made in the preceding account, viz., the work entitled "*Expositio problematum Aristotelis*" (Mantua, 1475, and Paris, 1520).

At this early period in the history of the Padua Medical School there were one or two other men who attained a considerable degree of celebrity for the excellence of the work which they did, either as authors or as class-room teachers. A brief account of one of these, Aegidius Corboliensis, has already been given on a preceding page, and it seems only fair that I should furnish here similar brief accounts of some of the others—Gentile da Foligno, Massilio and Galeazzo de St. Sophia, Giacomo and Giovanni

de' Dondi, and Giacomo della Torre, from Forli, all of whom contributed greatly to the steadily increasing fame of the Padua School of Medicine; but, under the conditions which govern the preparation of this brief history, I must reluctantly pass over these names in silence.

CHAPTER XXIII

FURTHER PROGRESS OF MEDICINE AND SURGERY IN WESTERN EUROPE DURING THE THIRTEENTH, FOURTEENTH AND A PART OF THE FIFTEENTH CENTURIES

Among the men who, during the thirteenth century, exerted more or less influence upon the growth of medical knowledge there are three who deserve to receive some consideration at our hands. They were not physicians, but yet some of their writings deal with topics which are closely related to the science of medicine. They are: Albert von Bollstädt, a German who is generally known as Albertus Magnus, one of the greatest scholastic philosophers of the Middle Ages; Vincent of Beauvais (Vincentius Bellovacensis), a French Dominican monk, who was reader to Louis IX., and who compiled a general encyclopaedia which brought him great fame at that period; and Roger Bacon, an Englishman who, by reason of the extraordinary extent of his knowledge and his remarkable powers of observation, was given the name of "Doctor mirabilis."

Albertus Magnus.—Albertus Magnus was born at Lauingen, Swabia, in 1193 A. D., obtained his education in Italy (at the University of Padua, during the latter part of his stay), joined the Order of the Dominicans on arriving at the age of thirty, and afterwards, throughout his long life, devoted himself largely to teaching, particularly at Paris and Cologne. He was a prolific writer and his works, particularly those which treat of topics belonging to the domain of natural history, were greatly appreciated. The effect, however, which they produced upon a certain class of readers was to persuade them that he was a great

magician. The chief distinction of his writings lies in the fact that they contain a large number of original observations which he made during the course of his journeys afoot through Germany in the character of Provincial of the Dominican Order. This habit of exercising entire independence in the use of his reasoning powers was something quite rare in those days. His observations were directed chiefly to matters belonging to the domains of zoölogy, botany, climatology, mineralogy, chemistry and physics. The following significant advice, says Neuburger, is attributed to him: "As regards the doctrines which relate to questions of belief and of morality, it is the part of wisdom to attach greater authority to Saint Augustine than to the philosophers; in matters belonging to the domain of medicine put your chief trust in Galen and in Hippocrates; in natural history, however, your best guide is Aristotle." Neuburger adds that, throughout the writings of Albertus Magnus, there appear interesting statements relating to anatomy, physiology, psychology, and the plants and minerals which may be used for remedial purposes.

An edition of the writings of Albertus Magnus (21 folio volumes) was published in Lyons by Petrus Jany in 1651. The work was republished in Paris in 1892 and following years.

Vincent of Beauvais.—Vincent of Beauvais, France, a Dominican monk who lived during the first half of the thirteenth century and was the tutor of Louis the Ninth's children, devoted the major part of his time to literary work. He wrote many theological treatises and also edited a large encyclopaedia in which information is furnished regarding everything that was known at that time. Several hundred authors aided him in compiling this work, which is entitled "*Speculum Majus.*" It is arranged in three parts, one of which ("*Speculum Naturale*") consists of 33 books that are divided into 3740 chapters; and quite a number of the divisions are devoted to topics relating to medicine. The authors, from whose writings this medical information has been abstracted, are Hippocrates, Aristotle, Dioscorides,

Haly Abbas, Rhazes, Avicenna and several others—not to mention the Church Fathers and other encyclopaedic writers connected with the Church. The first printed edition of this great work appeared toward the end of the fifteenth century (1473-1475 A. D.); the last, or one of the last, in 1624. Lack of space will not permit me to give any details concerning the works of a somewhat similar character which were prepared, about the same time, by the English Franciscan monk Bartholomaeus of Glanvilla (1260); by the Dominican, Thomas of Cantimpré (1204-1280 A. D.), a pupil of Albertus Magnus; and by others.

Roger Bacon.—Roger Bacon was born about 1210 A. D. in Ilchester, Somersetshire, England, and received his early training at Oxford. When he was thirty years of age he went to Paris and, after devoting himself assiduously for seven years to the study of various branches of learning, he received the Doctor's degree (1247). The wish to acquire a thorough knowledge of whatever subject he undertook to study constituted a prominent feature of his character. He was fond of languages, but he had an even greater love for mathematics, particularly in connection with astronomy, and for experimental work in the department of chemistry. It is said that he expended a large sum of money (£2000) upon these chemical investigations. He left Paris in 1250, returned to England, and not long afterward joined the Order of the Franciscans. Robert Grossetête, Bishop of Lincoln, and the Franciscan monk Adam of Marisco—two men whom Neuburger describes as theologians of a very liberal type—exercised a strong influence upon Bacon at this period of his life. They confirmed him in the belief that familiarity with the learned languages was an acquisition greatly to be prized, and at the same time they gave him every encouragement to pursue his researches in mathematics and in natural history. For a certain length of time he was an instructor at Oxford, but his views with regard to ecclesiastic and moral questions and the discoveries which he made in physics (especially in optics) were beyond the comprehension of his contemporaries, who did not hesitate to pronounce them works of the Devil and to subject Bacon

to all sorts of punishments and deprivations. Fortunately for him and for the cause of science the newly elected Pope, Clement IV. (1266), came to his rescue in those dark days and granted him—under the promise of absolute secrecy—permission to continue his researches without hindrance and to perfect the plans which he had in mind for reforms of different kinds. I cannot follow this pioneer of scientific research work, this man who was several centuries ahead of the time in which he lived, through all the vicissitudes of his interesting and extraordinarily fruitful life; I may simply add that his death occurred about the year 1294; that he left behind him many important treatises, only a small portion of which have thus far been published,[1] and that from these alone one is justified in classing Roger Bacon as one of the greatest thinkers whom history has recorded. So far as is now known, he wrote very little concerning medicine, and—strange to say—he seems to have attached considerable importance to astrology; indeed, he went so far as to blame the physicians of his day for their ignorance regarding this science, "as a result of which they neglect the best part of medicine." In strange contrast with these views, which to-day we characterize as foolishness, is Bacon's famous dictum: "Experiment is a firmer and more trustworthy basis of knowledge than argument"—a maxim which is the guiding principle of modern medicine.

The Medical School of Bologna.—The Medical School of Bologna first began to assume a certain degree of prominence in the early part of the thirteenth century, under the teaching of Thaddeus Alderotti—also frequently called Thaddeus of Florence.

Thaddeus Alderotti.—Thaddeus Alderotti, who was born at Florence, Italy, 1223 A. D., of humble parentage, began the study of philosophy and medicine at Bologna only after he had reached manhood; but he was such an earnest student and made such good use of his opportunities that in 1260 he was chosen to serve as one of the teachers in the school. Throughout a period of many years he filled the office so

[1] The Opus majus, ed. J. H. Bridges, Oxford, 1897 (2d edition, 1900); opera hactenus inedita, ed. B. Steele, Fasc. I., London.

acceptably that his colleagues bestowed upon him the name of "Master of Physicians." Before this time arrived, however, his lack of funds was sorely felt, for he was obliged, in order to support himself, to offer consecrated wax candles for sale at the entrance of the church. He is reported to have been not merely a most learned physician, but also a very successful practitioner. He was called into consultation from all parts of the country, so highly was his opinion valued by other physicians; and thus in due time he accumulated a large fortune. His charges were by no means small. It is related, for example, that Pope Honorius IV. sent for him to come to Rome, and, after the treatment was completed, paid him a fee of 10,000 gold pieces[1]—but not until after he had expressed surprise that Thaddeus should have charged as much as 100 gold pieces per day for his services. To this demurrer on the part of the Pope, Thaddeus replied that the petty princes and even the simple nobles made no objection to paying him 50 or more gold pieces per day. It is scarcely necessary to add that the Holy Father did not wish to be outdone by his inferiors.

Alderotti died 1303 A. D.

Among the writings of Thaddeus Alderotti which have come down to our time there are to be found a number of autobiographical references which are not without interest. In one place, for example, he mentions the fact that he occasionally walks in his sleep, and then proceeds (in Latin) to discuss the phenomenon of sleep-walking as observed in his own case. I give here a free translation of the text printed in Neuburger's History:—

> The fourth question which suggests itself is this: Can the senses during sleep come into active operation? Touching this fourth question I reason thus: It appears as if, when one is asleep, the senses must act, for a person may move about without incurring any harm when he is in that state, as is often observed in the case of those who, like myself, walk in their sleep. . . . . Furthermore, it has been remarked that these people are able to harness a horse and then to ride the animal safely,—acts which it is not

[1] *Aurei.* The *aureus* is said to have been worth about 16 shillings, English money.

possible to perform without the aid of the senses. On the other hand, Aristotle maintains that a man, when asleep, is not capable of using his senses. To this I reply by conceding that during sleep a man certainly does not perceive what is going on about him. Wherefore, if you answer me by saying that the mere fact of a man's ability to walk while he is asleep furnishes conclusive evidence that he possesses his senses, I reply that movements like that of walking are not the result of an impression made upon the mind ("*impressio imaginativa*"), but the product of a different mechanism, of a nature which permits it to operate during sleep. . . . . As to the second point to which you call attention—that, namely, with regard to the power of bridling and riding a horse while one is asleep—I make this reply: These acts are performed as a result of an impression made upon the mind through the working of the imagination, and not as a direct consequence of any images created upon the eye; for, if the sleep-walker happens to be in a strange house when the impulse to walk seizes him, he will not go to the stable. The route which he is sure to take will be one with which he is familiar, as happened in the case of the blind teacher who, unaccompanied by any person, walked habitually through the streets of Bologna. And then, besides, I am able to speak from personal experience, for in one of my sleep walks I jumped down from an elevation about four feet above the ground without awaking from my sleep. . . . . When, in the course of one of these walks, I am exposed to cold, or when I hear somebody speaking near me, I refer these phenomena entirely to something within myself, and I return to my bed.

Of the four medical schools to which a brief reference was made on a preceding page, that of Bologna was probably the first to attain a certain degree of celebrity; and it owed this distinction very largely to the work done by men who were primarily surgeons, viz.: Hugo of Lucca; Theodoric, Hugo's son; William of Saliceto; and possibly, to a very slight extent, Roland of Parma, who spent only a part of his professional life in Bologna. But there was one other who, while he was not a surgeon, yet contributed very greatly to the fame of the Bologna school and at the same time to the real advance in surgical knowledge which characterized the work of the men whose names have just been mentioned—viz., Mondino. These men, especially

Mondino, cultivated the study of anatomy much more earnestly than their rivals at Salerno had ever done, and the surgical methods which they adopted were of a more scientific character than those practiced by Roger. In the treatment of wounds, for example, instead of striving to bring about healing by the application of remedies which stimulate suppuration, they favored the dry method; in which practice they were justified not only by their own experience but also by Galen's teaching: "A dry state of the wound approaches more nearly to what may be considered the normal condition, whereas a moist state is surely unhealthy." (*Methodi medend.*, IV., 5.) As an offset to the latter authority the Salerno surgeons quoted that particular aphorism of Hippocrates (V., 67) which reads: "*Laxa bona, cruda vero mala.*"—almost the very opposite of Galen's doctrine. Then again, the Bologna surgeons effected improvements in other directions: They materially restricted the use of the red-hot cautery iron, and they cast aside as useless many of the complicated apparatuses which had previously been employed in the treatment of fractures and dislocations. It is evident from these facts that the Bologna surgeons were not, as were most of the physicians of the twelfth and thirteenth centuries (Thaddeus of Florence perhaps excepted), slavish followers of the ancients or even of the more modern Arabs, but men who thought independently and who were not afraid to use their own powers of observation.

Hugo of Lucca.—Hugo Borgognoni, more commonly called Hugo of Lucca—was born in that city about the middle of the twelfth century, served as municipal physician to the city of Bologna, accompanied the Bolognese Crusaders on their expedition to Syria and Egypt, was present at the siege of Damietta in 1219 A. D., and died a short time before 1258, at the age of nearly one hundred. He acquired a great reputation as a surgeon and brought up several sons who followed in the same walk of life, among the number being Theodoric, who gained even greater celebrity than his father in the domain of surgery. As Hugo himself left no writings of any kind, we are

largely dependent, for a knowledge of his achievements, on the treatises which his son Theodoric wrote. From this source we learn that Hugo recommended, for use in surgical operations, the employment of narcotizing sponges like those described on page 253, and was also an advocate of the plan of treating wounds by the dry method (compresses soaked in wine over which simple dressings were applied). In the treatment of empyema, of abscesses, of penetrating wounds of the chest, and of both complicated and simple wounds of the skull, he emphasized the wisdom of adopting simple measures, of interfering with the parts as little as possible, of abstaining from the use of the probe, and of observing strict cleanliness. In cases of fracture of a rib it was his practice to place the patient in a bath, and then, with fingers which had been thoroughly oiled, to attempt the replacement of the separated ends of the fractured bone. Neuburger regards Hugo of Lucca as the founder of the Bologna School of Surgery.

Theodoric of Lucca, known also as Bishop Theodoric, was born 1206 A. D. While still quite a young man he joined the recently established order of preachers, and not long afterward was appointed Almoner (*Poenitentiarius*)[3] to Pope Innocent IV. Eventually he became Bishop of Cervia, near Ravenna. By special permission of the Pope, he was able to complete the surgical training which he had received from his father, Hugo of Lucca; and thus, while he still held the office of Bishop, he practiced surgery to some extent in Bologna. In course of time his practice became very extensive and also very lucrative; as a result of which he was able to leave a large fortune to various charitable institutions. The first printed edition of his work on surgery appeared in Venice in 1498, and was followed by numerous later issues.

Theodoric, says Neuburger, was a most uncompromising advocate of the dry method of treating wounds. His (Theodoric's) words are these: "For it is not necessary—as Roger and Roland have said, as most of their disciples

[3] A church official to whom was intrusted the duty of granting dispensations; "Almoner" is perhaps the equivalent term in English.

teach, and as almost all modern surgeons practice—to favor the generation of pus in wounds. This doctrine is a very great error. To follow such teaching is simply to put an obstacle in the way of nature's efforts, to prolong the diseased action, and to prohibit the agglutination and final consolidation of the wound.'"[4]

In his enumeration of the different means that may be employed for arresting hemorrhage, Theodoric mentions cauterization, tamponading, the application of a ligature, and the complete division of the injured blood-vessel. He attached great importance to the proper feeding of the patient. In Book III., chapter 49, of his treatise on surgery, he gives minute instructions with regard to the proper manner of employing a salve made with quicksilver, and at the same time he mentions the fact that he observed a flow of saliva as one of the results of its use.

The expressions "healing by first intention" and "healing by second intention" are encountered for the first time in the writings of Brunus, a surgeon who practiced in the cities of Verona and Padua about the middle of the thirteenth century, and who was a vigorous advocate of the dry method of treating wounds. His two treatises (*"Chirurgia magna"* and *"Chirurgia minor"*) were printed in Venice in 1546. Neuburger says that although a large part of the text in these volumes consists of extracts from Galen, Avicenna, Hippocrates, Abulcasis and other authorities, there are to be found at the same time not a few observations of an original character.

William of Saliceto.—William of Saliceto (*Guglielmo da Saliceto*) is accorded by Neuburger the honor of being Bologna's greatest surgeon—if not, indeed, the greatest surgeon of that period. He was born in the early part of the thirteenth century and spent a large portion of his professional life in Bologna, where he not only practiced

[4] "Non enim est necesse saniem—sicut Rogerius et Rolandus scripserunt et plerique eorum discipuli docent, et fere omnes cururgici moderni servant—in vulneribus generare. Iste enim error est major quam potest esse. Non est enim aliud, nisi impedire naturam, prolongare morbum, prohibere conglutinationem et consolidationem vulneris." (II., cap. 27.)

medicine but also acted in the capacity of a teacher of this science. During the latter part of his career he lived in Verona, where he held the position of Municipal Physician and Attending Physician of the City Hospital. He died about the year 1280.

Saliceto's work on surgery is of a thoroughly practical character and reveals the author to have been a born surgeon.[5] In addition to the "*Cyrurgia,*" which was first printed in Piacenza 1476 A. D., he wrote a treatise which bears the title "*Summa conservationis et curationis*" (printed first in Piacenza in 1475). The "Surgery" is divided into five books, preceded by a short chapter on general methods, etc. Book I. is devoted to affections of the cranium, eruptions on the head, eye diseases, ear diseases (snaring of ear polypi), nasal polypi, abscesses in the axilla, affections of the mammary gland, tumors in different parts of the body, venereal lesions in the groin, and a long list of other surgical maladies. Book II. describes wounds of all sorts, including those produced by arrows (with reports of cases), penetrating wounds of the chest and abdomen (with instructions about sewing both longitudinal and transverse wounds of the intestine), etc. Under the head of penetrating wounds of nerves (declared by the author to be very dangerous), Saliceto recommends enlargement of the wound, the application of oil, and the employment of opium or hyoscyamus to quiet the pain. Book III. treats the subject of fractures and dislocations in a most thorough manner. Mention is made of the crepitation noise heard in fractures (*sonitus ossis fracti*) and a warning is given not to apply the bandages too tightly and to be careful to change the dressings every three or four days. The instructions given with regard to the reduction of dislocations are said by Neuburger to be most sensible. Book IV. contains such anatomical descriptions as may be helpful to the practical surgeon. From these, however, it is evident that the writer had never dissected the human cadaver. Book V. is devoted to the subject of

[5] The most recent edition of this work is a French translation made by P. Pifteau and published at Toulouse, in 1898.

cauterizing and to the consideration of those remedial agents which are commonly employed in surgery. The instruments used for cauterizing purposes were made of different metals, gold or silver being preferred for the more delicate ones, and brass and iron for the others. Immediately after the cauterization it was customary to apply butter, or the fat of some animal, or oil scented with roses, to the burned part.

Saliceto's other treatise—the *Summa conservationis etc.*—is also divided into five books, which contain chapters devoted to all the more important branches of internal medicine and to questions of diet, of the physician's behavior in the presence of a patient, etc. Especially interesting are his remarks about the importance of considering the psychological effect produced upon the patient by such matters as the physician's manner of feeling the pulse, his carefulness to inquire about the patient's various symptoms (how the night was passed, what food and drink had been taken, etc.)—an effect which oftentimes is "greater than that produced by instruments and medicines." In discussing the subject of prognosis, Saliceto makes the remark that it is always proper for the physician to hold out to the patient hope of recovery, although he urges at the same time the wisdom of telling the whole truth to the friends of the patient. He also lays great stress upon the importance of "not holding any conversation with the lady of the house upon confidential matters." Neuburger gives a number of other extracts from this most interesting work; but I must abstain from devoting any more space to this one mediaeval author, whose manner of writing makes it difficult to realize that the treatise which he has written belongs to the thirteenth century and not to a very recent period.

Roland of Parma.—Roland, who was born in the city of Parma and who spent a part of his life in Bologna, not only edited the work of his teacher, Roger of Salerno, but also wrote a concise treatise on surgery that is entitled "*Rolandina.*" Neuburger speaks of this book as differing

but little from Roger's "*Practica chirurgiae.*"[6] "It contains, however, the report of a case of penetrating wound of the chest in which Roland showed not a little courage by daring to cut off, flush with the skin, a portion of lung tissue which happened to protrude from the wound, and then applying a simple dressing."

The treatise known by the title "*Glossulae quatuor magistrorum super chirurgiam Rogerii et Rolandi*" was written by an unknown author or perhaps by several authors. It represents a collection of commentaries on the works of the two who are mentioned in the title of the book, and should probably be classed as a part of the literature of the Salerno School of Medicine.

Mondino the Anatomist.—Mondino, who was the first physician, after an interval of about fifteen hundred years, to revive the practice of dissecting human bodies, was born at Bologna at about 1275 A. D. He received his professional training at the medical school of his native city and was given the degree of Doctor in 1290, at the age of fifteen(!). Not long afterward he began to teach anatomy in the same institution and continued to serve in this capacity up to the time of his death in 1326. The physicians who aided him in his anatomical researches were Ottone Agenio Lustrulano, his prosector, and a woman named Alessandra Gilliani, from Perriceto.

Mondino's method of teaching anatomy was to deliver his lectures with the dissected cadaver directly before him; that is, he demonstrated the correctness of his statements as fast as he made them. (See Fig. 9.) Such a method was entirely new at the time and proved immensely popular, attracting students to Bologna in large numbers. Partly in this way and partly by means of the treatise on anatomy which he wrote ("*Anatomia Mundini*"), he became the instructor of numerous generations of physicians. His treatise remained the authoritative guide in anatomy up to the middle of the sixteenth century.

[6] According to Daremberg (*Histoire des Sciences Médicales*, Vol. I., p. 264) the title "Doctor" appears for the first time in the Preface of Roger's treatise (1180 A. D.).

FIG 9. THE OLDEST KNOWN PICTORIAL REPRESENTATION OF A FORMAL DISSECTION OF THE HUMAN BODY.

The original, which is in the library of the University of Montpellier, France, appears in a manuscript copy of Guy de Chauliac's *Chirurgia magna* (fourteenth century). Eugen Holländer of Berlin, the author of *Die Medizin in der klassischen Malerei*, has courteously given permission to copy the reproduction. The many defects which appear in this picture are due to the fact that the reproduction was taken directly from the original miniature, now six hundred years old. Holländer gives the following description of this interesting scene:

> "In one of the rooms of the hospital a woman's dead body is lying upon a table. Alongside the bed in which she died a nun is praying for her soul. Two physicians are busily engaged in the work of dissecting the body. An instructor is reading out of a book, for the benefit of the students who are crowding into the room, such portions of the text as apply to the case in hand, and at the same time he is directing their attention to the uterus which one of the dissectors is lifting out of the abdominal cavity. Owing to the defective state of the original miniature it is not possible to state positively what part the three women who stand near the head of the corpse are taking in the scene, but it is not unlikely that they too are physicians, especially as their presence on such an occasion would be quite in harmony with the customs of that period of time."

In one place in his "Anatomy," Mondino states explicitly that he dissected two human cadavers in the month of January, 1315. This statement renders it possible to fix the exact date when the practice of making such dissections—which had been carried on for a considerable period of time about 250 B. C.—was first resumed. If one reflects upon the nature of the obstacles which in 1315 stood in the way of a revival of this practice,—for example, the deep-seated prejudice against it entertained by all classes of the community, and the very strong opposition of the ecclesiastic authorities to what they honestly believed to be a desecration of the human body,—one will readily appreciate how great was the courage displayed by Mondino when he almost openly undertook his first dissection. The subsequent career of this famous teacher of anatomy justifies the belief that his determination to take the course which he did was based upon the profound conviction that the first step toward increasing the scanty stock of knowledge possessed at that time with regard to the structure of the human body in all its parts, must necessarily be one in continuation of that which Erasistratus and his associates had taken centuries earlier, but which had not been succeeded by a sufficient number of other steps in the same direction. The series of discoveries in anatomy, physiology and pathology which resulted from Mondino's courageous and intelligent act, form a part of the history of modern medicine, and do not therefore call for consideration in this place. We may simply add that much information of a very interesting character is furnished by Neuburger (*op. cit.*) with regard to the manner in which Mondino and his immediate successors carried on their instruction in anatomy from that time forward.

The Medical School at Bologna, as may well be imagined, gained great fame from the possession of such distinguished teachers as those whose careers I have briefly sketched—Hugo and Theodoric of Lucca, William of Saliceto, and Mondino; and it retained a large part of this celebrity throughout the fourteenth and fifteenth centuries, despite the appearance on the scene, toward the end of this time,

of several formidable claimants for high honors in the domain of medical research and education—viz., the schools at Montpellier and Paris, in France, and that of Padua, in Italy.

Lanfranchi and the Medical School of Paris.—According to Edouard Nicaise[7] medicine was not taught publicly at Paris previously to 1160 A. D. The teaching was carried on at that time by associations of physicians, and it was only during the following century (about 1250 A. D.) that something like a university was established in that city. Up to the end of the sixteenth century (1595 A. D.), during the reign of Henry IV., this institution remained under the control of the Church. Its functions—so far at least as medicine was concerned—were limited to the bestowing of degrees, for it possessed at that time no organization of instructors and no permanent quarters in which the teaching might be carried on systematically; a church (see Fig. 10) or the Dean's residence serving as the locality in which the lectures were commonly delivered.

During the middle part of the thirteenth century and for a long time afterward, the practice of surgery, which was then of a rather primitive type, was entirely in the hands of two classes of men—the barbers and the so-called surgeons.[8] As time went on, the surgeons began to feel the necessity of securing better protection for their material interests, which were being more and more encroached upon by the barbers—a class of men who were not privileged by the authorities to include in their field of activities anything beyond hair-cutting, shaving, cupping, the extraction of teeth, the application of leeches, the incision of boils and perhaps one or two other simple operations. For this reason, therefore, and also probably because they too felt

[7] "*La Grande Chirurgie de Guy de Chauliac,*" Paris, 1890.

[8] The distinguishing sign of the barbers was the shaving dish, made of *pewter* and hung up at the door of the shop; that employed by the surgeons was also a shaving dish, but made of polished brass. Those surgeons who had received their training at the school of Saint Cosmas and Saint Damian were permitted to display at the window a banner bearing the coat of arms of this institution.

in some measure the effects of the Renaissance spirit which was then abroad in the land, they organized themselves (1254 A. D.) into an association which bore the name of "College of Saint Cosmas" (*Collège de St. Côme*).[9] One of the early acts of this association was to establish the rule that all applicants for membership should pass successfully an examination as to their fitness before they could be admitted. Very little is known about the doings

FIG. 10. THE MANNER OF GIVING PUBLIC INSTRUCTION IN MEDICINE DURING THE MIDDLE AGES.

(From Meaux Saint-Marc's *L'École de Salerne.*)

The present cut is evidently a modern copy of a much earlier original.

of the organization during the early years of its existence. Later, as we shall see, it played a very important part in the history of medicine in France.

[9] The surgeons Cosmas and Damian were chosen patron saints of the new organization. They were born in Arabia in the third century, and are said to have been educated there. After having practiced medicine for a certain length of time in Sicily, they were tortured and killed, because of their Christian faith, by order of the Emperor Diocletian, 303 A. D. Hence the title "Saints."

From the account given by Nicaise it appears that no regular instruction in anatomy was given in the University of Paris until after the fourteenth century, and then only from three to five times a year, when the body of a person who had been hung was publicly dissected. "Such a dissection lasted seven days and was a veritable scientific festival." No official cliniques were held and the only way in which the student of medicine could obtain some practical acquaintance with disease and with the methods of treatment was by attaching himself to a physician or a surgeon, or to a barber.

From the preceding brief and very incomplete account the reader will, I trust, be able to form some idea of the condition of affairs, medical and surgical, in Paris at the time when Lanfranchi arrived in that city.

Lanfranchi, says Neuburger, was born in Milan, Italy, and was undoubtedly the most distinguished among the pupils of Saliceto at Bologna. After leaving the medical school he practiced both medicine and surgery for a certain length of time in his native city; but finally, becoming involved in the quarrels between the Guelphs and the Ghibellines, he—like many other Italian physicians—was obliged to take refuge in France. In Lyons, which was his first place of residence, he engaged for a short time in the practice of medicine and also wrote his first treatise on surgery—"*Chirurgia Parva.*" Then, after traveling from one place to another in the provinces, he finally (1295 A. D.) settled permanently in Paris. In that city he very soon acquired a large practice, and, at the same time, built up for himself a great reputation as a teacher of medicine. The *Collège de St. Côme* elected him a member of that organization and profited greatly from the fame which his teaching brought to the institution. It is said that Jean Passavant, who was at that time the Dean of the Medical Faculty of Paris, aided Lanfranchi in his work by every means in his power. As a result Paris, during a considerable period of time, was one of the few places in which genuine clinical instruction was given to all those who desired to acquire a practical acquaintance with disease.

His larger treatise, the "*Chirurgia Magna,*" was completed in 1296. It was dedicated to the King of France, Philip IV., commonly called "*Phillippe le Bel,*" and its intrinsic merits assured him a permanent reputation as a surgeon. This work, which was translated years ago into English and has recently (1894) been published by the "Early English Text Society," under the title "Lanfrank's Science of Cirurgie," consists of five separate fasciculi or parts. A few extracts from the text of this celebrated work may prove of interest to the reader. Not having access to the English version just mentioned, I shall have to translate from the version (partly Latin and partly German) supplied by Neuburger.

Part I. of the *Chirurgia Parva* mentions some of the characteristics which a surgeon should possess. He should, for example, have well-formed hands, with fingers that are long and slender; his body should be strong and firm in its movements; his hands and fingers should respond quickly to the workings of the mind; his mind should be of a subtle type; in character he should not be over-bold, but self-reliant and yet modest; he should have a good supply of common sense; he should be well-informed not only in medicine, but also in all the branches of philosophy; he should be a good logician; he should be familiar with the writings of medical authors; he should be virtuous and ethical; he should be trustworthy; he should not be avaricious nor envious; . . . . . and, finally, he should be thoroughly familiar with all the diseases to which the human body is liable. In one place Lanfranchi refers to the fact that exposure to the air favors the production of pus in a wound. Among the methods which may be employed for arresting hemorrhage he mentions digital compression and ligaturing of the bleeding vessels. He recommends that a wounded individual should abstain from wine and from an over-nutritious diet. No attempt, he says, should be made to extirpate, with the knife or by means of the actual cautery, an ulcerated cancer, unless it appears probable that by such means complete destruction of the tumor may be effected. In traumatic tetanus dependent

upon an injury of a tendon or nerve trunk he recommends complete division of the wounded structure.

Part II. is devoted to the consideration of wounds of the different parts of the body, taken in regular order from the head to the feet. The descriptions, in each instance, are preceded by an adequate account of the region affected. In his discussion of fractures of the skull he speaks of the diagnostic value of the rough and jarring sound perceived by the patient when the physician taps with a rod upon the injured skull; and he also states that an aid to diagnosis may be derived from the fact that a person whose skull is fractured experiences pain at the seat of the injury when somebody passes the ends of his finger-nails along a string which the patient holds suspended between his teeth.[10] According to Neuburger the description which Lanfranchi gives of the various symptoms observed in cases of fracture of the skull is admirable. In the section relating to the treatment of such fractures he warns against the tendency to resort too readily to the use of the trephine, and expresses the belief that this instrument should be employed only when the fractured bone is depressed or when there is evidence of irritation of the dura mater.

Part III. deals with skin diseases and various forms of tumors, including those of the thyroid gland; and with diseases of the eye, the ear and the nasal cavities; with the various kinds of hernia; with renal and cystic calculi; with hemorrhoids, varicose veins, etc.; with abdominal dropsy; and with still other affections. In bloodletting he recommends the practice of opening the vein longitudinally. He is very emphatic in his manner of insisting that medicine and surgery should not be divorced, and that the operation of drawing blood should not be intrusted to barbers.

After the death or retirement of Lanfranchi during the first decade of the fourteenth century, Paris appears to have played, at least for a few years, a comparatively small part in the history of medical teaching. Her rivals at

[10] Guy de Chauliac, who wrote a treatise on surgery in the latter half of the fourteenth century, also speaks of the value of this diagnostic sign.

Montpellier, in the south of France, and at Bologna and Padua, in Italy, far outstripped her during this period. There was one physician at Paris, however,—Henri de Mondeville,—who would probably have proved a worthy successor of Lanfranchi if circumstances had not seriously interfered with his acting the part of a teacher.

Henri de Mondeville.—Henri de Mondeville, says Edouard Nicaise, was born about 1260 A. D. in Normandy. In his native village—Mondeville or Mandeville, or Amondaville, all of which names are found in the manuscripts—he was known simply as Henri, but in the outside world and in medical literature he is mentioned, in accordance with the prevailing custom of that period, as Henri de Mondeville. After studying medicine for a certain length of time in Paris and Montpellier, he went to Italy and became the pupil of Theodoric of Bologna. He is said to have been passionately fond of surgery, which at that period was, in France, a much despised branch of medicine. In Italy, on the contrary, such men as William of Saliceto, Hugo of Lucca, Theodoric and Lanfranchi had raised surgery to a position of great honor, and Henri de Mondeville cherished the hope that he also might be able to accomplish the same result in France. Upon his return to Paris he was chosen one of the physicians (there were four in all) of the royal household, and from that time onward he was frequently obliged to set aside, for longer or shorter periods, all his personal interests (private practice, lecturing to medical students, hospital service at Hôtel-Dieu, etc.) in order to attend the King or the Comte de Valois on some military expedition. This sort of service, however, was by no means time lost, for it afforded him the opportunity to acquire great experience in the treatment of wounds, an experience which reveals itself on almost every page of his treatise on surgery. And yet there came a time (1312) when de Mondeville complained bitterly of these interruptions, for which he received no pay and which interfered seriously with his literary work. Despite these hindrances, he appears to have made a fair degree of progress in the writing of his book, for at the date last

named he gave a public reading of the first two sections "before a large and noble assemblage of medical students and other distinguished personages." The portrait of de Mondeville which is here reproduced is a copy of the miniature which appears in one of the manuscripts of his treatise that was prepared 1314 A. D., and is now preserved in the *Bibliothèque Nationale* at Paris. Nicaise furnishes the following details regarding the original miniature.

> Inasmuch as the MS. bears the date 1314 the portrait must have been painted while De Mondeville was still living. The master is represented wearing a violet-colored gown, red stockings, and a black skull-cap. He is thin, his beard is scanty and of a grey color like the hair of his head, his features are finely cut, and he appears to be a fairly tall man. So far as one may judge from this portrait De Mondeville's age was then about fifty.

The date of his death is not known exactly, but it must have been somewhere about 1320 A. D.

Nicaise sums up de Mondeville's personal history and his contributions to the science of medicine somewhat as follows: He was a man of warm impulses, who loved the truth and despised all shams. He never hesitated to speak his opinion about others, the King himself not being excluded from his criticisms. He was also quite frank in his exposures of the ignorance of both nobles and members of the clergy. He was not in the least degree superstitious. He remained unmarried throughout life and seems to have entertained a slight disposition to find fault with women, for he attacks somewhat violently their mode of life and their extravagance, especially in the case of the women of Montpellier. Although he possessed a great reputation and a very large clientèle of patients, he did not acquire a fortune. He is quoted as saying: "I was obliged from the very first to work hard for a living." Suppuration, according to the view of de Mondeville, was not a necessary phenomenon in the healing of wounds.

About the year 1316 the condition of de Mondeville's health—he probably had pulmonary tuberculosis—began to give him serious cause for anxiety lest he might not live

FIG. 11. HENRI DE MONDEVILLE.

(From Nicaise's Version, Paris, 1893.)

From a miniature at the head of a manuscript which bears the date A. D. 1313, now preserved in the Bibliothèque Nationale at Paris.

long enough to complete his book; and, as a matter of fact, the treatise which we now possess shows that his fears proved to be well grounded. The important subjects of fractures, dislocations and hernia, for example, are mentioned only casually. Those subjects, however, which he did discuss are treated in a very clear and practical manner. Thus, for example, his instructions with regard to the proper manner of treating wounds is most satisfactory. Theodoric and he were the great champions of the so-called dry treatment, which had been introduced at some remote period of antiquity, but which apparently had not met with general acceptance. Then, again, in his remarks on the subject of amputations, he taught that the ligaturing of the severed arteries after the removal of the amputated part, was universally recognized as the proper course to adopt and should never be neglected.

In Chapter VII. of the first section of his treatise, de Mondeville gives a description of the anatomy of the heart and related blood-vessels, and at the same time furnishes an unusually clear account of the physiology of the circulation which was universally accepted by the physicians of that period, as it had already been by those of earlier centuries. It seems desirable to reproduce this account here in order that it may serve for purposes of comparison with that which Harvey was to give three centuries later. It is only by making such a comparison that the physicians of our time can appreciate the vast importance which attaches to Harvey's wonderful discovery. De Mondeville's account, abbreviated wherever it seemed practicable to do this, reads as follows:—

The heart is the most important of all the organs. It transmits to the other members of the body vitalizing blood, heat and spirit. Its muscular tissue, unlike ordinary muscle, is composed of three kinds of fibres, and it is not under the control of the will. It has the shape of a pineapple and is located in the centre of the chest, like a prince in the middle of his kingdom. Its lower extremity is directed somewhat to the left of the chest, as we are assured by the Philosopher (Aristotle) in his history of animals. There are two reasons why it points toward the left: 1., in order that it may

not press upon the liver or be pressed upon by it; and 2., in order that it may not communicate its heat to the left side (the cool side) of that organ.

It is important to note the fact that the heart is the only structure which contains blood in its substance; in all the other members of the body the blood is contained in the veins. The base of the heart is situated at its highest point and represents the broadest portion of the organ; it is attached to the posterior wall of the chest by a few ligaments, than which no stronger are to be found in any part of the body. These bands do not touch the heart at any point except at the top, where they take their origin; and their great strength is explained by the fact that it is their duty to hold the heart firmly in its proper position.

The heart possesses two ventricles or cavities, of which the left one—by reason of the natural position of the organ as a whole—is a little higher than the right. Between these two cavities there is placed a partition which in its turn contains a small cavity—termed by some *the third ventricle.* Above each of the larger ventricles there is a sort of appendix—cartilaginous in structure, but flexible and at the same time strong,—which contains a cavity and has some resemblance to a cat's ear. These structures, to which the common people have given the name *auricles,* alternately contract and dilate. The purpose for which they exist is to serve as reservoirs for the blood and air that are needed for the nourishment and cooling of the heart.

To the right ventricle there comes a many-branched vein which conducts to the heart a coarse, thick and warm blood destined to nourish that organ. The portion of this abundant fluid which is not needed for this purpose is then rendered less coarse and thick by some subtle power possessed by the heart itself, after which it is driven into the cavity that is located within the partition wall which separates the ventricles the one from the other. From this smaller cavity, this so-called third ventricle, in which it receives additional heat and at the same time undergoes further thinning as well as some kind of digestion and purification, the blood passes on into the left ventricle and there undergoes a further change—one which is characterized by the development of that element which we call *spirit,* something clearer, more subtle, more pure, more glorious than any known substance in the human body, and therefore more nearly allied in its nature to celestial things. This new element forms a friendly and very appropriate link between the body and the soul; it is the direct agent or instrument

of the latter, conveying to man the different faculties with which he may be endowed.

From the left ventricle of the heart, alongside its auricle, two arteries are given off. One of them, which is only furnished with one tunic (as in the case of a vein) and which is called the *arteria venalis* (pulmonary vein), carries to the lungs the blood which they require for their nourishment, and breaks up into many branches after entering these structures; the other artery is provided with two tunics and is called *the grand artery* (the aorta). From the latter vessel are given off the numberless arteries which are distributed throughout the entire body—vessels which transport to every organ and structure both the blood which they need for their nourishment and the spirit required for their revivification. When this spirit passes into the ventricles of the brain it is subjected to a new species of digestion, which converts it into the *spirit of the soul.* Similarly, when it enters the liver it becomes *a nutritive spirit;* when it enters the testicles, *a generative spirit,* and so on through all the different organs.

CHAPTER XXIV

DURING THE LATTER HALF OF THE MIDDLE AGES SURGERY ASSUMES THE MOST PROMINENT PLACE IN THE ADVANCE OF MEDICAL SCIENCE

During the first half of the fourteenth century, as has been shown in the preceding chapter, Henri de Mondeville was largely successful in rendering Paris the most prominent centre of medical activity in France, if not in Western Europe generally. His life, however, was short, and his position as one of the leading surgeons of the French Army subjected him to many and prolonged interruptions, for which reasons he was not able to complete his excellent treatise on surgery. No physician of the same intellectual capacity and of equally strong character appears to have been living in Paris at the time of De Mondeville's death, and consequently the importance of that city as a centre of medical education diminished rapidly after that event. On the other hand, the Medical School at Montpellier in the southern part of France began at about this period, under the influence of Arnold of Villanova (probably a small town in Catalonia, Spain, in the diocese of Valencia), to acquire importance.

Arnold of Villanova and the Medical School of Montpellier.—Arnold of Villanova was born about 1240 A. D., of humble parentage. He obtained his early education in a Dominican cloister, and afterward devoted all his energies to the study of languages (especially Hebrew), theology, philosophy, the natural sciences (physics, alchemy), and medicine. Paris and Montpellier were the principal cities in which he prosecuted those studies. Already as early

as the year 1270, Arnold had attained considerable celebrity as a physician. Between the years 1289 and 1299 he appears to have made his home in Montpellier, and to have been very actively engaged both as a practicing physician and as a teacher of medicine. It was in that city also that he wrote the more important of his numerous medical treatises. At a later period of his life he appears largely to have lost his interest in medicine, for in 1299 we find him acting as an ambassador from the King of Aragon, whose private physician he was, to the Court of Philippe le Bel, King of France, and deeply entangled, during his stay in Paris, in disputes with the theologians of that city respecting certain religious doctrines. He was also at the same time busily engaged in championing various ecclesiastic reforms which he was anxious to see inaugurated. His opponents haled him before the tribunal of the Inquisition and succeeded in having him cast into prison, where he remained until he expressed a willingness to retract the obnoxious opinions which he had advanced. The same tribunal pronounced his treatise "*De Adventu Antichristi*" to be heretical. After these persecutions Arnold endeavored to procure aid and comfort from Popes Boniface VIII. and Benedict XI. The former was inclined in his favor, but Benedict manifested no disposition to aid him. Boniface's sentiments were doubtless influenced by the fact that Arnold had treated him successfully for stone in the bladder; and Neuburger incidentally states that, in the effecting of this cure, not only medical and dietetic treatment had been employed, but also two other measures—viz., the application of a bandage or truss which encircled the loins snugly, and the wearing (by the patient) of a magic seal ring upon which was engraved the effigy of a lion.[1] When Pope Clement V. (1305-1315 A. D.) removed the papal seat from Rome to Avignon, in France, Arnold was relieved from the charge of heresy and reinstated in the respect of his contemporaries. He became the trusted adviser of royalty, won the sympathy of Jayme II. and of his brother, Frederic III., King of Sicily,

[1] See remarks on the subject of amulets, etc., on pages 197, 198.

for his broad-minded views regarding religious matters, and was both hated and feared by his enemies. According to trustworthy chronicles, Arnold of Villanova died at sea in 1311, within sight of the coast of Genoa, while he was on a voyage (probably from Sicily) to visit the Court of Clement V. In 1316 the Inquisition pronounced most of his philosophical and theological writings heretical, and ordered them to be destroyed.

A complete collection of the medical writings of Arnold of Villanova, so far at least as they were then known to exist, was printed at Lyons, France, in 1586. It is said that many of the treatises which this author wrote have been lost. Of those which have come down to our time there are only three which call for any special comment—Arnold's "*Breviarium,*" a compendium of the practice of medicine; his "*Commentary on the Regimen Salernitanum,*" the sales of which, according to Neuburger, reached an enormous figure; and a work which bears the title "*Parabolae medicationis secundum instinctum veritatis aeternae, quae dicuntur a medicis regulae generales curationis morborum.*" (Basel, 1560.) The latter treatise, which might with propriety be given the simple title of "General Rules regarding the Treatment of Diseases," is dedicated (1300 A. D.) to Philippe le Bel, King of France. It contains a number of chapters on the principles of general pathology, and others on special pathology and therapeutics, with relation both to internal diseases and to those which particularly interest the surgeon. It also furnishes 345 aphorisms, many of which embody truths of the highest importance and reveal the author to have been a man of independent judgment, of wide experience, and of a philosophical type of mind.

In the "*Parabolae*" and the "*Breviarium,*" says Neuburger, are to be found the most marked evidences of the knowledge and ability which this great physician possessed. He then adds:—

> Arnold attached much importance to hygiene and the proper regulation of the diet as effective measures in preventing diseases, and he formulated an admirable set of rules for the ordering of

one's manner of living. In these he gives prominence to the value of baths, to the importance of taking a certain amount of physical exercise, and to the selection of the right kinds of food. He also describes in detail how wine may be utilized advantageously in cases of illness. As regards the choice of remedies to be employed he says that the physician should be guided by a very careful consideration of the patient's age, temperament, habits of living, etc.; and, so long as there remains any doubt about the correctness of the diagnosis, he should employ only mild and indifferent remedies. The greatest care, he adds, should be exercised in the preparation of the drugs that are to be administered, and one should be very cautious about prescribing substances which have not been sufficiently tried.

Arnold's writings are full of precepts which, like those quoted above, show him to have been an excellent practitioner of medicine as well as a man of sound common sense. And yet at the same time he appears to have been more or less tainted with the prevailing belief in astrology, in the efficacy of amulets (as in the case of Pope Boniface referred to on a previous page), etc. His enemies gave him the reputation of being a sorcerer upon whom the Devil had bestowed the power of transmuting metals,—a reputation which undoubtedly was based upon the fact that Arnold interested himself greatly in alchemistic processes, often referring to them as closely resembling such organic phenomena as generation, birth, growth, etc. But, in our judgment of the man, we should be careful to remember that during the thirteenth century a belief in alchemy, astrology, the efficacy of amulets, the influence of supernatural agencies, etc., was almost universal. Even theologians maintained that it was a sin for a practitioner of medicine to neglect the influence of certain constellations. Indeed, there are even to-day, not a few very sensible people in whose minds exists a lingering belief in the interference of supernatural agencies in human affairs.

The importance of the influence which Arnold of Villanova exerted upon the progress of medical science, and more especially upon the fame of the Medical School of Montpellier, should not be estimated exclusively from the

value of his writings nor from the character of the work which he performed as an instructor in that school. In the thirteenth and fourteenth centuries physicians as a class did not hold so high a position socially in Western Europe as they were probably entitled to hold, and consequently Arnold's later career, in which he showed himself to be a wise, broad-minded, and very able statesman and as an enthusiastic champion of greater liberty of thought in the domain of religion, must be looked upon as having aided very materially in raising the profession of medicine to a higher rank and in adding éclat to the School of Montpellier.

Contemporaries and Successors of Arnold of Villanova at Montpellier.—During Arnold's lifetime there does not appear to have been another physician at Montpellier who could be compared with him in professional ability or in general culture. There was one, however, who attained considerable fame as a medical author, and who certainly deserves at least a brief notice in this place—Bernard de Gourdon, also known as Gordonius.

Bernard de Gourdon[2] began teaching medicine in Montpellier in 1285 A. D. He was the author of a treatise which bore the title "*Lilium Medicinae,*" and which enjoyed an unusual degree of popularity for a long period of time. The earliest printed edition appeared in Lyons in 1474 and was followed by several others in 1491, 1550, 1559 and 1574. One of the latest editions is that of Frankfort, 1617. The book was also translated into both French and Spanish. In his description of the seven parts into which the book is divided, the author says, by way of praising his own work: "In the lily there are many different kinds of blossoms and in each one of these there are seven grains of a golden character." The book treats of fevers, poisonings, abscesses, tumors, wounds and ulcers, of diseases of the liver, spleen, kidneys and bladder, of affections of the eyes, and of numerous other topics. The work as a whole,

[2] A small town in the Department of Lot, France. The earliest Norman ancestors of the Gurdon family in England are said to have derived their name from that of this town.

says Neuburger, lacks depth and thoroughness, and reveals the author to be overfond of employing drugs, especially in combination, and by no means free from a belief in the efficacy of amulets and other supernatural remedies. It contains, however, one or two references to matters of historical interest. For example, in Chapter V., Part III., mention is made of spectacles. So far as now appears, this is the first time that these useful contrivances are referred to in medical literature; and the casual manner in which the author speaks of them suggests the idea that they had already been known for some time. Possibly Roger Bacon, who interested himself in researches in the department of optics and who was a contemporary of Gordonius, may have had something to do with the invention of spectacles.

At the ceremony of the marriage of the Duchess Juta of Austria to Count Louis of Oettingen, at Vienna in 1319, Pietro Buonaparte, the Podesta of Padua, created considerable excitement by wearing a pair of spectacles which he had received a short time previously from Salvino degli Armati of Florence, the reputed inventor of these contrivances. It is not generally known that the printing of books in very large and bold type during the latter part of the fifteenth and the early part of the sixteenth centuries was done expressly for the benefit of far-sighted readers—this defect in vision characterizing a very large percentage of the learned men of that period. The great number of books which, during those early days of the art of printing, were published in this style, emphasizes the fact that the usefulness of spectacles was not generally appreciated until after the lapse of many scores of years. Being very expensive they were within the reach of only persons of wealth, and, in addition, they were extremely difficult to obtain. As late as during the year 1572, Augustus, Elector of Saxony, moved by a strong wish to possess a pair of spectacles, despatched a special messenger first to Leipzig and then to Augsburg with instructions to purchase them for him at the great annual fair. This agent, however, was unsuccessful in the attempt, and, accordingly, in the summer of 1574, he was instructed to ride on as far as

Venice. But, on arriving there, he was informed that no glasses would be ground before the month of October. He was consequently obliged to remain in that city until the autumn, at which time he sent word to his master that the optician's charge for the instrument would be 50 thalers (equivalent to $250 at the present value of money). The Elector, it appears, was only too glad to pay this sum for the coveted article. The first spectacles made were equipped with only convex glasses, for the use of far-sighted persons. It was not until about two hundred years later that the art of grinding concave glasses for the relief of short-sighted individuals was discovered.

Guy de Chauliac.—After the lapse of a few years there appeared a man who was destined to add greatly to the fame of the Medical School of Montpellier—not in the way in which Arnold of Villanova had accomplished this result, but by the publication of the first systematic treatise on surgery which was written in Western Europe during the Middle Ages. This man was Guy de Chauliac, about whose early life very little is known. He was born in the village of Chauliac, in Auvergne, France, toward the end of the thirteenth century, his parents being simple peasants; and during early boyhood he probably attended the school connected with the village church. His medical studies were begun at Toulouse and completed at Montpellier. But, at some time later than 1326, he went to Bologna and perfected his knowledge of anatomy under the guidance of Bertrucius, Mondino's successor. After leaving Bologna Guy visited Paris, arriving there subsequently to the deaths of Lanfranchi, Pitard and Henri de Mondeville. Although he remained in that great city only a short time, he appears to have formed a warm friendship with several of the instructors in the medical school.

About the year 1330 he took up his residence in Lyons. His appointment to the position of Canon of Saint-Just, a church which is located in that city, doubtless made it necessary for him to adopt this course. And yet it is most improbable that he spent much of his time in Lyons, for his other duties—his attendance at the Papal Court in

Avignon, as private physician to three Popes in succession, and the numerous calls made upon him for professional advice and especially for surgical assistance by people living at a long distance from Lyons—compelled him repeatedly to absent himself from his home, sometimes for several days at a time. In 1348 the plague visited Avignon and carried off large numbers of people, the poet Petrarch's Laura being one of the victims. During that terrible epidemic Guy was most faithful in his devotion to Clement VI. and to many others who needed his professional services. In 1357 he was promoted by Innocent VI. to the office of Provost of Saint-Just. In 1363 when—according to his own declaration—he was an old man, he wrote the treatise on surgery which has rendered his name famous in the history of medicine. His death occurred about July 23, 1368.

Guy was not, as some writers have asserted, a professor of surgery in the University of Montpellier; he was simply a physician who had won at that institution the title of "Master in Medicine"—the highest grade conferred by the university authorities, and one which necessarily implied that the recipient had given a certain number of public readings on medical topics. And yet in actual practice Guy manifested a strong preference for the management of diseases which demanded surgical treatment. His writings, furthermore, make it clear that he had a strong affection for the institution in which he had been both a student and in some measure an instructor.

The book which Guy de Chauliac wrote, and which bears the title "*La Grande Chirurgie,*" is described by Malgaigne,[3] one of the most distinguished French surgeons of the nineteenth century, in the following terms: "I do not hesitate to say that, with the single exception of the book written by Hippocrates, there is not a work on surgery, no matter in what language written, which ranks higher than, or is even equal to, the magnificent treatise of Guy de Chauliac." Although most surgeons of the present day will scarcely assent to praise of such an extravagant

[3] Introduction to the "Oeuvres d'Ambroise Paré," Paris, 1840.

nature, they will undoubtedly agree in according to this admirable author of the fourteenth century a high place of honor in the Temple of Fame. Nicaise, the editor of the most recent version of Guy de Chauliac's treatise, speaks of him as the "founder of didactic surgery." From 1363 A. D., the date of its first publication in manuscript, to 1478, a period of more than one hundred years, Guy's book was universally regarded as the authoritative treatise on surgery. But this branch of medicine, it must not be forgotten, was, at that period of the Middle Ages, held in very small esteem by physicians generally, and therefore it is almost certain that Guy received no encouragement whatever from any outside source. All the greater credit, therefore, is due him for the admirable manner in which he carried on the task which he had set before himself during the last years of his life. Extraordinary as it appears to us to-day, the Montpellier School of Medicine, toward the end of the fifteenth century (that is, only a comparatively short time after Guy's death), issued a decree that thereafter their pupils were not to study nor to practice surgery. From this and other well-authenticated facts it appears that the prejudice which existed at that period among physicians against surgery, was strong enough to render them blind to the reality that it was through the instrumentality of this very branch of medical activity that the school at Montpellier had gained such an increase in celebrity. They were unable to dispossess their minds of the idea that operative and all other surgical procedures were derogatory to the dignity of the educated physician.

Guy de Chauliac wrote his treatise originally in Latin—not the Latin of the classical authors, but a Latin greatly deformed by the introduction of French, Arabic and Provençal terms—barbaric Latin, as it is often called. This language was commonly employed at the University of Montpellier and at all other universities at that period; but, as Nicaise states, the style of his writing is so concise, and at the same time so intelligible, that it would scarcely be possible to translate it into modern French without the

loss of much of that which constitutes the charm of the book. It was for the latter reason that he decided to write his version of Guy's treatise in old French—the French of the thirteenth and fourteenth centuries. In order that our readers, most of whom are doubtless more or less familiar with the finished language of modern French literature, may see for themselves to what extent the latter differs from its fourteenth century ancestor, I shall introduce here a single paragraph of Nicaise's text. I have chosen it, more or less at random, from the admirable chapter which Guy has written on wounds in general.

Consequemment playes mortelles non necessairement, ains pour la pluspart, sont petites playes, et superficielles és susdites parties, et qui penetrent iusques à icelles et aux chefs des muscles. La raison est, parce que si elles ne sont bien traitées, il advient qu'on en meurt: et si sont bien traitées, on en guerit: ainsi que i'ay veu de la partie posterieure du cerveau, de laquelle sortit un peu de la substance du cerveau, ce qui fut reconnu par l'offense de la mémoire, laquelle il recouvra apres la curation. Ie ne dis pas toutesfois qu'on vesquit, s'il en sortoit toute une cellule, comme Theodore raconte d'un cellier. Aussi Galen ne dit pas, de deux blessez qu'il vit guerir en Smyrne du vivant de son maistre Pelope, qu'il en fust sorty de la substance de cerveau, ains seulement que le cerveau avoit esté blessé: Ne, de celuy qu'il vist guery en Smyrne (comme il recite au huitiesme de *l'Usage*), il ne dit pas qu'il en sortit de la substance du cerveau, ains qu'il fust blessé en l'un des ventricules gemeaux. Et avec ce on pensoit qu'il fust guery par le vouloir de Dieu. Car si tous deux eussent esté blessez, il n'eust gueres duré, comme il dit: et de ce il conclud l'utilite de la duplication de quelques instruments, ainsi qu'a esté dit cy dessus en l'anatomie. Et tant de cettui-cy, que de ceux-là, la guerison rare est fort rarement faite, comme il est dit au commentaire dessus allegué.

There are many places in Guy's treatise where his description of a surgical condition, or of the proper measures to adopt for the relief or cure of such condition, would doubtless prove interesting to our readers, and would in any event aid them materially in forming an independent judgment as to the man's character in general and also

with regard to his qualifications as a surgeon. But all of these descriptions, when rendered in their entirety into English, occupy much space, and for this reason I shall be obliged to furnish here merely a few extracts from some of the more interesting portions of the text.

In the chapter which Guy devotes to wounds of nerves, cords and ligaments—all of which structures were classed by him, as well as by Galen, as belonging to the category of nerves—this author divides them into punctured and incised wounds, bruises and concussions. As to the first variety he says that they may be divided into closed punctured and open punctured wounds.

> In the incised wounds two kinds may be distinguished: those in which the nerve is incised in the direction of its length and those in which the cut is made across the fibres. A further subdivision is practicable, viz., into wounds accompanied by more or less destruction of the substance of the nerve or its envelopes, and those in which such loss has not occurred. Among other differences worthy of mention are these: pain, spasmodic phenomena, and abscess formation are present in certain cases and absent in others. From all of which symptoms useful indications as to the treatment needed may be deduced.

In the section relating to the treatment of such traumatic affections of nerves, Guy makes the remark that the measures called for are, for the most part, the same as those required for wounds involving simply the fleshy parts of the body.

> The element of pain, however, is one of the factors which distinguish wounds of a nerve from ordinary flesh wounds, and it may necessitate some slight modification of the treatment. Aside from this, one of the first things that should be done is to remove from the wound all foreign substances; after which the edges of the cavity should be brought together and held firmly in this position by appropriate means. Last of all, care should be taken to protect the parts. These are the general principles which are to guide the surgeon's action. As to the special details, they must depend upon the different conditions presented by each individual case. Thus, for example, if we are dealing with a punctured wound of a nerve, there will be no edges of an excavation to bring together.

If the object which produced the puncture is still lodged in the tissues, it must, as a matter of course, be withdrawn. After which, the further measures to be adopted may be enumerated under the following heads: careful regulation of the manner of living; removal from the system of all material which—attracted to the wounded part by the pain—might there cause irritation or inflammation; and protection of the body against any harm that might come to it through the occurrence of convulsions. These three measures are indicated for all wounds of nerves. But, in the case of a punctured wound, still other procedures should be employed, as will be discussed under a fourth head.

The four heads mentioned by Guy may be briefly stated in the following terms: I. The patient should be put upon a light and very simple diet; and, in addition, he should be given a bed that is soft and humid (*"humidus et mollis"*). His surroundings should be kept quiet, and nothing should be permitted to disturb his peace of mind. II. To protect his tissues from the injurious influence of any superfluous matters of an irritating nature that may be circulating in the blood (*i.e.*, cacochyme), a vein on the opposite side of the body should be opened and a certain amount of this fluid withdrawn. In certain cases, furthermore, it may be well, in addition, to administer an aperient remedy. III. If convulsions develop, the head, neck and the entire back should be anointed with well-warmed linseed oil or common (? olive) oil, as recommended by Galen. IV. Special measures should be adopted for providing a free outlet for any pus that may form in the deeper parts of the wound; and here again Galen recommends for this purpose the employment of one of several medicinal preparations which he enumerates. "But the more certain course," Guy adds, "is to make an opening in the skin either with the razor or with the actual cautery (which latter, according to Henri de Mondeville, is the better plan of the two), and then to apply some subtle drying remedy which possesses the power to penetrate into the deepest recesses of the injured nerve—for example, savin oil." (Guy has a good deal more to say on the subject of wounds of nerves, but the few extracts given above should suffice.)

It is now a well-known fact that Guy de Chauliac was in the habit of treating fractures of the thigh by the employment of the weight and pulley as means of keeping up a continuing extension of the damaged limb. As his description of the method in question is very brief, it may not seem out of place to reproduce it here. Translated into English it reads as follows:—

> As to the plan which I employ, it is this: After making fast to the fractured thigh splints which extend down as far as the feet, I reinforce the support which they give, either by placing the limb in a box or by applying to its sides bundles of straw (*appuyements*). [These are shown in the left-hand lower corner of Fig. 12.] I then attach to the foot a mass of lead as a weight, taking care to pass the cord which supports the lead over a small pulley in such a manner that it shall pull upon the leg in a longitudinal direction. And if it then be found that there is not complete equality between the fractured limb and its fellow as regards length, the discrepancy may be corrected by gently pulling upon the former. Every nine days the limb should be cautiously handled; and at the end of about fifty days it will be found that firm union has taken place.

One more remark seems to be called for in reference to the fact that Guy de Chauliac, although he was avowedly a surgeon, managed to win as great a reputation and as high a social position as was possessed by any physician of that period. The medical practitioner, it will be remembered, held himself, during the Middle Ages, and was universally held, to be a much higher type of man than the surgeon. The relative standing of the two is well shown in the accompanying sketch (Fig. 13), in which all the details (attitude, head gear, gown, etc.) have evidently been carefully studied by the artist. Guy, however, through the sheer force of his character, and also probably because he was known to have won the highest medical honor (the grade of "Master of Medicine") which it was in the power of the university to confer, pushed his way to the top, and held, for a period of twenty years, the position of private physician to three Popes in succession—Clement VI., Innocent VI. and Urban V. In other words, the prevailing

FIG. 12. ONE OF THE WARDS IN THE HÔTEL-DIEU OF PARIS.

As it appeared in the sixteenth century.

(From *Chirurgie de Pierre Franco*, edited by E. Nicaise. Paris. 1895.)

prejudices and jealousies were not sufficiently powerful to block the triumphant career of this man of solid merit and high character.

The State of Medicine and Surgery in Countries Other than Italy and France During the Later Portion of the Middle Ages.—From the account given by Neuburger it appears that the seeds planted by the famous teachers of medicine and surgery in Italy and France during the thirteenth and fourteenth centuries had begun to take root in England and in the Low Countries to the north of France, and were in fact already producing some good fruit in those lands. Thus, for example, there have been handed down to our time the names of four physicians who attained a certain degree of eminence in England during the thirteenth and fourteenth centuries—Gilbertus Anglicus, John of Gaddesden, John Mirfeld and John Arderne.

Gilbertus Anglicus, who was the first English medical writer to secure a certain degree of celebrity among the physicians of continental Europe, wrote a compendium of medicine that was commonly called the "*Laurea anglica.*" The book contains, along with some good original observations and the records of his own experience, not a few wearisome theoretical discussions; and at the same time it reveals the fact that the author was inclined to favor remedial measures of a superstitious nature. In the last chapter of his compendium, however, he makes the very practical suggestion that distillation may be resorted to when one desires to purify water that is contaminated. Gilbertus, after obtaining his preliminary training in England in the early part of the thirteenth century, visited some of the leading schools on the continent, among others those of Salerno and Montpellier, in which latter city he appears to have practiced medicine for a certain length of time.

John of Gaddesden, who is also spoken of as Johannes Anglicus, was born about 1280 A. D. and died in 1361. He was therefore a contemporary of Guy de Chauliac. He is said to have been a Fellow of Merton College, Oxford, and to have held the positions of Prebendary of St. Paul's,

London, and of private physician to the royal family. He was also the author of a medical treatise which was generally known by the title, "*Rosa Anglica*" (first printed in 1492). Neuburger speaks of this book as being an imitation of Gourdon's "*Lilium Medicinae,*" but of a somewhat inferior grade, and he quotes two or three passages which show that medicine was in a very low stage of development in England at the beginning of the fourteenth century. Gaddesden, for example, advises his confrères to adopt the rule of always securing their honorarium before they undertake the treatment of a sick person. In another part of the book he states that he treated one of the sons of Edward II. for small-pox and secured excellent results, not merely as regards the perfect restoration of his health, but also as regards the complete prevention of any pitting of his face. He attributes this success to the fact that he enveloped the patient in a red cloth and took pains to have every object in the vicinity of the bed draped in red.[4]

John Mirfeld, who lived during the second half of the fourteenth century, completed his medical studies in Oxford, then entered the Monastery of St. Bartholomew's in London, and devoted himself thenceforward to work in connection with the hospital belonging to that institution. Among the books which he wrote there are a few that deal with matters of interest to the physician. Such, for example, are a glossary which bears the title "*Synonyma Bartholomaei,*" a work called the "*Breviarium Bartholo-*

[4] "Gaddesden had for a long time been troubled how to cure stone: 'At last,' says he, in his *Rosa Anglica,* 'I thought of collecting a good quantity of those beetles which in summer are found in the dung of oxen, also of the crickets which sing in the fields. I cut off the heads and the wings of the crickets and put them with the beetles and common oil into a pot; I covered it and left it afterwards for a day and night in a bread oven. I drew out the pot and heated it at a moderate fire, I pounded the whole and rubbed the sick parts; in three days the pain had disappeared;' under the influence of the beetles and the crickets the stone was broken into bits. It was almost always thus, by a sudden illumination, that this doctor discovered his most efficacious remedies: Madame Trote [Trotula] of Salerno never confided to her agents in various parts of the world the secret of more marvelous and unexpected recipes." (From Jusserand's "English Wayfaring Life in the Middle Ages.")

FIG 13. THE PHYSICIAN, THE SURGEON AND THE PHARMACIST

Reproduction of a miniature at the head of Guy de Chauliac's *La Grande Chirurgie* edited by E. Nicaise. Paris. 1890

maei," and a shorter treatise on prognosis—the "*Speculum.*" None of these, however, possesses any special importance.

John Arderne was born in England 1307 A. D., probably obtained his medical training in Montpellier, accompanied the English Army to France in the character of a "Sergeant-Surgion," and was present at the battle of Crécy (1346 A. D.). During the succeeding twenty-four years he practiced medicine in Wiltshire and Newark, and then settled for the remainder of his life in London. Although his practice included both internal diseases and those which required surgical treatment, the great reputation which he acquired was based chiefly upon his success in the latter field. Most of his writings, it appears, are still in the form of manuscript. They deal chiefly with surgery and are accompanied by drawings of the instruments which he employed. They possess one feature which distinguishes them from the majority of medical writings of the Middle Ages, viz., they abound in reports of cases observed and treated by the author; and, furthermore, the methods of treatment which he recommends are in most instances rational and of a relatively simple nature. The only one of Arderne's treatises which has been printed is that relating to *fistula in ano.* It bears the title, "John Arderne—Treatises of Fistula in Ano, Haemorrhoids, and Clysters; from an early fifteenth-century manuscript translation," and is edited by D'Arcy Power, Early English Text Society, Original Series, 139; London and Oxford, 1910. Arderne, we are told by Neuburger, puts forward two claims: 1, that he succeeded in curing a large number of cases of anal fistula, in proof of which he gives the names of the persons upon whom he operated successfully, many of whom are high up in the social scale; and, 2, that no other surgeon of whom he has any knowledge, either in England or on the continent of Europe, is able to cure the disease.

The three English physicians of whom I have here given very brief accounts, can scarcely be said to compare favorably with those men who, during the same period, brought fame to the medical schools of Bologna, Padua,

Montpellier and Paris; and this fact suggests the question, Do these men really represent the best type of physicians who lived in England during the fourteenth century? The great English poet Chaucer, in his "Canterbury Tales" (written at about the same period of time), furnishes us with a portrait of a man who appears to have been well informed with regard to the earlier Greek and Arabian medical authorities as well as with the leading physicians of his own time, and who in addition was clever both in ascertaining the causes and nature of his patients' maladies and in prescribing for them the proper remedies. As this physician's name is not mentioned, we cannot be sure that he was not one of the three to whom reference has just been made. By the description given by the poet, who probably was personally acquainted with the man whose portrait he draws, one is tempted to believe that he was a physician of a higher type than any one of the three named above. Chaucer's account reads as follow:—

There was also a Doctor of Phisik,
In al this worlde was ther non him like
To speke of phisik and of surgerye;
For he was grounded in astronomye.
He kepte his pacient wondrously and we
In all houres by his magik natural.
Well coude he gesse the ascending of the star
Wherein his patientes fortunes settled were.
He knew the cause of every maladye,
Were it of cold, or hete, or moyst, or drye,
And where they engendered, and of what humour;
He was a very parfit practisour.
The cause once knowen and his right mesúre,
Anon he gaf the syke man his cure.
Ful redy hadde he his apothecaries,
To sende him drugges, and electuaries,
For eche of them made the other for to wynne;
Their friendshipe was not newe to begynne.
Wel knew he the old Esculapius,
And Discorides, and eek Rufus;
Old Ypocras, Haly and Galien;
Serapyon, Razis, and Avycen;

Averrois, Damascen, and Constantyn;
Bernard, and Gatisden, and Gilbertyn.
Of his diete mesuráble was he,
For it was of no superfluitee,
But of gret norishing and digestible.

With the names of the three English physicians mentioned above, there should be associated that of Jehan Yperman, who was born in Ypern, Flanders, during the latter half of the thirteenth century, obtained his professional training in Paris under Lanfranchi, and then, in 1303 or 1304, accepted the position of Physician to the Hospital of Belle, a small Flemish town. In 1318 he settled permanently in Ypern, his native city, and in a comparatively short time won completely the confidence and esteem of his fellow townsmen through his attentiveness to their wants when they were ill and through the great skill which he manifested in his work as a surgeon. He died 1329 A. D.

Yperman's writings deal with both medical and surgical topics. Of those which have been translated from the Latin into French are: "La chirurgie de maitre J. Yperman," Anvers, 1863; "Traité de médecine pratique de maitre J. Yperman," Anvers, 1863; and "Traité de médecine pratique de maitre J. Yperman," Anvers, 1867. A perusal of these works, says Neuburger, easily convinces one that Yperman was not only a skilful and clever surgeon, but also a physician of independent judgment and wide experience.

Revival of the Practice of Dissecting Human Bodies.— It was in Italy that dissecting was carried on during the fourteenth century more vigorously than elsewhere in Europe. At first the only persons who made such investigations for scientific purposes were individual physicians or groups of physicians; and, in addition, they were obliged to carry on the work in a secret manner—that is, by stealing from recently dug graves the corpses which were necessary for such studies. It is related, for example, that in 1319 one of the teachers in the Medical School at Bologna and four of his pupils were brought before the Court of Law under the charge of having clandestinely

disinterred, for purposes of dissection, the body of a man who had been hung for some crime. At first the authorities merely winked at such transgressions, but at the same time they made no attempts to have the law against dissecting annulled or at least modified. Then, at a somewhat later period, the conviction became general among the intelligent members of the community that, unless work of this nature were officially sanctioned, no real advance in the knowledge of human anatomy could be made, and—what was probably of even greater importance in their estimation—that Bologna might at the same time lose a good deal of its superiority over its rivals as a centre of learning; and accordingly it was found practicable to grant the desired sanction with many modifying restrictions attached. Then, with the further lapse of time, other medical schools fell into line and secured from the authorities similar privileges for their teachers and pupils. Thus, in 1368, the Senate of Venice authorized the medical school of that city to make a public dissection of a human body once every year; and, eight years later, the University of Montpellier acquired the same privilege. In 1391 John I. of Spain was equally generous in his treatment of the Medical School at Lerida. After the opening of the fifteenth century no further difficulties of a serious nature were experienced by the teachers of anatomy in procuring at least some material for dissecting purposes, and with each succeeding year such facilities steadily increased. Unfortunately, however, there did not follow a corresponding increase in the knowledge of human anatomy. As a matter of fact, it was not until during the sixteenth century that any really valuable work was accomplished in this branch of medicine. Guy de Chauliac, in the first chapter of his treatise (*"La Grande Chirurgie"*), gives the following description of the manner in which Bertrucius taught anatomy in Bologna at the beginning of the fourteenth century, and from this account it is easy to understand why the additions to our stock of information in this department of medicine were so few and so unimportant during this long period. The so-called dissecting, it clearly appears, was in reality a not very

profitable combination of purely anatomical work of a primitive character and a search for evidences of pathological changes. The clinical history of the individual whose body was undergoing examination does not seem to have played any part in the investigation. Here is De Chauliac's account:—

> After placing the dead body on a bench, my master proceeded with his instructions, devoting thereto four separate sittings. At the first of these he passed in review those parts or organs which are concerned in nutrition; his reason for considering them first being that they are the earliest to undergo decomposition. At the second sitting he devoted himself to the spiritual organs of the body; at the third, to the animal parts; and at the fourth, to the extremities. Following the example furnished by Galen in his commentary on the book entitled "The Sects," he maintained that there were nine things which should be taken into consideration when one examines the different parts of the body, to wit: their situation; their nature, color, bulk, number, and shape; their connections or relations; their actions and their utility; and the diseases which may affect them. Conducted in this manner the study of anatomy, he maintained, may prove helpful to the physician in recognizing diseases, in making prognoses, and in selecting a suitable plan for treatment.

Puschmann, quoting from Hyrtl, says that when Professor Galeazzo di Santa Sofia, who had been called from Padua to Vienna to fill the Chair of Anatomy in the medical school of that city, made his first public dissection of a human body (1404 A. D.) in the Bürgerspital, the sittings covered a period of eight days; at the end of which time he collected as much money as he could from those who had attended the course, and turned it over to the treasurer of the Faculty. Then followed a period of twelve years during which not a single public dissection of a human body was made in Vienna. In 1440 the Faculty were greatly rejoiced over the prospect of receiving from the authorities the body of a criminal who was to be hung on a certain day; but, when the time arrived and the body had actually been delivered to them, they were grievously disappointed by the sudden coming to life of the supposed

corpse. Instead of dissecting him for the benefit of science, the doctors bestirred themselves in the man's behalf, obtained a pardon in due form, and sent him back to his home in Bavaria under the escort of the college janitor. Not very long afterward, however, he committed a fresh crime, and this time was effectively hung. History does not state whether the dissection then came off, or not.

The Medical Faculty of the University of Tübingen established the rule in 1497 that one human body should be publicly dissected every three or four years; it being understood that during the progress of the dissection the professor should read aloud to the class appropriate portions of Mondino's treatise on anatomy. The instruction in this department of medical science was of the same general character in all the other universities of Germany at that period. Anatomical drawings, of a very crude type, were employed as substitutes for actual dissection.

At Padua, in Northern Italy, the science of medicine had already before the end of the first half of the fifteenth century made a decided advance, in proof of which several circumstances may be mentioned. In the first place, the importance of the study of anatomy had by this time become so generally recognized that no special difficulty appears to have been encountered in securing the erection, in 1446, of an anatomical theatre; and during this same period several physicians connected with the medical school acquired considerable celebrity by their publication of important treatises on topics belonging to the domain of general pathology and therapeutics, and by the wide influence which they exerted as teachers. Among the number of those who helped in these ways to spread the fame of the Medical School of Padua may be mentioned Hugo Benzi, Antonio Cermisone, Giovanni Savonarola and Bartolommeo Montagnana.

Hugo Benzi (or Hugo of Siena) taught philosophy as well as medicine in different institutions of learning—at Pavia, Piacenza, Florence, Bologna, Parma, Padua and Perugia. His death probably occurred at Ferrara about the year 1439. In addition to commentaries on Hippocrates,

Galen and Avicenna, he wrote several practical works (*"Consilia"*) on such topics as periodical insanity, stomachic vertigo, naso-pharyngeal polypi, epilepsy, lachrymal fistula, etc.

Antonio Cermisone was a native of Padua, became a teacher of medicine first in Pavia and afterward in Padua, wrote several useful treatises about various diseases, and finally died about 1441.

Giovanni Michele Savonarola—the grandfather of the celebrated Girolamo Savonarola, who was burned at the stake for heresy 1498 A. D.—held the Chair of Medicine in Padua from about 1390 to 1462, and also subsequently for a certain length of time in Ferrara. He was the author of a number of treatises on practical medical topics—such, for example, as fevers (first published in Venice in 1498), the art of preparing simple and compound *aqua vitae* (Basel, 1597), an introduction to the practice of medicine (1553), the baths of Italy and of the rest of the world (Venice, 1592), the different kinds of pulse, etc. (Venice, 1497)—and he also wrote a large work covering the entire field of medicine and modeled on the pattern of Avicenna's "Canon." The book is divided into six parts, each of which is preceded by an introduction that is devoted to the anatomico-physiological bearings of that particular part; and here, in addition, there are to be found scattered throughout the text references to surgical procedures. Among the references of this character the following deserve to be mentioned as worthy of some notice: the description of a speculum for use in operations upon the interior of the nose; a reference to direct laryngoscopy; the description of an instrument closely resembling the well-known syringotome; the treatment of curvature of the spine by mechanical means, etc. The book also reveals the fact that, already at this period of the history of medicine (the middle of the fifteenth century), physicians were beginning to take a more active part than they had previously done in the management of confinement cases, which as a rule were left entirely to the care of midwives. The records also show that medical men were interesting

themselves more and more, as time went on, in sanitary science as applied to municipal affairs. In most communities the need for such was indeed most urgent at that time. The reforms of this nature were pushed with special vigor in those parts of Italy which were governed by that enlightened ruler of the Hohenstaufen family, Frederic II., King of Sicily and Roman Emperor. The cultivation of personal hygiene was also pursued very systematically during the later Middle Ages, the *Regimen Salernitanum* serving as the guide in such matters.

Taken all together the conditions in the physician's world were in anything but a promising state toward the end of the fifteenth century; but the dawn of better times, of modern medicine, was near at hand, and already signs of its approach were beginning to be recognizable in different parts of Western Europe.

CHAPTER XXV

BRIEF HISTORY OF THE ALLIED SCIENCES—PHARMACY, CHEMISTRY AND BALNEOTHERAPEUTICS

During the excavations carried on at the site of Pompeii, there were discovered three houses which bore every appearance of having been occupied by apothecaries. Among the objects found in these buildings were: A bronze box equipped with the apparatus required for mixing ointments; a few surgical instruments; several glass receptables which had evidently at some earlier period contained fluid or semi-fluid pharmaceutical preparations, but which, at the time when the excavations were made, presented merely a deposit of some solid but easily friable substance at the bottom of the vessel; and quite a variety of drugs in the form of pills, tablets, powders, etc. At first, the impression prevailed that these must have been the houses of apothecaries, but subsequently the discovery, in each instance, of the house sign representing a snake with a pine cone in its mouth (the symbol of Aesculapius) satisfied the authorities that these particular buildings had belonged to physicians. Indeed, as a matter of fact, no good reasons have thus far been found for believing that apothecaries, in the modern acceptation of the term, existed in even the largest cities of Greece and Italy until a much later date.

Pharmacy in Its Infancy.—All through the Hippocratic period and during the years when Alexandria was at the height of its prosperity as the great centre of medical activity, it was customary for the physicians to prepare their own drugs. The same is true of the best physicians

belonging to the Augustan period; they were not willing to put their trust in the drugs which had been prepared in the shops where such things were usually sold.

In the second century of the present era Galen gave the definition that a remedial drug, or "Pharmakon," was something which, when taken into the living body, produces an alteration in its component tissues or organs, whereas foods or nutrient elements simply cause an increase of the parts. He attached great importance to such characteristics as purity, freshness, care in handling, etc. It was his custom to prepare with his own hands the different combinations of simple remedial agents which he administered to his patients, and he kept these combinations, as well as the simple drugs of the more costly kinds, carefully stored in locked wooden boxes in a room which was devoted to this special purpose and which was termed the "Apotheke." Originally, therefore, the "apothecary" was simply the person who had charge of this room in which the drugs and spices were carefully "placed to one side" (ἀπό, τίθημι) for safe keeping. At a later period, when the caretaker became also the compounder of drugs, another word of a more comprehensive significance—that of "pharmacist"—gradually supplanted the term apothecary.

There is another word, "antidote," which has very materially changed its significance during the lapse of centuries. Galen, for example, employed this word as a synonym of pharmakon—a simple remedial agent, and medical writers continued using the term in this sense during the following thirteen or fourteen centuries. The word commonly employed, by mediaeval physicians, to signify "pharmacopoeia," was "antidotarium." In modern times the word "antidote" signifies only an agent which neutralizes a poison.

Galen took a very great interest in everything relating to the subject of drugs, and sometimes made long journeys for the purpose of securing certain plants or roots which he was unable to procure near home or which he was very anxious to obtain in a more perfect condition than was possible when they were purchased from the regular deal-

ers. "Simple remedies," he declared, "are pure and unadulterated, and produce effects in only one direction. It is the business of pharmacology to combine drugs in such a manner—according to their elementary qualities of heat, cold, moistness and dryness—as shall render them effective in combating or overcoming the conditions which exist in the different diseases." Galen's interest in pharmacology materially aided the advance of medical science in other ways. He systematized the existing knowledge of materia medica and infused some measure of orderliness into the therapeutics of his day. The success of his efforts in this direction did not become manifest until after he had been dead about fifty years; but, if his ideas were slow in meeting with general acceptance, they took such deep root in the minds of physicians that to-day in Persia Galen's system of therapeutics is the only one generally received as authoritative. Although the facts do not warrant our making the same statement with regard to Western and Southern Europe, it is nevertheless true that our dispensatories still continue to honor the memory of this great physician by bestowing the name of "Galenical Preparations" on a large group of pharmaceutical combinations.

It is scarcely possible to state with any degree of positiveness at what date pharmacists, in the modern sense of the term, came to be recognized as constituting a separate and honorable class in every well-organized community. It is known, however, that in Syria and Persia, during the eighth and ninth centuries of the present era, not a few of the leading physicians were the sons of apothecaries. Honein, for example, of whose career I furnished a brief sketch in Chapter XIX., was the son of an apothecary; and the careful manner in which he was educated during his youth justifies the belief that his father must have been a man of some cultivation and not at all like the general average of that class of men of whom Galen speaks so disparagingly. But even at that early period there certainly were individuals who were skilled in the pharmaceutic art, for Berendes (*op. cit.*) tells us that Dioscorides (*circa* 100 A. D.) describes minutely the

manner of preparing "Oisypum." Oisypum is identical with the modern "Lanolin" or "Lanolinum," and is a pure fat of wool. Mention is made of the preparation by four different authors of medical treatises during the following sixteen centuries—viz., by Aëtius in the sixth, by Paulus Aegineta in the seventh, by Nicolaus Myrepsus in the thirteenth, and by Valerius Cordus in the seventeenth. Subsequently to the latter date no further mention of the preparation is to be found in any of the pharmacopoeias except the French Codex of the year 1758, in which it is classed among the simple remedies under the title of "Oesipe." Finally Liebreich, toward the end of the nineteenth century, brought the preparation once more into favor under the name of "lanolin." The fact that it remained in complete oblivion for such very long periods of time is easily explained by the statement which Berendes makes: "It was a troublesome ointment to manufacture, and consequently the apothecaries disliked it and resorted to all sorts of falsifications."

With the advance of the Arab Renaissance pharmacy gradually became a regular established occupation in every fairly large city in the East. It is known, for example, that the first public apothecary shop in the city of Bagdad was established during the eighth century of the present era under the caliphate of Almansur; and about the same time, probably a little earlier, there existed at Djondisabour a similar pharmacy in connection with the school and hospital of the Bakhtichou family. The training of an apothecary in those days was probably the same as that of the physician. Originally pharmacists were called "Szandalani," probably because they dealt largely in sandal wood.

The materia medica furnished by the Arab physician Rhazes in the different works which he has written, is unusually rich in simple elements, the majority of which are always drugs of a rather mild action; Greece, Persia, Syria, East India and Egypt were the sources from which they were derived. Beside the simple elements, Rhazes mentions a number of composite preparations of drugs.

As not a few of the latter required very careful manipulation, it may safely be inferred that the Arabian apothecaries of the ninth century had already acquired considerable skill and experience in their special field of work.

At Salerno, during the first half of the twelfth century, pharmacy began to assume a position of considerable importance. The work which was prepared by Nicolaus Praepositus, and which was known as an "Antidotarium," furnished quite full information with regard to the characters and therapeutic uses of nearly 150 different drugs. According to Berendes this work served for several centuries as the basis of later pharmacopoeias. One of its notable features is the importance which the author attaches to the duty of weighing very carefully each of the drugs that enter into the composition of a given preparation, of gathering certain vegetable products at the right season, and of paying strict attention to their quality and to the manner of preserving them.

In 1140 A. D., Roger, King of Naples and Sicily, promulgated a law which defined what should be the proper relations between physicians and apothecaries; and about one hundred years later (1241 A. D.) Frederick II. amplified and gave greater precision to this law, thus establishing what was practically an Institute of Apothecaries. The following provisions constitute the essential features of the law:—

1. The physician and the apothecary shall have no business interests in common.

2. The physician shall not himself conduct an apothecary shop.

3. In each department of the kingdom two respectable men, selected by the Faculty at Salerno, shall be assigned the duty of furnishing sworn statements to the effect that all the electuaries, syrups, and other preparations of drugs kept for sale in a given apothecary shop, have been made according to the established prescriptions and are offered for sale only in that state.

4. In the case of those preparations which ordinarily do not keep for a longer time than one year without spoiling, the price at which they are to be sold shall be at the rate of 3 Tarreni (about

30 cents) per ounce; while those which ordinarily remain unchanged during a longer period, shall be valued at 6 Tarreni per ounce.

At the time which we are now considering, it was not the custom, owing largely to the expensiveness of writing paper, to deliver to the pharmacist a written prescription. Instead, the physician first gave his instructions in person, and then, after he had seen the mixing and other steps of the apothecary's work properly performed, he carried the preparation to the patient's house.

Long before the middle of the fifteenth century apothecaries had become thoroughly well established throughout Central and Western Europe. Among the statutes of the Medical Faculty of Erfurt, Germany, there has been found one which dates back to the year 1412 and which says:—

The student of medicine, before he applies for the Bachelor's Degree, should spend one month in the spring of the year, in an apothecary's establishment, in order that he may familiarize himself with the proper manner of preparing clysters, suppositories, pessaries, syrups, electuaries and other things necessary for a physician to know.

The first work which was really worthy of being termed a treatise on materia medica was published in 1447. It bore the title, "Compendium Aromatariorum," and was written by Saladin of Ascolo, the private physician of Prince Antonio de Balza Ossino of Tarentum. Berendes says that it was a work of much practical value.

The First Indications of the Beginning of Chemistry.—Up to a comparatively recent date it has been customary to speak of Geber as the first practical chemist and the first writer among the ancients who appreciated the important part which chemistry was likely to take in medicine and philosophy at no distant period of time. But to-day, as appears from the researches made by M. Berthelot about 1893, we are compelled to abandon the belief that such a person as Geber existed, and shall have to adopt the more commonplace view that the science of chemistry represents a gradual development from the much older alchemy. We

may define the latter branch of knowledge as the science of transforming copper and brass into gold and silver. During the first two or three centuries of the Christian era there existed a firm belief that such a transformation had actually been accomplished, and in confirmation of the correctness of this statement it may be said that Zosimos of Panopolis, one of the leading philosophers of Alexandria during the fourth century of the present era, and a man who was considered by his contemporaries, as well as by all later alchemists, to be perhaps the greatest authority in this branch of knowledge, speaks in unmistakable terms in his cyclopædic work on alchemy (28 volumes), of a certain tincture which possesses the power of changing silver into gold, and also of a "divine water" or fluid which is capable of effecting many different transmutations. There can therefore be no reasonable doubt that in the earlier centuries of the Middle Ages the learned men of Alexandria accepted alchemy as a well-established agency of great power. From the sixth century to the thirteenth this science was cultivated with great assiduity by the Arabs in the academies which they established in Cordova and other cities of Spain; and it was from the latter region that the belief in alchemy spread to all the countries of Western Europe, gradually gaining strength up to perhaps the fifteenth century.

It was during the thirteenth century that the so-called "philosophers' stone" came to be considered the most effective agent in transmuting the baser metals into silver and gold, and there were not a few who even believed that this as yet non-existent stone possessed the power to increase longevity, to confer health, and to give a prosperous issue to one's undertakings. It was not the rabble, but the very best and most highly educated men in the community who, during the thirteenth century, took the most active interest in alchemy and the philosophers' stone. Arnold of Villanova, Raymund Lullus, Roger Bacon, Albertus Magnus, and, to a lesser degree, the famous theologian Thomas Aquinas were all believers in the art of the magician. And even more extraordinary than this is the fact

that in Germany men of this stamp continued for two or three centuries longer to cherish a belief in the reality of alchemistic processes. Even Martin Luther (1483-1546), the great reformer, did not hesitate to express his approval of "the black art," as is shown by the following quotation from one of his writings:—

> The art of alchemy is commendable and belongs in truth to the philosophy of the ancient wise men, a fact which pleases me greatly, not merely because of the intrinsic merits and usefulness of the art in the matter of distillations of vegetables and oily fluids and sublimation of metals, but also because it serves as such a noble and beautiful symbol of the resurrection of the dead at the last day of judgment. (Berendes.)

Another celebrated character who dabbled in the black art was Johannes Faust, who was born in 1485, obtained his degree of Bachelor of Arts at the University of Heidelberg, and died in 1540 in Staufen in Breisgau. Professor Scherer of Berlin says that "he was a great braggart, never failed to create a sensation wherever he went, and had the conceit and effrontery to pass himself off as a scientist among the learned men of his day. He called himself the philosopher of philosophers, a second Magus. He maintained that he was both a physician and an astrologer, and claimed that he could restore the dead to life, and could predict future events from a mere inspection of fire, air and water."

But although the persistent and wonderfully energetic activities of the alchemists failed to find the philosophers' stone, or to transmute the baser metals into silver and gold, they placed in the hands of man the key to a knowledge of chemistry, that branch of science which was destined in later years to play such an important part in pharmacy, in agriculture and in other industries. Thus we owe to alchemists the discovery of many processes and the invention of many apparatus which serve as the groundwork of modern chemistry. Some of the more important of these are the following: The use of the spirit lamp; the invention of tubular retorts; the production of potash and

soda by burning the hard deposit which collects in wine casks as well as various marine plants; the oxidizing of certain metals (iron, lead, copper, quicksilver and antimony); the making of metallic arsenic, of wine of antimony, of sulphate of iron, of chloride of silver, of acetic acid and of many other chemical products; the purification of metals by the use of lead, etc.

Supplementary Data Relating to Balneotherapeutics.—I have referred to this subject on several occasions in the course of the earlier chapters of this history, but always without entering very much into details. This policy was adopted, partly because the facts upon which a satisfactory sketch of the growth of balneotherapeutics might be based were not very numerous, and partly because of the necessity of gaining space for more important matters.

The principal facts to which I made reference were: First, that before the Christian era the employment of baths in a variety of different ways for therapeutic purposes was universal in the East; and, second, that in the city of Rome during the centuries immediately following the birth of Christ, facilities for this kind of treatment were provided on a most lavish scale—as in the baths of Agrippa (27 A. D.), of Titus (79 A. D.), of Caracalla (211 A. D.), and of Diocletian (302 A. D.). I may now add that the warm springs of Aachen (Aix-la-Chapelle), Baden-Baden and Wiesbaden, in Central Europe, and Bath, in England, were known to the ancient Romans, and were utilized by them to some extent for therapeutic purposes; but it was not until a much later period that they and the less well-known springs of Schwalbach, Driburg, Warmbrunn, Goeppingen and Gastein began to be actively frequented for remedial purposes. By the beginning of the sixteenth century it had become a very popular thing for sufferers from all sorts of ailments to resort to these and other European springs. The history of the therapeutic employment of mineral waters belongs, however, to the period of modern medicine rather than to that which I have been considering in the present volume.

PART III

MEDICINE DURING THE RENAISSANCE

CHAPTER XXVI

IMPORTANT EVENTS THAT PRECEDED THE RENAISSANCE—EARLY ATTEMPTS TO DISSECT THE HUMAN BODY

Important Events Immediately Preceding the Renaissance.—Three hundred years before the Christian era Erasistratus and Herophilus made, at Alexandria, Egypt, an attempt to develop a correct knowledge of anatomy by means of dissections of human corpses, but the political and religious conditions at that time were not favorable to scientific work, and therefore the success attained was of a very restricted character. Then, during the succeeding three or four centuries, this early movement gradually died out, and no further contributions to our knowledge of human anatomy were made until toward the end of the second century of the present era, at which time Claudius Galen, a man of giant intellect and tireless energy, did his best to supply the anatomical knowledge so urgently needed. But the deeply rooted prejudices of that age against dissections of the human body lay like an insurmountable barrier across his path and forced him to confine his efforts to the dissection of those animals whose bodily construction resembled more or less closely that of man. Galen believed that the anatomy which he thus evolved for the guidance of his professional brethren would satisfy all their legitimate wants of this nature, and he proceeded to build upon this faulty and unstable foundation an equally faulty physiology. History records the extraordinary fact that Galen's belief in the sufficiency of his anatomy and physiology for all the reasonable needs of physicians and surgeons was so well grounded that during the following

thirteen or fourteen centuries nobody dared to cast the slightest suspicion upon the trustworthiness of these foundations of the science of medicine. Then followed, during the fourteenth and fifteenth centuries, an awakening which seemed to affect all departments of human activity. This movement, which is commonly termed the "Renaissance," developed at first very slowly, and reached a noteworthy degree of momentum only toward the middle of the fifteenth century, about which time there occurred several events that contributed greatly to strengthen and perpetuate the movement. Such were, for example, the employment of gunpowder in the wars of Western Europe; the invention of a method of manufacturing paper—a discovery which led to the abandonment of the much more expensive parchment, and prepared the way for the invention of printing in its different forms; the taking of Constantinople by the Turks in 1453; the discovery of America in 1492; and, finally, the Reformation inaugurated by Martin Luther. Let us pass in review very briefly each of these events, in order that we may the better appreciate how the science of medicine, in the short space of time represented by a couple of centuries, made a greater advance than it had previously made in the course of several hundred years.

The employment of gunpowder in warfare robbed the knight of the protection which he had previously enjoyed from the wearing of metal armor, and thenceforward his life was as much imperiled in battle as was that of the foot-soldier, who was not permitted to protect his person in this manner. Thus were the two upper classes of the community, the nobles and the bourgeois, in any conflict which might arise between them, placed more nearly upon a footing of equality. The ultimate result showed itself in an increased importance, an increased prosperity, of the middle class or *bourgeoisie,* from which the physicians chiefly came. Indeed, feudalism from this time forward rapidly ceased to exist.

The discovery of paper, an excellent and relatively cheap substitute for parchment, facilitated wonderfully the spread

of knowledge. Parchment, the material upon which books were written, was expensive and was at times difficult to obtain; both of which circumstances rendered books so costly that only a few physicians were able to become the owners of the important standard medical works of that period—such, for example, as the Hippocratic writings, Galen's treatises, the surgical manuals of de Mondeville and Guy de Chauliac, the pharmacopoeia of Dioscorides, and still other books of lesser value. And, if a satisfactory method of manufacturing paper had not first been discovered, the benefits growing out of the invention of printing in 1467 would have been far less than they actually proved to be. Some idea of the magnitude of these benefits may be formed from the following statement of facts. The demand for books, after the invention of printing, became so great that the presses were kept almost constantly busy. At first, according to the record furnished by Haeser, Venice and Rome took the lead in supplying this great demand for books; the former city printing 2978 and the latter 972 volumes between the years 1467 and 1560; but, during a later period (1500-1536), Paris outstripped Venice with a total of 3056 volumes, and Strassburg advanced to the second place with a showing of 1021 volumes printed during the same period of time. Thanks to the great diminution in the market price of books that resulted from the two inventions named—the manufacture of paper and the introduction of printing—almost every physician in fairly prosperous circumstances was able at that period to purchase the relatively few medical treatises which issued from the presses; and, besides, new authors were thenceforth stimulated to put their experiences into print.

Among the very first medical books printed the following deserve to be mentioned:—

(In Germany.) *Buch der Bündth-Erznei,* by Heinrich von Volsprundt, 1460.—*Das buch der wund Artzeny. Handwirckung der Cirurgia von Jyeronimo brunschwick,* 1508.—*Das Feldtbuch der Wundtartzney,* by Hans von Gerssdorff, 1517.

(In Italy.) *Avicennae opera, arabice,* 1473.—*Guillelmi de Saliceto cyrurgia,* 1475. (A French translation was published at

Lyons in 1492.)—*Celsi de medicina liber*, etc., 1478.—*Guidonis de Cauliaco cyrurgia*, 1490. (A French version was printed in Lyons in 1498.)

(In France.) *Christophori de Barzizus de febribum cognitione et cura*, 1494.—*Bernard de Gourdon, traduction de son "Lilium medicinae,"* 1495.

When Constantinople fell into the hands of the Turks in 1453, many of its Greek inhabitants, and particularly those belonging to the more highly educated classes, fled to Western Europe in order to escape from the tyranny of the invaders. Not a few of these refugees brought with them to Italy and France copies of the works of the classical Greek authors, and on this account, as well as because of their willingness to give instruction in their native tongue, they met with a cordial welcome wherever they took up their new abodes. Their arrival in Italy happened at a most propitious time, for the interest in Greek literature was at that period just beginning to develop among Italian scholars. Previously, Greek had been an almost unknown tongue in Italy. Petrarch, for example, is reported to have said in 1360 that he did not know of ten educated men in that country who understood Greek; and there is no evidence to show that the number of such men increased between 1360 and the time when the refugees from Constantinople arrived. Many of the works of greatest importance to physicians—such, for example, as the writings of Hippocrates, of Galen, of Rufus of Ephesus, of Oribasius, of Alexander of Tralles, and of several other classical medical authors of antiquity—were accessible (in the original) only to those who were familiar with the Greek tongue. Consequently the arrival of these refugees from Constantinople constituted a most important event in the history of European medicine.

The discovery of America by Christopher Columbus in 1492 owed its origin in part to the restless spirit of adventure which was abroad in Spain and Italy at that time, and also, in perhaps still larger measure, to the hope of gain which might be expected to follow the discovery of a shorter and more direct route to India. As regards the

attainment of the latter object, the great explorer failed, but his discovery of a new continent resulted eventually in bringing great wealth to the rulers of Spain, in stimulating maritime commerce, and in broadening men's views with regard to every phase of human activity. The addition of a few new drugs to the pharmacopoeia was a further result of some importance. Luther's efforts to reform the government and doctrines of the Church undoubtedly gave a great impetus to the Renaissance and therefore to the growth of the science of medicine. Men learned to use their reasoning powers with greater freedom, and as a result our knowledge of the structure of the human body (anatomy) and of the working of its complicated machinery, both in health (physiology) and in disease (pathology), made astounding advances. And it is to the consideration of these fundamental branches of medical knowledge that we must now turn our attention.

Early Attempts to Dissect the Human Body.—Already as early as during the first half of the fourteenth century physicians began to appreciate the fact that further progress in the knowledge of medicine was not to be attained otherwise than by a more profound study of human anatomy than had been made up to that time; and they realized that it was only by means of actual dissections that this more profound study might be made. Various influences, however, co-operated to hinder such study. In the first place, the people at large were thoroughly imbued with the idea that dissecting a human corpse was an act of desecration, and consequently it was by no means safe for a physician to do any work of this character except in the most secret manner. Then, in addition, it was commonly believed—and this belief persisted even up to a comparatively recent date—that the bull which Pope Boniface VIII. issued in 1300—and which declared that whoever dared to cut up a human body or to boil it, would fall under the ban of the church—was intended to cover dissections for purposes of anatomical study. The recent investigations of Corradi, however, show (Haeser, p. 736 of the third edition) that this bull was not intended to apply to dissec-

tions for scientific purposes, but simply to put an end to the practice of cutting up human corpses and boiling the separate sections in order to obtain the bony framework in a condition suitable for transportation from Palestine to Europe,—a practice which had grown to be very common among the Crusaders.

Mondinus' "Anatomy," which was published in 1314, reveals the fact that, during the early part of the fourteenth century, several private dissections were made. As might be expected, from the primitive character of the illustrations that accompany the text of Mondinus' work, these dissections were carried out in a very imperfect manner, for—to mention only a single example—this author admits that he made no attempt to investigate the deeper structures of the ear, as such an examination would necessitate the employment of violent measures, "which would be a sinful act."

The archives of the Bolognese School of Medicine contain an item which reveals the active interest taken in anatomy by the students of that day. It reads as follows: "At Bologna, in 1319, several of the Masters stole from a grave the corpse of a woman who had been buried two days before, and then turned it over to Master Albertus to dissect in the presence of a large number of students." At the Medical School of Montpellier, in the south of France, the Faculty obtained permission in 1376 to dissect the corpse of an executed criminal once every year; and the records show that the school actually availed itself of this privilege in the years 1377, 1396 and 1446. Felix Platter, who afterward became one of the most distinguished physicians of Basel, Switzerland, pursued his early medical studies at the latter university during the years 1552-1557; and, in the diary which he faithfully kept during this period, he reveals in an interesting manner what difficulties as well as dangers he experienced, first, in reaching Montpellier from his home in the eastern part of Switzerland, and, second, in obtaining greater opportunities for acquiring a genuine knowledge of anatomy than the school itself afforded in its official course. Although,

owing to lack of space, I shall not be able to quote in full the appropriate portions of this most interesting narrative, I will furnish an abridged English translation of the story as it appears in Platter's journal or diary. In all its more important details the account reads as follows:—

Our little party was composed of three persons, viz., Thomas Schoepfius, the schoolmaster of St. Pierre; a Parisian by the name of Robert who happened to be passing then through Basel on his way to Geneva; and myself, a lad of sixteen. We traveled on horseback and all three of us were armed with rapiers. My outfit, which was handed to me by my father shortly before our departure, consisted of two extra shirts and a few pocket-handkerchiefs, wrapped up in a piece of waxed cloth. In the matter of funds for the journey I received from my father three crowns in silver and four gold pieces which, for further security, he sewed into my vest. In addition, he presented me with a rare piece of silver money which had been issued by the Cardinal Mathieu Schiner, of the Canton de Valais, who personally commanded the Swiss soldiers in their successful combat with the troops of Louis the Twelfth, at Marignan. It was a coin, therefore, which possessed considerable historical value. My mother also bestowed upon me a gold coin (a *couronne*). As a last injunction my father begged me not to forget that, in order to procure the money which he had just placed in my hands, as well as that which he had already paid for my horse, he had been obliged to mortgage his property.

We left the city at nine o'clock on the morning of Oct. 10th, 1552, and at the same moment the news reached us that the Plague had made its appearance in Basel. This was a most depressing piece of intelligence, especially as we were already in great fear that the army of the Emperor Charles the Fifth, which was at that time on its way to the siege of Metz, would utterly destroy our city.

We arrived at Berne early on the morning of Oct. 12th, and, after leaving our horses at the inn, The Falcon, lost no time in visiting the objects of interest in that ancient city, not forgetting the bear pit, in which there were at that time six of these creatures. In the afternoon we resumed our journey toward Fribourg, and very soon overtook a newly married couple. As they were traveling on horseback like ourselves, and were following the same route for a certain distance, we all agreed to keep together. While passing along a shady part of the road the bride's dress became so firmly entangled in the branches of an apple tree that, failing

to stop the horse, she was left suspended in the air by her skirts. I immediately dismounted and helped her to regain her feet, to adjust her disordered dress, and to resume her seat in the saddle. On arriving at Fribourg we put up at the inn called *La Croix Blanche,* and soon discovered that almost everybody in the town spoke French, a language with which Thomas and I, who were Germans, were not familiar; but, thanks to our companion Robert, the Parisian, we experienced no difficulty whatever in making all our wants known and in securing all the information that we desired.

On the following day, Oct. 13th, it was raining hard when we left Fribourg, and we were soon wet to the skin. After passing through several small villages we stopped for refreshment at an inn in the picturesque town of Romont, and at the same time availed ourselves of the opportunity to have our clothes dried. Then, having satisfied our appetites, we resumed our journey in the direction of Lausanne; but we did not get very far on our way before we discovered that Thomas had disappeared. We were of course obliged to wait for him, and, by the time he had rejoined the party, darkness and a thick fog combined to render further progress very difficult, and we soon realized that we had lost our way. We wandered up and down for some time without encountering a barn or building of any kind in which we might find shelter from the rain and secure a measure of protection from the robbers who, according to common report, infested that part of the country. Finally, however, we discovered a small village; but, when we applied for a night's lodging, not one of the householders was willing to receive us. So we engaged the services of a young peasant to act as our guide, and with his assistance we finally reached a mean-looking inn in a village called Mézières, which was composed of a few widely scattered houses. We entered the tavern and found several Savoyard peasants and some beggars seated at the long table of the bar-room; they were engaged in eating roasted chestnuts and black bread, which they washed down with copious draughts of a liquor called *piquette.* They unceremoniously examined our weapons and acted with great rudeness toward us in other respects. The woman who kept the house said she had no other room which she could place at our disposal, and our first impulse therefore was to resume our journey immediately after we had finished our meal of black bread and chestnuts; but, after careful reflection, we came to the conclusion that such a course might prove fraught with considerable danger. So we decided to

remain awake and watch for an opportunity to make our escape. Very soon afterward these half-intoxicated men lay down on the floor before the fire in the adjoining hall-way or vestibule and fell into a sound sleep. Our guide then confessed to us that, while at work in the stable, he had heard them planning to waylay us on the highway at an early hour of the following day. As soon, therefore, as we heard them all snoring lustily we very quietly slipped out of the house. Our score having already been paid earlier in the evening, and our horses having been left saddled and bridled in the stable, we mounted and took our departure by a road which led at first in a direction different from that in which we were supposed to be traveling. We experienced no further trouble on this part of our journey and in due time reached Lausanne. When we told the people at the inn about our experience at Mézières they replied that we might consider ourselves most fortunate, as almost every day there occurred, in the forest through which we had passed (*la Forêt du Jorat*), a murder or some other deed of violence.[1] It was plain, therefore, that we had had a narrow escape from death.

In the further course of our journey along the north shore of the lake we reached the city of Geneva on Oct. 15th. When I called upon John Calvin, to whom my father had given me a letter of introduction, he said to me: "My Felix, you arrive at the right moment, for I am now able to give you an excellent traveling companion for the remainder of your journey—*to wit,* Dr. Michel Heronard, a native of Montpellier." This Dr. Heronard, as I learned subsequently, was a Protestant who played a prominent part in the religious disorders which, a few years later, greatly disturbed the peace of that city

On the 30th of October—just twenty days after we set out from Basel—we entered the city of Montpellier, and I lost no time in hunting up Laurent Catalan, the apothecary, at whose house I expected to reside during my stay in that city.

Platter had now, after a long and dangerous journey, reached one of the three greatest medical schools of that

[1] Some weeks later our fellow voyager, Thomas Schoepfius, wrote to me that, on the return journey, he learned at Berne that "Long Peter," the leader of the Mézières robbers, had been apprehended by the authorities and executed for his crimes; and that, when stretched on the rack, he had confessed, among other things, that he had tried to murder and rob some students who passed through Mézières on their way to Lausanne.

period, and it was his hope and expectation that he would here be able to acquire a correct and intimate knowledge of human anatomy. He was already aware that this knowledge could be satisfactorily obtained in only one way—that is, by dissecting the human body; and accordingly he availed himself of every possible opportunity, during the five years which he spent at Montpellier, to accomplish this purpose. From the somewhat superficial examination which I have made of the record furnished by the diary, it appears that only five or six official lessons or demonstrations were given by the professor of anatomy during the period of time named; but—as every student of medicine knows—instruction of this character is of relatively small value; and Platter himself seems to have realized fully the truth of this statement, for during the second year of his stay at Montpellier he joined a secret band of nocturnal grave-robbers who were determined at all hazards to obtain the material needed for self-instruction. The following brief description of one of the raids made by this band of eager searchers after knowledge will convey a good idea of the manner in which the work was conducted:—

Our first excursion of this kind was made on Dec. 11th, 1554. As soon as it was really dark our fellow student Gallotus guided us, along the road that leads to Nîmes, to the Augustinian Monastery, which is situated about half-way between Castelnau and the Verdanson brook. Here we were received by a monk called Brother Bernard, a bold and determined fellow, who had disguised himself for the business in hand. At midnight, after we had partaken of food and drink, we started out, sword in hand, for the cemetery which is located close to the church of Saint Denis. Here we dug up with our hands a corpse which had been interred that very day; and, having lifted it out of the pit by means of ropes, and wrapped our cloaks around it, we carried the body on two canes as far as Montpellier. Then, having concealed our load close to the postern, alongside the city gateway, we summoned the keeper and begged him to get us some wine, as we were dying of thirst and very tired. While he was absent in search of the wine three of our party slipped in through the passage and carried the corpse safely to Gallotus' house, which was only a short distance

from the gate. The gate-keeper returned in due time with the wine, and did not appear to have the slightest suspicion of the trick that we had played upon him. It was now three o'clock in the morning.

The control exercised by the authorities over the practice of dissecting human corpses differed very appreciably at different dates in different parts of Europe. Thus, for example, orders were issued to the Italian bishops during the latter part of the fourteenth century to put a stop to further dissections, and for a period of over one hundred years these orders accomplished the purpose desired. On the other hand, the Emperor Charles the Fourth adopted a more liberal course: from the year 1348 on he permitted dissections of human corpses to be made without hindrance in Prague, Bohemia, but his liberality in this particular appears to have been of little use, for there is no evidence to show that the knowledge of anatomy made any appreciable advance anywhere in Europe until after the beginning of the sixteenth century.

Gabriel Zerbi of Verona (1468-1505) published at Venice in 1502 the first modern treatise on human anatomy that deserves to receive special mention. Pagel speaks of it as containing fairly good descriptions of different parts of the body. Zerbi held the Chair of Medicine, Logic and Philosophy in the University of Padua, and lectured first in that city, next at Bologna, and finally at Rome. One incident in his career may prove of interest to the reader as showing the fearful risks to which a practicing physician in those days was sometimes exposed. The incident was of this nature:—

A wealthy pacha in Constantinople, failing to obtain relief from his malady at the hands of the native Turkish doctors, summoned an Italian physician from Venice. Zerbi, whom the ruling Doge invited to accept the summons, sailed immediately for Constantinople in company with his two sons who were mere lads. The treatment which he inaugurated proved promptly successful, and Zerbi, having been handsomely remunerated for his services, was already on his way back to Venice when his ship was overhauled by a swift-sailing caique on board of which were the sons of his recent

patient, who—as the story goes—had celebrated his recovery by eating and drinking to excess. This debauch promptly caused his death—probably by cerebral apoplexy; but the sons were convinced that it was the result of poison administered by Zerbi, and accordingly they lost no time in starting out to capture the supposed murderer. Their first act, on reaching the vessel which they were pursuing, was to kill the younger of the two sons, in the presence of the father, by sawing his body in two lengthwise. Then they killed Zerbi himself in the same manner.

Tiraboschi, the first historian of Italian literature (1731-1794), is mentioned by Dezeimeris as his authority for this terrible tale. The events here narrated occurred in 1505.

At the beginning of the sixteenth century—the period with which our history now has to deal—the only available knowledge of anatomy was that which had been supplied by Galen in the third century of the Christian era, and which had been handed down through all the intervening centuries as something absolutely correct and not to be challenged. But the time had arrived when men were no longer willing to accept as truth the teachings of any individual until they had subjected them afresh to the most searching investigations; and thus it came about that a group of remarkably able men devoted all their energies, during the greater part of the sixteenth century, to a very critical study of human anatomy. As the work accomplished by these men constitutes a very important chapter—perhaps the most important chapter—in the history of medicine, I may be pardoned if I devote a disproportionately large amount of space to the consideration of the careers of the more prominent of these founders of modern anatomy, and to an enumeration of the details of the work which they accomplished, and which furnished the most complete verification of the truth stated by Francis Bacon, Lord Verulam (1561-1626), in the following words (*translation*):—

Man has no other means of getting at and revealing the truth than by induction coupled with a never-tiring, unprejudiced observation of nature and an imitation of her operations. Actual

facts must first be collected, and not created by a process of speculation.

One of the earliest and most thorough students of human anatomy was Marc Antonio della Torre (1473-1506), who belonged to an honorable family of Verona, several members of which had attained distinction as physicians. He planned to publish a treatise on anatomy, and, with this object in view, secured the assistance of Leonardo da Vinci (1452-1515), the celebrated painter, architect and civil engineer, to make life-size pictures of the parts which he had dissected with such care. But, after the latter had completed many of the drawings which were intended to serve as illustrations for the projected treatise, Della Torre unexpectedly died, and the book was never finished. Quite a number of the drawings, however, found their way to England, and for many years past they have been carefully treasured at Windsor Castle and in certain private collections. If Della Torre's life had been spared it is highly probable that his treatise on anatomy, equipped with illustrations copied from this great artist's drawings, would have constituted a formidable rival of Vesalius' famous work.

Not long after this event it became the rule, among the leading painters and sculptors of the Renaissance period, to pay a great deal of attention to the study of human anatomy. The museums of Central and Southern Italy contain quite a large number of anatomical drawings that were made by Michael Angelo, by Raphael and by other great masters of that period. Doubtless many of my readers recall seeing, in the Cathedral of Milan, Marco Agrate's (1562) extraordinary masterpiece, in the form of a life-size black marble statue which represents Saint Bartholomew standing erect, and carrying on one arm the folded skin of his entire body. In this statue all the muscles and bony prominences are modeled with perfect accuracy. It is a remarkable work of art.

CHAPTER XXVII

THE FOUNDERS OF HUMAN ANATOMY AND PHYSIOLOGY

Among the earliest physicians of this period to inculcate the importance of substituting a correct knowledge of anatomy for the frequently incorrect descriptions that had been prepared by Galen and handed down through the succeeding centuries, were the following: Jacques DuBois of Paris (1478-1555), who was perhaps better known by his latinized name of "Sylvius"; Guido Guidi (died in 1569), who was also known as "Vidus Vidius"; and Winther of Andernach, a small city on the Rhine. These three men, all of whom taught anatomy at Paris, were commonly considered the best anatomists of that early period. DuBois was further entitled to the credit of having been the first physician to inject blood-vessels with a material that renders them more easily visible, and also the first person in Paris to dissect a human corpse. It was from these men that Vesalius, who afterward became such a famous anatomist, received his first practical instruction in this branch of medical science. Nothing further need be said here of DuBois, but brief sketches of Guido Guidi and of Berengarius of Carpi, another contemporary anatomist of considerable distinction, deserve to find places in our history of this period. Vesalius' facetious remark that "Winther of Andernach never used a knife except for the purpose of dissecting his food" absolves us from the duty of saying anything further about his career as an anatomist.

In 1542 Francis the First, King of France, gave a great impulse to the study of medicine by calling Guido Guidi from Florence, Italy, to teach that science in the *Collége*

de France, an institution which he had founded at Paris in 1530. Guidi, upon his arrival in Paris, was at once most cordially received, both by those who were to be his colleagues and by the King. Francis bestowed upon him a suitable gift, appointed him to the position of First Physician (Archiater) at his Court, and assured him that he would receive an ample salary during his residence in the French metropolis. In 1547, after the death of Francis the First, Guidi returned to his home in Florence, where Cosimo dei Medici, at that time the head of the Florentine Republic and a little later Grand Duke of Tuscany (Cosimo III.), made him his First Physician and gave him the appointment of Professor of Philosophy in the University of Pisa. Not long afterward Guidi was transferred to the Chair of Medicine. He retained this position almost up to the time of his death (May 26, 1569), and during this long period Cosimo bestowed upon him various ecclesiastic honors, which not only increased his social rank but added materially to his financial resources.

Dezeimeris says that, while Guidi does not deserve to be placed, as an anatomist, in the same rank with Vesalius and Fallopius,[1] he merits full credit for the very important service which he rendered the physicians of his day by placing within their reach translations of certain Greek treatises relating to surgical topics—such treatises, for example, as those of Hippocrates on ulcers, on wounds of the head, on the joints and on fractures (with Galen's comments), Galen's treatise on fasciae, and that of Oribasius on ligatures and other surgical contrivances.

Apart from his merits as a worker in the field of medical science, Guidi occupies a creditable place in the history of medicine as a fine type of the well-educated and kindly disposed physician, as the following testimony given by Benvenuto Cellini, the distinguished Florentine sculptor, shows:—

> On the occasion of my visit to Paris I made the acquaintance of Messer Guidi, and I wish to state in what a very friendly manner

[1] Also often spelled "Falloppius."

I was received by that noble citizen of Florence and excellent physician, the most virtuous, the most lovable, and the most domestic man whom I have ever met.

Guidi's treatise on anatomy was first published at Venice (under the editorship of his nephew) in 1611—*i.e.*, forty-two years after his death. His translations from the Greek treatises of Hippocrates, Galen and Oribasius will be found in the work which bears the title "*Collectio Chirurgica Parisina*," Paris, 1544.

Berengarius of Carpi (a small town in Northern Italy), who died in 1530, is pronounced by Kurt Sprengel a worthy predecessor of Vesalius. He was Professor of Anatomy, first at Pavia and then at Bologna (from 1502 to 1527), and he is reported to have dissected more than one hundred(!) cadavers during that period. Fallopius and Eustachius were among his pupils, and it was their opinion that he did more than anybody else to revive the interest in anatomical work. The famous sculptor, Benvenuto Cellini (1500-1571), is authority for the statement that Berengarius was not only an experienced anatomist and practicing physician, but also a very skilful draughtsman; the three works which he published being illustrated with a certain number of original woodcuts that are not without interest both to the anatomist and to the lover of art.

Andreas Vesalius (1514-1564) was born at Brussels, of German parents whose home was located at Wessels on the Rhine,—whence the name "Vesalius." His father was the apothecary of the Princess Margaretha, Charles the Fifth's aunt, and several of his ancestors had been physicians of considerable distinction. At Louvain he received, in early youth, a thorough training in the Latin, Greek and Arabic languages and also in mathematics. When he was about eighteen years of age, he visited Montpellier and afterward Paris, at which latter city he received practical instruction in anatomy from the three men whose names I have mentioned in the preceding paragraph—viz., Guido Guidi, Jacques DuBois and Winther of Andernach. The instruction in anatomy given in Paris at that period (about 1533) consisted in interpretations of Galen's teachings, in dis-

sections of a few animals, and in occasional demonstrations—which never lasted longer than three days—of the easily accessible parts of a human cadaver. Scanty as were these sources of information, Vesalius cultivated them with the greatest zest. From time to time his teacher, DuBois, noting the interest which his pupil took in anatomy, and recognizing his fitness for imparting instruction, assigned to him the special duty of rehearsing, in the auditorium, before his fellow students, the essential facts of the day's lecture. After war had been declared between the Emperor Charles the Fifth and Francis the First, King of France, Vesalius left Paris and returned to Louvain, where he began lecturing on anatomy. These lectures constituted the very first attempt at anything like systematic instruction in anatomy that is known to have been made at that ancient university. It was while he was engaged in this work that Vesalius, in order to become the possessor of an entire human skeleton,—a thing of which he felt a very great need,—ventured to remove from the gallows, outside the city, the cadaver of a criminal. This, as Haeser declares, was an act of great boldness and full of peril.

The life of a military surgeon attached to the army of Charles the Fifth, which was the life that Vesalius led during the following year or two, was not sufficiently attractive to divert his mind seriously from his favorite study; and it is therefore not surprising that we find him, at the age of twenty-three, accepting from the Senate at Venice the appointment of the professorship of anatomy at the University of Padua. When he entered upon this new work Vesalius felt considerable uncertainty as to the correctness of the anatomy which he was then teaching, and it is therefore easy to understand why his first three lectures were based entirely upon the teachings of Galen; but, before he had finished the third one of the series, he made up his mind that he would cut loose from the anatomy of the ape and confine himself to that of the human subject, as was then being revealed to him more and more perfectly from his own dissections. The stock of knowledge which he had thus begun to accumulate, increased steadily until, after

seven years of teaching at Padua, Bologna and Pisa, at each of which schools of medicine he gave courses in anatomy of seven weeks' duration, and after conducting the most painstaking dissections of a number of human cadavers, he finally declared that he was ready to publish his great treatise on anatomy. Some of his friends, foreseeing clearly what a storm of protest the new book would arouse among the followers of Galen, urged him to postpone for a time its publication; but a few others agreed with him that it should be issued without further delay. Accordingly Vesalius sent the manuscript of his work at once to the printers at Basel, and the book was finally published in June, 1543, before its author had attained his twenty-ninth year. Its title was "*De corporis humani fabrica,*" and it was provided with exceptionally fine pictorial illustrations, most of which were drawn, as is generally believed, by John de Calcar, one of Titian's pupils. A second edition, superior in every respect to the first, was published in 1555. In comparison with this great work the few treatises written by Vesalius in later years are of minor importance.

Vesalius may rightly be considered the founder of modern anatomy, for he was the first to furnish correct information, based on actual dissections of the human cadaver, respecting quite a large number of the more important anatomical relations; and by this very act he won the further credit of having dealt the first effective blow toward the dethronement of Galen, the man who, next to Hippocrates,—probably even more than Hippocrates,—had exercised, by his teachings in nearly every department of medical science, almost despotic sway over physicians for considerably more than one thousand years. At this distance of time, it is hard to realize what a startling effect was produced by the announcement of the discovery of so many errors in Galen's scheme of anatomy. Albert von Haller, the great authority on medical literature, speaks of Vesalius' book as an "immortal work"; and, although its title would lead one to suppose that it deals only with the construction of the human body, an examination of its

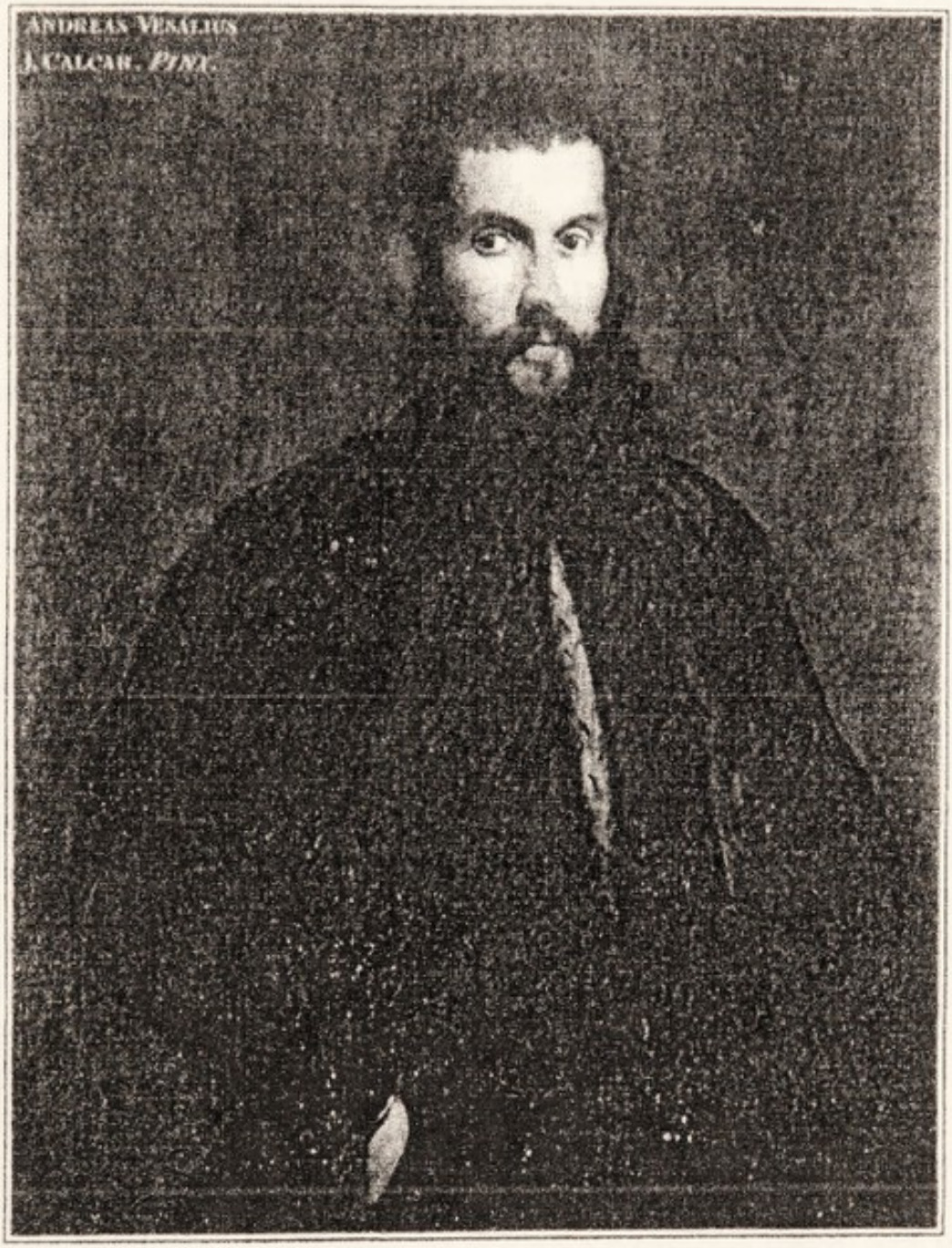


FIG. 14. ANDREAS VESALIUS.

(After the portrait by Van Calcar in the Royal College of Surgeons, London.)

Copied from the reproduction published in the *Nederlandsch Tidschrift voor Geneeskunde*, Jan. 2, 1915

contents reveals the fact that it contains in addition quite full information regarding physiology and pathological anatomy, as well as many details relating to comparative anatomy. Perhaps the most marvelous thing about this book is the fact that its author completed his work before he had reached his twenty-eighth year. It may also interest the reader to learn that, prior to 1914, the University of Louvain possessed a copy of Vesalius' great work printed on vellum and illustrated with many drawings in colors; but I am unable to say whether this beautiful volume did or did not escape destruction at the hands of the ruthless men who invaded Belgium during the summer of that memorable year.

When the human mind has adjusted itself, in the course of years, to consider certain beliefs and ideas as settled truths, it comes as a painful shock to be told that these beliefs are erroneous and that new ones must take their places. This is precisely what happened when Vesalius' book was first published. From one end of Europe to the other there was a very great stir among the well-educated physicians; the more liberal minded being ready to accept at once the genuineness of the new anatomy, whereas others,—and possibly they represented the larger number,—acting under the influence of personal jealousy or perhaps blinded by the belief that it was impious not to accept without questioning the descriptions made by Galen, were scandalized by the boldness of Vesalius in asserting that many of the statements made by this great medical authority were incorrect. Jacques DuBois, whose name has been mentioned by me on a previous page, was one of the most bitter of Vesalius' assailants. In a pamphlet which he published in Paris in 1551 he even went so far as to speak of his late pupil as "a crazy fool who is poisoning the air of Europe with his vaporings." On account of their former pleasant relations, and also because DuBois was at that time an old man, Vesalius made no reply to these attacks; but when Bartholomaeus Eustachius, Professor of Anatomy at Rome, one of the most celebrated anatomists of that period, and a man of his own age, entered

the lists as the champion of Galen, Vesalius took up the challenge, left the work upon which he was then engaged, and began a tour of visits to the universities of Padua, Bologna and Pisa, for the express purpose of disproving, by the aid of numerous dissections, the statements made by his antagonists. Throughout this tour he was received everywhere with enthusiasm, the older men among the teachers of anatomy vying with the younger in manifesting the strength of their approval. The entire journey, says Haeser, was from beginning to end a series of the most brilliant triumphs. But, notwithstanding this vindication, which most men would have accepted with the greatest satisfaction, Vesalius returned to his home in Brussels only to find that the bitter attacks made by his enemies had not ceased. This depressed him greatly, for he was not philosophical enough to recognize the facts that jealousy was at the bottom of this ill feeling toward him, and also that sufficient time had not yet elapsed for the news of his triumphant vindication to travel from Italy to Belgium. While suffering from this fit of the blues he committed to the flames all his books and manuscripts. These latter, it appears, contained not only the fruits of many years of laborious anatomical and physiological research, but also a large number of memoranda relating to pathological anatomy.

In 1556, complaints having reached the ears of Charles the Fifth to the effect that the sin of dissecting human corpses was greatly on the increase, this monarch decided to refer the question to the Theological Faculty of the University of Salamanca, in the northwestern part of Spain, for an authoritative opinion. The reply which these broad-minded theologians sent to the Emperor was most satisfactory. It is reported to have been expressed in the following words: "The dissection of human cadavers serves a useful purpose and is therefore permissible to Christians of the Catholic Church." This decision did not of course put an immediate end to the harsh criticisms and petty persecutions of the bigots; but, as the years went by, it was noted that the work of scientific research in human

anatomy and physiology acquired greater freedom of action, and it is fair to assume that this result was largely due to the famous decision to which I have just referred.

Shortly after Vesalius had retired, as stated above, from active participation in anatomical research work, he was called by Charles the Fifth to serve him in the capacity of private physician. During this service, which lasted for several years, he visited, in company with the Emperor, many of the principal cities of Europe; and then, when the latter abdicated the throne of Spain,—for Charles was not only Emperor of the Holy Roman Empire but also King of Spain,—Vesalius became the private physician of Philip the Second, Charles' son and successor on the Spanish throne. This long period is largely a blank in the history of Vesalius. Toward the end he got into trouble with the Inquisition and was obliged, as a means of escaping the punishment of death, to undertake a voyage to the Holy Sepulchre in Jerusalem. While he was in that city he received an official invitation from the Senate at Venice to fill the Chair of Anatomy at Padua. He then at once turned his steps toward Italy, doubtless very happy over the prospect of once more engaging in anatomical work; but he was shipwrecked on the coast of the Island of Zante, October 2, 1564. Thirteen days later, before he had completed his fiftieth year, he died from starvation and exposure. A memorial tablet was placed in one of the neighboring churches on the island, and in 1847 his Belgian compatriots erected a suitable monument to his memory in the city of Brussels.

Admirable as was Vesalius' treatise on human anatomy, it was soon discovered that it was deficient in certain particulars. Not a few of the descriptions, for example, were incomplete, and there were also a number of parts or organs for which no descriptions whatever had been provided. Many of these deficiencies were supplied by contemporary anatomists, nearly all of whom were Italians. First and foremost among this secondary but yet very important group of laborers in the field of original

research work, the names of Fallopius and Eustachius deserve to be mentioned.

Gabriele Fallopius, who was born in Modena in 1523, was appointed to the Chair of Anatomy at Ferrara when he was only twenty-four years of age. Subsequently he taught at the University of Pisa. At the time of his death in 1563 he was Professor of Anatomy, Surgery and Botany at Padua. He made many important discoveries in anatomy, more particularly in relation to foetal osteology and the distribution of the blood-vessels. His work in the latter department is all the more remarkable from the fact that it was accomplished at a time when the art of injecting blood-vessels with some opaque material was unknown in Italy. His name has been perpetuated in connection with the Fallopian tube. As a man Fallopius was much liked because of his kindly disposition and absence of conceit. The only treatise which he published was that entitled "*Observationes anatomicae,*" Venice, 1561.

Bartholomaeus Eustachius, born at San Severino, in the Marches of Ancona, in the early part of the sixteenth century, was one of the most distinguished physicians of his day. He taught anatomy at the famous University of Sapienza at Rome, and devoted a great deal of time and thought to the preparation of a large work which was to bear the title "On the Dissensions and Controversies Relating to Anatomy"; but death overtook him before he had completed this undertaking. It appears, however, that in 1564—that is, ten years before he died—he published a smaller work containing separate chapters on the kidneys, the organ of hearing, the movements of the head, the vena azygos, the vena profunda of the arm, and on certain questions relating to osteology; and he introduced, as illustrations for the text, eight plates of octavo size. These plates and thirty-eight others, which were to have served as illustrations for the great work, were all completed as early as during the year 1552. The artist Pini, who made the drawings that served as the originals from which the plates were made, was related in some degree to Eustachius, and upon the latter's death the metal plates became his

property by inheritance. But nothing further was heard of them until they were discovered, early in the eighteenth century, by Lancisi, the Pope's attending physician, in the possession of Pini's descendants. They were published for the first time in 1714. Haeser says that these pictures are true to nature, but that in artistic merit they are not equal to those which belong to the treatise published by Vesalius. The name Eustachius is permanently connected with the channel which leads from the tympanum to the nasal cavities—the Eustachian tube.

Only the briefest possible mention may here be made of those anatomists who, following immediately in the footsteps of the three great leaders mentioned above, played parts of greater or less importance in building up the science of anatomy. Each one of them did creditable work in correcting the errors made by their predecessors or in supplying descriptions of structures or structural relations which these pioneers had overlooked. Thus, long before the sixteenth century came to an end, the gross anatomy of the human being had attained a large measure of the completeness which it possesses to-day. The names of some of the more prominent men among those to whom I have just referred are the following: Giovanni Filippo Ingrassia, Matthaeus Realdus Columbus, Julius Caesar Arantius, Constantius Varolius, Volcher Koyter and Hieronymus Fabricius ab Acquapendente.

Ingrassia (1510-1580), a Sicilian physician, cultivated osteology assiduously, and is entitled to special credit for having first described the stapes, the third one of the ossicles of hearing, and for having made valuable contributions to our knowledge of epidemic diseases. He was a professor in the University of Naples, and, after the year 1563, held the position of Archiater in Palermo, Sicily. His descriptions of the different bones of the skeleton were made with such care and thoroughness that later anatomists found very little for them to discover or to alter.

Matthaeus Realdus Columbus (or simply Realdus Columbus), who died in 1559, was born in Cremona, Northern Italy. He served for some time as Prosector

to Vesalius at Padua, and then succeeded him in the Chair of Anatomy, first at Padua and afterward at Pisa. The last teaching position which he held was that of Professor of Anatomy in Rome, in which city he counted Michael Angelo among his intimate friends. The discoveries which he made in anatomy were quite numerous and of considerable importance, and his descriptions were distinguished by an unusual degree of accuracy and clearness. Unfortunately, he did not hesitate, at the same time, to exalt the value of his own work by disparaging that of his famous teacher.

Arantius, who also was one of the pupils of Vesalius, occupied the Chair of Anatomy in his native city of Bologna during the latter half of the century. His death occurred in 1589. The particular department in which he gained considerable fame was that of the foetus, the placenta, the uterus, etc. His descriptions of these structures are written with very great care. Blumenbach gives him credit for having been the first anatomist to furnish a description of the pregnant uterus in its different stages. His earliest published work bears the title "*De humano foetu opusculum,*" Rome, 1564.

Constantinus Varolius, whose name is imperishably connected with that part of the brain which is known as the "Pons Varolii," was born in Bologna in 1543. He was appointed Professor of Anatomy in the Academy of his native city at an early age, and soon distinguished himself by the careful studies which he made of the human brain and nervous system in general. Before his untimely death at the age of thirty-two he was chosen the attending physician of Pope Gregory the Thirteenth. His earliest published work bears the title "*De nervis opticis, etc., epistola,*" Padua, 1573.

Volcher Koyter, who was born at Groningen, North Holland, in 1534, studied under Fallopius and Guillaume Rondelet (1507-1566), to whom the University of Montpellier was indebted for its anatomical theatre, and to whom (rather than to Gaspard Bauhin of Basel) is due the honor of discovering the ileo-caecal valve. Koyter was

one of the earliest workers in the field of comparative anatomy—a department of knowledge to which Vesalius had already made some creditable additions; and his two most important published treatises bear these titles: "*De ossibus et cartilaginibus corporis humani tabulae*" (Bologna, 1566), and "*Externarum et internarum principalium humani corporis partium tabulae*" (Nuremberg, 1573). He died in 1600.

Hieronymus Fabricius was born in 1537 at Acquapendente, a small city of Etruria, about fifty miles northwest of Rome. He studied anatomy at Padua under Fallopius, and, after the latter's death, was assigned to the duty of making the necessary dissections and anatomical demonstrations before the class. In 1565 he was appointed Professor of Surgery, with the understanding that he was to continue giving his demonstrations in anatomy. The salary which he received for this double work was 100 ducats, but it was increased from time to time until finally he was paid 1100 ducats yearly. At the end of thirty-six years he was retired upon a pension of 1000 ducats for the remainder of his life, and was allowed the privilege of appointing his successor in the Chair of Surgery. He gave the place to Julius Casserius in 1609. To distinguish him from another Fabricius, who gained great distinction in the field of surgery, it has always been customary for later historical writers to speak of him as "Fabricius ab Acquapendente." His namesake is known as "Fabricius Hildanus."

As a teacher of anatomy, especially in its relations to physiology, Fabricius was held in the highest esteem. Albert von Haller speaks of him as being one of the glories of the Italian school of medicine. Pupils came in flocks from all parts of Europe to attend his lectures, and among them were some who, like William Harvey of England, afterward attained great celebrity for the effective work which they did in advancing the science of medicine. One of the attractive features of Fabricius' teaching was to be found in his practice—something quite new at that period—of showing to the students, not only the particular organ

(human) upon which he happened then to be lecturing, but also the corresponding organ in one or several of the animals; thus enabling them to learn what were the features possessed in common by all the species, and what were those in respect of which the species differed. As time went on, the number of those who came to witness his anatomical demonstrations increased so greatly that he felt impelled to build, at his own expense, a new and larger amphitheatre. But even this, in a short time, proved to be too small, and then the Senate at Venice, which exercised a governing control over the University of Padua, erected (in 1593) a much larger and more complete amphitheatre, upon the walls of which there was placed an inscription stating that it had been built in honor of Fabricius. Among the other distinctions which were conferred upon him at this time he was raised to the rank of Knight of the Order of Saint Mark and made an honorary citizen of Padua.

Fabricius ab Acquapendente added to our stock of anatomical knowledge by his researches on the structure of the oesophagus, stomach and intestines, the eye, ear, larynx and foetus. One of his chief claims to distinction, however, rests upon the fact that he wrote an elaborate monograph on the valves of the veins. Although these structures had been seen and described at an earlier date by Charles Estienne, Berengarius, Vesalius, Cannani and others (Fra Paolo Sarpi, for example), nobody had yet offered a satisfactory explanation of their probable use or had traced them through the venous system at large. In 1574 Fabricius demonstrated their presence in all the veins of the extremities.

But Fabricius ab Acquapendente was not merely a good anatomist and physiologist; he was also a most distinguished surgeon and general practitioner. From far and from near patients came to consult him about their ailments, and he appears to have been immensely popular among all classes of the community. His home, situated on the River Brenta, just outside the city of Padua, was most attractive, and it was there that he dispensed hospitality in a princely fashion. One of his peculiarities was that in many cases

he was unwilling to accept a fee for his services. As a natural result, gifts of all sorts, many of them of considerable value, were showered upon him. He devoted one of the rooms of his residence to the purposes of a cabinet or museum, in which all those gifts which were suited to such display might be properly exposed to view, and over the doorway of the room he placed this inscription, "*Lucri neglecti lucrum,*" which I venture to render into English by the following, "Costly gifts representing unproductive wealth."[2]

Fabricius remained a bachelor all his life, and at the time of his death (May 21, 1619, at the age of eighty-two) his fortune, which he bequeathed to his brother's daughter, amounted to 200,000 ducats—a very large sum in those days.

The writings of Fabricius were published at Leipzig in a single volume in 1687, but Johann Bohn, who edited the collection, omitted the different prefaces which Fabricius had written. In the Leyden edition of 1737 this defect has been remedied.

To furnish here even a much abbreviated account of the important discoveries made in anatomy and physiology during the sixteenth century would call for a much larger amount of space than can possibly be given to these two branches of medical science. Our modern text books on the subject of anatomy alone are, in a certain sense, catalogues of these very discoveries, and every physician knows what a vast amount of space they occupy. I have already made mention of a few of these discoveries, and, when I come to consider the splendid work done by William Harvey in the early part of the seventeenth century, I shall have

[2] The meaning of this Latin inscription can best be appreciated by those physicians who have, through a long period of years, practiced their profession largely among the well-to-do classes of a metropolitan city. They alone, I believe, would understand the significance of "*lucrum neglectum*" as applied to a large proportion of the gifts which a practitioner of medicine receives from grateful patients; and it is not at all likely that a layman who is not familiar with this aspect of a physician's life would, under the circumstances mentioned, have the slightest suspicion that the device quoted above could possibly bear the meaning that I have given to it.

occasion to recapitulate briefly the more important discoveries made by his predecessors in this particular field. In this way I shall be able to supply information regarding several of the discoveries which I am now obliged to pass over in silence, but which, under other circumstances, would more properly receive consideration in the present chapter.

CHAPTER XXVIII

FURTHER DETAILS CONCERNING THE ADVANCE IN OUR KNOWLEDGE OF ANATOMY—DISSECTING MADE A PART OF THE REGULAR TRAINING OF A MEDICAL STUDENT—IATROCHEMISTS AND IATROPHYSICISTS—THE EMPLOYMENT OF LATIN IN LECTURING AND WRITING ON MEDICAL TOPICS

Further Details Concerning the Advance in Our Knowledge of Gross Anatomy.—In the preceding chapter I have given some account of the efforts made during the sixteenth century by certain physicians to lay solidly the foundations of a gross anatomy of the human body. The time was ripe for such a movement, and the right sort of men took charge of it and pushed it forward to such a stage of successful accomplishment that we physicians of to-day are able to continue in the direction indicated, and under the impulse communicated, by these master builders. These men, it should be remembered, did something more than merely to lay solid and durable foundations in the form of an accurate anatomy, they also taught the correct methods of procedure for the erection of the superstructure of the science of medicine.

Up to the end of the sixteenth century almost all the work done in anatomy was effected with the aid of the scalpel alone, the object being to isolate and expose clearly to view the larger tissues and organs, such as muscles, arteries, veins, nerves, etc. In a very few instances more elaborate methods were devised, even as early as during the fifteenth

century, by men of exceptional cleverness. Thus, for example, in 1490, Alexander Benedetti, Professor of Anatomy at Padua, invented a method of preserving muscles, nerves and blood-vessels as permanent dry specimens, and it is said that he sold such preparations for large sums of money. As already stated on a previous page, the injection of blood-vessels with certain fluids was also employed to a very limited extent at this early period as a means of distinguishing them more easily from the surrounding structures; but this practice gave place, during the seventeenth century, to the better method of employing, as an injecting material, a semi-fluid preparation which became quite solid soon after it had penetrated well into the interior of the vessels, and to which any desired opaque color might be given. This method was invented by the Hollander, John Swammerdam (1627-1680) and perfected by Van Horne. It was largely by the employment of this procedure that Friedrich Ruysch of Amsterdam (1638-1731), Professor of Anatomy and Botany in the university of his native city, gained such celebrity throughout Europe for the great beauty of his permanent anatomical preparations. Hyrtl mentions the fact that Peter the Great of Russia, who resided for a certain length of time at Zaandam, near Amsterdam, in order that he might familiarize himself with the art of ship-building, was in the habit of visiting Ruysch from time to time in his museum and laboratory; and finally (in 1717) bought from him, for the sum of 30,000 florins, his entire collection of specimens, together with the formula of the mixture which he employed in making his injections. The collection itself, it should be stated, contained not only specimens illustrative of normal human anatomy (*e.g.*, the various solid and hollow organs, the organs of special sense, and objects belonging to the vascular, muscular, nervous and osseous systems), but also many specimens illustrating pathological and comparative anatomy, and a great variety of monstrosities.

Ruysch also attained remarkable success in restoring the rosy color and soft flexibility of the skin and the natural facial expression in certain dead bodies by the employment

of a preservative fluid widely known as "*Liquor balsamicus.*" Tradition says that in one instance, that of a child whose corpse had been treated in this manner by Ruysch, the face presented such a perfectly life-like appearance that the Czar, as he passed near the object, thought he was looking upon a sleeping child and gave it a kiss.

The aged professor lived to be ninety-three, and continued giving his lectures on anatomy almost up to the day of his death, which resulted from accidental injuries. When it became clear that these were of so serious a nature that he could not possibly recover, he asked to be carried on a stretcher into the assembly room in order that he might say a farewell to the students who had been attending his lectures.

Although some critics have intimated that Ruysch should be ranked merely as a very clever mechanic in the domain of anatomy, there are certain well-established facts which show that this estimate of the man is unfair. It is known, for example, that he was the first anatomist to call attention to the features which distinguish the male from the female skeleton (*e.g.*, the differences in the form of the pelvis and of the thorax). Ruysch also advanced our knowledge of the vascular system by means of the improvements which he effected in the method of injecting blood-vessels. His skill in this special work was so great that people were wont to say of him that he possessed the fingers of a fairy and the eyes of a lynx. It was Ruysch too who furnished the first descriptions of the bronchial blood-vessels and of the vascular plexuses of the heart. Finally, the term "*membrana Ruyschiana,*" in connection with the choroid of the eye, bears testimony to the fact that he was also an original worker in this very difficult corner of the field of human anatomy.

The crowning event in the life of Ruysch—an event which shows how wasteful many of us men are of our productive powers when we deliberately retire from all participation in active work, physical or mental, at the comparatively early age of sixty-five—occurred in 1717, when he had attained the age of seventy-nine. Peter the Great had

hardly left the premises with the great collection of specimens for which he had paid such a fabulous price, when Ruysch began the making of a new collection; and at this task he worked so diligently that in less than ten years he was able to deliver to John Sobieski, King of Poland, the greater part of the new collection (for which he received the sum of 20,000 florins). Then followed a period of about three years during which he continued active work as a teacher of anatomy, death alone seeming to possess the power to arrest his extraordinary energy.

Ruysch's only published works are the following: Catalogue of the Specimens contained in his Museum, Amsterdam, 1691; and a *Thesaurus Anatomicus,* in 10 volumes, Amsterdam, 1701-1715.

In reading over the account which I have given of the discoveries made in gross anatomy and in physiology during the sixteenth and seventeenth centuries, I find that I have omitted some that may just as appropriately be mentioned in this section as in that which I intend to devote to work done in the domain of minute anatomy. I shall therefore refer to them briefly now, and then pass on to the consideration of the latter branch of my subject.

Eustachius, the famous Italian anatomist, deserves special credit for the experimental methods which he devised and employed in his efforts to gain a better knowledge of the anatomy and physiology of the kidneys. Moritz Hofmann of Fürstenwald discovered in 1641, in the turkey gobbler, the outlet duct of the pancreas, and a short time afterward George Wirsung, a Bavarian, discovered the same structure in the human being. Then, in 1651, Olaus Rudbeck, Professor of Anatomy in the University of Upsala, Sweden, discovered the lymphatics of the intestines, and established (at a later date) the fact that they are a separate system from that of the chyle ducts. Francis Glisson (1597-1677) of Cambridge University, England, one of Harvey's pupils, made two series of anatomical investigations of a most creditable character—the first concerning the relationship which exists between the intestinal lymphatics and the alimentary canal, and the

second regarding the internal construction of the liver ("capsule of Glisson"). Thomas Wharton (1610-1673), a native of Yorkshire, England, and a London practitioner of medicine, discovered the outlet channel of the submaxillary salivary gland, now known as "Wharton's duct," and he also published the first exhaustive treatise on the structure of glands in general (thymus, pancreas, submaxillary, etc.). About the middle of the seventeenth century Nathanael Highmore of Oxford, England (1613-1685), discovered and adequately described the cavity in the superior maxilla which bears his name ("antrum of Highmore"), and which in comparatively recent years has assumed such importance from the viewpoint of the practical surgeon. A Danish anatomist, who is known to us English-speaking physicians as Nicholas Steno (1638-1686), but to his own countrymen as Niels Stensen, discovered the outlet duct of the parotid gland ("Steno's duct"). Stephen Blancaard (1650-1702), a practicing physician of Amsterdam, made the first successful injections of capillary blood-vessels; and Domenico de Marchettis (1626-1688), Professor in the University of Padua, employing Blancaard's technique, succeeded in proving that the finest ramifications of both veins and arteries communicate the one with the other. To Conrad Victor Schneider, a professor at the University of Wittenberg, Germany (1614-1680), we are indebted for putting an end forever to the erroneous doctrine that the nasal mucus is produced in the brain. He did not, however, have the good fortune to discover the glands from which this mucus actually comes; the credit for this discovery being due to Niels Stensen. Among the host of other successful discoverers in the domain of anatomy during the seventeenth century the following men deserve at least to be mentioned by name: Johann Conrad Peyer (1653-1712) of Schaffhausen, Switzerland; Johann Conrad Brunner (1653-1727), also a native of Switzerland; Theodor Kerckring (1640-1693) of Hamburg, Germany; Anton Nuck (1650-1692), Professor of Anatomy at the University of Leyden, Holland; Reignier de Graaf (1641-1673), a native of the

Netherlands; and Thomas Willis (1622-1675) and William Cowper (1666-1709), both of them Englishmen.

And, finally, it may be stated that all the leading anatomists of the sixteenth century devoted a great deal of time to the study of the manner in which the nerves are distributed throughout the body and to ascertaining the arrangement of the intracranial and intraspinal nervous structures. To give even the most superficial account of what these men accomplished would occupy far more space than can well be spared for this purpose. Kurt Sprengel is my authority for saying that, of all the workers in this particular field during the period in question, Fallopius is entitled to receive the greatest credit for what he accomplished.

The First Beginnings of Minute or Microscopic Anatomy.—The anatomy of the tissues—microscopic anatomy—begins with Marcello Malpighi (1628-1694), a native of Crevalcuore, near Bologna, Italy. It is not positively known who was the inventor of the compound microscope. First employed about the year 1620, the instruments of this type came into fairly general use toward the middle of the seventeenth century. But the early compound microscopes were not very satisfactory, and consequently preference was given, for a long time, to those of the simple type. Achromatic instruments were not purchasable until 1780, when the famous German physicist, Leonhard Euler, succeeded in overcoming the obstacles which had up to that time stood in the way of their successful manufacture.

In 1661 Malpighi, who was in the habit of manufacturing his own microscopes, was able, by aid of one of these instruments, to exhibit the blood, loaded with its corpuscular bodies, passing rapidly from one capillary vessel to another in the frog's lung. Then in 1683 Guillaume Molyneux, in 1690 Anton van Leeuwenhoek, and in 1697 William Cowper, witnessed the same phenomenon in warm-blooded animals. Among the other anatomists of this period who contributed in varying degrees to our knowledge of the minute anatomy of the different tissues and organs the following deserve to be mentioned: J. Riolan

(1577-1657), Boselli of Naples (1608-1679), Lower of Oxford, England (1631-1691), Vesling of Minden, Germany (1598-1649), Regnier de Graaf of Delft, Holland (1641-1673), who gained so great distinction by his accurate description of the ovarian follicles ("Graafian follicles"); and James Douglas (1676-1742), the English anatomist, who ascertained and described the precise limits of the peritoneum.

Of all the men whom I have mentioned above, Malpighi and Leeuwenhoek are probably the best known to our readers for the large number and important character of the contributions which they made to microscopic anatomy. The list of Malpighi's achievements, for example, includes the following, in addition to the demonstration of the blood in actual circulation, as already mentioned: contributions to our knowledge of the finer structure of plants; the demonstration of the minute anatomy of the skin ("*rete mucosum*" or "*rete Malpighi*"); the amplification of our knowledge of the structure of the teeth; the discovery that the lungs are composed to a large extent of terminal vesicles, the walls of which are richly supplied with blood-channels; the demonstration that certain glands possess an acinous structure (*i.e.*, an outlet channel springing from numerous small sacs, the whole group resembling a cluster of grapes); more complete details regarding the structure of the spleen and the kidneys ("Malpighian bodies or corpuscles"); additions to our knowledge of the structure of the white and the gray substances of the brain and the demonstration that fibres from the spinal cord pass on into the brain; the declaration that the papillae of the tongue are organs of taste and the papillae of the skin are organs of the sense of touch; and not a few other contributions of greater or less importance. During his long life Anton Leeuwenhoek (1632-1723) of Delft, Holland, made a great many additions to microscopic anatomy, some of the more important of which are the following: he was the first to discover and to describe the many varieties of Infusoria (the animalcules found in stagnant collections of water); to him is also due the credit of first observing the faceted

arrangement in the eyes of insects; he made original investigations into the origin and mode of development of several species of the lower organisms; he was the first to observe the canaliculated mode of construction in bone, and he also noted the existence of the so-called bone-corpuscles (afterward rediscovered and more accurately described by Purkinje); he discovered the striated condition of the bundles of muscular fibres, and was also the first person to teach the doctrine that the growth of muscles is effected by an enlargement of the primitive bundles of fibres and not by a multiplication of these structures; he taught further that muscle-substance consists of numberless small spheres; he was the first to describe the crystalline lens as a structure composed of fibres which are arranged in layers or sheets; in association with Guillaume Molyneux he studied, under the microscope, the speed with which the blood-current travels in the blood-vessels; he made valuable observations on the nature of the spermatozoa; and, finally, the very first studies in bacteriology appear to have been made by Leeuwenhoek. As a result of his discovery of "round, rod-shaped, thread-like and corkscrew-shaped bacteria" between the teeth of a human being, the theory was set forth that probably many diseases owe their origin to such "little animals."[1]

The same idea, as will be shown farther on, occurred to the distinguished medical practitioner of Verona, Italy,—viz., Fracastoro,—one hundred years earlier (1546). Leeuwenhoek, it should here be stated, possessed a very great advantage over his rivals in the field of minute anatomy, for he was in the habit of using, in his investigations, microscopes which he himself had made, and which magnified from 160 to 270 diameters, whereas those utilized by the others were capable of magnifying, at the maximum, only 143 diameters. While a large part of the work which he performed shows plainly that he was a skilful and careful anatomist and endowed with good mental powers,

[1] See F. Loeffler: "Vorlesungen uber die geschichtliche Entwickelung der Lehre von den Bakterien," Leipzig, 1887, Th. 1; and also p. 310 of Puschmann's "Geschichte des Medicinischen Unterrichts," Leipzig, 1889.

Leeuwenhoek nevertheless manifested certain mean traits of character. Daremberg says that these "consisted in his disposition to conceal his technical methods from his associates, and in his jealousy of others—as manifested, for example, toward Leibnitz, who had established a similar laboratory for research work in minute anatomy. These traits of character showed that fundamentally he was not a true lover of science, but rather an artisan. And yet, with all these faults, he does not appear to have placed an inordinately high value upon his discoveries or to have been unreasonably sure of the correctness of his conclusions." The first monograph published by Leeuwenhoek bears the date 1673. It is a study of the minute anatomy of the bee's sting. He was the first to declare that the blood is the nutritive fluid *par excellence,* and that it is to be found in the entire series of organisms belonging to the animal kingdom. He divided blood into two parts—the red, or the solid portion, and the serum. The corpuscles which float in the serum and give to the whole fluid its red color, are called by him "particles," in the case of blood from birds, reptiles and fishes, and "globules" in that from quadrupeds. He employed this term "globules" because he believed that these bodies were exactly spherical in shape. According to Daremberg, Leeuwenhoek's studies cover the entire field of human histology, and his findings are for the most part correct.

The Founding of Organizations for the Advancement of Medical Science.—During the seventeenth century there were formed a number of associations which had for their object the promotion of scientific knowledge, and these organizations contributed greatly to stimulate original researches in anatomy and physiology and to secure accuracy in the published results. Perhaps the most important institution of this kind was the French *Académie des sciences,* which was founded in 1666, and which deserves the credit of having taken a very important part in the perfecting of our knowledge of anatomy and physiology. The Royal Society of London, founded in 1645, possesses a splendid record of valuable work accomplished. The

following organizations also deserve to be honorably mentioned in this place: the *Accademia dei Lincei* at Rome, founded in 1603; the *Académie des Curieux de la Nature,* 1652; and the *Accademia del Cimento,* founded at Florence in 1657. New universities were also founded in Germany.

During the second half of the seventeenth century there were three French physicians who deserve credit for the excellence of the work which they did in the departments of anatomy and physiology, viz., Vieussens, du Verney and Dionis.

Raymond Vieussens (1641-1716), a native of Rovergue, was Professor of Anatomy at the University of Montpellier, in Southern France. Some idea of the extraordinary industry displayed by this anatomist may be gained from the fact that he is credited with having dissected more than five hundred bodies. His more important published works relate to the heart, the nervous system and the structures of the organ of hearing. Pagel speaks of him as being entitled to the name of founder of the pathology of diseases of the heart.

Jean Guichard du Verney (1648-1730), who held the Chair of Anatomy in the University of Paris, gained a large part of his fame as an anatomist from the excellence of his investigations into the complicated structures of the internal ear.

Pierre Dionis, who died in 1718, was Demonstrator of Anatomy and Surgery at the Jardin du Roi in Paris during the latter part of the seventeenth century and early part of the eighteenth. In 1690 he published a treatise on anatomy which remained the standard book on this subject for a number of years. In course of time it was translated into the Latin, English, German and Chinese languages.

Dissecting Made a Part of the Regular Training of a Medical Student.—The opportunities for dissecting human bodies varied greatly in different parts of Europe during the period of which I am now treating. Vieussens, as we have just seen, dissected no fewer than five hundred bodies during his long professorship at Montpellier; and Joseph Lieutaud, Professor of Anatomy at Paris, dissected

more than twelve hundred bodies during the continuance of his connection with that institution. So far as I have been able to learn from my examination of the literature, the professors and their immediate official assistants were the only persons who had, up to this time, derived the principal benefits that flow from work of this nature; the students merely listened to the instructor's remarks upon the objects which had previously been exposed to view by dissection. But toward the end of the period—a little before or shortly after the beginning of the eighteenth century—facilities were provided in some of the medical schools, and before long in all of the leading ones, for the students themselves to participate in this highly important part of a physician's education. The value of such training was emphasized by the statement made by the English philosopher, John Locke (1632-1704), toward the end of his life, viz., that all human understanding is based upon experience. He wrote that at birth the human soul is like a clean sheet of paper upon which all the objects perceived by the senses are recorded as experiences, and there they remain until by the aid of reflexion—*i.e.*, by the aid of the understanding, which Locke calls the inner sense—they are combined into conceptions or ideas. Locke, it should be remembered, was educated as a physician, but he never took his degree, nor did he ever practice medicine.

The first stimulating effects of the Renaissance upon the devotees of the science of medicine were felt in Italy toward the end of the fifteenth century, and these effects rapidly gained in intensity during the following century. First France and afterward Switzerland, Belgium, Holland and England were almost simultaneously brought under the same influence; and in all these countries the students manifested a remarkable eagerness to acquire all the knowledge they possibly could. In Germany, however, the influence of the Renaissance did not make itself felt until a much later date, and the thirst for knowledge was very much slower in developing than was the case in any of the other countries mentioned. Thus Puschmann, in his "History of Medical Education," makes the following

statement which shows clearly that in Germany the university students of that period must have been a very rough set of men: "In 1625 the Senate of the University of Leipzig was obliged to warn its students that they must cease disturbing wedding festivals and handling the guests roughly, that they must no longer make obscene remarks to married women and maidens, etc. And in 1631 a physician named Lotichius, in writing to a friend, made the statement that 'in our German high schools the students seem to prefer strife to the reading of books, daggers to copy-books, swords to pens, bloody encounters to learned discussions, incessant boozing and noisy reveling to the quiet pursuit of their studies, and public-houses and brothels to students' work-rooms and libraries.'" In 1660 the students at Jena, on one occasion, carried on a regular battle with the police, and as a result of this encounter several persons were killed. In the light of this evidence, therefore, it is not surprising that the science of medicine made comparatively little advance in Germany until after the eighteenth century was reached.

Iatrochemists and Iatrophysicists.—During the seventeenth century there was a great deal of disputing among physiologists about the nature of certain processes like assimilation and retrograde metamorphosis, about the manner in which blood is formed, about digestion, and about the rôle played by the lymph vessels. According to Haeser a large proportion of the physicians of that day were confident that chemistry was entirely competent to solve these riddles, and yet, on the other hand, there were not a few who believed that the science of physics, which was then much further advanced than that of chemistry, was quite as competent to explain all the phenomena. At first the split into these two factions was confined to men who were interested in questions of a purely physiological nature, but in a short time the practitioners of medicine were also drawn into the controversy; and from that time onward it became customary to employ the terms, "iatrochemists" and "iatrophysicists" in speaking of the partisans of the two schools of medicine (the iatrochemical

and the iatrophysical or iatromechanical). The iatrochemists described digestion as an act that is essentially chemical in character, a form of fermentation; and by the latter term the more advanced members of this school—François Deleboë Sylvius (1614-1672), who was born in Hanau, Prussia, of Dutch parents, and who took his doctor's degree in Basel in 1637, and Thomas Willis of London (1622-1675)—understood something quite different from our modern conception of fermentation. Their interpretation was as follows: "An internal chemical movement of matter which is set agoing and continued in action in the stomach and intestinal canal through the agency of certain chemical reagents." (Haeser.) They attributed an important influence to the saliva, the pancreatic juice and the bile in effecting the changes mentioned. The iatrophysicists, on the other hand, and more particularly Archibald Pitcairn of Edinburgh, Scotland (1652-1713), and Giorgio Baglivi of Ragusa, Italy (1668-1707), described digestion as a purely mechanical breaking up of the elements of the food partaken—a "trituration." As to the further fate of the resulting chyle (its mode of reaching the blood, for example) the two schools were in perfect accord.

Sprengel mentions it as an actual fact that, during the seventeenth century, there were several physicians who combined the two careers of teacher of medicine and hydraulic engineer (iatrophysicists or iatromathematicians).[2] Several events conduced to the formation, in Italy and in Great Britain, of a distinct iatromathematical school. Among them may be mentioned, first and foremost, Harvey's discovery of the circulation of the blood; second, the spread of the doctrines taught by Descartes favored in a marked degree the union of medicine and mathematics (physiology, the iatromathematicians claimed, was only a branch of applied mathematics); and, third, the formation at Florence, in the middle of the seventeenth century, of an association of the pupils of Galileo. The objects of this

[2] The iatrophysicists and the iatromathematicians constituted apparently two kindred branches of the same school.

association were to cultivate their master's philosophy, to carry on the work of experimental physics, and to apply its principles in every department of natural science. Alphonso Borelli (1608-1679), Professor of Mathematics first at Messina and afterward at Pisa, the author of the famous treatise on "The Movements of Animals," and the founder of the iatromathematical school, was a member of the association. In this connection it is important to mention another zealous worker in the field of iatromathematics, viz., Sanctorius Sanctorinus, of Capo d'Istria (1561-1636). His work was done quite independently of any general movement among scientific investigators and at a much earlier period than that during which the school flourished. He was quite successful, for example, in his attempts to measure the actual amount of imperceptible evaporation, and to determine the influence which this process exerts upon health and disease. In the course of these investigations in what he called "static medicine," Sanctorinus invented a number of unusual instruments.

The phenomenon of the formation of schools or sects, the members of which were keenly interested in the maintenance and promulgation of certain physiological, pathological, or therapeutic doctrines, manifested itself anew, as I have shown above, in the seventeenth century. In the early years of the Christian era the partisans of different medical doctrines formed schools of this nature which flourished for a certain period of time and then died out completely. Such, for example, were the sects of the Dogmatists, the Methodists, the Pneumatists, etc. The mere fact of the existence of these different schools or sects showed unmistakably that the science of medicine was alive at that time and that its devotees were making vigorous efforts to increase their stock of knowledge. Then followed the long period of the Middle Ages, a series of many centuries, during which medicine made only slight gains; but at last came the Renaissance,—the fifteenth, sixteenth and seventeenth centuries,—and here again we have a recurrence of the same phenomenon of sects in medicine; but note the great difference between the earlier manifestations

and those which I have just outlined. The present group, it is proper to remark, is merely the forerunner of several similar movements that are to occur during the eighteenth and nineteenth centuries, movements that are all based, in varying degrees, upon the truth.

The Employment of Latin in Lecturing and Writing on Medical Topics.—In all the countries of Europe, but more particularly in Germany, there existed during the sixteenth and seventeenth centuries—and for a long time subsequently—the practice of delivering all the lectures on medical topics in the Latin tongue—*i.e.*, in a language which at best could not be easily understood by more than a small proportion of the students. Even the lecturers themselves must have been hampered in the full expression of their thoughts by this rule, which was practically compulsory. Paracelsus (1493-1534), the famous Swiss physician, tried—a full century earlier, as will be shown farther on—to break up this seemingly harmless but in reality objectionable custom; his example, however, was not followed, and the practice was continued without interruption for at least two centuries longer. The use of Latin as the language in which all medical knowledge was to be taught was undoubtedly based upon the idea that it was necessary for the educated physician to be reasonably familiar with that particular tongue, for the simple reason that it was the only one in which, in those early days in Western Europe, the writings of Galen were accessible, for nobody but a few expert scholars had yet acquired any useful knowledge of Greek, the language in which all of Galen's works were originally written. But it is quite likely that with this motive, which certainly was intended to produce good and useful fruit, there was coupled the further idea that the great mass of irregular practitioners—the quacks, the early barber-surgeons (*Wundaerzte*), and the peripatetic physicians—would in this way be debarred from entering the ranks of the regularly trained physicians. It was only after the custom of using the Latin for lecturing and writing purposes had become thoroughly rooted in the minds of medical men as something right and

proper, that it began to dawn upon the minds of some of the brighter men that this practice was harmful to the advance of medicine beyond the standards established by Galen. Vesalius, who was a contemporary of Paracelsus, fully appreciated how serious an obstacle to further progress in anatomical knowledge the teachings of Galen were, and it was he who made the first really successful attack on this great hindrance to further progress; but there is no evidence to show that he had the slightest idea that lecturing and writing about medical topics in Latin played any part in the perpetuation of the evil which he was fighting. To Paracelsus alone belongs the credit, so far as I know, of endeavoring, through the force of example and by spoken arguments, to break up the practice which we are here considering. I may be mistaken in the view which I have here expressed, but it is difficult for me not to believe that the habitual use of Latin as the proper vehicle for the transmission of facts and ideas belonging to the domain of medicine must have materially hindered the advancement of that science; for such use certainly tended to keep men's minds moving in fixed ruts, and those ruts all led straight toward the faulty teachings of Galen.

CHAPTER XXIX

THE CONTRIBUTIONS MADE BY DIFFERENT MEN DURING THE RENAISSANCE, AND MORE PARTICULARLY BY WILLIAM HARVEY OF ENGLAND, TO OUR KNOWLEDGE OF THE CIRCULATION OF THE BLOOD, LYMPH AND CHYLE

Among the earliest known doctrines relating to the nature of the blood and its mode of distribution throughout the body are those attributed to Erasistratus and Galen; for the still more ancient ones, of which Diogenes of Apollonia, Aristotle and the Hippocratic writers are reputed to be the authors, are too incomplete to call for serious consideration in this place.

(*a*) *The Doctrine Taught by Erasistratus.*—Erasistratus, who was born at Julis in the Island of Ceos (Aegean Sea) during the third century before Christ, held the belief that the arteries contain only air, which is drawn into the lungs by way of the trachea and bronchi, whence it enters the pulmonary vein (called by him the "venous artery"). In its further course this air passes from the pulmonary vein into the left ventricle of the heart, and is then conveyed from that organ through the arteries to the different tissues of the body. Erasistratus further taught that the smallest subdivisions of both the arteries and the veins lie side by side in the tissues, and that, in certain abnormal bodily conditions, they communicate the one with the other through anastomoses; but that, in a normal condition of the body, no communication takes place between the two. In common with all other physicians of that time, he believed that only the veins carry blood. Here, then, we

find the first glimmering of the truth with regard to the nature of the circulating medium and also with regard to the course which it pursues in one part of its circuit—that part, namely, where the two kinds of vessels become capillary in character. His substitution of air for blood in the arteries is plainly the principal error in his scheme.

(*b*) *The Teaching of Galen and of Caesalpinus with Regard to the Nature of the Blood and Its Mode of Distribution.*—Galen, in the second century of the present era, disputed the correctness of the doctrine taught by Erasistratus. His objections are thus stated: "Inasmuch as blood flows from an artery when it is wounded, one of two things must be the truth. Either blood was already contained in the vessel before it was wounded, or it must have found its way in from the outside. But, if the blood comes from the outside into a vessel which contains only air, then air must necessarily escape from that vessel (when wounded) before blood does—which is contrary to the fact, as blood alone flows out. Therefore arteries contain only blood." As a further proof of the correctness of his statement Galen carried out the following experiment: In a living animal he placed two ligatures around an artery at points situated not far apart, and then made an opening in the vessel between the two ligatures. The intervening section of the artery, it was thus found, contained only blood. This experiment, it might reasonably be supposed, would have definitely settled the question; but such was not the case. The followers of Erasistratus immediately raised this objection: If the arteries contain blood, how may the air which is drawn into the lungs find its way to all parts of the body? Galen replied that the inhaled air does not pass through the lungs, but is rejected by them after it has cooled the blood. This refrigerating process, he claimed, constitutes the sole purpose of the respiratory act.

Although Galen's idea regarding the true function of respiration is not in harmony with the doctrine taught by modern physiologists, it nevertheless represents a marked advance over the belief previously maintained. Even as

recently as in the time of Albert von Haller (approximately 1760-1780) physicians still continued to believe that it was the function of respiration to cool the blood; and indeed it was scarcely possible before 1800 to offer a more correct physiology of the act of breathing, for it was not until after the lapse of many centuries that the advance in our knowledge of chemistry reached a point at which it became possible to find a satisfactory solution of so complicated a problem.

As to the nature of the blood itself Galen believed, as I have already stated more fully in Part I. ("Ancient Medicine"), that there are two kinds—spirituous blood (or spirit) and venous blood. He gave the name of spirituous blood to that which is found circulating in the arteries, and which is appreciably brighter in color than that which fills the veins. According to Flourens, the distinguished French physiologist of the nineteenth century, Galen was the first among the ancient anatomists to make this distinction of two different kinds of blood. To the spirituous variety Galen ascribed the function of nourishing the more delicately constructed organs like the lungs, while he claimed that the venous blood is suited to nourish only the coarser ones, like the liver, spleen, etc.

In his further development of a physiology of the circulation of the blood Galen, who as a rule expresses his ideas with great clearness, makes statements which I find it extremely difficult to comprehend. I am therefore tempted to assume that the copyists, to whom we are indebted for handing down his actual words from age to age, are the persons upon whom should be cast the blame for the obscurity of which I complain. However this may be, it is an unquestionable fact that the ablest physiologists, were they to be confronted to-day with the duty of solving this problem of the circulation under the conditions of knowledge which existed during the third century of our era, would surely not be able to provide a more correct solution than that which is credited to Galen. The problem was attacked repeatedly by some of the brightest and best-equipped minds of the Renaissance period, but not one of

these exceptionally clever men was able to offer an entirely acceptable solution. Harvey alone, as will appear farther on in this account, solved the riddle once and for all.

The "spirit"—the purest part of the blood—is lodged, according to Galen, in the left ventricle; and, inasmuch as even the venous blood, if it is to fulfil in some degree the function of a nourishing fluid, must possess a certain proportion of "spirit," it is clear that the two ventricles should communicate the one with the other; for how otherwise—thought Galen—is it possible for a certain amount of "spirit" to commingle with the venous blood? The locality at which this communication was assumed to exist was the interventricular septum; and, as nobody was able to find anything like a foramen in this membrane, it was asserted that the communication is effected through an infinite number of pores. For over one thousand years physicians accepted this porous character of the interventricular septum as an established fact. In his commentaries on Mondino's "Anatomy" (1521), Berengarius of Carpi timidly ventured the statement that the openings of communication are not distinctly visible, and this apparently was the first feeble expression of doubt concerning the correctness of the prevailing doctrine. Vesalius, on the other hand, boldly denied their existence altogether.

According to Galen's teaching the liver is the source of origin of all the veins, just as the heart is the starting-point of all the arteries. It is quite remarkable, says Flourens, that physicians who performed almost daily the operation of venesection should, during a long series of years, have failed to observe that this doctrine of blood flowing through the veins from the liver to the different parts of the body, could not possibly be true, inasmuch as at each such operation the vein always became distended with blood *below* (*i.e.*, on the distal side of) the ligature which they applied to the part (arm, for example) before opening the vessel. This phenomenon, of course, indicated clearly that the blood in the veins flowed *toward the heart,* and not from any centrally located spot or organ *toward the extremities.* And yet—he adds—even so bright and

thoughtful a man as Vesalius does not appear to have noticed this fact. Andreas Caesalpinus (1519-1603), on the other hand, did observe and correctly interpret the phenomenon; and he made the further observation that physicians were habitually applying the ligature *above* the spot which they expected to bleed, regardless of the fact that in so doing they were not acting in harmony with their belief concerning the circulation of blood in the veins. Caesalpinus also states, in one part of his writings, that "the blood, carried to the heart by the veins, receives in that organ its last transformation toward perfection, and is then—in this perfected state—transported by the arteries to the remotest parts of the body." So far as it relates to the general movement of the blood this statement is correct, but it errs, as will be shown presently, in mentioning the heart as the locality where the perfecting process takes place. In his final remarks regarding the anatomical relations which exist in the two chambers of the heart Caesalpinus makes the following statement:—

> Each ventricle possesses two vessels—one through which the blood reaches that chamber, and a second one which serves to carry it out of the ventricle. The vessel through which the blood enters the right ventricle is called the *vena cava,* and that by which it leaves this same chamber is called the pulmonary artery. The vessel through which the blood arrives in the left ventricle is called the pulmonary vein, and that through which it leaves this left chamber of the heart is known as the aorta.

The Circulation of the Blood as Elucidated by Michael Servetus.—Michael Servetus, a native of Villanueva, Spain, who in 1553 was burned alive at the stake near the city of Geneva, Switzerland, because of his heretical teachings, is not infrequently mentioned as the individual to whom credit is due for having furnished the first description of the lesser or pulmonary circulation. There is no question whatever regarding the justice of according to him at least a part of this honor, but one should be careful to specify that Servetus is entitled only to the credit of having been the first to teach that the blood, in its journey from

the right to the left side of the heart, must pass entirely through the lungs. So far, his doctrine is correct; but he also taught at the same time that the fluid which enters the aorta from the left ventricle is not blood but perfected "vital spirit" (Galen), and that it becomes genuine blood only after it has tarried for a few brief instants in the ventricular chamber and has there been subjected to some unknown influence exerted by the heart itself. This second erroneous part of Servetus' description seems to me to diminish very materially the credit to which he is otherwise entitled; and I cannot help feeling that Dezeimeris is right when he claims that Realdus Columbus, whose more perfect account of the lesser circulation was written only a little later than that of Servetus, is perhaps better entitled to the honor in question.

It is an interesting fact that Servetus introduces his disquisition on the circulation of the blood in the very midst of a treatise which bears the title "Restitution of Christianity,"—in other words, in a treatise which would never, under ordinary circumstances, be consulted by physicians in their search for information regarding an important problem in physiology like that of the circulation of the blood. In this physiologico-theological treatise Servetus, who—as I omitted to state—was a theologian as well as a physiologist, used the following expressions:—

> The soul, says Holy Writ, is in the blood; as a matter of fact, the soul is the blood. And since the soul is in the blood, one should—if one wishes to learn how the soul is formed—endeavor to learn how the blood is formed; and, in order to learn how the blood is formed, it is necessary to ascertain how it moves. (Flourens.)

I am unable to state whether it was this particular chapter, or the work taken as a whole, which appeared to the ecclesiastical authorities—first those of France and afterward those of Geneva—to warrant the author's condemnation as a heretic. And, when we are disposed to blame severely those bigots who, in the fifteenth and sixteenth centuries, manifested such a keen desire to destroy

"heretics," let us remember, with a proper sense of shame, that we still have in our midst, in this twentieth century and in this "land of freedom," men of high social standing who are as virulent heresy-hunters as ever were the enemies of Servetus.

Experiments of Realdus Columbus.—Matthaeus Realdus Columbus, who was born at Cremona, Northern Italy, in the early part of the sixteenth century, acted for some time as Vesalius' prosector, and must therefore have had ample opportunities for acquiring a thorough knowledge of the experimental method of studying questions in physiology. He wrote a description of the pulmonary circulation which was more lucid and nearer to the truth than any which his predecessors had furnished. This description, which will be found in his treatise on anatomy (Venice, 1559), was based largely upon experiments that he carried out upon living dogs. As rendered into English from the French version supplied by Dezeimeris, it reads as follows:—

> When the heart dilates the blood passes from the vena cava into the right ventricle; from the latter chamber it is pushed into the arterial vein (the pulmonary artery), along which channel it is carried to the lung, there to be properly thinned and mixed with air. Ultimately the blood passes on into the venous artery (= the pulmonary vein), the function of which vessel is to carry this fluid, now charged with air through the action of the lung, into the left ventricle of the heart. Then follows the contraction (systole) of this organ, as a result of which action the tricuspid valves rise up into position and form a dam that prevents the return of the blood into the vena cava and the pulmonary veins. Simultaneously with this action the valves placed at the opening which represents the commencement of the aorta (left ventricle), and those placed at the opening which corresponds to the beginning of the pulmonary artery (right ventricle), yield and thus open the way for the distribution of the blood throughout the rest of the body.

The reader will, I believe, admit that this description, while perhaps not faultless, is distinctly superior to that given by Servetus.

Columbus' experimental studies threw considerable light upon other matters relating to the physiology of the heart.

He demonstrated, for example, that the fluid which enters the left ventricle from the lungs is genuine blood, and he also learned by the same method of investigation the true nature of the systole and diastole of the heart and the relations of these acts to the pulse and to the changes in the position of the heart. The discovery of all these facts constituted a material advance in our knowledge of the physiology of that organ; but, from this time onward, for a period of nearly three-quarters of a century, no further advance was made until William Harvey of England appeared on the scene. The explanation of the failure of such able investigators as Realdus Columbus, Vesalius, Servetus and others to push their researches still further is to be found largely in the fact that they were all still in bondage to the doctrines taught by Galen centuries earlier, and probably more particularly to that dogma which maintains that blood—if it is to be accepted as genuine or fully formed blood—must first have been elaborated in the depths of the liver. The impossibility of harmonizing such a dogma with the facts which by that time were well established, is too plainly evident to warrant further discussion in these pages.

Discovery of Valves in the Larger Veins by Fabricius ab Acquapendente.—The discovery of the presence of valves in the interior of the larger veins is credited by some to Cannani (1546) and by others to Fabricius ab Acquapendente (1574), but the best authorities appear to favor the claim of Fabricius to this honor. There are also a few authorities who maintain that Fra Sarpi, the celebrated monk and scientist of Venice, is entitled to be considered the discoverer of the valves in veins, but Tiraboschi, the historian of Italian literature, makes it clear that this claim is unfounded.

Although it was known to Fabricius that these valves are inclined toward the heart, he does not appear to have appreciated the fact that this arrangement is entirely incompatible with Galen's doctrine that the flow of venous blood is from the liver toward the extremities; nor did any other anatomist, so far as I am able to learn, discover this

incompatibility before it was pointed out by Harvey nearly fifty years later.

William Harvey, Who is Universally Acknowledged to be the Real Discoverer of the Circulation of the Blood.—William Harvey was born at Folkstone, England, in 1578, received his academic education at Caius College, Cambridge, and became a doctor of medicine in 1602, at the age of twenty-four. Four or five years before this event he went to Padua, Italy, to study medicine under Fabricius ab Acquapendente, who was considered at that period to be the ablest and most inspiring teacher of anatomy and physiology in Europe. It was from him, it may safely be assumed, that Harvey learned the importance of studying Nature herself, rather than books, when one is desirous of learning her secrets. Equipped with a thorough knowledge of the methods that may best be employed in making studies of this character, Harvey returned to England at the end of his long stay at Padua. He was soon afterward made a member of the College of Physicians of London, and in 1615 was elected to the Chair of Anatomy and Surgery in that institution. Later still, he was appointed one of the physicians of St. Bartholomew's Hospital. He also held for several years the position of Court Physician, first to James the First and then to Charles the First. It was during this period of his professional career that he began working in earnest upon the problem of the circulation of the blood, and he kept steadily at this work throughout a period of several years. Among the manuscripts preserved in the British Museum there is one bearing the date of 1616 which shows that Harvey had already at this time reached conclusions which, in all essential respects, agree with those which appear in his final treatise published in 1628. The title of the latter work is, "*Exercitatio anatomica de motu cordis et sanguinis in animalibus*" (Frankfort, 1628).

Although, as I have shown above, several of the links in the chain of proofs bearing upon this question of the circulation had already been discovered before Harvey began his researches, he was not willing to accept them as proven facts until he had himself tested them thor-

oughly by the experimental method. Furthermore, they were often disconnected, and this lack of continuity obliged him to supply missing links at several points; in other words, nobody had as yet demonstrated the important fact that the blood travels regularly in an unbroken circuit, and it was to this great task that Harvey devoted himself at the period which we are now considering. He carried out all these investigations with the most painstaking care and made public announcement of his discoveries only after the lapse of an extraordinary length of time; his chief object being that ample opportunity might thereby be afforded for complete verification. The following are among the more important questions which he investigated and to which he furnished satisfactory solutions. He learned, for example, that the auricle and ventricle of each side of the heart do not contract simultaneously but in succession. When the right auricle contracts the blood which it then contains passes into the right ventricle; and when the right ventricle contracts the blood is driven into the pulmonary artery. From this vessel it passes ultimately into the pulmonary vein, and from the latter into the left auricle, which then contracts and drives the blood into the left ventricle. The latter chamber next contracts and forces the blood into the aorta, whence it is carried into all the arteries of the body. From these, in turn, it passes into the veins and thence back to the right auricle of the heart—the point from which it started. He corroborated the finding—by other anatomists who had preceded him—of membranous valves at the spots where the blood passes from one chamber to the other; and he compared these valves to little doors which open to permit the passage of the blood in one direction, but which close when there is any tendency for it to pass in the opposite direction. The valves of the right auricle, for example, allow the blood to pass into the right ventricle, but prevent it from returning into the auricle. Then, further, the valves of the right ventricle permit the blood to pass into the pulmonary artery, but prevent it from returning into the ventricle. The valves of the left auricle permit the blood

FIG 15. WILLIAM HARVEY

(After the portrait by Cornelius Jonson.)

to pass into the left ventricle, but do not permit it to return into the left auricle. Finally, the valves of the left ventricle allow the blood to pass into the aorta, but prevent it from regurgitating into the same ventricle. The valves with which the veins are equipped permit the blood to travel onward toward the heart, but do not permit it to back up into the arteries.

Galen taught that the arteries pulsated by reason of a "pulsific power" which they derive in direct continuity from the tunics of the heart. He tried to prove the correctness of his doctrine by experimental methods, but in this he failed. Harvey was convinced that the arteries do not pulsate by reason of their own inherent power, but by a force of impulsion communicated to the blood at the heart. He refers to this question in the following terms: "When an artery is opened the blood escapes in jets of unequal force; the alternate jets being stronger than the intermediate, and the stronger jets corresponding in time of occurrence, not with the systoles but with the diastoles of the artery. The artery, therefore, must be distended by impulsion, by the shock of the blood. If the artery dilates by reason of its own inherent power, the blood would not be expelled with the maximum force at the very moment when this dilatation occurs." As evidence of the nonexistence of Galen's assumed "pulsific power," Harvey mentions the fact that, in the case of a patch-shaped calcification of the crural artery which came under his observation, the pulsation took place as usual, but at a point below (distal to) the edge of the patch. The intervening patch of rigid calcareous matter was not able to prevent the traveling onward of the propelling power.

Harvey next takes up the consideration of the veins, and, after showing that they permit a flow of the contained blood in only one direction,—viz., that from the extremities toward the heart,—he calls attention to certain experiences which he has had: (1) When a cord is tied lightly around a limb the flow of blood is arrested *only in the veins,* because these vessels are located near the surface of the skin; but, if the cord is tied more tightly, the flow of blood is also

arrested in the arteries, which lie at a relatively great depth. (2) When a vein is tied the resulting distension manifests itself *only below* (*i.e.*, on the distal side of) the ligature; whereas, when an artery is similarly tied, the distension takes place *above* (*i.e.*, on the proximal side of) the ligature. It is therefore plain that in the veins the blood flows from the individual parts toward the heart, but that in the arteries the flow is in the reverse direction—*i.e.*, from the heart toward the individual parts. "If one reflects upon the nature of the movement of the blood," says Flourens, "one will promptly realize how speedy it is. Scarcely has the blood entered the heart before it is hurried into the arteries; and then from these vessels it passes in an instant into the veins, from which, with almost equal speed, it finally travels back to the heart again. It is this never-ending movement from one channel into another, and then eventually back to the starting-point, which constitutes the circulation of the blood. . . . . Modern physiology dates from the discovery of the circulation of the blood. Up to the time of this discovery physiologists followed the ancients; they did not dare to walk alone. Harvey had discovered the most beautiful phenomenon in the animal economy. . . . . From this time forward, instead of swearing by Galen and by Aristotle, one had to swear by Harvey!"

Despite the great care which Harvey took to back up his scheme of the circulation of the blood with unimpeachable proofs of its correctness, he was obliged to pass through the same sort of experience as that to which Vesalius and scores of other pioneers in the field of scientific inquiry had been subjected. Two hostile forces stood constantly ready, during that fruitful period of the Renaissance, to attack with merciless bitterness all those who ventured to add new facts to our stock of knowledge in the domain of medicine. On the one side were the many men of small calibre, men filled with jealousy over the successes gained by co-workers in the same field; and on the other was marshaled the host of those who honestly believed that all medical wisdom ended with Galen. Before his death, however (hardly

thirty years later), Harvey had the satisfaction of witnessing the almost unanimous acceptance of his dogma concerning the circulation of the blood. Louis the Fourteenth, King of France at this period, was so appreciative of the importance of Harvey's discoveries that he appointed Dionis, the distinguished French anatomist, to demonstrate to the students of the Medical School of the Jardin des Plantes at Paris the circulation of the blood and other recent discoveries. Descartes (1596-1650), the celebrated French philosopher, paid an even greater compliment to the high character of the work accomplished by Harvey. His words, as quoted by Flourens, are as follows:—

> If I am asked why the supply of venous blood does not become exhausted in flowing thus unceasingly into the heart, and why the arteries—since all the blood that passes through the heart must travel along these vessels—do not become filled to overflowing, I can see no good reason why I should not give to this question the very same answer that William Harvey, an English physician, to whom praise is due for having taught . . . . , has already given. [Then follows the text of Harvey's reply.]

Our readers have doubtless noted the fact that, while Harvey, as I have endeavored to show in the preceding account, has clearly established his right to be considered the discoverer of the circulation of the blood in all its most essential features, his scheme fails to furnish any information concerning the composition of the blood and the manner in which it is built up into a life-giving fluid. In the minds of some this may seem to be an omission. A moment's reflection, however, will satisfy any reasonable person that questions of this nature do not form a legitimate part of the problem which Harvey was engaged in solving, and that they therefore should receive separate consideration. Thus, for example, Harvey's scheme fails to furnish satisfactory information concerning those portions of the circuit where the blood is obliged to travel through a system of communicating capillary channels, as happens in the lungs and in the tissues generally throughout the body. But Harvey had no means at his command

for investigating a question of this nature. Capillary blood-vessels are invisible to the naked eye, and may be studied only with the aid of a microscope; but this instrument was not available until long after the time (1605-1616) when Harvey was engaged in carrying out his investigations into the circulation of the blood.

Other Discoveries Relating to the Vascular System.—To Vesalius is due the credit of having discovered the fact that anastomoses exist between the carotids and the vertebral arteries, thus explaining how a man may continue to live even after both carotids have been severed or ligated. His great rival, Fallopius, described these anastomoses in the most detailed manner, and he noted the further fact that an anastomosis with the basilar artery exists.

By the end of the sixteenth century a certain amount of progress had been made toward a correct knowledge of the lymphatics. Bartholomaeus Eustachius, for example, discovered the existence (in horses) of the thoracic duct, but he supposed it to be a vein. His description of this vessel reads as follows:—

> In these animals there is a large vessel which extends downward from the inner aspect of the clavicular vein (= left subclavian vein). At the point where it joins the vein it is closed by means of a semicircular valve. This vessel is of a whitish color and it contains a scanty watery fluid. Not far from its starting-point it divides into two branches which very soon, however, join together again, and then, as a single trunk from which no further branches are given off, it passes down along the left side of the spinal column, penetrates the diaphragm, spreads itself out over the aorta, and ends in a manner unknown to me.

About one hundred years later (1647), Jean Pecquet of Dieppe, France, professor in the Medical School of Montpellier, rediscovered (in a dog) this same duct, with its tributary chyle ducts and also its point of entrance into the left subclavian vein; and, as he had rightly interpreted its nature, anatomists by common agreement accorded him the rights of discoverer.

At a still earlier date (1622) Caspar Aselli of Cremona, Northern Italy, professor in the Medical School of Pavia, discovered the chyle ducts. This discovery was made under the following circumstances, which reveal the fact that good luck sometimes plays an important part in the work of the searcher after truth in the departments of anatomy and physiology:—

Aselli was studying the distribution of the recurrent nerves and the movements of the diaphragm in a well-nourished living dog, when his attention was drawn to the presence of a large number of delicate white threads coursing as it were over the surface of the mesentery. Following the accidental injuring of one of these threads there escaped from the wounded structure quite a large quantity of chyle. Aselli, who instantly appreciated the full significance of what had happened, exclaimed, in the presence of the bystanders, "Eureka!" At the time he supposed that these chyle vessels terminated in the liver and contributed in some manner to the elaboration of the blood (in harmony with Galen's universally accepted theory of sanguification); but later, after he had carried out a carefully conducted series of experiments, he was able to rectify this erroneous belief. (Haeser.)

Galen's theory of sanguification may be stated as follows: The chyle is received into the veins of the intestinal wall and carried thence to the liver, in which organ they are all gathered together into a single venous trunk which has received the name of "*vena portae*"—the vein of the gateway. Everything that is destined to enter the liver passes through this portal vein. In the organ itself the chyle undergoes certain modifications, the result of which is, first, to deprive it of its impurities and then, in addition, to effect other changes that convert it into blood. Aselli's glory, then, consists in his having shown that chyle is taken up from the intestinal mucous membrane by a set of its own vessels, and not by the veins, as taught by Galen.

In 1651 Olaus Rudbeck of Arosen, Sweden, discovered the lymphatics of the intestinal canal and followed their distribution into the lymph nodes; he also established their relations with the thoracic duct and with the venous system.

Thus, thanks to the series of brilliant discoveries made

by William Harvey, Realdus Columbus, Fabricius ab Acquapendente, Pecquet, Aselli and a few others, the doctrine of the circulation of the blood and of the part played by the accessory chyle and lymphatic vascular systems, became firmly established before the end of the seventeenth century.

CHAPTER XXX

ADVANCES MADE IN INTERNAL MEDICINE AND IN THE COLLATERAL BRANCHES OF BOTANY, PHARMACOLOGY, CHEMISTRY AND PATHOLOGICAL ANATOMY

General Remarks.—In the fundamental branches of medical knowledge—anatomy and physiology—advances of a very decided character were accomplished during the sixteenth and seventeenth centuries; and in the preceding chapters I have endeavored to give my readers some idea of the nature of these advances, of the men who were instrumental in effecting them, and of the extent to which the way was made easy, during this period, for the accomplishment of still further advances. In carrying on the work of correcting the many errors which were found to exist in the two departments mentioned, it was soon discovered that the obstacles to be overcome were of a serious character, and that the most formidable one of the group was what is universally known as Galenism. If I now refer to this subject once more, perhaps for the second or third time in the course of this history, it is because I fear that my remarks with regard to the harmful influence exerted by Galenism may not be rightly interpreted. For Galen's personal character I entertain, as I have already stated in the section relating to Ancient and Mediaeval Medicine, the deepest respect, and I am filled with great admiration for what he accomplished in advancing the science of medicine; but at the same time I cannot overlook the fact that he was hemmed in by insurmountable limitations. No single human being, living at the beginning of the present era and surrounded, as Galen was, by a herd of

jealous rivals, could have successfully bid defiance to those who considered it sacrilegious to dissect the dead body of a fellow man; and yet, without the knowledge which may only in this way be gained, how was it practicable for any individual, no matter how clever he might be, to lay the foundations for a further advance in medical knowledge? It seems to me therefore plain that Galen did all that lay in his power to advance the science of medicine; and whatever words of condemnation I may have employed in the text, when speaking of the Galenists, refer solely to those physicians of later centuries who were of such a narrow-minded type, so rigidly crystallized in the belief that Galen's teachings had reached the limit of all possible knowledge in the science of medicine, that they did not hesitate to class the efforts of men like Vesalius as acts of unpardonable impiety. Galenism, then, refers to the very widely prevalent tendency among physicians of the fifteenth, sixteenth and seventeenth centuries to uphold the teachings of Galen as the *only* trustworthy code upon which they should depend for their guidance. In short, Galenism, at the period named, meant for medicine a complete arrest of development.

I have now arrived at a point in the history of medicine where, owing to the limited amount of space at my command, the difficulty of deciding as to what subjects and what individual workers in the field of medicine—a field now grown to very great proportions—shall receive consideration in my sketch. Having decided from the very outset that my best efforts shall be directed, consistently with a strict adherence to historical truth, toward making my account readable, I now find it absolutely necessary to jettison—if I may be permitted to use such a nautical expression—much really valuable cargo, and to put ashore, before continuing our voyage, many passengers of undoubted worth. Nobody need bemoan the loss of all these valuable treasures, for the great majority of them, I am confident, will be cared for properly by those authors who are privileged to treat this whole subject with some degree of thoroughness; and the reader, if he is familiar with

German, will even now find, in the excellent general treatises of Haeser, von Gurlt, Pagel, Puschmann, Baas-Henderson and Neuburger, great stores of the most satisfactory information concerning the thousand and one details about which I am obliged to remain silent.

Internal Pathology.—During the fifteenth century the practitioners of medicine in Italy and France were still strongly under the influence of the teachings of the Arabian medical authors. One of the first writers in Italy to place the doctrines of internal medicine upon a firmer footing was Antonius Benevienus, a native of Florence (1440-1502). His treatise on some of the unusual causes of disease, which was printed in Florence in 1506, is said to be written in very clear language and to be based entirely upon cases which came under his own observation. According to Haeser the first improvements in the doctrines relating to pathological anatomy may be credited to Benevienus, who also taught that pathological phenomena should be studied by direct observation rather than from books.

Johannes Manardus of Ferrara (1462-1536) was a very sturdy opponent of astrology, and, in general, did all in his power to weaken the prevailing blind trust in the authority of the Arabian medical authors. But the two physicians who, next to Fabricius ab Acquapendente, stand out most conspicuously among their Italian contemporaries of the sixteenth and seventeenth centuries, are Fracastoro and Lancisi—the former a native of Northern and the latter of Southern Italy.

Hieronymus Fracastoro of Verona (1483-1553) ranks very high among the physicians of the first half of the sixteenth century for his valuable contributions to our knowledge of internal pathology. In the treatise which he published in 1546 on contagious maladies, he states in plain language his belief that the causes of diseases of this nature are to be found in living germs that are endowed with the power of propagating themselves. He divides these diseases into the following three groups:—

1, Those which infect only by contact; 2, Those which not only infect by contact, but at the same time leave behind a centre or

focus of infection—in which category he places tuberculosis, elephantiasis, and similar diseases; and 3, Those which infect not only by direct contact, or through the agency of a residuary centre or focus of infection, but also those which are capable of spreading their infective elements over wide areas—for instance, the pestilential fevers, certain ophthalmias, variola, etc. (From Viktor Fossel's version of Fracastoro's treatise published in Leipzig in 1910.)

Speaking of tuberculosis (called by him "phthisis"), Fracastoro says that it is astonishing for how great a length of time the virus of this disease retains its infective power. "It has been noted, for example, that in quite a number of instances the clothes worn by a tuberculous patient have communicated the disease to a healthy individual as late as two years subsequently to the date at which they were removed from the original tuberculous individual." The same power of communicating infection, he continues, may reside in such other objects as the bed, the walls and the floor of the room in which a tuberculosis patient has died. Under these circumstances, he adds, we are obliged to assume that germs of this infective disease have remained attached to the different objects mentioned.

Fracastoro was born in Verona, Italy, of parents who belonged to the patrician class and were in easy circumstances. He studied mathematics and philosophy at the University of Padua, and was quite prepared, on reaching the age of twenty, to pass the examinations required of candidates for the degree of Doctor of Medicine. Just at this time, however, Padua was not a safe place of residence, owing to the war that was threatened between the Emperor Maximilian the First and the Republic of Venice. Accordingly Fracastoro took his degree at the newly established Academy of Pordenone, in what is known to-day as the Province of Udine (northeast of Venice); and shortly afterward, upon the death of his father, he returned to Verona and began the practice of medicine. As he quickly gained the confidence of the people, he very soon found himself in a sufficiently prosperous condition to warrant him in retaining possession of the family residence, which

was charmingly located at the foot of Monte Incaffi, midway between the Adige River and the Lake of Garda. Here it was that Fracastoro did a large part of his literary work, for he was a poet as well as a physician. Pope Paul the Third appointed him to the position of Physician-in-Ordinary to the Council of Trent, and it was by his advice that, upon the appearance of the Plague in that city, the sittings of the Council were thereafter held for a short season at Bologna. Later, still other honors fell to his lot. He enjoyed the esteem of the Emperor Charles the Fifth and of Francis the First, King of France; and the latter's highly cultivated sister, Margaret of Navarre, offered him every inducement to settle at her Court, but the attractions of his own home made it easy for him to decline all these offers. He died at his villa on August 6, 1553, and six years later the city of Verona erected in his honor a marble memorial tablet.

Fossel, in his biographical sketch of Fracastoro, says that the most popular of his poetical writings was that entitled, "*Syphilis sive morbus Gallicus.*" It was published in several successive editions, and was translated into nearly all the languages of European countries. I shall have occasion to refer to it again in a later chapter.

Giovanni Maria Lancisi was born at Rome on October 26, 1654. Like Boerhaave he began his university studies under the service of the Church, but, as time went on, his leaning toward the profession of medicine became more and more pronounced, and he soon took up in earnest the study of that science at the University of Sapienza, devoting a large share of his time to dissecting and to clinical work in the hospitals. In 1672, when he was only eighteen years old, he was given the degree of Doctor of Medicine; and four years later, after a competitive examination, he was appointed an assistant at the Hospital of the Holy Ghost. In 1678 he was permitted, as a special honor, to enrol himself as a student in the Collége de Saint-Sauveur. During the following five years he enjoyed at this institution exceptional facilities for studying medical literature, and was thus able to accumulate an immense

mass of useful extracts from the writings of the best authors. In 1684 he was assigned to the duty of teaching anatomy at the Sapienza, and for thirteen years he filled this post with great credit to himself; Malpighi being one of those who took pleasure in following his lectures. He had scarcely attained his thirtieth year when he was honored by being appointed Physician-in-Chief and Privy Councilor to Pope Innocent the Eleventh; and soon afterward he was made a Canon of the Church of Saint Lawrence, the main purpose of which appointment was to provide him with a suitable income. On the death of the Pope in 1689 he resigned the latter office, in order that he might have more leisure and freedom to pursue his professional duties. Subsequently he became the regular medical attendant, first of Pope Innocent the Twelfth and afterward of Pope Clement the Eleventh. He died on January 21, 1720.

Von Haller speaks of Lancisi as "a physician who was most highly esteemed by Pope Clement the Eleventh, who was very learned and very philanthropic, and who loved to give aid to the afflicted and to prevent litigation by wise counsels." It was Lancisi also, as I have stated on a previous page, who discovered at Rome, in the possession of the heirs of the artist Pini who made the original drawings, the copper plates which Eustachius had ordered nearly two hundred years earlier, and which were to have been used by this celebrated anatomist in the production of a most beautiful set of anatomical illustrations.[1]

The two most important original treatises published by Lancisi bear the following titles: "*De motu cordis et aneurysmatibus*" (on the movements of the heart and on aneurysms), Rome, 1728 (a later edition in 1745); and "*De subitaneis mortibus Libri II*" (on sudden deaths), Rome, 1707 (also later editions).

Botany and Botanical Gardens.—The Egyptians, the Persians, the inhabitants of India and China, and the ancient Greeks accumulated a great mass of information

[1] An edition of the completed set of these plates was published by Lancisi at Rome in 1714.

relating to plants which might be utilized in the treatment of different diseases. Then, in the early part of the present era, Galen contributed not a little to our further knowledge on this subject; but from that time forward, until the sixteenth century, pharmacology practically remained unchanged. The beginnings of a systematic study of all plants—in other words, modern botany—may be traced to the establishment of botanical gardens, first in Italy and afterward in Holland and France. According to Berendes the very earliest attempt in relatively modern times to cultivate such a garden was made at Salerno by Matthaeus Silvaticus. Then Master Gualterus, in 1333, was permitted by the Governing Council of Venice to make use of a certain plot of ground for the cultivation of the plants in which he was specially interested. So far as one may judge, however, both of these were private undertakings. In 1545, at the request of Francesco Buonafrede, Professor of Therapeutics at the University of Padua, the Senate of that city laid out a garden for his uses in teaching. This appears to be the earliest instance of the establishment of a botanical garden in connection with a regularly organized medical school. Then, in fairly quick succession, similar gardens were established at Pisa (1547), Bologna (1567), Leyden, Holland (by Boerhaave in 1577), and Heidelberg (1593). In France the University of Montpellier received its first botanical garden in the year last named. Thus it appears that about the middle of the sixteenth century botany began to receive attention as a branch of knowledge which, as was then believed, it was important for physicians to study; and from that time forward, for more than two centuries, it formed a regular part of the curriculum in all the leading medical schools. The two chairs of botany and anatomy were not infrequently combined. Fallopius, for example, held the Chair of Anatomy, Surgery and Botany in the University of Padua, and so also did Vesling in the same university at a somewhat later date. The first systematic works on botany were also published in the sixteenth century. They were all written by German or Swiss authors, the most note-

worthy one of the collection being that of Conrad Gesner of Zürich (1516-1565), who is spoken of by Haeser as "a man of noble birth, of extraordinary industry, of extensive knowledge in every department of natural history, and the author of a large number of treatises, which, by reason of their intrinsic value, cannot fail to perpetuate the memory of this distinguished scientist throughout all time." He had much to contend with throughout his short but eventful life. In the first place, he was very poor—so poor that both he and his young wife were obliged to support themselves during the early years of their married life by teaching school. Then he studied medicine at Basel, and afterward accepted the professorship of Greek, first at Lausanne and then in turn at Basel and at Zürich. From the beginning to the end of his career he was hampered by poverty and by frequent illnesses. But, despite these obstacles and also notwithstanding the fact that he was an indefatigable worker in matters relating to natural history, he is reported to have played one of the most influential parts in the drama of the Reformation. Only a man of exceptionally strong character and of unusual ability would have found it possible to attain the success which Gesner attained in these different undertakings and under such unfavorable circumstances. Andreas Caesalpinus, whom I have already mentioned as one of the earliest investigators of the question of the circulation of the blood, also interested himself in the science of botany. Puschmann speaks of him as the greatest botanist of the sixteenth century. For several years he was Professor of Philosophy and Medicine in the University of Pisa, but at a later date Pope Clement the Eighth chose him to be his private physician and also appointed him Professor of Medicine in the University of Sapienza at Rome. His death occurred in the latter city in 1603.

Before dismissing all further consideration of the part played by Italian and Spanish physicians during the sixteenth century in the advancement of the science of medicine, I shall briefly mention a few additional discoveries in botany and pharmacy that may serve to render the present

account more complete. In 1518 the monk Romano Pane published the first account of the discovery of tobacco in America. In 1560 Jean Nicot, a French diplomatist, brought back with him from Portugal (to which country he had been sent as an ambassador) a small supply of the seeds of the plant. To commemorate this service the alkaloid found in the leaves of the tobacco plant was given the name of *nicotine*. Capsicum was made known to the world by Dr. Chanca, a companion of Christopher Columbus on the occasion of his second voyage (1493) to America. Balsam of Copaiva was discovered by a Portuguese monk in Brazil at some time between the years 1570 and 1600. It is mentioned for the first time in the Amsterdam Pharmacopoeia of 1636. Monardes described the Peruvian and Tolu balsams in 1565. Cacao was first made known to Europeans by Fernando Cortez in 1519. About the year 1550 coca was introduced as a drug that possesses the power of allaying hunger and of enabling one to endure the fatigues attending prolonged expeditions. Sarsaparilla came into use at about the same date. Then followed jalap in 1556 and sassafras toward the end of the century.

In Germany and in the Netherlands there were, during the sixteenth century, very few physicians who manifested any marked degree of learning in the science of medicine. The teachings of Paracelsus met with a favorable reception in these parts of Europe and they continued to hold supreme sway over the minds of men during a long period of time. There were some physicians, however, who had received their early professional training in Italy and France, and who for this reason were less ready to accept unreservedly the doctrines of Paracelsus; and, among these more independent spirits, Rembert Dodoens (Dodonaeus, 1517-1586) of Malines, near Antwerp, distinguished himself by making a number of valuable contributions to the science of medicine. He held the Chair of Medicine at the University of Leyden and was also the personal physician of the Emperors Maximilian the Second and Rudolphus the Second. He was a very accurate observer, and his writings are particularly rich in matters relating to pathological

anatomy; for which reason not a few authorities are inclined to credit him with the honor of being the founder of this department of medical science. Felix Platter of Basel, Switzerland, of whose experiences as a student at the University of Montpellier I have given a brief account on a previous page, and who was at this time Professor of Medicine in his native city, was also greatly interested in pathological anatomy. Haeser gives him credit for publishing a number of valuable contributions to this department of medical knowledge, and also for making the first attempt at a classification of diseases.

Before I close this chapter it seems only fair that I should add a few comments upon the careers of two physicians whose professional attainments entitle them to some consideration. The men to whom I have reference are Marcello Donato and Raymond Minderer.

Marcello Donato was a distinguished medical practitioner of the city of Mantua, Northeastern Italy, who died about the year 1600. He was one of the few who, at that early period, taught that it was very important to study disease from nature—*i.e.*, from direct observation—and not from books. His description of the epidemic of small-pox of 1567 (published at Mantua in 1569) is worthy of commendation. His chief work, however, is that which bears the title "*De medica historia mirabili etc.*" (Mantua, 1586.) It contains a remarkably large and complete collection of rare and extraordinary cases belonging to every department of medicine, and in his descriptions Donato pays particular attention to the pathologico-anatomical aspects of each case. He reports, for example, the instance of a Caesarian section performed on a living woman in 1540 by Christopher Bain; the child being found dead. Another interesting case reported by Donato is that of a child in whose ear a cherry pit had been allowed to remain undisturbed until it began to sprout; after which it was found easy to remove the impacted object. In a somewhat similar case which Donato also reports, the sprouting of the seed of Anagyris was hastened by the presence of a purulent discharge from the ear. In both instances all

attempts to extract the foreign body had failed until the sprouting had caused the seed to split. Finally, there is recorded the case of a young man into whose nasal passage a leech had penetrated, while he was bathing, and had then taken up its abode far back in the canal. Donato, by aid of direct sunlight, "discovered the creature in that part where the nasal channel merges into the oral cavity." Presumably he succeeded in removing the animal, but the text quoted by von Gurlt (Vol. II., p. 517) furnishes no further particulars.

CHAPTER XXXI

CHEMISTRY AND EXPERIMENTAL PHARMACOLOGY

The experiments which were carried out by Antonius Musa Brasavola, in the early part of the sixteenth century, upon animals and criminals, for the purpose of learning the effects produced by certain drugs when administered internally, afford one of the earliest instances of a genuine experimental pharmacology. The account of these experiments, which was published at Rome, in 1536, under the title "*Examen omnium simplicium, quorum usus est in publicis officinis*," deserves honorable mention. An even more remarkable evidence of the research spirit which was abroad at that period is to be found in the work done by Fortunatus Fedelis, a native of Palermo, Sicily, and an ardent champion of the direct method of observation as applied to therapeutics.

Van Helmont, of whose life and contributions to the science of medicine I now propose to furnish a sketch, represents in a certain sense Paracelsus' successor; and, as a matter of fact, he was even more closely associated with the development of chemistry as an independent science than was his predecessor.

Jean Baptiste Van Helmont was born at Brussels in 1577. His parents, who belonged to the nobility, possessed ample financial means and were therefore able to give their son every opportunity to secure a liberal education. While still a lad he enrolled himself among the students of the University of Louvain, and advanced so rapidly in his studies that, already at the early age of seventeen, he had passed all the examinations required of applicants for the degree of Master of Philosophy. He was not willing,

however, to receive this honor at that time, feeling that he had not acquired sufficient knowledge to justify such acceptance; and from that date forward he turned his attention to the study of other branches of learning. Finally, in 1599, he accepted from the same university the degree of Doctor of Medicine, and soon afterward left Belgium with a large party of his friends to make an extensive tour through the Alps of Switzerland and Savoy. After his return home in 1602 he devoted his attention chiefly to chemical researches; but in a very short time he started off again on a journey to Spain and France, and eventually to England, where he spent nearly a year in the city of London, returning to Belgium in 1605. He married, about this time, a rich heiress of Wilworde, in the neighborhood of Brussels, and resumed with great zest his labors in chemistry and alchemy. He was thus enabled to manufacture many remarkable remedies with which—as he himself declared—he succeeded in curing myriads of patients who had failed to receive any benefit whatever from the ordinary resources of medical science. He died on December 30, 1644.

I do not feel equal to the task of expounding Van Helmont's often very obscure theories regarding the physical and psychological processes that take place in the human being; regarding the distinctions which he makes between the "*archaeus influus*"—the regulating principle which governs all the psychical and physiological processes in the body—and the "*archaeus insitus*"—the subsidiary power which resides in each individual part of the body, but which at the same time is under the control of the "*archaeus influus*"; and regarding the doctrine that disease is the result of an "*idea morbosa*" of the "*archaeus influus.*" August Hirsch says that in developing these theories Van Helmont puts forward many bright ideas, which unfortunately lead one into a wilderness of fantastic, theosophic concepts. If sufficient time and space were at my command it might be interesting to separate some of these bright thoughts from the extravagances in which they are buried, and thus demonstrate the truth of the state-

ments made by both Hirsch and Dezeimeris to the effect that Van Helmont, in matters relating to physiology and pathology, was unquestionably a precise and critical observer, a sound thinker, and a correct interpreter; but the plan of the present work will not permit me to enter into all these details. I can only quote a few of the teachings or sayings to which Hirsch refers:—

Digestion does not, as Galen maintains, depend upon heat, but upon a certain ferment existing in the gastric juice.

Heat is not, as has hitherto been taught, the cause of life, but rather one of its products.

The final cause of the sensory phenomena of life is the *archaeus influus*, which, while it is inseparably united with matter, nevertheless does not represent the soul itself, but rather the organ of the soul, and is seated in the "duumvirate" of the spleen and the stomach.

Disease, in order to acquire sufficient power to antagonize life effectively, must unite its forces with the *archaeus influus*.

It is claimed that Van Helmont, more than any other teacher of medicine, was instrumental in giving the death-blow to the practice—which prevailed in all the medical schools of that day—of teaching the obsolescent Galenic doctrines, and that for this valuable service alone he deserves full recognition at the hands of the medical profession of to-day. But, as we learn from Ernest von Meyer's history of chemistry, Van Helmont has a much stronger claim for recognition in the fact that he made many important contributions to iatrochemistry and also to fundamental or pure chemistry. Taking one thing with another, says von Meyer, we may safely assert that Van Helmont's useful contributions to the medical and chemical sciences by far outweigh those which are of a fantastic or useless nature. It was he, for example, who materially increased our knowledge of the nature of carbonic acid. He demonstrated how it may be extracted from limestone or from potash by the aid of acids, from burning coal, and from wine and beer while they are undergoing fermentation. He also showed that it is present in the stomach, in various

mineral waters, and in hollows in the earth. He gave it the name of "*gas sylvestre.*" He would doubtless have carried his discoveries much farther along if he had possessed the apparatus which is required for such researches. However, despite the lack of these facilities, he was able to describe hydrogen and marsh gas as special varieties which do not possess the same composition as ordinary air. Finally, in his treatise entitled "*Pharmacopolium ac dispensatorium modernum*" will be found a goodly number of useful instructions as to the proper manner of preparing drugs.

A complete collection of his writings was published at Amsterdam by his son, in 1648, under the title "*Ortus medicinae vel opera et opuscula omnia.*"

Theophrast von Hohenheim—who is known everywhere throughout the world as "Paracelsus"—was the son of Wilhelm Bombast von Hohenheim, a physician who belonged to one of the noble families of the Duchy of Württemberg. He was born in 1493 at a spot called "*Das Hohe Nest*" (the lofty nest) in the Canton of Schwyz, about one hour's distance from the celebrated monastery or cloister of Einsiedeln, of which institution his father was the official physician. Switzerland, therefore, has a right to claim Paracelsus as one of her sons. In 1502 his father transferred his home to Villach, in Carinthia (to the east of Tyrol), and continued to live there up to the time of his death in 1534. It is not known where the son obtained his degree of Doctor of Medicine. It is a well-established fact, however, that he received the first part of his training as a chemist from Johann Trietheim, the Prior of Sponheim, and his subsequent education in the laboratory of Sigmund Fugger, the cultivated owner of wines at Schwatz in the Tyrol. He traveled all over Europe, going from one university to another and making the acquaintance of people who were well informed in matters relating to natural history, chemistry and metallurgy; and during all this time he appears to have absorbed a great deal of information relating to almost every department of human knowledge. Finally in 1526, soon

after he had returned to Switzerland, he received, through the aid of certain influential citizens, two important official positions in Basel,—that of City Physician and that of Professor of Medicine and Surgery in the University. To the surprise of all, and contrary to long-established custom, he delivered his lectures in German and not in Latin. This action on his part called forth bitter criticism from the university authorities, but at first it met with the approval of the students. During the following two years, however, he gradually became unpopular with all classes of the community, and was finally obliged to leave Basel. Haeser attributes this unpopularity to Paracelsus' rough manners, to his intolerance of the opinions of his colleagues, and to his tirades against the apothecaries for their excessive charges. It is very difficult to determine how far jealousy was responsible for the state of affairs which I have just described. Cabanès, the author of an admirable biography of Paracelsus (*Revue Scientifique,* Paris, May 19, 1894), gives his own estimate of this remarkable man's character in the following terms: "Poor, miserable, and persecuted during his lifetime, he was misunderstood even after his death, and was calumniated by history." Paracelsus evidently believed it to be his bounden duty to destroy the then prevailing cult of Aristotle, Galen and Avicenna as the great teachers in medicine; and, filled with this idea, he prophesied the growth of a new science of medicine on the ruins of their teachings. It is stated that the students, after one of these excited lectures, made a bonfire and burned a number of copies of the works of these famous authors, thus showing that Paracelsus was sufficiently eloquent to infuse some of his own reforming spirit into the minds of his auditors. He made a great mistake, however, when he attacked in a similarly violent manner the shortcomings of many of his contemporaries. "The medical profession," he said, "has become a mere money-making business." As a natural result of such tirades, Paracelsus was forced to leave Basel. He fled first to Colmar in Alsace and at a later date took refuge in St. Gall, Switzerland; and it was while he resided in that city that

he published three books of his "*Paramirum.*" Then in 1535 he once more resumed his wandering life, in the course of which he visited Poland, Lithuania, Illyria, etc. On reaching Salzburg, in Austria, he fell ill and died on September 24, 1541, at the age of forty-eight.

Paracelsus was a prolific writer. To all the treatises which he published he gave extravagant titles. To his principal work, for example, he gave that of "*Paramirum*"—The Surprising Marvel; to another, that of "*Paragranum*"—Grain of Superior Quality; and to a third, that of "*Archidoxia*"—Transcendental Science. He wrote treatises on syphilis, on the plague, on epidemics, on the diseases of grave-diggers, on ore-smelters, etc. It is admitted by all his critics that he devoted altogether too much time and thought to alchemy, demonology, necromancy, etc. Cabanès quotes Cruveilhier as saying that Paracelsus believed in the reality of beings of a fantastic nature, but attached little or no importance to them. Then Cabanès himself adds: "The thing which more than anything else absorbed his thoughts was the irresistible desire to overthrow the Galenic idol and substitute for it the science of experience, of observation pure and simple." Bordes-Pagès, another distinguished French physician, says of this extraordinary man: "The great glory of Paracelsus is to be found in the facts that he cast off the yoke of a former epoch, more speculative than practical; that he summoned physicians to resume their allegiance to experience; and that he opened a long career for the alchemists, upon whom he urged the duty thenceforward of making new remedies the principal object of their researches. . . . . He simplified and spiritualized therapeutics." Some of Paracelsus' own sayings are worth preserving: "Without air all living creatures would perish from suffocation." "Man is the supreme animal, the one last created." "*Alterius non sit, qui suus esse potest*" [He who is able to be his own master should not allow himself to be led blindly by another]. When he was accused of being coarse-grained and of deceiving the people, he replied: "By nature and also owing to the kind of

people with whom I associated in my youth I am not of a finely-spun texture. . . . . We were not nourished with figs and white bread, but with cheese, milk and black bread—food that does not make delicate lads. . . . . They say of me that I lead the people astray, that I am possessed of a devil, that I am a sorcerer, and that I am a magician. Whatever truth there may be in these charges, one thing is certain: You are all of you unworthy to unloose the latchets of my shoes." (From *Paragranum,* II., 120.)

Oporinus, who acted for a long time as Paracelsus' assistant, made the following statements with regard to some of the methods of his former master:—

> He always kept several preparations stewing on his furnace—as, for example, a sublimate of oil or of arsenic, a mixture of saffron and iron, or his marvelous Opedeldoch. He never prescribed a special diet nor any hygienic measures. As a purge he gave a precipitate of theriaca or of mithridate, or simply the juice of cherries or grapes, in the form of granules (about the size of the droppings of mice), and he was careful always to give them in uneven numbers (1, 3, or 5). He was bitterly opposed to the polypharmacy which prevailed so widely in his day.

Cabanès says that we probably owe to Paracelsus an increased knowledge of the virtues possessed by the different preparations of antimony, mercury and iron, and by salines. It was he who created the distinction between officinal and magistral preparations. To our list of pharmaceutical preparations, he added tincture of hellebore, compound tincture of aloes, digestive ointment, the tincture of metals ("Lilium" of Paracelsus), the "Saffron of Mars," etc. He was the inventor of the precious preparation known as "*la mumie,*" a preparation which was popularly believed to possess marvelous healing powers. Ambroise Paré, toward the end of his career, was greatly blamed because he did not employ this remedy, and he was finally compelled in self-defense to write a pamphlet on the subject. (The text is reprinted in Malgaigne's "*Ambroise Paré,*" under the title of "*Traité de la mumie et de la licorne.*")

Adolphe Gubler of Paris credits Paracelsus with the distinction of having been the first physician to give an impetus to the movement which had for its object the application of chemistry to the perfection of medicinal preparations. He also maintains that Paracelsus should be looked upon as in a large degree the originator of specific remedies, and that he is justly entitled to the distinction of having been the first publicly to announce the "quintessences"—that is, the active principles (vegetable alkaloids)—of drugs. According to this claim it is understood that Paracelsus taught that each drug contained a specially active elementary body which it was possible to extract as a separate substance. Acting upon this belief Paracelsus did not hesitate to give the preference to the pharmaceutical preparations known as "tinctures"—that is, alcoholic extracts. Great credit is also due to Paracelsus for his rejection of the doctrine that guaiac is an efficient remedy against syphilis, and for his insistence that mercury is the only useful agent in curing that disease. Tartar emetic (potassium antimonyl tartrate) is one of the drugs the introduction of which into our pharmacopoeia should be credited to Paracelsus.

One of the earliest references to genuine diphtheria is to be found in the writings of Paracelsus, who speaks of the disease in the following terms:—

> When this disease is located in an external wound it not infrequently spreads to the muscles of the larynx; and, *vice versa*, when a person has the disease in his throat, and at the same time happens to have an external wound, the malady is likely to spread to the wound.

Paracelsus' idea of the existence of an "*archaeus*," a power which presides over all physiological actions as well as over all the operations of medicinal drugs, resembles very closely the "vital force," or "animism" so strongly championed by Stahl in the seventeenth century.

From all that I have said above regarding the excitable nature of Paracelsus it seems almost a waste of time to tell our readers that his contributions to the science of

surgery were of very slight value. He despised the study of anatomy, claiming that a knowledge of this branch of medical science was not essential to a proper acquaintance with the human body. "To dissect," he once remarked, "was a peasant's manner of procedure." (Cabanès.) His surgery, as one may imagine, showed clearly the bad effects of such beliefs.

During the latter part of the nineteenth century there developed among the leading men of the medical profession a sentiment in favor of honoring the memory of Paracelsus by the erection of a suitable monument at Basel, Switzerland, the city in which he made his first public appearance. The project met with a favorable reception and the statue is now an accomplished fact. This is a remarkable instance of tardy justice being rendered to the memory of a physician who, for three hundred years, was almost universally looked upon as a vain, half-crazy man.

The next advances of any special importance in the department of chemistry were made in Great Britain by Robert Boyle, who was born at Lismore, County of Cork, Ireland, on January 25, 1626. He was the fourteenth child of the Earl of Cork. His early training was obtained at Eton, and then afterward he spent two years at Geneva, Switzerland, in prosecuting his scientific studies. In 1654 he entered Oxford University and became intimately acquainted with some of the most learned men of that day. While he was a student at the university he became a member of what was known as "The Invisible College," a society which was influential in bringing about the founding of "The Royal Society," of which organization he was president from the year 1680 to the time of his death in 1691.

Boyle was endowed with a noble character—modest, religious and generous. He gained distinction as a chemist in several departments. Applied chemistry is indebted to him for a number of important contributions; he added to our knowledge of chemical combinations and to the methods of analyzing them; he enriched the chemistry of gases and also pharmacology; and he gave a clear and easily intelli-

gible definition of what a "chemical element" is. He laid stress upon the doctrine that a chemical combination represents the union of two component elements, and that this combination possesses characteristics quite different from those possessed by either of the two component elements. Before his day there was practically no such thing as analytical chemistry, and it is to Boyle that we owe the establishment of a clear conception of what the terms "chemical reaction" and "chemical analysis" signify. The part played by atmospheric air in combustion was made by him the subject of numerous experiments which proved later to be of great assistance in the final solution of the problem.

In one of his writings Boyle says in substance that if men would devote their energies to carrying out experiments and collecting observations, rather than to the constructing of theories without having previously tested with thoroughness the grounds upon which they believe them to be based, the world would be greatly the gainer. The promulgation and insistence upon the importance of this doctrine for the growth of the science of chemistry constitute—so those competent to judge claim—Boyle's greatest merit in scientific work and his most important contribution to chemistry.

Among the chemical treatises which Boyle wrote and published the following deserve to receive special mention: "Sceptical Chymist," 1661; "*Tentamina quaedam physiologica,*" 1661; "*Experimenta et considerationes de coloribus,*" 1663; and "Medical Experiments," 1692-1698. Although Boyle was not an avowed follower of Bacon, he carried out thoroughly the principles which the latter taught.

Raymond Minderer, a practicing physician in Augsburg, Germany (1570-1621), deserves the credit of having added to our stock of remedies the acetate of ammonia (*liquor ammonii acetatis*). Diluted with an equal quantity of water it is still employed to-day as a remedy under the name of "Spirit of Mindererus." He was the compiler, in 1613, of the Augsburg Pharmacopoeia.

General Therapeutics.—Transfusion.—The Discovery of Cinchona and Ipecacuanha.—In the department of general therapeutics, as we learn from Berendes, several important new measures were brought forward during the seventeenth century; and among these the following deserve to receive brief mention in this place: the operation of transfusing blood from a healthy individual to one who is ill; the introduction of cinchona into the European pharmacopoeia as an efficient remedy in the treatment of certain fevers; the similar introduction of another South American drug—viz., ipecacuanha; and the invention of many medico-chemical products and the improvement of others that were already in common use.

As regards the operation of transfusion, from which great things were expected, Sir Christopher Wren (1632-1723), the famous architect and astronomer of London, is reported to have been the first person to urge a trial of this procedure. On the other hand, Robert Boyle, the chemist, actually performed the operation on animals. He followed the method suggested by Richard Lower (1631-1691) of England, viz., by allowing the blood to flow from the carotid artery of one animal into the jugular vein of a second animal; while Edmund King adopted the plan of allowing the blood to pass from the jugular vein of one animal into the corresponding vein of a second animal. Upon a human being the operation was probably performed for the first time (in 1666) by Denys, Professor of Philosophy and Mathematics in Paris. Repetitions of the operation were made, two or three years later, in London and in Rome, but they produced no good effects and in some instances they terminated in the death of the individual for whose benefit the operation had been performed. In 1668 the French Parliament and the Papal Government forbade a repetition of the operation.

In 1638—so the story runs—the wife of Count Cinchon, Viceroy of Peru, was cured of a stubborn intermittent fever by the native physicians, who employed, in their treatment of the malady, the bark of the tree now universally known by the name of "Cinchona." In 1640 Juan del Vego, the

regular medical attendant of Count Cinchon, introduced the new remedy into Spain, but it was not until after the lapse of about fourteen years that the drug found its way into England and Central Europe. The price at which it could be purchased was at first very high; it was almost literally "worth its weight in gold." Even as late as 1680 the bark sold in England for £8 sterling per pound. Notwithstanding the generally recognized value of the drug in the treatment of certain fevers there were not a few men who continued for many years to oppose its use. Thus, Johann Kanold, a practitioner of medicine in Breslau, Germany, is reported to have said, on his deathbed in 1729, that he would rather die than be cured by a remedy the action of which was so opposed to all the principles which he considered right in therapeutics.

Ipecacuanha, another very important drug, was added to our stock of remedial agents toward the end of the seventeenth century. It was brought into France from Brazil, in 1672, by a French physician named Le Gras, but its value as a remedy for the cure of dysentery did not begin to be appreciated until after Helvetius, a semi-quack, had sold to Louis the Fourteenth, for one thousand louis d'or (about $4000), the formula for the preparation which he (Helvetius) had been using with great success during the recent epidemic of that disease, and which moreover had effected a remarkably rapid cure in the case of the King's own son—the Dauphin. After the purchase had been made by Louis the Fourteenth, in the interest of the French people in general, it was ascertained that the only active reagent among the ingredients of the formula was ipecac, a drug with which the Paris physicians had long been more or less familiar. Ipecac, it will also doubtless be remembered, constitutes the important element in what is known as the East Indian treatment of dysentery.

Probably the earliest modern treatise on matters connected with pharmacy is that which bears the title "*Onomasticon Latino Germanico-Polonicum rerum ad artem pharmaceuticam pertinentium.*" It was published about the year 1600, and its author was Paul Guldinus.

One of the most important iatrochemical authorities of the seventeenth century was Johann Rudolf Glauber (1604-1668), to whom we are indebted for the invention or improvement of a large number of medico-chemical products. The well-known "Glauber's salt" may be named as one of these products, and chloride of iron as another.

CHAPTER XXXII

SOME OF THE LEADERS IN MEDICINE IN ITALY, FRANCE AND ENGLAND DURING THE SIXTEENTH AND SEVENTEENTH CENTURIES

Eminent French Physicians.—Among the physicians of France who attained a widespread and well-grounded celebrity throughout Europe during the sixteenth century, Pierre Brissot deserves to be given the first place. He was born in 1478 at Fontenay-le-Comte, not far from Rochelle, and was a professor of medicine at Paris. He attained considerable distinction, during the sixteenth century, by his advocacy of the superiority of the Hippocratic method of bloodletting over that introduced—or, rather, perpetuated—by the practitioners of that day in Central Europe. The rule which was laid down by Hippocrates was to the effect that, in venesection, the blood should be drawn from the vein lying nearest to the part inflamed. The Greek physicians of a later period forgot all about this rule and adopted in its place one that was based on the doctrine that venesection practiced in the vicinity of a focus of inflammation favors a determination of blood to that part and therefore does only harm; and they accordingly—especially in cases of pleuritis—abstracted blood from the arm on the side opposite to that on which the disease was located, or from one of the veins of the foot. This new rule was subsequently adopted by the Arabian physicians, and it remained in full force up to the end of the sixteenth century. A wide experience in the treatment of the epidemic pleuritis which raged in Paris in 1514 confirmed Brissot in the belief that the Hippocratic method is the one to be preferred; but, despite his pleadings, the Parisian

physicians refused to adopt the method which he advocated and used their influence in securing from the French Parliament an order forbidding him to continue employing it in Paris. Discouraged by the treatment which he experienced in that city, Brissot removed to Lisbon in Portugal, and soon had occasion (in the epidemic which raged at Evora in 1516) further to satisfy himself that the Hippocratic rule is the correct one. But here too he encountered bitter opposition on the part of the Portuguese physicians; his most active opponent being Dionysius, the Physician-in-Ordinary to the King. Brissot then wrote an elaborate defense of the method which he advocated, and this treatise was submitted to the judgment of the Medical Faculty of the University of Salamanca. When the decision of this learned body was given in Brissot's favor, his opponents, dissatisfied with the result, made still another effort to gain their point, viz., by appealing to the Emperor Charles the Fifth. They assured his Majesty that the Brissot Heresy, as they termed it, was fully as dangerous to the cause of humanity as that championed by Luther. But here again they failed. This final victory, however, brought no satisfaction to Brissot, who died of dysentery in 1522, just before the decision was rendered. Haeser speaks of this unusually bitter dispute as one of the last of the violent battles which occurred between the adherents of the Arabian physicians and the supporters of the teachings of Hippocrates, and which terminated in "a most brilliant victory of experience over Arabian dogmatism."

During the first half of the sixteenth century there developed a belief, among the more ignorant physicians, that, in many cases of illness, important information may be derived from a simple naked-eye inspection of the patent's urine as exposed to view in a flask-shaped glass vessel. In the Hippocratic writings no adequate grounds for such a belief are discoverable, but in one of Galen's treatises there have been found statements which appear(†) to give some sanction to this new idea. However this may be, it is an established fact that uroscopy was taken up at the time named with great zeal by all the quacks in the

FIG. 16. "THE LOVESICK MAIDEN."

(After the painting by Jan Steen, 1626-1679.)

One of this famous Dutch artist's objects, in painting the scene here represented, was to satirize the practice, which was very prevalent among certain physicians of that period, of pretending to diagnose all sorts of maladies from the mere naked-eye inspection of his patient's urine.

(Courtesy of Dr. Eugen Hollander, author of *Die Medizin in der klassischen Malerei*, Stuttgart, 1903.)

land and by large numbers of practitioners of medicine who saw in this procedure an easy and safe method of bettering their fortunes. The public at large were greatly impressed with this new and wonderful manner of detecting disease, and for a long period—indeed, for more than half a century—this piece of clap-trap charlatanry continued to thrive, and to reflect only discredit upon the medical profession. There came a time, however, when people generally began to suspect that uroscopy was not all that the charlatans claimed it to be, and these suspicions were voiced in the popular saying, "The pulse is good, the urine is normal, and yet the patient dies." The writers who were the most active in showing up the hollowness of the claims of the uroscopists were Scribonius of Marburg, Germany, Peter Forcest (1522-1597) of Alkmaar, Holland, and Leonardo Botallo of Asti, in Piedmont (born in 1530). The latter authority, it may be recalled, owes his chief distinction to the fact that he rediscovered what has been erroneously named in his honor the "*foramen Botalli*"—*i.e.*, the *ductus arteriosus* in the foetus. He also attained some distinction in another direction. He revived the violent disputes about venesection by recommending a resort to this therapeutic procedure in nearly all illnesses. He went so far as to advocate four or five bloodlettings in the course of an acute attack, in each one of which operations from three to four pounds of blood should, as he believed, be abstracted. Indeed, he claimed that in an extreme case it might be perfectly proper to abstract as much as *seventeen pounds*(!). Inasmuch as Botallo's practice was largely confined to the strong soldiers of Northern Italy it is easier to understand how such extravagant bloodletting did not more often prove fatal than it did. When, soon afterward, the Paris Faculty condemned the practice in the strongest possible terms, Botallo's followers characterized sarcastically the French physicians as "pigmy bloodletters" (*petits saigneurs*).

But the efforts of Scribonius, Botallo and others to put an end to the uroscopy scandal were—I fully believe—not the only or perhaps even the most potent factors in

bringing about the suppression of the evil. As many of our readers will remember, the art collections of European capitals contain admirably painted specimens of Dutch and Flemish genre pictures representing every phase of this uroscopic fraud, and these striking masterpieces, revealing, as they undoubtedly did to the community at large, the ridiculous character of the claims made by the charlatans, could scarcely have failed to give a deadly blow to the fraud. (See Fig. 17.)

In the early part of the sixteenth century Jean Fernel of Amiens (1497-1558) was one of the leading medical authorities of France. After receiving his degree of Doctor of Medicine at Paris, in 1530, he settled in that city and soon acquired considerable reputation, not only as a practitioner but also as a lecturer. In 1545 he was called upon to take charge, professionally, of Diane de Poitiers, the mistress of Henry, the son of Francis the First, King of France. About the same time he was asked to serve as First Physician to the Dauphin, but he was not disposed to accept the latter position, as he disliked the duties of the office and also because he feared that they would interfere with his favorite studies. He pleaded poor health, and his excuse was accepted as valid. That Fernel was held in very high esteem by the royal family is evident from the events which succeeded this refusal. In the first place, it was insisted that he should accept the stipend (600 livres) attached to the office, as a mark of the royal favor; and then, in 1547, when Henry was crowned king (Henry the Second), Fernel was urged to become his First Physician; but again he declined the honor, this time on the ground that Louis de Bourges, who had held the position with great credit under Francis the First (Henry's father), was entitled to be retained in office. The King yielded to Fernel's generous intervention in behalf of de Bourges. But in 1556, when the latter died, Fernel felt obliged to accept the position which had then become vacant; and from that time forward, until the time of his death on April 26, 1558, he accompanied the King on all his military expeditions. As he did not possess a robust constitution,

his health suffered not a little from the frequent exposures to hardships of all sorts to which he was subjected; and, in addition, during this long period he saw very little of his wife to whom he was devotedly attached.

Fernel is universally admitted by French physicians to have been one of the most cultivated teachers and practitioners of medicine of his day. He was a very clear writer, and would doubtless have made a number of valuable additions to the science if he had not been carried off by illness at a comparatively early age.

Of his published writings the following are reckoned the most important: "*Universa medicina,*" Paris, 1567; "*De abditis rerum causis,*" Paris, 1548, and "*Therapeutices universalis seu medendi rationis libri VII.,*" Paris, 1554. (Many editions of each of these works were published.)

In his discussion of various questions relating to physiology Fernel maintains that the component elements of the body are vivified by means of heat, and he elaborates this idea very much in the same manner as Hippocrates does that of the "*callidum innatum.*" The spiritual life, he says, is presided over by the soul ("*anima*"). When he comes, however, to consider the individual powers of the soul, Fernel treats the subject exactly as does Galen. He gives expression to one rather bright idea: "The specific functions of each of the different organs may be inferred in large measure from the character of the structural elements of which they are composed."

In his scheme of pathology Fernel divides diseases into *simple* ("*similares*")—diseases of the tissues; *compound* ("*organici*")—diseases involving entire organs; and *complicated* ("*communes*")—diseases in which the normal relations between the different parts are broken up.

In the chapter which Fernel devotes to the subject of therapeutics, there is a section relating to venesection which, according to Haeser, is well worth reading, as it reveals the power of the writer to grasp the leading points and to reason correctly from them.

Two English Physicians Who Became Famous During the Sixteenth Century.—In the early part of the sixteenth

century the medical profession of Great Britain was in a most unsatisfactory state. Humbuggery, ignorance and superstition were at that period of time the most prominent characteristics of the majority of physicians upon whom the people at large had to depend for the relief or cure of their bodily ailments, and there were very few and very untrustworthy measures in force for the production of a better class of practitioners. Just at this juncture there appeared on the scene a man who was eminently well equipped to rescue England from this lamentable state of affairs and to put her on the high road to the acquisition of an honorable body of medical men and of a corps of apothecaries who could be trusted to dispense pure drugs properly compounded. I refer to Thomas Linacre, who was born at Canterbury in 1461 or 1462, was a Fellow of All Souls College, Oxford, and a graduate of the University of Padua, and whose biography is sketched by John Freind (1675-1728) in such an admirably clear, concise and appreciative manner that I cannot do better—in view of the great importance of this event in the history of medicine in England—than to reproduce it here in considerable fulness of detail.

Thomas Linacre was a man of a bright genius and a clear understanding, as well as unusual knowledge in different parts of learning: . . . . . and, being very desirous to make further improvements by travelling, he thought he could no where succeed in his designs so well as by going to Italy, which began then to be famous for reviving the ancient Greek and Roman learning. There he was treated with extraordinary kindness by Lorenzo de Medicis, one of the politest men in his age and a great patron of letters; who favoured him so far in his studies as to give him the privilege of having the same preceptors with his own sons. Linacre knew how to make all his advantages of so lucky an opportunity; and accordingly, by the instructions of Demetrius Chalcondylas, a native of Greece, he acquired a perfect knowledge of the Greek tongue; and so far improved under his Latin master Politian, as to arrive to a greater correctness of style than even Politian himself. . . . . .

Having laid in such an uncommon stock of learning, he applied himself to the study of natural philosophy and physick; particu-

larly he made it his business, and was the first Englishman who ever did so, to be well acquainted with the original works of Aristotle and Galen. He translated and published several tracts of the latter. . . . . .

In his own Faculty he distinguished himself so much that, soon after his return, he was pitched upon by that wise king, Henry the Seventh, as the fittest person to be placed about Prince Arthur, and to take care both of his health and his education. He was afterward made successively Physician to that king, to his successor Henry the Eighth, and to the Princess Mary. . . . . And indeed, as he was perfectly skilled himself in his own art, so he always shewed a remarkable kindness for all those who bent their studies that way; and wherever he found, in young students, any ingenuity, learning, modesty, good manners, and a desire to excel, he assisted them with his advice, his interest, and his purse. And to give a still stronger proof, how much he had the good of his own Profession and that of the Publick at heart, he founded two *Lectures of Physick* in Oxford, and one at Cambridge. . . . . .

But he had still further views for the advantage of our Profession: he saw in how low a condition the practice of Physick then was, that it was mostly engrossed by illiterate monks and empiricks, who in an infamous manner imposed on the Publick; the Bishop of London or the Dean of St. Paul's for the time being, having the chief power in approving and admitting the practitioners in London, and the rest of the bishops in their several dioceses. And he found that there was no way left of redressing this grievance, but by giving encouragement to men of reputation and learning, and placing this power of licensing in more proper hands. Upon these motives he projected the foundations of our College [of Physicians]; and using his interest at Court, particularly with that great patriot and munificent promoter of all learning, Cardinal Woolsey, he procured Letters Patent from the King, which were confirmed by Parliament, to establish a corporate Society of Physicians in this city, by virtue of which authority the College, as a corporation, now enjoys the sole privilege of admitting all persons whatever to the practice of physick, as well as that of supervising all prescriptions. And it is expressly declared that no one shall be admitted to exercise physick in any of the dioceses in England, out of London, till such time that he be examined by the President and three of the Elects, and have letters testimonial from them, unless he be a graduate in either University, who, as such, by his very Degree, has a right to practice all over England,

except within seven miles of London, without being obliged to take any license from the Bishop. . . . . .

By other Acts another weighty affair is committed to the care of the College, [viz.,] the visiting of shops and the inspection of medicines; a thing surely of as much consequence at least to the patient as to the prescriber. . . . . .

Linacre was the first president of his new-erected college, and held that office for the seven years he lived after. . . . . And perhaps no Founder ever had the good fortune to have his designs succeed more to his wish; this society has constantly produced one sett of men after another, who have done both credit and service to their country by their practice and their writings.

If further evidence be needed to show what was the type of mind possessed by this remarkable English physician, I may be permitted to quote here a single brief statement made by his friend Erasmus, the famous Dutch scholar and theologian, in a letter addressed to John Fisher, Chancellor of Cambridge University: "Linacre is as deep and acute a thinker as I have ever met with."

In England, during the seventeenth century, there appeared on the scene only one practicing physician of such conspicuous ability and of so marked personal traits of character as to place his name, after the lapse of a few years from the time of his death, and by the almost unanimous assent of his associates, high up on the roll of honor. I refer to the famous physician Sydenham.

Thomas Sydenham was born at Wynford Eagle, Dorsetshire, England, in 1624. At the age of eighteen he entered Magdalen College, Oxford, and remained there until 1644, when he enlisted in the Parliamentary Army. After a brief military service, he resumed his studies at the university and received his Bachelor's degree in 1648. It was only at a much later date (1676), however, that he was given (after he had pursued the prescribed course of studies) the degree of Doctor of Medicine, and then not by Oxford, but by Cambridge. After leaving the university he first spent a few months at the Medical School of Montpellier, France, and then settled (1666) in London as a practicing physician, the necessary license having been

FIG. 17. THOMAS SYDENHAM.

(After the portrait in the hall of All Souls' College, Oxford.)

granted him by the College of Physicians. His first medical treatise, which bore the title "*Methodus Curandi Febres*" [Method of Treating Fevers], was published in 1666. The third edition of this work was issued ten years later, but with the title changed to "*Observationes Medicae* etc." Between 1666 and 1683 he published several other treatises, the more important of which deal with epidemic diseases—syphilis, small-pox, hysteria and gout.

During the later period of Sydenham's career he attained great celebrity as a physician; but this celebrity would have been short-lived if it had rested on nothing more substantial than mere cleverness and professional success. As a matter of fact he had brought about, by his teaching and also by his example, a most important revolution in medicine, and it was the appreciation of this fact which led the physicians of England to bestow upon him, after his death, the appellation of "The English Hippocrates," and which ultimately gave him so highly honorable a position in the history of medicine in general. A brief review of the state of medicine in England during the seventeenth century will enable the reader to understand the full importance of the change which Sydenham was instrumental in bringing about.

The physicians of that period were split up into three sects: the followers of Galen, with whom should be classed the Graeco-Arabists; the iatrochemists; and the iatrophysicists.

The Galenists were largely intent upon the strictest interpretation of the teachings of Hippocrates, Galen and some of the Arabian authors. Instead of studying disease itself they devoted their time and thoughts largely to the interpretation of the words used by these fathers in medicine—*i.e.*, to philology. Real progress in the science of medicine was not possible along this route. Accepting without dispute the dogma of the four humoral qualities, together with the different temperaments which result from the predominance of any one of them, they combated these different temperaments or constitutions by pre-

scribing drugs in a very great variety of combinations (polypharmacy).

The iatrochemists, attaching small importance to simple dietetic measures, prescribed without stint all the most active substances belonging to the mineral kingdom and all the new remedies which the chemists had evolved from their furnaces.

Finally, the iatrophysicists directed their efforts to the removal or diminution of all bodily conditions that appeared to act as mechanical hindrances to health.

Sydenham, who possessed a rare degree of common sense, cast aside all these hypotheses, disregarded the prevailing routine methods of treatment, and refused to accept the therapeutic novelties of the day. "Nature is to be my guide," he declared, and from that time forward he studied disease at the bedside, and watched carefully, and with a mind free from prejudice, the effects of the remedies which he employed. Thus, pursuing the methods advocated by the great master Hippocrates, he was able to place his medical brethren once more on the pathway which leads to an increase in knowledge of the healing art. Practical medicine, which had previously been falling into an almost moribund condition, was by his efforts made again a living and growing science. That Sydenham had a perfectly clear conception of what was needed at that time to renew the vitality of the medical profession of England is plainly shown by the following statement which he makes in the dedication of one of his writings to Dr. Mapletoft:—[1]

After studying medicine for a few years at the University of Oxford, I returned to London and entered upon the practice of my profession. As I devoted myself with all possible zeal to the work in hand it was not long before I realized thoroughly that the best way of increasing one's knowledge of medicine is to begin applying, in actual practice, such principles as one may already have acquired; and thus I became convinced that the physician

[1] Translated from the French version printed by Daremberg in his *Histoire de la Médecine*, Vol. II, p. 706. The originals of Sydenham's writings are all in Latin.

who earnestly studies, with his own eyes,—and not through the medium of books,—the natural phenomena of the different diseases, must necessarily excel in the art of discovering what, in any given case, are the true indications as to the remedial measures that should be employed. This was the method in which I placed my entire faith, being fully persuaded that if I took Nature for my guide I should never stray far from the right road, even if from time to time I might find myself traversing ground that was wholly new to me.

In the brief account which I have thus far given of the part played by Sydenham in advancing the science of medicine, I have called attention only to the general character of the services which he rendered. It may now be interesting to furnish here a few details that will aid in completing the picture of this great English physician,—details relating to his life and personal character, to his views regarding certain diseases and the remedies which he was in the habit of employing for their relief or cure, and to his later writings.

Throughout the greater part of his professional career Sydenham was a frequent sufferer from gout, some of the attacks being of a severe type and occasionally of long duration. During the winter of 1676, for example, he was seriously ill from renal calculus, haematuria being brought on by the slightest movements of his body. All through the year 1677 he continued to experience frequent attacks of pain, and on one occasion he was unable to leave the house for a period of three months.

Speaking of the epidemic of the Plague in 1665, during the progress of which he left London, Sydenham says: "When I saw that the danger was in my immediate neighborhood I listened to the advice of my friends and joined the crowd of those who were fleeing to the country. A little later, when the epidemic had further increased in severity, and before any of my neighbors had returned, I yielded to the calls of those who had need of my services, and went back to London." It is worthy of remark, says Laboulbène, who fully appreciated the heroism which prompted this last decision, that we should never have

known of Sydenham's weakness in regard to facing his duty, if he himself had not stated the facts. This famous epidemic, as is well known, was accompanied by an appalling mortality.

Andrew Browne, a Scotch physician of good standing, entertained serious objections to some of the advice given by Sydenham in the treatise entitled "*Schedula monitoria de novae febris ingressu*,"[2] and, in order to learn more precisely what the author's views on the subject really were, he decided to run down to London for a day or two. Sydenham gave him such a cordial reception and made his stay in the metropolis so pleasant that he remained there several months—instead of a day or two. "And when I returned to Scotland I felt contented and joyful as if I were carrying back with me a valuable treasure."

As an instance of his thoughtful kindness, it is related that Sydenham had occasion to treat a poor man who lived in his neighborhood for an obstinate bilious colic, but his employment of narcotics did not effect very much in the way of relief. "I felt moved by pity for this poor man in his misery; and accordingly I loaned one of my horses to him in order that he might take long excursions on horseback."

Sydenham had no eagerness for professional honors, although he appreciated highly those which came to him spontaneously. As already stated at the beginning of this sketch, the degree of Doctor of Medicine was not conferred upon him by Cambridge as a mere honorary affair, but was won by him after he had passed through the regular course of training required of all candidates for this degree. His case, however, was peculiar in one respect: he waited until after he had been in active practice several years before he decided to pass through the course of training required. He was not a member of the College of Physicians of London, and he held no official position at Court.

The following summary may serve to convey some idea of Sydenham's views regarding pathology and treatment.

[2] Pronounced by Haeser to be a compilation, and not one of Sydenham's genuine writings.

He defines an acute disease as "a helpful effort made by Nature to drive out of the body or system, in every way possible, the morbific material." As regards the latter he makes the following remarks:—

> Certain diseases are caused by particles which are disseminated throughout the atmosphere, which possess qualities that are antagonistic to the humors of the body, and which—when once they gain an entrance into the system—become mingled with the blood and thus are distributed throughout the entire organism. Certain other diseases owe their origin to fermentations or putrefactions of the humors, which fermentations vary in their nature—in some cases the humors being excessive in quantity, while in others they are bad in quality; and in either event the body finds itself incapable of first assimilating them and then excreting them—a state of affairs which cannot continue beyond a certain length of time without producing further harmful effects.

According to Sydenham the fever, in the acute diseases, assists Nature by separating from the general (total) mass of the blood those particles which have undergone putrefaction or have been rendered unassimilable. Then they are driven out of the body by the route of the sweat-glands, by diarrhoea, by eruptions upon the skin, etc. On the other hand, in chronic diseases the morbific material is not of such a nature as to produce fever, which is a mechanism for securing complete purification. It is therefore deposited in one part or another of the body where no force exists which is capable of ejecting it; or its final transformation is not completed until after the lapse of a long period of time.

In some of Sydenham's writings one is occasionally surprised to find teachings which seem to be strongly at variance with the advice which he was so fond of giving—namely, that physicians should be careful not to set up hypotheses which are not based upon observed facts. A conspicuous instance of such a disregard of his own rule may be found in his setting up of a pathological process to which he gives the name of "inflammation of the blood." This process, he maintains, is the active cause of quite a large number of diseases, especially those of an epidemic

nature—such, for example, as pleurisy, pneumonia, rheumatism, erysipelas, scarlet fever, etc. It is well-nigh impossible for us moderns to comprehend how so practical and clear-headed a man as Sydenham could have formulated such a purely hypothetical pathology, a doctrine so completely lacking in anything like a solid foundation of fact.

Sydenham excelled in the description of the clinical manifestations of certain diseases, as, for example, smallpox, hysterical affections, the encystment of a renal calculus, and the gout—a disease from which, as already stated, he was a very frequent sufferer throughout a large portion of his life. All his published works are in the Latin language, but translations have been made into English, French, German, Flemish and Italian. At All Souls College, Oxford, where Sydenham spent eight years of his life, it was a fixed rule that all its members should habitually converse and write in Latin.

Sydenham's remarks upon liquid laudanum are worth recording:—

> Of all the remedies which a kind Providence has bestowed upon mankind for the purpose of lightening its miseries there is not one which equals opium in its power to moderate the violence of so many maladies and even to cure some of them. . . . . Medicine would be a one-arm man if it did not possess this remedy. . . . . Laudanum is the best of all the cordials; indeed, it is the only genuine cordial that we possess to-day. [This was written in the middle of the seventeenth century.]

The laudanum employed by Sydenham was made according to the following formula: Spanish wine, 400 grammes; Opium, 62 grammes; Saffron, 31 grammes; Powder of Canella and Powder of Clove, of each 4 grammes.

After much suffering and extreme weakness, Sydenham died on December 31, 1689.

Andrew Browne, the Scotch physician of whom mention has already been made on an earlier page, makes the following comments on the closing days of Sydenham's career: "It is a difficult matter to believe, and yet it is the truth: This great physician, who throughout his life

gave the clearest proof of nobility of soul, generosity and clear-sightedness, died with the accusation hanging over his head that he was 'an impostor and an assassin of humanity.'" Laboulbène adds: "After years of self-sacrifice in behalf of his fellow men Sydenham received as his final earthly reward calumny and ignominy, and the jealousy of many professional brethren."

CHAPTER XXXIII

THE THREE LEADING PHYSICIANS OF GERMANY DURING THE LATTER HALF OF THE SEVENTEENTH CENTURY: FRANZ DE LE BOË SYLVIUS, FRIEDRICH HOFFMANN AND GEORG ERNST STAHL

The seventeenth century, says Berendes, was one of the saddest periods in the history of Germany; but, during the greater part of this time, the neighboring countries—Holland, France, England and Italy—still continued to enjoy many of the blessings of the Renaissance,—such, for example, as an uninterrupted activity of artistic efforts, of scientific work, and of commerce;—but in Germany everything seemed to be in a state of confusion. A bloody religious war was at this period devastating the land, and the best powers of the people were being wasted. Instead of increasing cultivation of manners and sentiments, there was a steady growth of savagery. The Protestants, although they probably were numerically superior, were split up into factions. The Catholics, on the other hand, were united, and their power steadily increased. In 1618 the disturbances, which previously had been scattered in character, took on the form of what in time came to be known as "The Thirty Years' War," a struggle which proved to be most sanguinary, costing Germany a great deal in every respect. Finally, the war was brought to an end by the signing of the Westphalian Treaty of Peace at Lützen, in 1648. Some idea of the terribly destructive nature of this long war may be gathered from the fact that the population of Germany, which previously had been

estimated at twenty millions, was found to have been reduced to about six millions. Whole towns and villages were laid in ashes, and as a consequence those who had survived the disaster lost confidence in themselves and were not able, at least for several years, to undertake anything in art, literature or science; and this depressing atmosphere affected in some degree the people of the Netherlands. Toward the end of the century, however, there came a marked awakening among the younger generation of physicians, and in the course of twenty or thirty years four men, only three of whom, however, were of German birth, succeeded in attaining a decided leadership in this department of science. The names of the Germans are Franz de le Boë (commonly spoken of as Sylvius), Friedrich Hoffmann and Georg Ernst Stahl. I shall now attempt to furnish, as nearly as possible in proper chronological order, very brief sketches of the lives of these distinguished physicians, together with an account of the contributions which they made to the science of medicine.

Franz de le Boë (*Sylvius*).—Franz de le Boë (Sylvius) was born at Hanau, Prussia, in 1614, of parents who belonged to the nobility and were wealthy, and who consequently were able to give their son every opportunity for acquiring an excellent education. Thus Franz first received a thorough training in philosophy and the classics and afterward visited in turn all the leading universities of Holland, France and Germany before he finally took his degree of Doctor of Medicine at Basel, Switzerland, in 1637. From this time forward, for a period of twenty-three years, he devoted himself to the practice of his profession, first in his native city and then in Leyden and Amsterdam. In 1660 he accepted an invitation to occupy the Chair of Medicine in the University of Leyden, and this position he held during the remainder of his life. He died in 1672.

As a teacher Sylvius was very popular, Boerhaave alone, at a later period, finding greater favor among the crowds of medical students and physicians who frequented this

university. Haeser and Haller both attribute some portion of this popularity to the fact that Sylvius combined genuine eloquence with a wonderful charm of manner and a profound knowledge of chemistry, pharmacy and pathological anatomy. In the practice of medicine he followed Van Helmont very closely, but he was not willing to accept his teachings about an "*archaeus insitus*" and an "*archaeus influus.*" The system which he advocated was of a very simple character, and this fact undoubtedly contributed much to his popularity among the students. His therapeutic methods were also of a thoroughly practical nature.

Of the works which Sylvius published the following deserve to receive special mention: "*Disputationes medicae,*" a book in which are set forth his views regarding the fundamental principles of the science of medicine—physiology in particular; "*De methodo medendi,*" a treatise on therapeutics; and "*Praxeos medicae idea nova,*" a new idea concerning the practice of medicine.

Sylvius was one of the earliest defenders of Harvey's great discovery, and he was also one of the first to call attention to the part played by chemistry in elucidating some of the problems in physiology and pathology. At the same time he was always ready to acknowledge the importance of the part played by mechanics in respiration, in the circulation of the blood, in the movements of the intestines, etc., in which respects he was in entire agreement with the iatrophysicists or iatromathematicians.[1]

Finally, there is one more respect in which Sylvius is entitled to great credit: he paid most careful attention to the work of giving clinical instruction. Recognizing, as I do, the importance of this branch of medicine, I shall not hesitate to devote here a page or two to a brief review of the manner in which it came to hold the honorable position which it occupies to-day in all the best schemes for medical education.

During the sixteenth century, as Puschmann assures us, an attempt was made at Padua, Italy, to render clinical

[1] Physicians who maintain that all physiological and pathological phenomena may be explained by the laws of physics.

instruction an essential part of the physician's education, but the difficulties which were encountered proved so much greater than was anticipated that it was soon found necessary to abandon the plan; and then for many years no further effort was made, either at Padua or at any of the other Italian medical schools, to introduce clinical teaching. After the lapse of nearly a century, Johannes Heurnius (1543-1601), Professor of Medicine at the University of Leyden, made an effort to introduce the plan of teaching medicine at the bedside; and a few years later (1630) two other professors of the same university—viz., Otho Heurnius, son of Johannes, and E. Schrevelius—formally introduced clinical instruction at the city hospital. The plan which they adopted was the following: The students in turn were permitted first to question the patient about his ailment and then afterward to make whatever physical examination appeared to be necessary; next, each one of them stated briefly what he believed to be the nature of the malady, and also gave his views as to the prognosis, symptoms and treatment; after which the professor commented on these different reports, pointing out both the correct and the incorrect features in each case. After a short trial of the plan it became clear that it would have to be abandoned, for the students did not like to have attention called in such a public manner to their mistakes. Then, a few years later, Sylvius, who at that time was the Professor of Medicine, introduced a system of clinical teaching which is thus briefly described by his colleague, Lucas Schacht:—

> When, followed by his pupils, he approached the bedside of a patient, he assumed the air of one who is entirely ignorant of the nature of that person's malady, of the accompanying symptoms, and of the treatment which was being carried out. Then he began to ask first one and then another of the students a great variety of questions respecting the case that was under consideration,—questions which at first seemed to have been propounded in a haphazard fashion, but which in reality were so cleverly formulated as to elicit from the class all the information needed for the making of a correct diagnosis, while leaving on the minds of the

students the impression that they, and not the professor, had worked out the problem to a successful result.

This system, if such it may be termed, proved extremely successful, and the knowledge of this success spread rapidly from one end of Europe to the other, causing students and physicians to flock to Leyden from Russia, Poland, Hungary, Germany, Denmark, Sweden, France, Italy and England. So long as this particular university continued to possess, as a member of its faculty, a professor of medicine who was clever enough to carry on clinical instruction with the same profound knowledge of human nature as had been displayed by Sylvius, just so long did this institution remain without a rival in this part of the field of medical education. Then Sylvius was followed, in the work of clinical teaching, by Boerhaave, a man admirably fitted, both by nature and by the training which he had received, to keep the University of Leyden in the first rank of medical schools as regards this most useful form of discipline. After 1738, the year in which Boerhaave died, other universities besides that of Leyden began to provide fairly satisfactory facilities for clinical study, and among the number of such institutions those of Utrecht, Rome, Edinburgh, Paris and Halle deserve to be mentioned. The lack of funds and doubtless also the lack of the right sort of teachers were the principal reasons why these schools were not able to vie with Leyden in furnishing the facilities needed for clinical instruction. That the fault—at least in the case of the University of Halle—was not to be attributed to a failure on the part of the Medical Faculty to appreciate the value of such instruction is clearly shown by the saying attributed to Friedrich Hoffmann, who at that period was the Professor of Medicine:—

> By a mere attendance upon medical lectures no man will ever succeed in becoming a properly equipped practitioner of that art; it is indispensable, in addition, that he should receive clinical instruction.

The fairly permanent establishment of this fundamental branch of medical teaching was not effected until about the

middle of the eighteenth century, when Van Swieten, one of Boerhaave's most distinguished pupils, was given full authority by the Empress Maria Theresa to furnish, at the University of Vienna, all the facilities required for successfully carrying on such instruction. From that time onward, to a quite recent date, Vienna has been the Mecca of all the younger physicians who aspired to become fully equipped in the practical branches of the science of medicine.

Georg Ernst Stahl.—Georg Ernst Stahl was born at Anspach, Germany, in 1660. Little is known about his early life beyond the fact that he pursued his studies at the University of Jena, received the degree of Doctor of Medicine from that institution in 1684, and shortly afterward began giving private courses in medicine which proved to be very popular and soon brought him into public notice. In 1687 he was given the position of Court Physician at Weimar. In 1694, upon the recommendation of Friedrich Hoffmann, who was at that time the incumbent of the regular Chair, he was appointed Associate Professor of Medicine in the recently founded University of Halle, Prussian Saxony; the understanding being that he was to devote his attention more particularly to the physiological, pathological, chemical and botanical aspects of the subject. He held this position up to the year 1716, when he was appointed one of the attending physicians of Frederick William the First, King of Prussia, and thereafter was obliged to reside in Berlin, in which city he died in 1734.

Stahl was a tireless worker, and wrote a large number of treatises (two hundred and forty-four in all) on physiological and pathological topics—all of them in Latin. Albert Lemoine, who has written an elaborate monograph on one of these treatises (that relating to animism), says that, despite the obscure style in which this and most of his other treatises are written, one may, upon careful study, satisfy himself that Stahl is a very close reasoner and possesses a clear mind. His most conspicuous faults, Lemoine adds, are these: he is opinionated and vain, and objects strongly to any criticisms that his opponents make;

and yet he is careful to take up these criticisms one by one and subject them to a close analysis. His vanity led him to maintain that he was the only person then living who was capable of lifting medicine out of the rut in which it was at that time rigidly held. He manifested a sovereign contempt, not only for the men whose opinions differed from his, but also for those who complained of the difficulty of comprehending the Latin in which his treatises are written. Finally, Lemoine states that Stahl is addicted to mysticism, as is shown by the invocations of all sorts with which he begins and ends most of his writings. Haeser adds that Stahl possessed a gloomy, reticent and overbearing spirit, in striking contrast with the charming sweetness of temper of his colleague Hoffmann.

Among Stahl's numerous contributions to medical literature there is only one in which our readers are likely to take any particular interest; I refer to the treatise which bears the title "*Theoria medica vera*"—the true theory upon which the science of medicine is based. It is in this work more particularly that Stahl expounds the doctrine of animism. As I have tried in vain to obtain a really satisfactory conception of this doctrine, which occupied so great a place in the thoughts of the physicians of the period between 1650 and 1750, I have decided to rest satisfied with merely reproducing here the interpretation which William Cullen of Edinburgh, one of Stahl's contemporaries and also one of the greatest English physicians of that period, gives in his celebrated "First Lines of the Practice of Physic":—

> What is frequently spoken of as the power of nature—the "*vis conservatrix et medicatrix naturae*"—resides entirely in the rational soul. Stahl supposes that upon many occasions the soul acts independently of the body, and that, without any physical necessity arising from that state, the soul, purely in consequence of its intelligence, perceiving the tendency of noxious powers threatening, or of disorders any ways arising in the system, immediately excites such motions in the body as are suited to obviate the hurtful or pernicious consequences which might otherwise take place.

Barthélemy St. Hilaire of Paris (1805-1895) in one of his writings says: "I am convinced that the central idea in Stahl's physiology was suggested to him by the reading of Aristotle's '*De anima,*' in which this great philosopher states that the soul nourishes the body, and also that nutrition is one of the four ways in which the soul manifests itself."

Speaking of the effect of Stahl's doctrines upon the actual practice of medicine as a whole, Cullen says that it was of a controlling character, leading physicians to propose the "art of curing by expectation"; the natural result of which was that they advocated for the most part the employment of only very inert and frivolous remedies. On the other hand, they zealously opposed the use of some of the most efficacious drugs, such as opium and the Peruvian bark, and resorted to bleeding and to the administration of emetics only in exceptional cases. Cullen adds that:—

> The Stahlian system has often had a very baneful influence on the practice of physic, as either leading physicians into, or continuing them in, a weak and feeble practice, and at the same time superseding or discouraging all the attempts of art. . . . . The opposition to chemical medicines in the sixteenth and seventeenth centuries, and the noted condemnation of antimony by the Medical Faculty of Paris, are to be attributed chiefly to those prejudices which the physicians of France did not entirely get the better of for near a hundred years after. We may take notice of the reserve it produced in Boerhaave with respect to the use of the Peruvian bark.

Stahl, after taking up his residence in Berlin, devoted himself energetically to the increase and spread of the knowledge of chemistry. The thing which brought him the greatest celebrity, both in his own lifetime and also during the years following his death, was his propounding of the "phlogiston" theory. This theory was to the effect that all combustible materials or substances contain (as he assumed) an element to which he gave the name of *phlogiston.* He was not able, however, to demonstrate the actual existence of this element; he simply assumed that

it existed. At the same time the fact should here be stated that the terms "oxidation" and "reduction," which came into use during the following century, developed out of this theory of phlogiston.

Friedrich Hoffmann.—Friedrich Hoffmann was born at Halle, Prussian Saxony, February 19, 1660, and received his medical education in his native city, largely under the direction of his father, who was himself a physician. In 1678 he attended lectures at the University of Jena, and in the following year visited Erfurt in order to benefit from the instruction of Caspar Cramer, who was at that time a distinguished authority in chemistry. At the end of two years he returned to Jena, took his degree of Doctor of Medicine, and acquired the right to deliver public lectures. Then, during the following three years, he visited Holland and England, and, upon his return in 1685, settled at Minden, Westphalia, as a general practitioner of medicine. In 1686 he was appointed District Physician of the Principality of Minden and also Court Physician of the Prince Elector; and two years later he accepted the position of District Physician at Halberstadt. After the inauguration of the new university at Halle, July 12, 1694, Hoffmann appears as one of the earliest professors chosen to serve the institution. In 1701, when Frederick the Third, Electoral Prince of Prussia, assumed the crown under the title of Frederick the First, King of Prussia, he extended to Hoffmann an invitation to come to Berlin and accept the position of Private Physician to His Majesty. Hoffmann was not at first willing to accept the invitation, but in 1708, when the King, who had then become seriously ill, renewed his request, Hoffmann accepted, on condition that he might retain his professorship. In 1712 he returned to Halle and remained there until he died in 1742.

Before Hoffmann's time very little was known concerning the nature of carbonous (or carbonic) oxide and concerning the fatal effects which may be produced by inhalation of this gas. It was a common belief, for example, that the gas was given off by freshly plastered walls; and—as an even worse error—the theological authorities showed an incli-

nation, in many of the fatal instances which probably were due to inhalation of carbonous oxide, but in which no recognizable cause of death had been discovered, to explain the event as due to the malign interference of the Devil. In our time it is well understood in the community that the fumes of carbonous oxide constitute the most dangerous gas that one is liable to encounter, but in Hoffmann's day the people appear to have been less well informed concerning this danger than they were in ancient times. In the treatise on this subject which Hoffmann published in 1716,[1] several of the earliest known instances of such poisoning are narrated, the first one being that mentioned very briefly by Aristotle (384-322 B. C.). Then follow two very short references to this subject in the "*De rerum natura*" of the Roman poet Titus Lucretius Carus (95-52 B. C.). They read as follows: (1) "The fumes of burning charcoal easily affect the brain if thou hast not first taken a drink of water." (Book VI., verse 803.) (2) "If the fumes of the night lamp,[2] after it has been extinguished, are inhaled rather deeply the effect experienced will be the same as if one had been struck down by a blow on the head." (Book VI., verse 792.) The idea that the previous drinking of water is competent to prevent the effects of poisoning by charcoal fumes is declared by Neuburger, the translator of Hoffmann's treatise, to be erroneous.

The earliest really satisfactory description of an instance of non-fatal poisoning by the fumes of burning charcoal is credited by Hoffmann to the Roman Emperor, Julian the Apostate, who reigned from 361 A. D. to 363 A. D. Before he was made Emperor, Julian was intrusted by Constantius II., in 355 A. D., with the government of the Province of Gaul, and in 357 he won a great battle against the Alamanni at Strassburg; after which he took up his residence in the little city of Lutetia, the present Paris. It was undoubtedly

[1] "Gründliches Bedenken und physicalische Anmerkungen von dem tödtlichen Damff der Holzkohlen," Halle, 1716.

[2] Probably this refers simply to a brazier containing burning charcoal, the light emitted by which would doubtless be sufficient to answer the purpose of a night lamp.

soon after this event that he wrote the Greek satire which bears the title "Misopogon," and from which Hoffmann quotes the following account of Julian's narrow escape from death through the poisonous effects of carbonous oxide:—

The little city which the Celts call Lutetia is built upon a small island in the midst of a river, and access to it from both sides is gained by means of wooden bridges. Ordinarily the winter climate in this region is mild, owing—as the people of the place claim—to the proximity of the Ocean. Good wine is produced there, and even fig-trees flourish provided care be taken to wrap them well in wheat straw or some similar protective material during the winter season. But my visit happened to have been made during an exceptionally severe winter, and as a result things which looked like slabs of Phrygian marble, closely packed together, were constantly floating down the river with the current, and, soon becoming jammed, they formed a sort of natural bridge. Although most of the houses—the one I occupied among the number—were provided with fireplaces and chimney-flues, and might therefore readily be heated, I was not willing that a fire should be kindled in my bedroom. I was very little sensitive to cold, and, in addition, I was desirous of becoming more and more hardened to its influence. . . . . As the severity of the weather, however, showed no signs of letting up, I permitted the attendants to bring into the room a few glowing coals, just enough to render the air of the chamber less chilly. But, notwithstanding the very small degree of heat which these few burning coals supplied, it proved to be sufficient to draw out from the damp walls exhalations that caused my head to feel as if it were tightly held in a vice and also produced a sensation as if I were choking. I was immediately removed from the room, and the physicians who were promptly summoned administered an emetic which enabled me to get rid of the food which I had eaten a short time before. Soon afterward I had a refreshing sleep and was able on the following day to resume my work as usual. [Translated from the German version printed in Neuburger's monograph.]

As will be seen from the reports which I have just quoted, there existed among the Germans, early in the eighteenth century, no fixed belief as to the real cause of death in many of these unexplained fatal cases; and it was therefore no

small public service which Hoffmann rendered when he, in whose judgment about such matters the people at large placed the greatest confidence, published such a clear and simple explanation of the real cause of these deaths as that which is given in this interesting monograph.

Hoffmann also added not a little to his fame by the invention of a remedy which was first known as "Hoffmann's drops," but which to-day appears in the United States Pharmacopoeia under the name of "Hoffmann's anodyne" or "*spiritus aetheris compositus*" (sulphuric ether, 325; alcohol, 650; ethereal oil, 25).

CHAPTER XXXIV

HERMANN BOERHAAVE OF LEYDEN, HOLLAND, ONE OF THE MOST DISTINGUISHED PHYSICIANS OF THE SEVENTEENTH CENTURY

Hermann Boerhaave, who was born at Voorhout, near Leyden, Holland, on December 31, 1668, was the son of a poor but highly educated clergyman; and it was owing to this circumstance that he received in early youth a most careful training in Latin and Greek and in belles-lettres. At the age of fourteen he entered the public school of Leyden, and made such rapid progess in his studies—history, mathematics, the different branches of natural philosophy, Hebrew and Chaldean languages, and metaphysics—that he was soon able to follow regularly the lectures given at the university. He was only fifteen at the time when his father died, leaving him absolutely penniless; but Van Alphen, the Burgomaster of Leyden, befriended him and furnished all the funds needed for a continuance of his studies at the university. But young Boerhaave, who was not willing to be entirely dependent on the aid thus provided, contributed to his own support not a little by giving private instruction to young students of the wealthy class. In 1690 he received the degree of Doctor of Philosophy, the subject of his dissertation being a refutal of the doctrines of Epicurus, Hobbes and Spinosa. His original intention had been to prepare himself for the ministry, but, after continuing his studies in theology for a short time, he determined that the better course for him would be to choose the career of physician. Accordingly he began, at the age of twenty-two, to study the anatomical treatises of Vesalius, Fallopius and Bartholinus, and at the same time he followed a course of instruction in dissecting,

under the guidance of the anatomist Nuck, and also occasionally attended the lectures given by Drelincourt, who at that time was Professor of the Theory of Medicine. In his reading of medical literature he showed a decided preference for the writings of Hippocrates and Sydenham; and he devoted a large portion of his time to the study of botany and chemistry, two branches of the science of medicine in which he took a very strong interest all through life. In 1693 he received the degree of Doctor of Medicine from the University of Harderwyk.[1] In 1701 he was appointed Associate Professor of the Theory of Medicine in the University of Leyden, and it was in this capacity that he began building up that great reputation which in a very few years brought crowds of students from all parts of the world to Leyden. As already stated on a previous page, he owed a large part of his fame to the admirable manner in which he conducted his clinical teaching. To show how widely he was known throughout Europe the story is told that a letter which had been sent to him from a mandarin living in China and which bore the address, "To the illustrious Boerhaave, Physician in Europe," reached him in due course.

Soon after his first appointment at Leyden, he received other most flattering offers, such as that of William the Third, Hereditary Prince of the Netherlands, to accept the position of Court Physician at The Hague, and a call from the University of Groningen (1703) to occupy the Chair of Medicine. He declined these offers as he preferred to remain at Leyden; but, a few years later, in 1709, he accepted the full professorship of the Practice of Medicine in the institution with which he was already connected. From the vantage ground of this more responsible position he was able most successfully to teach the students the best methods of observing, identifying and treating the different diseases; and as a further result of this promotion in rank his private practice grew rapidly, monarchs and princes

[1] A small seaport town located on the Zuider Zee, about thirty miles northeast of Amsterdam. The university, which was founded there in 1648, was abandoned in 1818.

coming from every country in Europe to consult him about their maladies. Boerhaave was also most popular among his fellow townsmen. It is related of him, for example, that on one occasion, after he had been confined to the house for about six months by an illness of a gouty nature, the citizens of Leyden manifested their joy at his recovery by inaugurating a general illumination of the town during the evening of the day on which he made his first appearance on the street. He had two relapses of the gouty affection, one in 1727 and another in 1729, and he finally died from disease of the heart on September 23, 1738. The monument raised in his honor by the city of Leyden bears the inscription: "*Salutifero Boerhaavii genio sacrum*" (Sacred to the memory of the health-giving genius of Boerhaave).

Some idea of the lucrative character of Boerhaave's private practice may be gained from the fact that he left to his only child, a daughter, the sum of about four million francs. And yet he was noted for the generous gifts which he made during his lifetime to all sorts of scientific and benevolent objects.

Boerhaave, says Dezeimeris, exercised during his career, and also for a long time after his death, an immense influence upon medical thought. He is justly ranked, he adds, among the iatromathematicians, and it is correct to say that he was largely instrumental in overthrowing the chemical system which de le Boë (Sylvius) had developed. His own treatise on this branch of knowledge ("Elementa Chemiae"), which was published toward the end of his life, soon became the standard work on this subject, and it retained its popularity for many years. "It is to be regretted that, possessing as Boerhaave unquestionably did, remarkable powers of observation, he should have allowed himself, in opposition to the very principles which he advocated so strongly, to indulge in the making of systems and hypotheses. He commenced by advocating with enthusiasm the method of Hippocrates, and ended by following the brilliant but not very trustworthy example of Galen." (Dezeimeris.)

The number of treatises which Boerhaave published is quite large, the most important among them being the following: "*Oratio de commendando studio Hippocratico,*" 1701; "*Institutiones medicae in usus annuae exercitationis domesticos,*" 1708; "*Aphorismi de cognoscendis et curandis morbis in usum doctrinae medicae,*" 1709 (English version printed in London in 1742); and "*Elementa chemiae,*" 1732 (English translation by Peter Shaw, London, 1741).

Of the "Aphorisms," one of the most widely known of Boerhaave's published treatises, I shall take the liberty of saying a few words. This work is in reality a very concise statement of the author's views regarding pathology, pathological anatomy and therapeutics, and I believe that the following paragraphs, although few in number, will suffice to give our readers a fair idea of the general character of the book. At the same time I must confess that I have not found it an easy matter to understand and satisfactorily digest many of the individual aphorisms, the text of which has been compressed into such a small space. It therefore does seem surprising to learn from one critic that, if one wishes to ascertain what Boerhaave's views are with regard to the science of medicine, one should read by preference the Commentaries of Van Swieten, who was Boerhaave's favorite pupil and assistant.

The following four or five aphorisms are typical specimens belonging to the earlier sections of the book:—[2]

(7.) A disease when present in a body, must needs be the bodily effect of a particular cause directed to that body.

(8.) Which effect being entirely removed, health is recovered.

(9.) It may be removed by correcting the illness itself in particular, *viz.*, by the applications of medicines to the particular diseased part, or by some remedies which operate equally upon the whole: the first we'll call a *particular*, the latter a *general* cure.

(10.) The way to both is discovered either *by observation*, or *by comparing* one case with another, or *by a true reasoning* from them both.

(13.) He who doth, with the greatest exactness imaginable, weigh every individual thing that shall happen or hath happened

[2] Quoted from the English translation mentioned above.

to his patient and may be known from the observations of his own or of others, and who afterward compareth all these with one another, and puts them in an opposite view to such things as happen in an healthy state; and lastly, from all this, with the nicest and severest bridle upon his reasoning faculty, riseth to the knowledge of the very first cause of the disease, and of the remedies fit to remove them; *he*, and *only he*, deserveth the name of *a true physician*.

Then Boerhaave proceeds to make a classification of diseases, and among the very first groups which one finds in this classified list are the following: "Distempers of a lax and weak fibre"; "Distempers of the stiff and elastic fibre"; "Distempers of the less and larger vessels"; "Distempers of weak and lax entrails"; "Distempers of the too strong and stiff entrails"; etc.—from which it is apparent that the old doctrine of the *strictum* and the *laxum*, which was taught by the Methodists in the early centuries of our era, has here been adopted by Boerhaave in all its essential characters; and also that the treatment which he recommends for some of these classes of maladies does not materially differ from that advocated by this ancient school of medicine. The following extracts, I believe, will suffice to give the reader a fairly clear understanding of what Boerhaave means by the expressions "distempers of the solid simple fibre," "distempers of a lax and weak fibre," and "distempers of the stiff and elastic fibre," and will at the same time show what methods he employed for overcoming these distempers. At the time when Boerhaave made use of the term "fibre" (*fibra*) in the very uncertain sense in which he here employs it, Leeuwenhoek and Malpighi were demonstrating, by aid of the newly perfected microscope, that the so-called simple tissues were in reality quite complex structures; and one's first impulse, therefore, is to express surprise that a physician of such high standing as our author should have used the term. But we moderns must not forget that, in those early days, it took decades for knowledge of this nature to spread even a very short distance, as from Delft to Leyden, and then to exert its legitimate influence upon medical

thought—that is, to be digested and afterward permanently appropriated. There can be scarcely any doubt that, at the time (1709) when Boerhaave wrote these aphorisms, he had already heard about the existence and the capabilities of the recently perfected microscope, but it is not at all likely that he had as yet digested the gains in anatomical knowledge which had been acquired through the assistance of this instrument. The extracts referred to above are the following:—

DISTEMPERS OF THE SOLID SIMPLE FIBRE

(21) Those parts (which, being separated from the fluid contained in the vessels, are applied and sticking to each other by the strength of the living body, and make the least fibre) are the least, the simplest, earthy, and hardly changeable from or by virtue of any cause, which are found in our living bodies.

DISTEMPERS OF A LAX AND WEAK FIBRE

(24) The weakness of the fibre is that cohesion of the minutest parts described (21), which is so loosely linked that it may be pulled asunder even by that degree of motion which is requisite in healthy bodies, or not much exceeding it.

(26) The weakness produceth easily a stretching and a breaking of the small vessels made up of those weak fibres (24), and consequently abates of their power over the fluids therein contained; from which distensions arise tumors, from the stagnating or extravasated liquids putrefactions, and, farther, all such innumerable ills as are the consequences of them both.

(28) [In distempers of a lax and weak fibre] the cure must be obtained, 1. By aliments that abound in such matter as is described in section 21, and which [should] be almost so prepared beforehand as they are in a strong and healthy body; such are milk, eggs, flesh-broths, panadoes[3] rightly prepared of well-fermented bread; and rough wines. All which must be given in small quantities, but often. 2. By increasing and invigorating the motion of the solids and fluids by means of frictions with a flesh-brush, or with flannel; by riding on horse-back, and in a coach, or by being carried in a boat; and lastly by walking, running and other bodily exercises. 3. By a gentle pressure or a bandage upon the vessels, and a moderate repelling of the liquids therein contained. 4. By medi-

[3] Bread boiled in water to the consistence of pulp.

cines both acid and austere, or such as are spirituous and well fermented, but applied with great caution and gentleness. 5. By any means that will remove and remedy the too great pulling of them.

[That Boerhaave belonged to the iatrophysical or iatromechanical school appears very clearly throughout these quotations.]

DISTEMPERS OF THE STIFF AND ELASTIC FIBRE

(35) [In distempers of this group] the cure is effected, 1. By such meat and drink as is thin and watery, without any roughness, chiefly by the continued use of milk-whey, of the softest herbs and salads, barley-water, thin gruel, and unfermented liquors. 2. By avoiding of exercise, and dwelling in a moist, coolish air, and taking long sleeps. 3. By the taking or outwardly applying watery, lukewarm, tasteless medicines, and such as contain the lightest and softest oils.

In the second half of the volume I find abundant evidence of Boerhaave's ability to treat efficiently some of the acute and chronic maladies; and, after a perusal of the text which deals with these affections, I have no difficulty in understanding how he came to be looked upon as one of the leading medical practitioners of the period during which he lived. I should be glad to reproduce here such portions of the aphorisms as would corroborate the statement that I have just made, but unfortunately the small amount of space that I can command does not permit me to do this. At every step, as I advance, I am warned against the danger of exceeding the limits permitted, and I shall, therefore, in the present instance, have to rest satisfied with quoting the larger part of a single paragraph in which is given an account of the treatment employed in a case of acute pleurisy.

(890) . . . . . If the same pleurisy be recent before the end of the third day, yet violent from the many and strong symptoms, and dry, in a strong, exercised, dry body, without the hopes of the presence of (887 and 888) [a resolution or a concoction and excretion of the cause], then let the patient immediately be blooded

largely, with a quick running stream out of a great vessel, and a large orifice, keeping his body quiet and leaning backwards, enforcing his breathing all the while with coughing or panting, fomenting the side at the same time, and gently rubbing it; which bleeding ought to be continued till the pain seems to abate pretty considerably, unless a fainting fit forces you to leave off sooner; at whose approach the vein must immediately be stopped. Bleeding ought to be repeated according as these symptoms do return upon whose account it was done the first time; and when that skin doth not any longer appear upon the surface of the blood, it is time to forbear more bleeding.

From the beginning ought to be used fomentations, bathings, warm streams, liniments, plaisters, and the like; which may be of use as they loosen, resolve, mitigate, and avert. . . . . .

As only extracts of considerable length would suffice to give our readers a satisfactory idea of the attractive manner in which Boerhaave deals with the subject of chemistry, I prefer to omit them altogether, and to recommend to those who are specially interested in this branch of science, that they consult Peter Shaw's excellent English translation of the "*Elementa Chemiae.*"

Albert von Haller, the celebrated Swiss physiologist and historian of medical literature, speaks of Boerhaave as "my beloved preceptor, a man of refined taste and a speaker or lecturer so logical and charming that one more gifted can hardly be imagined."

CHAPTER XXXV

GENERAL REMARKS ON THE DEVELOPMENT OF SURGERY IN EUROPE DURING THE FIFTEENTH AND SIXTEENTH CENTURIES

In the early period of the Renaissance surgery was apparently the first of the practical branches of medicine to spring forward into active life. Anatomy,—that is, human anatomy,—the foundation that is absolutely necessary to the solid growth of surgery, scarcely existed before the beginning of the sixteenth century; and it is therefore not surprising that the records of the past reveal to us so very few instances of men who attained any eminence as surgeons. When this fact is taken into consideration I cannot help feeling that, in the sketches which I drew, on earlier pages, of Theodoric of Cervia, William of Saliceto, Lanfranchi of Milan (and later of France), Henri de Mondeville and Guy de Chauliac, I gave to these men only a small fraction of the credit to which they were justly entitled. Indeed, the excellence of the work done by them and recorded in the treatises which they published, is so great as to arouse the suspicion that they had clandestinely acquired more knowledge of human anatomy than they dared to admit. The life of a dissector of human bodies, it should be remembered, was by no means safe in those days.

But the lack of a trustworthy knowledge of anatomy was not the only hindrance to a healthy development of the art of surgery. There were other obstacles which, up to a comparatively late period in the sixteenth century, continued to block the advance of this art. Of these, the principal one was perhaps the custom—not by any means considered at that period professionally dishonorable—of

keeping secret the technique of certain operative procedures like that of cutting for stone in the bladder or that of the radical cure of hernia. Such knowledge was treated as private property, and was very carefully handed down from father to son, or was sold for a large sum of money to certain surgeons who engaged, under oath, not to reveal the details to others. Thus we are assured by Haeser that two such eminent surgeons as Ambroise Paré and Fabricius of Hilden were obliged to pay handsomely for the information which they received from certain specialists concerning their particular methods of procedure. It is from such scraps of information which come to our knowledge casually that we often learn the actual truth concerning the advance made at a given period of time by a certain department of medical science. Although it is not possible to fix the date when the custom to which I have just referred was definitely abandoned, it may be stated as a fact that after the seventeenth century very few instances of such ownership of surgical secrets are discoverable in the records.

Inasmuch as at the very beginning of the Renaissance surgery was looked upon, in the southern and central parts of Europe, as an occupation of a somewhat menial character, the regularly organized medical schools made very inadequate provision for the proper education and training of those young men who were disposed to adopt a surgical career. During the fourteenth and fifteenth centuries surgery was still tolerated at Montpellier, but after the papal seat had been removed from Avignon to Rome—that is, after 1479,—the pupils of that university were forbidden to do any surgical work. In 1490, however, a course in surgery was provided for the exclusive use of barbers. At first the instruction was given in Latin, but, as these men did not understand this language, the professor was soon compelled to employ a barbaric Latin (half French and half Latin) in making his comments upon the text of the lecture. This state of affairs lasted for more than a century. In fact, it was not until after Paré, Franco and Wuertz had demonstrated by their remarkable careers

how honorable was this branch of the science of medicine, that provision was made at Montpellier (in 1597) for regular instruction in surgery. But even then, for a period of several years, it was found to be a very difficult matter to keep the peace between the two groups of students—the medical and the surgical; the governing authorities being finally obliged, in order to prevent the encounters which frequently took place between the rival bodies, to appoint four a.m. as the hour when the instruction in surgery was to be given. Those students who were pursuing the course in medicine looked upon the surgical pupils as intruders, as men unworthy to associate with them, and they availed themselves of every possible opportunity for making their connection with the university unpleasant.

In Paris, during the twelfth and thirteenth centuries the surgeons formed themselves into corporations. Minor surgery was left entirely in the hands of the barbers (a word which is derived from the Latin "*barbarus*," uncultivated) and barber surgeons. They were largely itinerant practitioners and army surgeons. As they traveled from one city to another, the more enterprising ones announced their approach by means of a sort of herald who proclaimed loudly the cures which his chief was able to accomplish. In the course of time the surgeons who lived in Paris formed themselves into the so-called "College of Surgeons." At a later date (1255) there was established in that city by Jehan Pitard, the surgeon of Louis the Ninth ("Saint Louis," 1215-1270), a more perfect organization under the name of the "College of Saint Cosmas," which was placed under the protection of Saints Cosmas and Damian. The members of this Brotherhood were known as "Surgeons of the Long Robe," to distinguish them from the Barber-Surgeons or "Surgeons of the Short Robe"; and they were also known as "*Maitres Chirurgiens Jurés.*" Through the influence of Pitard this organization received from the King a set of governing rules or constitution.

It may prove interesting to learn who Cosmas and Damian were, how they came to be canonized, and for what reasons the organizers of the new brotherhood preferred

them to all others as guardian saints. Cosmas and Damian were the youngest of five brothers who belonged to a family of some distinction in Arabia. They chose the career of peripatetic physicians, and gave their services free to those who might have need of them. They spent some time in the Province of Cilicia, Asia Minor, and while in that country they met the death of martyrs, somewhere about 287 A. D., during the persecutions of the Christians which occurred in the reign of Diocletian. In the church pictures they are represented as physicians, each one of whom holds in his hand either a vessel containing a remedial preparation, or a staff around which the emblematic serpent is twined, or (less frequently) a surgical instrument of some kind. During the time of the Crusades there existed an Order of Knights of Saint Cosmas and Saint Damian, who devoted themselves specially to the care of sick pilgrims and to the freeing of those who were held as prisoners.

In all the large cities of France there existed, during the fourteenth and fifteenth centuries, corporations of surgeons, the great majority of whom belonged to the class or grade of barbers. These men were not permitted by their rules to use the knife, and, as a result, great jealousy existed between them and the few who, having passed the required examination, were authorized to perform cutting operations and to assume the title of "Masters in Surgery." In 1493, as the result of an effort made by the barbers of Paris as a body, to gain some knowledge of medical science, they obtained from the university permission to purchase a corpse which had not yet been removed from the gallows. They had, it appears, engaged a doctor of medicine to give them instruction in anatomy, and it was upon a dissection of this body that the teaching was to be based. In 1494 the Faculty made provision for giving the barbers a regular course of lectures on surgery; and, eleven years later (1505), additional privileges having in the meantime been granted them by the university, they organized the "Corporation of Barber Surgeons, or Surgeons of the Short Robe." In the oath which the members of this organization were obliged to take, it is expressly stated, among other

things, that "they will give due honor and reverence to the Faculty, and will not administer any laxative or alterative drug."

From 1601 to 1731, when the *Académie de Chirurgie* was founded, there was an almost continuous series of squabbles between the surgeons and the barbers, on the one hand, and the Medical Faculty of the University, on the other. At a still earlier period, dating back even to the fourteenth century, the quarrels were between the surgeons (École de St. Côme) and the barbers, but, during the seventeenth century and the early part of the eighteenth, the surgeons and the barbers seem to have harmonized their interests and to have made common cause against the Faculty. An edict was issued by Louis the Twelfth in 1613 to the effect that the two corporations (the surgeons and the barbers) should be fused into a single organization; and, even before this, it had become customary to employ the words "surgeon" and "barber" as synonymous terms. Finally, in the years 1644, 1645 and 1656, further agreements were entered into by the two bodies. After the founding of the Academy of Surgery in 1731 nothing further is heard of barber-surgeons.

In the account which I have thus far given of the agencies that were available during the Renaissance for the perpetuation and increase of medical knowledge, I make reference only to the established medical schools and to the less pretentious but much more practical teaching organizations furnished by the guilds or brotherhoods. In my remarks I have said little or nothing about hospitals, which—potentially, at least,—have a great deal to do with the advance of medical knowledge, especially in the department of surgery. Unfortunately, my efforts to procure information relating to this subject have not been rewarded with much success and I shall therefore not be able to furnish more than a few disconnected and very imperfect details.

At the beginning of the sixteenth century the city of Lyons possessed (and it still possesses) the oldest hospital in France—viz., the Hôtel-Dieu,—which was founded by Childebert the First in 542 A. D. The city itself was at

that period second in importance only to Paris, and in some respects it was the equal of the metropolis in celebrity. The art of printing was introduced there in 1472, and the presses of that city were soon reckoned the best in Europe. Many medical books were published at Lyons. François Rabelais (1483-1553), the celebrated author of the humorous and satirical works "Gargantua" and "Pantagruel," was a regularly educated physician, and during his residence at Lyons he edited various works of Hippocrates and Galen. Michael Servetus, who displayed such marked ability by his researches in regard to the circulation of the blood, was also a resident of Lyons from 1530 to 1543. Some idea of the way in which a large hospital was managed in those early days may be gained from the following statement of facts: In 1619 as many as five patients were permitted to occupy one bed in Hôtel-Dieu at Lyons. Although the hospital possessed accommodations for a total of five hundred and forty-nine patients (including pilgrims and poor people), there was only one medical man whose duty it was to look after the surgical cases, and he resided outside the building. At a somewhat later date there was provided a "*chirurgien principal,*" whose duty it was to give the needed surgical care to this class of patients, and who was obliged to reside in the hospital. When this chief surgeon required assistance in the dressing of wounds, etc., he was authorized to make use of the "apothecary's boy." The stock of surgical instruments possessed by the hospital in 1543 comprised the following items: One uterine speculum; one trephine, which was composed of thirteen separate parts; one mouth-plug, for use in keeping the jaws separated; one ear speculum; and one elevatorium. All these facts, taken together, furnish strongly corroborative evidence of the statement made by von Gurlt in his *Geschichte der Chirurgie,* viz., that in France, during the sixteenth century, the occupation of surgeon was considered by the community but little better than that of a hair-cutter. It is therefore not surprising that the great hospital of Lyons should have been managed at that time in accordance with such a low sanitary standard and with

an almost total disregard of the purposes for which a hospital exists. So far as I am able to learn, the conditions just described were not peculiar to the city of Lyons. "During the reign of Francis the First (1515-1547) there were in the main room (thirty-six feet wide) of the Infirmary of Hôtel-Dieu at Paris," says Boisseau, "six rows of beds (three feet wide), each one of which accommodated ordinarily three (at times even four) sick persons, who necessarily were very uncomfortable. This is not all; for there were also in this same infirmary seven or eight beds which were designed to accommodate from twenty-five to thirty infants or young children, the great majority of whom died from the poor quality of air which they had to breathe in that institution." I do not need to furnish additional proofs in corroboration of the truth of the statement that during the Renaissance the French civil hospitals contributed practically nothing to the advance of medical science. It is possible that in Italy these institutions may have been better managed, for, in the account which he gives of his trip to Rome, Luther speaks of having visited a hospital which particularly attracted his notice by reason of its orderliness and the conspicuous cleanliness of every part of the building. As an offset, however, to this favorable testimony I should state that in some documents discovered in comparatively recent times there are memoranda relating to the duties of the medical staff in the civil hospital of Padua (1569)—a city in which was located the most famous medical school to be found anywhere in Europe during the sixteenth century. These memoranda read as follows: "There shall be a doctor of physic upon whom rests the duty of visiting all the poor patients in the building, females as well as males; a doctor of surgery whose duty it is to apply ointments to all the poor people in the hospital who have wounds of any kind; and a barber who is competent to do, for the women as well as for the men, all the other things that a good surgeon usually does." (The word "surgeon" is evidently employed here in the sense of barber-surgeon, and not in the modern sense of the word.) This testimony and that furnished on a pre-

ceding page with regard to the management at the two leading civil hospitals in France amply justify the statement that during the sixteenth century medicine received no aid whatever from these institutions in its efforts to advance.

For the sake of orderliness I shall, from this point onward, arrange the information which I may find it desirable to furnish, under the headings of the different countries of Europe; and in carrying out this plan I shall begin with Germany, as it was there that the oldest fifteenth-century treatises on practical surgery were first printed.

CHAPTER XXXVI

SURGERY IN GERMANY AND SWITZERLAND DURING THE FIFTEENTH AND SIXTEENTH CENTURIES

There were five men in Germany and German Switzerland who, during the Renaissance, attained distinction as surgeons, and who at the same time contributed, by their published writings as well as by the force of example, to the advancement of medical science. The names of these five surgeons are: Pfolspeundt, Brunschwig, von Gerssdorff, Fabricius of Hilden and Felix Wuertz. The first three mentioned were born in the early part of the fifteenth century, and all five of them derived their practical knowledge of surgery in large measure from their experience in warfare. Individual sketches of these men will be furnished farther on, but I believe that these will be better understood if a brief account of the state of medical education in general throughout Germany, at the period which I am now considering, be first supplied.

State of Medical Education in General Throughout Germany (1400-1600).—The University of Heidelberg was founded in 1386, but it was not until about 1550 that the first beginnings of medical teaching made their appearance in that institution. Equally feeble attempts were made, twenty years later, to organize the teaching of medicine at the University of Wuertzburg; but very little appears to have been accomplished during the immediately following years, as may be judged from the official announcement, in 1587, of what things the Professor of Surgery would teach in the three-years' course. "*First year:* Lectures on the subject of tumors, in accordance with the teachings

of Galen; *Second year:* Lectures on the subjects of wounds and ulcers, in accordance with the teachings of Galen and Hippocrates and the Arabian medical writers; *Third year:* Lectures on fractures and dislocations, in accordance with the teachings of Galen and Hippocrates. Then, if sufficient time is available during this last year of the course, a certain amount of anatomy is to be taught (during the winter season) from Galen's writings on this subject. In the summer time the subject of simple remedies may be taken up advantageously, and botanical demonstrations may also be given." Von Gurlt quotes Koelliker as his authority for the statement that throughout the seventeenth century the medical and surgical teaching at the University of Wuertzburg was very defective, "almost nothing worthy of mention being accomplished during that long period in the departments of anatomy and physiology." In the University of Basel, Switzerland, which was founded in 1460, medical teaching was as barren as it was in all the German universities at that early period. It was only in 1542 that the first public dissection of a human body took place there. Vesalius was visiting the city at that time for the purpose of superintending the printing of his great work on anatomy, and the university authorities availed themselves of the opportunity to secure from him not only this single demonstration, but also in addition a course of lectures on anatomy. Fifteen years later, Felix Platter, a native of Basel and a man of exceptional ability (see sketch on pp. 332 *et seq.*), made the first postmortem examination known to have been made in that city. Two years later still (1559), following in the footsteps of Vesalius, he made a public dissection of a criminal's corpse in the Church of St. Elizabeth. From 1581 onward, with occasional omissions, a public dissection of the corpse of a criminal was made by the professor of anatomy once every year. In 1590 the question was discussed by the Faculty whether it "might not also be practicable to secure from the hospital, for dissection, an occasional corpse." The first body obtained from this source was dissected in 1604, but it was not until 1669 that a second one was avail-

able. There was no museum of anatomy and the medical school owned only two human skeletons—one male, that had been set up by Vesalius, and one female which had been prepared by Platter. During the first two hundred years of the existence of this university, only twenty three copies of the different writings of Hippocrates, of Galen, of Dioscorides and of Paulus Aegineta were available for the instruction of the medical students. "These books should be diligently read aloud to the young men if their contents are to furnish the maximum of useful information." As for clinical instruction, each student was expected to secure for himself, by private arrangement with some active practitioner, the position of assistant, or to obtain from the Archiater or City Physician an occasional opportunity of seeing patients at the hospital. According to the rules established by the Faculty the students were permitted to take private courses with different physicians. Another and very valuable source of information that was within the reach of these young men, was supplied by the public disputations which were held quite frequently.

The preceding brief account, which I have compiled from von Gurlt's work, will serve, as I believe, to convey a fairly clear idea of the primitive and very limited opportunities of acquiring a knowledge of medicine and surgery which were afforded the student in Germany during the fifteenth and sixteenth centuries. (It should be borne in mind that Basel, although located in Switzerland, was in nearly all respects a German city.) It was not until a much later period that the schools of that country, in nearly every department of human knowledge, caught up with and eventually surpassed—at least for a number of years—the similar institutions in Italy and France.

Hieronymus Brunschwig.—Hieronymus Brunschwig was born at Strassburg during the early part of the fifteenth century, the exact date not being known. It is believed that he attained a great age, some even claiming that he was one hundred and ten years old at the time of his death. His treatise on surgery, bearing the simple title "*Das buch*

der Wund Artzeny," was first published in 1497, when he was already an old man, and it passed through nine editions during the following forty-two years. It was also twice translated into English. Up to the time of the discovery

FIG. 18. CONSULTATION BY THREE PHYSICIANS UPON A CASE OF WOUND IN THE CHEST.

(From a woodcut in the *Surgery of Hieronymus Brunschwig*, Strassburg, 1508.)

This treatise, which was written by the author in 1497, passed through nine successive editions, the last one in 1539. Probably no woodcuts of a higher order of merit than those represented in this and the two following illustrations (Figs. XIX and XX) are to be found in medical literature.

of Pfolspeundt's work it was believed to be the oldest German treatise on surgery known. It was very freely illustrated with original woodcuts, not a few of which possess considerable artistic merit. (See accompanying reproduction.) The following headings of some of the more important chapters will convey at least a fair idea of the character of the book: "Definition of the Word 'Surgeon' "; "Anatomy"; "Fatality of Wounds in Different Parts of the Body"; "Different Kinds of Wounds"; "Different Kinds of Surgical Instruments"; "Different Modes of Ligating Blood-Vessels"; "Wounds of Blood-Vessels and Nerves"; "Methods of Arresting Bleeding"; "Foreign Bodies in Wounds"; "Treatment of Wounds Inflicted by Poisoned Arrows"; "Bruised or Crushed Wounds"; "Stab Wounds"; "Bites and Stings"; "Wounds of the Head"; "Operations for Hare-Lip"; and several other chapters on wounds and pathological conditions of other parts of the body. Syphilis is not once mentioned in the book; and from this circumstance von Gurlt infers that a knowledge of the existence of this disease had not yet, at that early date (1497), reached Germany. In Brunschwig's *Liber pestilentialis, etc.*, however, which was printed three years later, syphilis is incidentally mentioned as the "*malefrancose*" or "*malum mortuum.*" That Brunschwig was well informed in the earlier surgical literature is shown by the fact that he quotes from the writings of Theodoric, Guillaume de Saliceto, Guy de Chauliac, Henri de Mondeville, and many others. A hasty and necessarily very superficial perusal of the text of a few of the more important chapters of this remarkable book satisfies me that Brunschwig deserves to be classed among the really great surgeons of the fifteenth and sixteenth centuries. A copy of this rare book may be seen in the Surgeon-General's Library at Washington, D. C.

Heinrich von Pfolspeundt.—The earliest German treatise relating to surgery is that which bears the title "*Buch der Bündth-Ertznei,*" by Heinrich von Pfolspeundt, "*Bruder des deutschen Ordens.*" It was written in 1460, and was first published in printed form in 1868 by H. Haeser and

A. Middeldorpf, Berlin. The text of this very early German work on the practice of surgery furnishes ample evidence to show that the author was worthy to be ranked among the leading surgeons of the fifteenth century. At page fifty-seven, says von Gurlt, may be read the remarkable statement that, in the case of a wound of the intestinal canal, one may cut through that organ at the point of injury and then introduce into the opposite ends of the divided bowel a silver tube the margins of which have been carefully bent so as not to offer at any point a cutting edge. The tube may then be tied in place with thread of green silk. (Von Gurlt speaks of this as the forerunner of Murphy's button.) Speaking of wounds caused by arrows, Pfolspeundt says that, to insure the patient's recovery, the planet under which he happens at that time to be, should be in favorable conjunction. In one case which came under Pfolspeundt's care he was obliged to pay an astrologer the sum of fifty gulden in order to ascertain whether the planet in question was or was not in a favorable conjunction.

There is only one place in the entire book, says von Gurlt, where a gunshot wound is mentioned, and then only incidentally; but this is positively the first reference (about the middle of the fifteenth century) to such wounds discoverable in medical literature.

Among the topics which are treated quite fully and in such a manner as to show clearly that the author was well versed in at least this part of operative surgery, those relating to rhinoplasty deserve to receive special mention. From the viewpoint of history, this part of the book is of very great importance. In no other treatise, says von Gurlt, do we find an equally detailed and satisfactory account of the operative method employed by the Two Brancas (father and son, from Catania, Italy), who were contemporaries of Pfolspeundt. The latter learned this method from an Italian surgeon, whose name he does not mention, and he was particularly careful not to divulge the essential details to anybody except two of his brethren in the Order to which he belonged.

For anaesthetic purposes in operative cases, Pfolspeundt

was in the habit of employing sponges saturated with the juices of opium, Atropa mandragora, Conium maculatum, Hedera helix or arborosa, Lactuca and Daphne mezereum; his technique resembling very closely that employed by Guy de Chauliac, Theodoric and others. (See the appropriate chapters in the earlier part of this volume.)

In his remarks upon the manner of bringing about the healing of an open wound, Pfolspeundt says that "in all cases he tries to dispense with stitches, but that, when he finds such support necessary, he first spreads a thick layer of adhesive material over both margins of the wound and afterward introduces the threaded needle through the mass into the skin. Then, in order to bring the edges of the wound together, he draws the thread taut and makes it fast by means of a very small knot. . . . . Whether the sharp fever which sometimes sets in afterward as a complication, is due to simple inflammation or to erysipelas, is a question which cannot always be decided; and it is still more difficult to determine whether the thin watery secretion which sometimes develops in a wound may not signify—as some writers maintain—the beginning of suppuration in a joint."

Were it not for the difficulty which one experiences in translating correctly the ancient provincial German of Pfolspeundt's text, I might readily furnish further examples of his surgical pathology and methods of treatment. The few, however, which I have already given will have to suffice.

Hans von Gerssdorff.—Hans von Gerssdorff, who was also called "Schielhans" (squint eyed Hans), was born in Strassburg about the middle of the fifteenth century. He was a bold and skilful surgeon, and acquired a wide experience and great self confidence from his long service in connection with the army. He was present, for example, at the famous battles of Grandson (1476, in Switzerland) and Nancy (1477, in France), in both of which the slaughter was very great, and in both also Charles the Bold, Duke of Burgundy, was badly beaten. In 1517 von Gerssdorff published at Strassburg a treatise on military surgery,

FIG. 19. BARBER-SURGEON (*WUNDARZT*) EXTRACTING AN ARROW FROM A WOUNDED SOLDIER'S CHEST WHILE THE BATTLE IS STILL IN PROGRESS.

(From the *Feldbuch der Wundarznei* of Hans von Gersdorff, first published in 1517; many later editions followed.)

under the title: "*Feldbuch der Wundartzney.*" This book, which is illustrated with exceptionally good woodcuts, two specimens of which are here reproduced (Figs. 19 and 20), contains the earliest discussion of gunshot wounds; and, in his remarks on the proper manner of treating such wounds, von Gerssdorff leads one to infer that he shared, although somewhat hesitatingly, the at that time prevailing belief that these wounds are poisoned. He was a pronounced advocate of the use of the red-hot cautery in cases of serious hemorrhage from a wound. When it was found that the ball had penetrated the flesh to some depth, he recommended that it be cut out; and if, after the removal of the missile, the patient complained of much pain in the wound, hot oil was to be poured into it freely. Before the employment of firearms in warfare, amputation of a limb was rarely performed—that is, only in cases where gangrene had developed in the corresponding hand or foot. But von Gerssdorff assures us that, up to the time of writing his "*Feldbuch,*" he had personally performed "nearly two hundred amputations." This great increase in the fre quency of performing this operation is clearly to be attributed to the increased use of the new agent gunpowder—in warfare. In this operation, according to his own declaration, von Gerssdorff was not in the habit of suturing the flaps. Instead, he brought the opposing edges together and then covered the stump thus formed with the bladder of some animal. There are a number of other interesting details relating to von Gerssdorff's manner of conducting this important operation, but it is not practicable to give up the space that would be required for a satisfactory description of them. There is one point, however, to which I may be permitted to refer very briefly in this place, viz., the manner in which the surgeons of this and even much earlier periods secured a fairly satisfactory degree of local anaesthesia when they had occasion to perform an amputation. They produced insensibility of the part by tying a band tightly around the limb a short distance above the spot at which the amputation was to be performed. At a somewhat later period, as in the middle

FIG. 20. AMPUTATION OF THE LEG.

(From Hans von Gersdorff's *Feldbuch der Wundarznei.*)

Von Gurlt says that this is the earliest known pictorial illustration of the amputation of a limb.

of the seventeenth century, artificial anaesthesia was also effected through the application of snow or ice to the part.

The date of von Gerssdorff's death is not known.

Fabricius of Hilden.—Fabricius Hildanus—or Fabricius of Hilden, near Düsseldorf—was born in 1560 and received his early training in surgery from Cosmas Slotanus, a pupil of Vesalius and the first barber-surgeon of Duke Wilhelm of Guelich-Cleve-Berg (eighteen miles northeast of Aix-la-Chapelle). In 1585 he visited Geneva, Switzerland, and continued his studies in that city under the guidance of Jean Griffon, one of the most distinguished surgeons of that period. After leaving Geneva he practiced medicine at Cologne, and during that period (1591-1596) steadily increased his reputation as a skilful surgeon, particularly well versed in anatomy. But he appears to have acquired a strong liking for Switzerland and for the professional friends whom he had gained in that country; and consequently it is not surprising to learn that, during the later years of his life, he spent long periods of time in Geneva, Lausanne and Berne, in the last of which cities he filled the office of City Physician. He died in 1634, at the age of seventy-four, full of honors and greatly beloved by all who knew him.

Fabricius of Hilden laid great stress upon the importance, to the surgeon, of a thorough grounding in anatomy. He had been profoundly impressed by the fact that his instructor at Geneva, Jean Griffon, never undertook an important operation until after he had refreshed his memory by a dissection of the region involved. He was also much interested in pathological anatomy, and always availed himself of every possible opportunity for making a postmortem examination. As evidence of the slowness with which news of important scientific discoveries, particularly in the domain of medicine, traveled in those days I may mention here the fact that, up to the time of his death in 1634, Fabricius had not heard of Harvey's great discovery of the circulation of the blood (1628). Although he gained distinction in more than one field of medicine his greatest reputation was unquestionably gained in that of

surgery; and his success in this field was to be ascribed to his profound knowledge of anatomy, to his inventive genius, and to his great technical skill. He insisted very strongly upon the importance, for the surgeon, of possessing good instruments and well-constructed apparatus.

If we compare Fabricius of Hilden with Ambroise Paré we are obliged to admit that the latter, although decidedly inferior to his rival in scientific training, was the greater surgeon of the two. It is perhaps worth recording that Paracelsus and Wuertz were Fabricius' bitter opponents.

Of his published contributions to surgical literature, the most important are to be found in the work entitled: "*Observationum et curationum chirurgicarum centuriae VII.*," published at Lyons in 1641.

Felix Wuertz.—Felix Wuertz was born at Zurich, Switzerland, between the years 1500 and 1510 (the exact date is not known). As to his early life and surroundings I am only able to say that his father was a painter, that he himself took service under a barber, and that at the end of two or three years, after he had learned the details of this branch of work, he started out on his travels over Europe in the character of a barber's apprentice, as was, in those days, the regular custom with apprentices of all trades or occupations. In this way he visited such cities as Bamberg, Pforzheim, Nuernberg, Padua and Rome, in each of which he spent a certain length of time as an aid to those surgeons who were willing to employ him. It is not unlikely that it was during this wandering period of his life that he gained some experience in the treatment of gunshot wounds. In 1536, after an absence of four or five years, he returned to his native city and was regularly enrolled as a member of the barbers' guild. During the following twenty years he carried on the practice of medicine and surgery, but more particularly the latter, with ever-increasing success. In 1559, for reasons which are not mentioned by any of his biographers, he left Zurich and established himself in Strassburg; and then, at the end of another ten or twelve years, he again changed his residence, this time giving the preference to Basel, a Swiss city located at the boundary

line between Germany and Switzerland. The exact date of Wuertz's death is not known, but—from various facts which he mentions in his book—it may be inferred that it occurred in 1576, and that he was residing at the time in the house of his son, who had the same name as himself and was also a surgeon. The title of the treatise which he wrote and which passed through a number of editions between the years 1563 and 1651,—not to mention translations into the French and Dutch languages—was: "*Practica der Wundarznei*" (The Treatment of Surgical Affections).

Malgaigne—says von Gurlt, in his History of Surgery—does not hesitate to speak of Wuertz as one of the three greatest surgeons of the sixteenth century (Franco and Ambroise Paré being the other two); and von Gurlt adds that Wuertz's "*Practica*" is rich in facts which he had gathered from his own experience in everyday practice, and upon which he makes comments that really represent his own views and not those of various other authors. The leading principles which guided Wuertz in his treatment of wounds of all kinds are thus formulated by him:—

> Keep them as neat and clean as possible, and disturb them as little as you can; so far as may be practicable, exclude the air; favor healing under a scab; and do not give the patient a lowering diet, but feed him as you would a woman recovering from her confinement.

According to von Gurlt, Wuertz attached relatively small importance to healing by first intention, and only in rare cases did he make special efforts to secure this result. On the other hand, he availed himself of every opportunity to enter his protest against some of the bad tendencies which had somewhat suddenly made their appearance in the practice of surgery in his day, and more especially "against the almost universal employment of caustics and the red-hot iron for arresting bleeding; against the uncalled-for and positively harmful habit of repeatedly probing a wound; against the unreasonable practice of inserting tents into wounds; against the uncontrolled application of

mushy poultices to wounds; and against the excessive employment of bloodletting in the treatment of wounds." He exhibited his conservatism in still other ways. Thus, for example, he was very slow in reaching a decision to amputate a limb or to remove splinters or larger portions of loose bone from a wound, for he put greater trust in the reparative powers of Nature than did most of the surgeons of that day. Wuertz was also slower than were most of them in resorting to the operation of trephining the skull. His ideas with regard to the nature of gunshot wounds were not very clear, for he still believed that the projectile caused some burning and a certain degree of poisoning of the wound; but he condemned all unnecessary efforts at extraction, especially by means of complicated instruments. It was better, he said, to wait until the bullet or other missile manfested its presence at some easily accessible spot in the body.

The statements made above bring out some of the good features of Wuertz's treatise. This work, however, says von Gurlt, also contains not a few bad features, and among them he mentions the fact that it abounds in repetitions and in evidences of the author's superstitiousness.

Some of Wuertz's comments on the symptoms which occasionally develop in cases of injury to the head, and the suggestions which he makes as to the treatment that should be adopted, throw considerable light upon his mode of procedure in the presence of certain surgical phenomena. The following clinical lesson is based upon three hypothetical developments in a case of cranial injuries:—

(1) The patient's wound in the head, let us suppose, has to all appearances healed, when it unexpectedly becomes swollen and painful and begins to discharge again. What measures are indicated under these circumstances? The wound should at once be freely reopened, for it may confidently be assumed that such a lighting up of the local symptoms is due either to a loose splinter of bone that is trying to escape or to the presence of a small area of bone caries. If, under these circumstances, you should not establish a free opening a large abscess will surely collect in that region and will soon make for itself a new outlet.

(2) If the patient complains that he has constant pain in his head on the same side as that on which the injury was originally inflicted, that the pain is steadily increasing in severity, and that in addition he feels a sensation of pulsation in his head; and if, furthermore, you inspect closely the site of the original wound, and pass your finger cautiously over the spot, but fail to discover any appreciable external swelling, you may feel almost certain that a splinter or a spicule of bone projects from the inner table of the skull cap into the substance of the brain. Then, when the surgeon believes that the condition as just described truly represents the existing intracranial lesions, he should not hesitate to make an opening in the calvarium over the affected spot and remove the offending splinter.

(3) If the patient, after the external wound has healed, complains of a throbbing and roaring in his head, not merely in the region of the actual injury but involving the entire head, and if the symptoms tend rather to increase than to diminish, and eventually become so severe that the patient is almost beside himself with the pain, then is the surgeon justified in believing that a clot of blood is imprisoned somewhere beneath the cranium and is gradually being converted into an abscess or a condition of ulceration. And if at the same time some swelling appears in the vicinity of the eyes, or if a bloody and purulent discharge begins to flow from the nose or the ears, he may not merely entertain a belief that his diagnosis is correct, but may assert with positiveness that the lesions just named really exist. And then the proper treatment for him to adopt is [in essentials] the following: The head having first been shaved over the site of the original wound, make a crucial incision through the scalp and pericranium, turn the flaps back, apply a strong, sharp-edged chisel to the surface of the bone, and remove enough of the cranium to afford a satisfactory view of the underlying parts. [Among the effects first observed] probably pus will well up into the opening, and the patient will then experience relief; and if a spicule of bone comes into view, remove it forthwith. The plan of treatment here suggested is the only one which can be trusted to effect a cure in a case like that which is now being considered. . . . . If a boring instrument is employed for making an opening in the bone, be careful not to allow any of the chips made by the borer to enter or remain in the cranial cavity. Some surgeons teach that, if pus be not found at the first opening, a second one should be made at the distance of a finger's breadth from the first, and that the inter-

vening bone should be broken down with a strong and sharp knife so as to convert the two into a single opening. [Wuertz adds that he had never found it necessary to act in accordance with this advice.] After the pus or clot of blood has been removed, one may as a rule readily discover the true cause of the pain and other symptoms. As a final step, suitable dressings should be applied to the wound.

Another important department of practical surgery, in which Wuertz appears to have gained special distinction, is that which relates to wounds and certain diseases of the abdomen. Owing to lack of space it will not be practicable to reproduce here any histories of the cases of this nature which came under his observation, but I believe that the following brief extracts from his remarks upon the best way of treating them may in some measure answer the same purpose:—

Penetrating wounds of the abdomen are universally admitted to be very dangerous, no matter what organs (stomach, intestines, liver, gall-bladder, spleen or kidneys) be involved in the injury. In the case of a wound of the liver or spleen it is not advisable to employ sutures; instead, one may use some kind of sticking plaster for bringing the edges of the wound together. Proper regulation of the diet plays an important part in the treatment of these conditions, and so also may venesection. When an intestine is the organ wounded I adopt the plan of treatment recommended by most authorities; that is, I stitch together the opposite edges of the wound and I cleanse the surface of the bowel carefully with milk that has been well saturated with the juice of anise seeds.

In his remarks about the treatment of suppurative processes involving the thigh in the vicinity of the knee, Wuertz gives the following advice:—

Do not allow the knee to remain quiet, but stretch the surrounding parts and manipulate them as much as you can, in order that the joint may not become permanently rigid; for if you wait until the healing is completed before you resort to these measures you will often find that it is already too late.

Separate chapters are devoted to such topics as would to-day receive the designations "pyaemia," "hospital

gangrene," and "septicaemia"; and in a separate short treatise which deals with the various ailments of young children, Wuertz mentions the fact that he once suffered greatly for ten days from an attack of migraine (hemicrania) and that he experienced marked and permanent relief only after the operation of arteriotomy had been performed upon his left temporal artery. In another part of the volume he expresses himself in terms which justify the belief that he must have performed amputation of the thigh on one or more occasions. He does not, it is true, furnish any details regarding the indications that point to the necessity of resorting to this operation, nor does he state how it should be carried out; he simply makes the remark, while speaking of the employment of the red-hot cautery iron in arresting hemorrhage, that "it is useful in amputation of a limb, particularly in the thicker part of the thigh, and occasionally in other places, as in the removal of a tumor by the use of the knife." So far as I am aware, Celsus was the first among ancient writers on surgery to say anything about amputations, and what he does say on this subject consists simply of quotations from still earlier writers—from Archigenes, Leonides and Heliodorus, surgeons whose writings no longer exist except in the form of detached extracts that appear in more modern treatises. The portions of text which Celsus quotes show clearly that the surgeons whom I have just named were in the habit of making flap operations in cases of amputation above the elbow and above the knee; and Archigenes even taught the advisability of first ligating the larger supply blood-vessels before one proceeds to the amputation of a limb.

From the remarks which Wuertz makes in one or two places it is easy to see that he was often not a little annoyed by the criticisms which his professional brethren made with regard to some of his methods of procedure. Thus, for example, he boldly declares that one's experience is of much greater value than any rule that may have been laid down by the ancients.

There can be no doubt, he says, that the ancients occasionally displayed great ignorance and great want of judgment, just as

happens in our own time. . . . . How much do you suppose I care whether Galen's, or Avicenna's, or Guy de Chauliac's opinion does or does not agree with mine? Every such opinion—it should be remembered—was, at one time or another in their day, a new [and therefore unproved] opinion. . . . . In practical surgery much more importance attaches to the manner in which one carries out one's manipulations, and to the amount of experience which one may have acquired, than to the length of time which one devotes to windy consultations.

Fortune conferred very few favors upon Wuertz in the course of his career; the aid granted by kings and princes played no part in the moulding of his character; his greatness was entirely due to his own unaided efforts. Paré, on the other hand, was certainly one of Fortune's favorites. He, too, like Franco and Wuertz, began his professional life as a barber's apprentice, but, as he was made of a much finer clay, the ultimate product of his development was a princely surgeon, perhaps no more efficient or skilful than his two distinguished contemporaries, but unquestionably more many-sided, more lovable than either of them. On the other hand, Wuertz rendered a most valuable service to the science of surgery by his close and patient study of certain symptoms which his confrères had overlooked or incorrectly interpreted (such, for example, as pyaemia, hospital gangrene and septicaemia); and he thus established the fact that these were in reality independent diseases.

CHAPTER XXXVII

THE DEVELOPMENT OF SURGERY IN ITALY DURING THE RENAISSANCE

During the latter part of the fifteenth, all of the sixteenth and the early part of the seventeenth centuries quite a large number of Italian surgeons attained honorable distinction by the contributions which they made to the science of medicine; and even in the neighboring Latin countries of Spain and Portugal,—countries in which the force of the revival of all departments of learning had made itself felt to a much feebler degree, and in which at the same time the opposition to such revival was much more active,—several surgeons succeeded in winning creditable places for themselves in the history of their art. The names of the Italian surgeons are as follows: Giovanni da Vigo, Bartolommeo Maggi, Marianus Sanctus, Fallopius, Carcano Leone, Fabricius ab Acquapendente, Aranzi and Tagliacozzi. I will now add brief notices of the careers of all these men, in order to convey at least some idea of the grounds upon which their claim to honorable distinction rests.

Giovanni da Vigo—perhaps more frequently referred to in literature by the French form of his name, "Jean de Vigo"—was born at Rapallo, near Genoa, Italy, about the year 1460. He was the son of Bernardo di Rapallo, who was also a surgeon; and he himself was the founder of a school which sent out quite a number of practical surgeons. In 1485 he began the practice of his profession at Saluzzo, a small town about forty miles south of Turin; and ten years later he settled at Savona, which is located on the Mediterranean, a short distance to the west of Genoa. In 1503 he was chosen the personal physician of Cardinal

Giuliano della Rovere, who resided at Savona, and he continued to hold this position after the cardinal was elected to the papal office under the name of Julius the Second.

Da Vigo's great treatise on surgery ("*Practica in arte chirurgica copiosa continens novem libros,*" Rome, 1514) owed its celebrity, during the early part of the sixteenth century, chiefly to the fact that he was the first author to write somewhat thoroughly upon syphilis and upon gunshot wounds—two surgical disorders of great importance at that time. As to gunshot wounds, da Vigo was one of the first to maintain that they were poisoned wounds; and for a long time afterward this was the generally accepted opinion. Like all his contemporaries, da Vigo was not willing to undertake such operations as those for the cure of stone in the bladder, for the relief of cataract, and for the cure of hernia. He left these, says Haeser, to the itinerant surgeons. But he gained well-merited credit by his employment of ligatures for the arrest of bleeding in a variety of conditions—not, however, in amputations, as he appears to have avoided cutting operations. According to the same authority, the circular pattern of trephine (the kind which the surgeons of the present day prefer) was first introduced by da Vigo. The following passage copied from his "*Practica*" shows that he was familiar with the use of the ear speculum: ". . . . . *si ad solem speculo instrumento aure ampliata.*" Da Vigo died soon after 1517.

Bartolommeo Maggi, who was born at Bologna either in 1477 (Haeser) or in 1516 (von Gurlt), held the Chair of Anatomy and Surgery in the medical school of his native city, and then at a later date accepted the position of private physician to Pope Julius the Third (1550-1555). He held this position, however, only for a short time, as he found that the climate of Rome did not agree with him. His posthumous fame rests largely on the treatise which he wrote on gunshot wounds and which was published by his brother a short time after the former's death. His treatise, says von Gurlt, is one of the best of those which

were published on this subject during the sixteenth century. Henry the Second, King of France, expressed his gratitude to Maggi for the care which he took of the wounded French soldiers who fell into the hands of the papal troops at the sieges of Parma and Mirandola. Maggi maintained firmly the belief that gunshot wounds are either poisoned or burned. His death occurred in 1552. The title of his treatise on gunshot wounds is: "*De vulnerum bombardarum etc.*," Bologna, 1552.

Marianus Sanctus of Barletta near Naples (born in 1489, died at some unknown date after 1550) is credited with having been the first to publish a description of the so-called "*apparatus magnus*"—the name given in those early days to the method of extracting a calculus from the urinary bladder through an incision in the perineum after a grooved sound or director had first been passed into this organ by way of the urethra. The title of the book in which this description is given is the following: "*De lapide renum liber et de lapide ex vesica per incisionem extrahendo*," Venice, 1535. Marianus, however, does not claim to have been the inventor of this method. Some writers give the credit for this to Jean da Vigo's father, Bernardo di Rapallo, who communicated a knowledge of the method to Giovanni de Romanis, who in turn instructed Marianus Sanctus. It is believed, furthermore, by some writers that Giovanni de Romanis was the inventor of lithontripsy[1]—the operation of crushing a stone in the bladder or urethra. Laurent Colot, the famous French lithotomist of the eighteenth century, obtained his knowledge from a certain Octavianus de Villa, a friend of Marianus Sanctus, and then kept the matter secret for many years.

Fallopius, the famous anatomist of the early part of the sixteenth century, does not appear to have attained equal distinction in the field of surgery. So far as one may judge from the portions of the text selected from his writings by von Gurlt, Fallopius was a very conservative if not a very timid surgeon, in this respect being not unlike Fab-

[1] The modern operation known as litholapaxy.

ricius ab Acquapendente. In the text to which reference has just been made, I find a brief mention of a case which passed under Fallopius' observation and which, perhaps, is of sufficient interest to be recorded here. The patient's—a German student's—finger had been nearly severed by some cutting instrument, and the greater part of the member remained attached to the hand only by a narrow strip of flesh. "I stitched together the separated edges, and at the end of three or four days I was astonished to find that firm union between the separated parts had already taken place. This result seemed to me like something miraculous."

Carcano Leone was born at Milan in 1536, his parents being people of good social standing. After receiving a thorough classical education, he began his medical studies in his native city, under the guidance of Pietro Martire, a pupil of Vesalius. He next continued his studies at the University of Pavia, but eventually went to Padua, where he enrolled himself among the pupils of Fallopius. After a residence of two years in that city, he returned to Milan and opened a medical school of his own. Upon the occasion of the death of the Cardinal and Archbishop Carlo Borromeo, whose remains now rest in the cathedral of Milan, it was Carcano Leone who was invited to make the postmortem examination. He carried on the practice of his profession during a period of about twenty-eight years, his death occurring—so far as may now be learned—in 1606.

Carcano Leone's reputation as a surgeon rests mainly on the treatise which he wrote on the wounds of the head, and which was published at Milan in 1583. From among the numerous cases of this character which came under his observation, and of which a certain number are reported by von Gurlt, I have selected the very brief histories of three that seem to me well adapted to serve as examples of Leone's knowledge of surgery and also of his ability to cope with problems of so serious a character. They reveal the fact that he was a surgeon of excellent judgment, most persevering, and very resourceful. Briefly told, the

accounts of the three cases to which I have referred read as follows:—

Case I.—A small boy was hit on the right temple by a stone that had been thrown by one of his companions. Unconsciousness resulted and lasted for six days. On the seventh day signs of returning consciousness manifested themselves, but inability to speak persisted. By the end of another week the boy had already made some efforts to speak, but his speech was incomprehensible. After the twentieth day it was possible to understand a little of what the boy was trying to say; and from this time onward steady improvement in this respect was recognizable from day to day; but the boy's speech did not become quite normal until after the lapse of about a year.

When Carcano Leone was called to see the patient he found that the entire temporal muscle had been crushed and that almost the entire right side of the head was occupied by a fluctuating swelling. By making a free incision in the swelling Leone gave exit to a large quantity of black coagulated blood. On the following day, when he made an examination with the probe, he found that the entire squamous portion of the temporal bone was in a fractured state, one part of it overriding the rest. By the aid of elevators he succeeded in lifting up the depressed part of the bone, but the accomplishment of this result left a large gap between the opposite edges of the fragments, and through this opening one could see the movements of the dura mater. Complete healing took place only after the lapse of twelve months.

When Leone reported the case to his former teacher, Fallopius, the latter replied that he would not have had the courage to adopt the course which his former pupil had pursued.

Case II.—In another case the patient, a full-grown man, was struck on the right temple by a highwayman with a heavy cane which broke in two in the middle under the great force which the assailant had employed. He was left lying on the roadside in a state of unconsciousness until some passers-by discovered him and carried him to his home. He remained unconscious for several days. Before the physician was summoned all sorts of measures had been resorted to for the purpose of dissipating the swelling in the temporal region, but without success. Leone, on arriving upon the scene, made a free incision which afforded escape to a large quantity of decomposing blood that appeared to be collected, not between the muscle and the skin, but between the muscle and

the bone. The latter was found to be fractured transversely and depressed; and, in order to lift it back to its proper level, it became necessary first to incise the muscle transversely. At the end of three months the wound had completely healed and the patient had regained his health.

Speaking of the cases just narrated and of others of a similar nature, Leone remarks that he has never had any experience that would justify the fear expressed by Hippocrates that convulsions are likely to result from dividing the temporal muscle.

With reference to the value of trephining the skull in cases of injury to the head, Leone narrates the following experience:—

Case III.—A man was struck by a heavy stone on the upper part of the forehead close to where the hair grows, and was thrown to the ground by the force of the blow. Here he lay as if dead. When Leone was called, a short time afterward, to see the patient he found the skin unbroken except at one small spot, and from this point he made an incision of such length that he was thereby enabled to explore the surface of the skull. In this way he discovered that there was a fracture which appeared to extend through the entire thickness of the skull. He then, without further delay, trephined the cranium over the line of the fracture. This was followed by such a copious flow of blood that Leone was obliged to adopt measures for arresting any further hemorrhage. During the following fourteen days (the summer season then being at its height) large quantities of decomposed and evil-smelling blood escaped from the wound; but the dura mater gradually assumed a more natural appearance, many splinters of bone were ejected, and finally—at the end of forty days—the wound healed. (As no further details are given in the text, it is fair to assume that there were no sequelae of an unfavorable nature.)

The whole subject of injuries to the skull is treated in a most thorough manner by Leone, and the book is pronounced by Scarpa (1752-1832), the famous anatomist, the best that, up to his time, had been written on the subject. The three histories of cases which I have here reproduced and which furnish such striking proof of what surgery may accomplish when practiced by a man of good courage

as well as of good judgment, certainly justify the favorable opinion expressed by Scarpa upon Leone's work.

Fabricius ab Acquapendente, of whom I have already given some account on a previous page, was distinguished not only as an anatomist and as a physiologist, but also—which was true of his instructor, Fallopius—as a surgeon. From his published writings, however, it appears very clearly that, like Fallopius, he had a decided aversion to the use of the knife; his activities as a surgeon being restricted largely to the improvement of certain of the more bloodless operations (for example, tracheotomy and thoracentesis and operations for the relief of stricture of the urethra). He also invented several new surgical instruments and devised a number of machines for use in orthopaedic practice. He attached great value to the teachings of Celsus and Paulus Aegineta, his writings containing frequent and copious references to these authorities and relatively few data based upon his own experience. In the section which he devotes to the subject of wounds of the abdomen, Fabricius confirms the opinion very generally held by the ancients, viz., that a wound of the small intestine is invariably fatal.

Gaspare Tagliacozzi was born at Bologna in 1546. He studied medicine under Girolamo Cardano, Professor of Medicine, first at Pavia and afterward at Bologna, and received his degree ("Doctor of Philosophy and Medicine") in 1570. Very soon afterward he began teaching surgery, and a little later he also taught anatomy and the theoretical part of medicine. In this work he was so successful that in 1576 he was made a member of the Faculty. He died on November 7, 1599, at the age of fifty-three.

The Italian method of performing plastic operations, says von Gurlt, had already flourished for about one hundred and fifty years before Tagliacozzi took up the subject in serious earnest and attained results of decided scientific value. There are some doubts, however, as to the precise degree of credit that should be awarded Tagliacozzi for his share in the development of the operation which

bears his name. The facts which throw some light upon this question may be stated in the following paragraphs:—

(1.) Tagliacozzi's Latin is not easy to understand, and he certainly does not furnish satisfactory information as to the manner in which he learned the details of the operation which we are here considering Vesalius, Paré and other surgical authors of that period throw no light upon that question and furnish erroneous descriptions of the steps of the operation. Apparently they had never witnessed one of that character (Von Gurlt.)

(2 The records seem to warrant the statement that, about the middle of the fifteenth century a surgeon by the name of Branca, who lived in the city of Catania on the southeast coast of Sicily, devoted himself largely to the reconstruction of damaged or defective noses. At first he transplanted a flap from the forehead or cheek; but afterward his son sought to improve the method by utilizing a flap of skin taken from the arm. By this plan the disfiguring of the patient's face was avoided The son employed the same method in repairing the lips and the ears Pupils of the latter carried a knowledge of the method to the Bojano (Vianea or Vieneo) family in Tropea, Calabria, and from them it was transmitted, about the middle of the sixteenth century, to Tagliacozzi and eventually to the medical profession in every part of the world.

(3) In 1591 there was published at Cracow, Galicia (formerly Poland , a book which bore the title "Przymiot" and which gave a most complete account of the disease syphilis in all its manifestations and complications. This book, in its original form, is to day one of the greatest bibliographical rarities; but a reprint of the work was published in 1881 by the Warsaw Surgical Society. In this volume Wojciech Oczko, the personal physician and secretary of the Polish kings Stephan Bathory and Sigismund the Third, discusses other surgical topics beside syphilis. He states, for example, that Aranzio (or Arantius), who was Professor of Surgery at Bologna at the time (1569 when he frequented that medical school, was successful in making a new nose by transplanting a flap of skin from the patient's arm; and that he performed this operation without injuring the muscles of the arm, and also with perfect success as regards the creation of a straight and shapely nose. "This statement," says von Gurlt, "coming as it does from an eye witness who was at Bologna several years before Tagliacozzi's time, furnishes satisfactory proof that rhinoplasty was successfully performed in that city several years before the

FIG. 21. THE MANNER IN WHICH THE SO-CALLED TAGLIACOTIAN OPERATION FOR REPAIRING A DEFECTIVE NOSE SHOULD BE CARRIED OUT.

(From the treatise published by Tagliacozzi, Venice, 1597.)

date of publication (1586) of Tagliacozzi's earliest comments on the subject, and that the credit for first bringing the operation to the knowledge of European surgeons is due to Aranzio rather than to Tagliacozzi." The latter's famous treatise on rhinoplasty ("*De chirurgia curtorum per insitionem*") was published at Venice in 1597.

(4.) Fabricius of Hilden, the distinguished German surgeon of the sixteenth century, assures us that his teacher, Jean Griffon, at that time the leading surgeon of Lausanne (but, at an earlier period, of Geneva), performed the same operation in 1592. The patient was a young Genevese woman whose nose had been cut off by some soldiers belonging to the army of the Duke of Savoy who were enraged at the resistance which she offered to their familiarities; and the operation proved most successful, "the new nose eliciting the admiration of all who saw it." Fabricius adds that during the winter seasons, up to the year 1613, the tip of this nose presented a somewhat purplish hue. The woman married in 1603.

(5.) During the short lifetime of Tagliacozzi several tablets, on which laudatory inscriptions were engraved, were erected in the high school (*archiginasio*) of Bologna, and after his death a bust that represented him holding a nose in his hand was erected in the same building. Corradi, the medical historian (1833-1892), writes that in his time both bust and tablets had disappeared. Tagliacozzi's remains were temporarily lodged in the cloisters of the church of San Giovanni Battista, and the report was circulated that, a few weeks after his death, a voice was heard saying that he was among the damned. Thereupon the remains were removed to the walls of the city, and the Tagliacotian method was soon forgotten, to be revived only after the lapse of many years.

All the data which I have reproduced in the preceding paragraphs seem to point to the conclusion suggested by von Gurlt, viz., that Tagliacozzi was willing to accept for himself a credit which belonged in reality to another, and that there would be more justice in calling the famous rhinoplastic method of procedure "the Arantian operation" than the Tagliacotian; especially as our knowledge of the method adopted by the younger Branca is entirely too vague to justify us in bestowing this honor upon him.

Giulio Cesare Aranzio (or Arantius) was born at Bologna about the year 1530. He studied medicine first in his native

city, under the guidance of his uncle, Bartolommeo Maggi, and then afterward went to Padua, where he may possibly have been one of Vesalius' pupils. In 1548 he made, at Padua, his first anatomical discovery—that of the *musculus levator palpebrae superioris*. Before he was twenty-seven years old he was chosen Professor of Medicine, Surgery and Anatomy in the University of Bologna, and he filled the position with distinction up to the time of his death on April 7, 1589—*i.e.*, during a period of thirty-three years.

The part taken by Aranzio in the advancement of surgery was apparently of small importance. He succeeded, it is true (see remarks on page 479), in reviving the interest of contemporary surgeons in the possibility of restoring damaged parts of the human face by means of flaps taken from the patient's arm. But I have not been able to discover that he made any other material contributions to this department of the science of medicine. It is possible, however, that his plan of illuminating the interior of the nose and of operating upon nasal polypi may possess some measure of originality; but I do not feel competent to decide this question. As regards the procedure just referred to, it may be stated briefly that Aranzio was in the habit, when operating within the nasal cavity, of using by preference, for illuminating purposes, the direct rays of the sun, which were allowed to enter the room through a slit or hole in the wooden window blind; and, when sunlight was not available, he used as a source of light the rays emanating from a lighted wax candle. In the latter case he increased the brilliancy of the illumination by interposing between the flame of the candle and the illuminated field, a glass globe filled with water,—an idea which probably originated with the goldsmiths or the shoemakers. The employment of light reflected from a concave mirror supplanted this method somewhere about the year 1866.

In Italy, during the sixteenth century, there were several surgeons—uneducated empirics—who contributed not a little to our knowledge of the radical cure of hernia; and of this number the members of the Norsa family (from Norsa, a small town in the district of Naples) were

undoubtedly the best known and most experienced operators. Horazio Norsa, for example, is reputed to have performed the radical operation (in combination with castration) no less than two hundred times. It was this same Horazio Norsa who, in the latter part of his career, complained to Fabricius ab Acquapendente that, since the wearing of trusses had become so common a custom as it then was, the number of operations for the cure of hernia had greatly diminished.

CHAPTER XXXVIII

THE DEVELOPMENT OF SURGERY IN SPAIN AND PORTUGAL DURING THE RENAISSANCE

According to the authority of Morejon, who published (1842-1852) an elaborate history of medicine in Spain and Portugal, these countries almost rivaled Italy, during the sixteenth century, in the number and excellence of their physicians. But, so far as I am able to judge from the record, very few of these men appear to have taken a strong interest in surgery, and of these few there are only three—Daza Chacon, Francisco Arceo and Amatus Lusitanus—who left behind them treatises which seem to call for a brief notice.

Dionisio Daza Chacon, who was born in 1503 at Valladolid, about one hundred miles north of Madrid, received his early training partly in his native city and partly at the University of Salamanca. After being engaged for some time in private practice he joined the imperial army (Charles the Fifth) in the capacity of a field surgeon in charge of a corps of three thousand men. In addition to these troops there were six thousand English archers, in the pay of the Emperor. At the two sieges in which these men participated—the siege of Landrecy in 1543 and that of Saint Dizier in 1544—Daza Chacon acquired an extensive experience in the treatment of both arrow and gunshot wounds, for the number of those injured on those occasions was very great. In 1545, after he had been chosen personal physician of Charles the Fifth, he returned home by way of Madrid, and distinguished himself greatly in 1547 by his self-sacrificing attendance upon the victims of the Plague in his native city. In 1557 he offered himself as a candidate for the position of Surgeon-in-Chief of the hospital at Valla-

dolid, and, after passing with great credit the competitive examination, he was given the appointment. During the following six years he served that institution with conspicuous ability, and then accepted the position of private physician to Prince Don Carlos, the son of Philip the Second, King of Spain. Four years later he entered the service of Don Juan of Austria (the natural brother of Philip the Second), and accompanied this prince on his sea voyages to various parts of the Mediterranean; being with him, for example, on the occasion of the bloody sea fight in the Gulf of Lepanto in 1571. On reaching the age of seventy, Daza Chacon retired from active practice and devoted himself to the writing of his great work on surgery—"*Practica y teorica de cirujia, en Romance y en Latin,*" Valladolid, 1600; and several later editions. The date of Chacon's death is not known, but it certainly occurred before the publication of his book.

Von Gurlt says that Chacon's treatise is distinguished by the systematic and clear manner in which the author treats the subjects with which he deals, and it shows him to be well versed in the teachings of other writers on surgery, that he is ready at all times to give them full credit for any contributions which they may have made to this branch of medicine, and that he is remarkably free from the superstitiousness which was so prevalent in his day. Of all the treatises on surgery which have been written by Spaniards, either during the sixteenth century or at a more recent date, this work, says von Gurlt, is unquestionably the best.

The edition of the treatise published at Madrid in 1626 contains 922 pages—a large work. Among the reports of cases published in Part II., there are several which possess features of considerable interest, but I shall be able to reproduce only one of them here:—

The young prince, Don Carlos, aged seventeen, while residing temporarily at Alcalá de Henares, plunged head foremost, in the dark, down a steep staircase and struck his head against a closed door. When the lad was picked up it was found that, at the back of his head, there was an open wound about the size of a man's thumbnail, that the surrounding scalp showed evidences of being

bruised, and that the pericranium in this region had been laid bare. During the first three days following the accident the patient manifested only a moderate degree of fever, but on the fourth day the fever became more pronounced. The wound, which by this time was discharging actively, presented at first a healthy appearance, but it soon acquired an unhealthy aspect, and the patient began to complain of numbness in the right leg. Vesalius, the private physician of Charles the Fifth, the boy's grandfather, was one of the many physicians who were called in to consult about the treatment of this case; he was sent for on the eleventh day following the accident. On the seventeenth day the wound was enlarged and the bone carefully examined, but no evidence of a fracture or a fissure was discovered. On the following day erysipelas manifested itself on the head and neck and extended downward until it had involved both arms. At the same time the fever increased very markedly, and for five days the patient was delirious. As by this time there was ample reason for suspecting that some intracranial injury had occurred, it was decided to trephine the skull. The operation was performed on the twenty-first day, but nothing of importance was discovered. The patient's life was now evidently in great peril, and an unfavorable prognosis was pronounced. Four days later, however, complete consciousness returned. On the twenty-ninth day a quantity of pus was evacuated from the very much swollen eyelids; and, three days later still, the patient was found to be quite free from fever. On the forty-sixth day he left his bed for the first time, and at the end of ninety-three days the wound was found to have firmly cicatrized.

[Some interesting details concerning the subsequent life of Don Carlos will be found in Motley's "Rise of the Dutch Republic." They suggest the possibility that his attacks of violent temper may have resulted from the lesions produced by the accident narrated above.]

Francisco Arceo was born, about the year 1493, at Fregenal in the Province of Badajoz, Spain. It is not known at what university or other educational institution he received his early training in the science of medicine. It is a well-established fact, however, that at quite an early stage of his professional career he acquired great celebrity for his skill in treating both surgical and internal maladies, and that, as a consequence, patients flocked in large numbers

from all parts of Spain to consult him. Rather late in life he wrote two treatises—one on the treatment of wounds, as well as on ulcers and syphilis, and another on the management of fevers. These two works were published at Antwerp, in the year 1574, as a single volume, the author being at that time, despite his advanced age (eighty), still in vigorous health and able to practice with skill both branches of the science of medicine. In 1658 a second edition of Arceo's two treatises was published at Amsterdam; and even at an earlier date there were published an English translation (1588) and a German version (1614). A perusal of the chapter which he devotes to the treatment of clubfoot gives the impression that Arceo was an excellent surgeon—eminently practical in his choice of means for securing certain results, and thoroughly familiar with the extent to which he might depend upon the powers of Nature to aid his efforts. The date of his death is not known.

Amatus Lusitanus is the name by which the Portuguese medical writer, Juan Rodriguez de Castel Bianco, is commonly known. He was born in the Province of Beira, Portugal, in 1511, of Jewish parents, and studied medicine at the University of Salamanca. After doing duty as a surgeon in two of the hospitals of that city, he took up his residence, for short periods of time, first in Antwerp and then in Ragusa, Dalmatia, on the eastern coast of the Adriatic. At this period of our history the Inquisition was extremely active throughout the domains that were under the rule of Charles the Fifth, and as a result Amatus soon found himself obliged to abandon all his books, instruments, etc., and flee for his life to Northern Greece. As the Turks, who were in possession of that country, were perfectly indifferent with regard to the religious beliefs of the Jews, Amatus was allowed to settle down quietly for the rest of his life at Thessalonica, in Macedonia.

During the later years of his career he published several books on topics relating to the science of medicine—two of them on materia medica and two on the cases of special interest which had come under his personal observation

during the course of his practice. The latter work, which is entitled "*Curationum medicinalium centuriae* VII.,"[1] was printed in its entirety in Venice, in 1556 (2 vols.). Von Gurlt speaks of Amatus as a cultivated scholar and an excellent observer. Of the seven hundred cases reported in this work only a very few are of interest to the surgeon. Von Gurlt calls attention to the fact that, during the earlier years of his practice, Amatus devoted a fair share of his attention to surgery, but that subsequently he performed no operations whatever; it being his rule to intrust this work entirely to a regular surgeon or to a specialist.

In my search among the dozen or more histories of cases selected by von Gurlt from the seven "Centuries" (700) of the complete treatise as suitably illustrating Amatus' manner of reporting the cases which he had seen in practice, the various methods of treatment which he adopted in his efforts to relieve the diseases or injuries that came under his observation, and the demeanor of the man in the presence of the ever-changing problems presented to the physician, I have succeeded in finding only four that seem to furnish in even a slight degree the information which I have just outlined. Unsatisfactory as these four reports are in certain respects,—especially in their failure to reveal to us the more strictly surgical capabilities of Amatus,—they at least show that he was an able and conscientious practitioner, and to this extent they possess value.

The first case reported in Century I. is that of a peasant girl, aged thirteen, who, while walking barefooted in a field was bitten by a viper. Amatus did not see the patient until three hours later, but already at this early stage he observed many blue and red patches, scattered over the leg and thigh of the side on which the bite had been inflicted. Near the base of the foot there were two quite black spots corresponding to the bites of the reptile; and from the fact that there were only two such spots Amatus inferred that the snake must have been a male viper, which has only two poison fangs and is therefore less dangerous than the female which has four. The symptoms which the girl experienced were faintness, trembling and dizziness. As regards the treatment adopted,

[1] The word "*centuria*" is employed here in the sense of "a group of one hundred."

the skin in the immediate neighborhood of the bites was scarified and suction by the means of cupping glasses was employed; afterward a plaster, which was composed in part of theriaca, was applied to this region. The patient made a complete recovery.

In Century V., Amatus gives an account of a fatal case of ear disease. The patient, a sickly-looking boy of eight who had been affected for a long time with a discharge from one ear, presented a non-sensitive lump on the side of the head. "As he began to show signs of feverishness it was decided to incise the lump; and when the incision had been made, it was found that a large part of the skull in this region had been destroyed by caries, as a result of which there was left a cavity in the side of the head, and this cavity was filled with a foul-smelling pus, débris, and granulation tissue that apparently rested on the dura mater. Three days later the surgeon[2] succeeded in removing from the cavity only a small quantity of the sanious material. On the fourth day, after an attack of convulsions, the patient died."

In Century VII. there is given an account of a man of the wealthy class who had been exposed to an excessive degree of cold for so long a time that he was literally almost half frozen. "As he was being carried into the village he gave orders that an ox should be slaughtered and that he himself should be snugly stowed away inside the carcass of the animal as soon as its interior furnishings had been removed. Thus he escaped freezing to death."

In the same century Amatus speaks of having seen a rather interesting case of *Filaria Medinensis* (called by the Arabs "*vena medena*") in a negro boy, eighteen years old, who had come to Thessalonica from Memphis, Egypt. "The worm had caused the production of an ulcer close to the boy's heel, and in this the creature's head, which looked very much like a vein, was recognizable. After the Turks had correctly diagnosed the nature of the trouble an Arabian physician, who had managed to secure a purchase on the worm, began rolling it up on a small stick. Gradually, after the lapse of several days, he succeeded in uncoiling the animal in its entire length (three cubits), as shown by the construction of the end of the tail, and thus permanently freed the boy from his trouble. The ancient authors express doubts as to the true nature of the object found in these ulcers, but I, Amatus, having examined the slender white creature and having witnessed its curved outlines as it projected itself outside the opening, do vouch for the fact that it possesses all the characteristics of a true worm."

[2] Not Amatus, but a specialist. See remark near the top of page 488.

CHAPTER XXXIX

THE DEVELOPMENT OF SURGERY IN FRANCE DURING THE RENAISSANCE.—PIERRE FRANCO

Von Gurlt speaks of Pierre Franco as "one of the most skilful surgeons and at the same time one of the most original medical writers of the sixteenth century." He and his contemporary, Ambroise Paré, were of French birth, and to France therefore belongs the conspicuous distinction of having contributed to medical science during the Renaissance two of its most illuminating and efficient laborers. These men, who were the leading operative surgeons in France during the first half of the sixteenth century, did not owe their education as physicians to the official training provided by the Medical Faculty, but partly to the men who were classed as barbers and surgeons, or barber-surgeons (*Collège de St. Côme*), and still more to their own efforts. They gathered practical knowledge wherever they might—largely from their official connection with armies during the progress of different wars. Further details with regard to their personal characters and the principal events of their professional careers will be furnished in the following brief sketches.

Pierre Franco.—Pierre Franco was born in the village of Turriers, in Provence (now the Department of Basses-Alpes), about the year 1500. He received his instruction in surgery from itinerant lithotomists, operators for cataract, hernia-healers and men of that class; and it is quite likely that, in the early days of his professional career in Provence, he was himself a practitioner of this humble type. At a somewhat later date he left the southern part of France and took up his residence in Switzerland, first at Berne and then at Lausanne. He probably left Provence

because, in the early part of the sixteenth century, the Protestants of that region were being subjected to every form of persecution; and it is almost certain that Franco belonged then to the Reformed Church, for he accepted the salaried office of City Surgeon at Berne, the authorities of which city were bitterly opposed to everybody and everything connected with the Roman Catholic Church. Franco held the office named during a period of ten years, the first part of the time at Berne, and afterward at Lausanne, which latter city was then under the control of the Bernese Government. He was a very close observer, a most enthusiastic student of his art, and a man of intensely religious nature. Malgaigne, the distinguished editor of the modern edition of Paré's writings, speaks thus of Franco: "I have no intention of writing here the history of this man who was endowed with such a fine surgical genius; I may say, however, that his was a life devoted entirely to the advancement of surgery as a science."

As an operative surgeon, says Edouard Nicaise, Franco ranked higher than any of his contemporaries. Strange as it may appear, Ambroise Paré frequently refused to take charge of cases in which an operation for stone in the bladder, for hernia, or for cataract was required, whereas Franco owed much of his reputation to the success which he had in operating upon these three classes of cases. The latter, furthermore, did most of his work on patients who belonged to the middle class, and consequently his operations were characterized by very little of the *éclat* which marked a large part of the work done by Paré, who from the very beginning was befriended by Royalty and the Court circle. At the same time, says Nicaise, Franco did more than any other man of that period to enrich surgery with new discoveries.

Franco has written only two treatises. The first one, which was published in Lyons, France, in 1556, bears the title: "A Small Treatise on the Operative Treatment of Hernia"—one of the most important departments of surgery (a book of 144 pages, 8vo). The second work, which was issued in 1561, also at Lyons but by a different pub-

lisher, bears the title: "*Traité des hernies contenant une ample déclaration de toutes leurs espèces, etc.*" (a book of 554 pages, 8vo). This work goes very thoroughly into the subject of hernia in all its bearings, and also deals with several other important surgical topics, such as genito-urinary diseases (in both the male and the female), affections of the eyes, hare-lip, tumors, wounds in general, dislocations, fractures, amputations, etc.; in short, it is a fairly complete and decidedly original treatise on general surgery. When Franco wrote the smaller work (that of 1556), he was settled at Lausanne; but in 1561 he was living in Orange, which at that time was the capital of a Principality that belonged to the House of Nassau.[1] A few brief citations from the larger of the two treatises will suffice to give our readers some idea of the manner in which Franco deals with the subject-matter of the book.

Franco, says von Gurlt, was one of the first surgeons—perhaps the very first—to perform the operation required for the relief of strangulated hernia and at the same time to furnish a description of the manner in which it should be performed. After mentioning the fact that the strangulation of a portion of the intestine is attended with considerable danger to the patient's life, Franco proceeds to consider the subject in greater detail:—

Owing to the large amount of the fecal matter and gas contained within the portion of the intestine that is imprisoned in the scrotum, and also owing to the inflamed condition of the parts, it is frequently not possible to push the bowel back through the narrow aperture in the peritoneum; and this condition of things is apt to be aggravated by the constipation or by the efforts at vomiting that frequently accompany such strangulation. The vomiting, it is true, may in certain cases facilitate the desired reduction, but in others it does harm, especially by forcing more fecal matter into the scrotum. If the conditions described are permitted to continue unrelieved, death may certainly be expected to result. In a few cases the timely administration of medicine internally may overcome the difficulty, but, if this measure fail to produce the desired

[1] Orange, which is only a short distance from Avignon and Turriers, was ceded to France in 1713.

result, recourse must be had to surgery—not, however, if already the scrotum and neighboring genital parts have changed their color to a black, livid, bluish or some other unnatural hue, or if the hernial tumor manifest a round rather than an elongated shape, for all these signs are harbingers of death; and, as further unfavorable signs, should be reckoned a livid or black mucous membrane of the patient's mouth, contracted nostrils, and an appreciably sunken condition of the eyes. But if, on the other hand, the scrotum possess a natural color and if it have not a spherical form but rather an oval shape, then it is proper, after a failure to secure the desired reduction by the internal use of medicine, to resort to a surgical operation.

For the proper performance of this operation the surgeon should be provided with a nicely rounded metal staff, flat on one side, and a little larger than a goose's quill. [Paré's grooved sound or director, says von Gurlt, had not yet at that time been invented, and this staff was intended to serve, in a crude fashion, the same purpose.] The first step is to make an incision in the upper part of the scrotum, the direction in which it is to be carried being toward the symphysis pubis. When the hernial sac is reached the staff is introduced into the slit and pushed upward between the wall of the sac and the fleshy part of the penis, the flat side of the instrument being kept uppermost, as it is upon this surface that the cutting with the scalpel or the razor is to be done. After the end of the staff has been pushed well upward the flesh of the scrotum is to be divided upon the flat surface of this instrument; all danger of injuring the intestine being thus avoided. Then the attempt should cautiously be made to reduce or replace the intestinal folds. But if these efforts fail,—owing to the excessive distension of the bowel or because the constricting band has not yet been sufficiently relaxed,—then the following steps should be taken:—Grasp the spermatic cord ("*didymis*"), lift up its enveloping membranes one by one with hooks, and divide each one of them completely upon one's finger nail, up to the point where the intestine is encountered. Then, having established, between the intestinal wall and the membranous coverings of the cord, an aperture large enough to admit the end of the metal staff, push the instrument onward and upward while at the same time it is held as it were balanced in the air, so that early warning may be communicated to the holding fingers in case the instrument, as it travels onward, should become caught in the folds of the intestine—an accident, however, which the slippery nature of the outer sur-

face of the intestine renders improbable, but which nevertheless may occur if at any point there happen to be a break in the continuity of the tissues. As the next step in the operation the cord should be completely divided high up (the incision being made upon the staff) close to the opening in the peritoneum through which the folds of the intestine forced their way, in the first instance, into the scrotum; but the surgeon must, without fear of doing harm, and remembering that he is dealing with conditions of a desperate nature, see to it that the opening made in the peritoneum is amply large. Finally, with the aid of a soft piece of linen he should return the folds of the intestine to the peritoneal cavity, etc. [The remaining portions of the description are of minor importance and may well be omitted here.]

Franco, speaking of those cases in which a portion of the omentum is found projecting into the hernial sac, lays great stress upon the importance of "not doing what many a surgeon has done in the past and what not a few are still doing in our time, viz., simply cutting off the imprisoned distal portion of this membrane and returning the remainder to the peritoneal cavity without first ligating the divided blood-vessels and then cauterizing the cut surface; the danger being that a failure to take these steps frequently leads to a fatal hemorrhage into the peritoneal cavity—an occurrence which actually happened to one of our most experienced surgeons in a case of enterepiplocele."

There were certain operative procedures in which Franco took a greater interest than in others. Thus, for example, he was particularly fond of operating for the relief of cataract, and the results which he obtained were exceptionally favorable (180 cures out of a total of 200 cases subjected to operation). Von Gurlt quotes him as saying:—

> If I had to choose between operations for the cure of cataract and abandoning all the rest of my surgical practice, I should prefer to adopt the latter course, so highly do I estimate the amount of good which I can do in this line of work, so very important does it appear to me, and so small is the amount of labor and worry which it entails.

Franco was also greatly interested in the cure of stone in the bladder, and it was while treating cases of this

character that he invented the very important surgical procedure known in France as the "Franconian operation for stone in the bladder" (hypogastric cystotomy, suprapubic lithotomy). Here is the account which he gives of the circumstances under which he was led to devise this method of removing a stone from the bladder:—

I will mention here an experience which I had on one occasion when I tried to remove a calculus from the bladder of a boy about ten years of age. The stone was about as large as a hen's egg and resisted all my efforts to extract it by way of the incision made in the perinaeum. Being in a quandary as to how I should proceed next, and the parents and friends being greatly demoralized by the suffering to which I was unavoidably subjecting their child,—they maintained, I should add, that they would rather have him die than be subjected to such awful suffering;—and being influenced also by the thought that I could not afford to have it charged against me that I was not able to extract the calculus, I deliberately decided that I would make an opening above the pubic bone, and would remove the stone in this manner. Accordingly I incised the skin above the pubes, a little to one side of the base of the penis, and carried the knife through the soft tissues down to the calculus, which I had simultaneously pushed upward by pressing the fingers of my left hand against the perinaeum, while at the same time my assistant made counter-pressure against the stone by firmly compressing the abdominal wall above the object. This method of extraction proved successful.

In due time the wounds healed firmly and the patient was relieved of his trouble, but only after a long and most serious illness.

Franco does not appear to have performed the suprapubic operation for the extraction of a cystic calculus more than once (the case just narrated), and he carefully refrains from recommending it to other physicians. Most surgical authors, says Edouard Nicaise, blame Franco very strongly for not having dared to recommend his suprapubic operation. "But I do not agree with this judgment; Franco should rather be praised for his prudence in not immediately announcing to the world his invention of an important surgical operation."[2]

[2] In the absence of a more fitting place in which to speak of the employment of urethral bougies, it seems permissible to state here that the first

The subsequent history of suprapubic lithotomy shows that Franco was laboring under an exaggerated idea of the dangers attending this operation. The comments of Pascal Baseilhac—a nephew of "Brother Cosmas" (the famous French lithotomist of the early part of the eighteenth century) and himself a skilled lithotomist—are worthy of being repeated here. He says (p. 318 of his "*Traité sur la lithotomie,*" Paris, 1804): "Franco based his unwillingness to recommend the operation of suprapubic lithotomy on the belief which was then widely prevalent, and which still persists even in our time (middle of the eighteenth century), that the making of an incision into the main body of the urinary bladder is sure to prove fatal, a belief which experience and observation have now shown to be unwarranted."

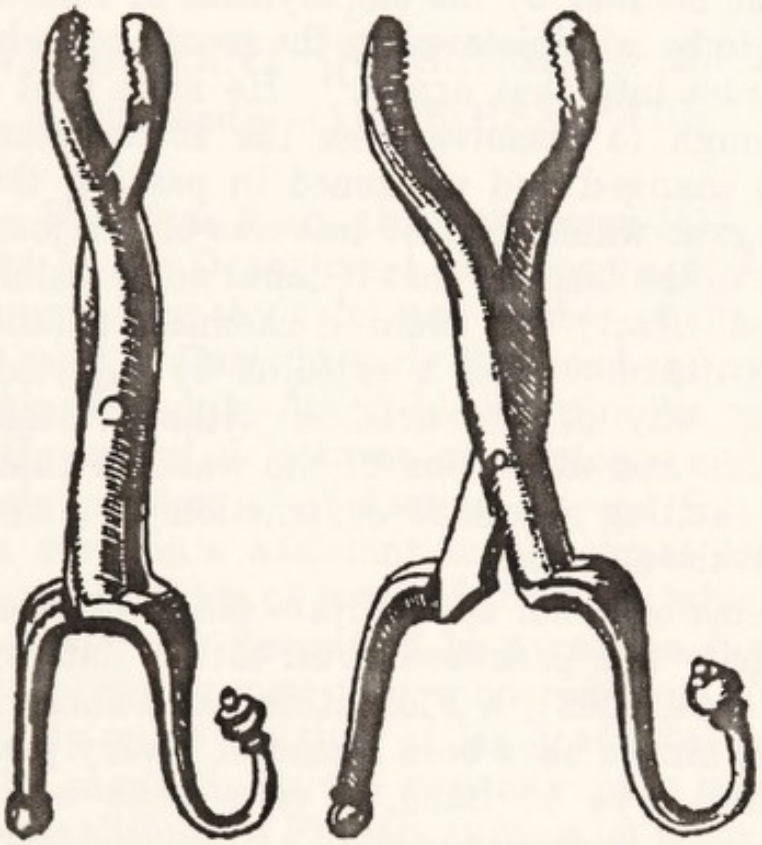
The Franconian operation, the great value of which was not sufficiently appreciated by its inventor nor by contemporary surgeons, was revived in 1719 by an Englishman, John Douglas, the distinguished surgeon of Westminster Hospital, London, and the brother of James Douglas—the anatomist who in 1730 described so minutely the relations of the peritonaeum to the bladder (Douglas' *cul-de-sac*).

In the case the history of which has just been narrated, the circumstances attending the invention of the operation known to-day as suprapubic cystotomy[3] or "suprapubic lithotomy," were certainly of such an unfavorable character as to call for the display of an unusual degree of courage, wisdom, patience and manual skill on the part of the surgeon in charge; and it was through a careful consideration of these facts that Edouard Nicaise was led to award such high praise to Franco for the work which he had done. Scarcely less remarkable is the talent which the latter

mention (in medical literature) of these instruments occurs in Chapter XV. of the treatise of Guainerio, Professor of Medicine at the University of Pavia. This work, which was first published in 1439, bears the title: "*Practica Antonii Guainerii,*" and a later edition was issued at Venice in 1508. Speaking of a case of stone in the bladder, Guainerius says: "And if the urine does not flow from the bladder . . . . . introduce a slender flexible rod of tin or silver into the urethra."

[3] Franco calls it the "high operation" or "hypogastric lithotomy."

displayed in the invention of a forceps (Fig. 22) strong enough to crush all but the hardest calculi and yet so cleverly planned that it is practicable, while the crushing end of the instrument is lying inside the bladder, to separate the blades sufficiently far apart to render possible the



a *b*

FIG. 22. PIERRE FRANCO'S FORCEPS FOR CRUSHING CALCULI IN THE URINARY BLADDER.

(From Edouard Nicaise's *Pierre Franco*, Paris, 1895.)

a, closed; *b*, open.

grasping of the stone between the jaws of the instrument without at the same moment injuriously crushing the soft parts in the narrow channel of the wound or opening.[4]

[4] After I had written the preceding description of Franco's new method of extracting a calculus from the urinary bladder, I learned, from Haeser's account of the surgical writings of Susrutas in the Ayur-Veda (Sanscrit), that already before the Christian era (the exact date is not known) the surgeons of East India had performed this very operation. This fact, however, could not possibly have been known to Franco, who—so far as modern surgeons are concerned—should continue to be looked upon as the real inventor of suprapubic cystotomy.—AUTHOR.

In Franco's day the belief was widely prevalent that there were remedies which possessed the power of dissolving a cystic calculus. His own opinion in regard to this matter is expressed in the following words: "I am astonished that there should be many men who do not hesitate to undertake the disintegration and pulverization of a stone in the bladder by the employment of remedies which are either to be administered by the mouth or to be injected *per urethram* into that organ." He adds that a remedy strong enough to dissolve even the softer stones would become so changed and weakened in passing through the various organs which it must traverse on its journey from the mouth to the bladder that it could not possibly produce the desired effect; nor could a chemical solution strong enough to dissolve such a calculus be injected into the bladder by way of the urethra without either causing inflammation and ulceration of the walls of that organ or promptly exciting muscular contraction that would effectively expel the solution.

This seems to be an appropriate place in which to state that lithotrity was practiced at an earlier date by Antonio Beniveni (1440-1502), a Florentine physician whose writings reveal him to have been a man of a very practical and unprejudiced type of mind, a very clear writer, and a practitioner of wide experience. He also deserves credit for having been the first surgeon to revive the operation of tracheotomy, a procedure which was carried out by Antyllus fourteen centuries earlier, but which appears to have been forgotten during this long interval. He saved a patient's life by means of the operation.

The date of Franco's death is not known.

CHAPTER XL

THE DEVELOPMENT OF SURGERY IN FRANCE (Continued).—AMBROISE PARÉ

Ambroise Paré was born, about the year 1517, at Laval, a small town in the Department of Mayenne, France. His father was probably the valet and barber of the Count of Laval. He went to Paris in early manhood and spent three years, at this period, in fitting himself for the career of a surgeon. He attended lectures on anatomy and surgery, did a certain amount of dissecting, served for over two years as a surgeon's assistant in the great hospital of Hôtel-Dieu, made notes of some of the cases which he saw, and was occasionally permitted to prescribe for patients and even to perform some minor operations. From 1536 onward, nearly up to the time of his death, he was almost continuously engaged, in the capacity of a surgeon, in accompanying different French armies on their military expeditions. His professional title at first was that of "barber," but he doubtless very soon discovered that, if he wished to advance, it would be absolutely necessary for him to secure a higher title. Accordingly, in 1541, he and his friend Thierry de Héry presented themselves for, and passed successfully, the required examination and were accepted as "master-barbers." It is an interesting fact that, during his long professional career, Paré was Chief Surgeon to four Kings of France in succession—first to Henry the Second (1547-1559), next to Francis the Second (1559-1560), then to Charles the Ninth (1560-1574), and finally to Henry the Third (1574-1589). The last-named King bestowed upon him the additional honor of "Councilor to his Majesty." He also served, during a certain period of his career, as an attending surgeon at Hôtel-Dieu.

The three large volumes of Paré's writings (Malgaigne's edition) are filled with the rich experience which this great surgeon gained in the course of a large private practice and in the field expeditions and sieges conducted during the reigns of these Kings. Interspersed among the reports of cases and descriptions of operations are to be found not a few comments of a more general character and some biographic details which add greatly to the charm of the work as a whole, and which at the same time make it possible to form a general idea of Paré's traits of character. On almost every page one finds statements which reveal the fact that he weighed almost all the duties of his daily life in a profoundly religious manner. He showed himself warmly sympathetic for all those whose ailments he was called upon to treat, and he was always as ready to bestow his best services upon the Roman Catholics as upon the Huguenots—to which latter denomination (if we may so call it) he himself is commonly reported to have belonged. It seems to me more probable, however, that he was a liberal-minded Roman Catholic rather than a Protestant, for there is trustworthy evidence showing that all his ten children were baptized in that faith and that he himself, nineteen years before the night of Saint Bartholomew (August 24, 1572), held the office of "*Pathe*" in the church of the parish in which he lived. Another prominent trait of Paré's character was the modest estimate which he placed upon his own professional achievements. One of his sayings, which occurs a number of times in his writings and which has since become famous, is this:—

Je le pansay, et Dieu le guarist.
[I dressed his wound and God caused it to heal.]

Some of the other sayings attributed to his pen and printed under the heading "Surgical Canons and Rules," at the end of Book XXVI., are characterized by a homely type of wisdom which seems to have have secured for them a permanent place in French literature. I give here in the form of English translations six or seven of the more striking specimens:—

Mere knowledge without experience does not give the surgeon much self-confidence.

Small will be the influence exerted by him who chooses surgery as a career simply for what he may make out of it.

The frequent changing of physicians is not likely to bring comfort to the patient.

The facts already discovered are few in comparison with those which are yet to be brought to light. We must not allow ourselves to lie down or fall asleep under the impression that the ancients knew all or have divulged all that is worth knowing. What they have accomplished should be utilized by us as a sort of scaffolding from which a more extensive view may be obtained.

In another place Paré expresses the same sentiment in a somewhat different form, as follows:—

My professional brethren must not expect to find any new and startling facts [Paré is speaking here of his treatise on surgery], but simply here and there some little addition to our previous stock of knowledge; for the good Guy de Chauliac has taught us that we are like the child who sits astride the giant's neck; that is, we can see all that he sees and just a little more—or, in other words, we are able, through the aid afforded by the writings of our predecessors, to learn all that they have learned, and may at the same time acquire a little further knowledge through our own observations.

A remedy that has been thoroughly tested is better than one recently invented.

An injury which opens a large blood-vessel is likely to lead the victim of such a wound to the tomb.

It is always wise to hold out hope to the patient, even if the symptoms point strongly to a fatal issue.

All through his professional career, but more especially during the later years, Paré was repeatedly annoyed by the efforts which the Medical Faculty made to bring him into disrepute. These men were bitterly jealous of him on account of the great favor which he enjoyed at Court, and so they adopted every possible means to injure his reputation. When the complete collection of his writings was published in 1575, they petitioned the authorities not to allow these "works of a very impudent and ignorant man"

to be sold until they should have received the official sanction of the Faculty. One of Paré's chief offenses, as it appears, was that of not writing his treatises in Latin, and among the twenty-nine specifications of his shortcomings was that of plagiarism. (See remarks on this subject further on.)

In his efforts to extend his knowledge of the science of medicine, and in particular to learn what the ancients had written on the subject, Paré soon discovered that many obstacles stood in his way. He did not allow himself, however, to be discouraged by this fact, but set to work, without delay and in his usual resolute fashion, to remove them. He found, in the first place, that all the available treatises of the ancient medical authors were written in Latin, a language of which he possessed scarcely any knowledge. So he was obliged to hire men to translate for his own use large portions of these books. Then, at a later date, after he had begun to accumulate notes for the treatises in which he proposed to publish his own experiences and his own views about the surgical topics in which he was interested, he saw clearly that suitable pictorial illustrations would add materially to the value of the written text, and he therefore did not hesitate to spend a considerable sum of money—Malgaigne says three thousand livres—in having the needed drawings made. Paré was also in no small degree a public benefactor, for he purchased the formulae of some of the more valuable of the remedies employed by the leading charlatans, in order that he might print them and so place them within the reach of everybody.

Paré gives the following picturesque account of his first experiences as an army surgeon in actual warfare:—

In 1536, he says, I accompanied the large army sent to Turin by Francis the First, King of France, to retake certain castles and fortifications which were held at that time by the troops of the Emperor Charles the Fifth. My official position was that of surgeon to the foot soldiers; and when our men took possession of Susa, after the enemy had been defeated, I was among the first to enter the city. Our horses rode rough-shod over the dead bodies lying on the roadway, and over the bodies of many who were simply

wounded. It excited my compassion strongly to hear the cries of those who were thus subjected to great additional suffering, and I could not help wishing that I had never left Paris. Once actually in the city, I began to look around for a stable in which the horses of myself and my orderly might find shelter. The one I entered contained the corpses of four soldiers who had presumably died there, and three badly wounded men who were still alive, but whose faces were greatly disfigured by the wounds which they had received, and who—as we soon learned—were unable to see, hear or speak. An old soldier who entered the stable at that moment, and whose pity was excited by what he saw, asked me if it would be possible to save the lives of the men who were so badly injured. I replied "No." He thereupon proceeded, without the least excitement and with due gentleness, to cut the throats of all three. At the sight of this act, of what seemed to me to be great cruelty, I exclaimed, "You are a wicked man!" His reply was: "I pray God that, if it should ever be my fate to be situated as these three men were when I entered the stable, there may be somebody at hand who will do to me what I have just done to these men, and will save me from a lingering and painful death."

When the fighting was entirely over, we surgeons had much work to do. I had not yet had any personal experience with the treatment of gunshot wounds, but I had read in Giovanni da Vigo's work that such injuries should be considered poisoned wounds, by reason of their contact with gunpowder, and that the correct way of treating such wounds was to cauterize them with oil of sambucus (elder flowers) that was actually boiling and to which a little theriaca had been added. At first I hesitated somewhat about carrying out this practice, but after watching the other surgeons, in order to learn exactly how they applied the boiling oil, I plucked up my courage and did exactly what they did. My supply of oil, however, soon gave out, and I then decided to use as a substitute a healing preparation composed of yolk of egg, oil of roses, and turpentine. I slept badly that night, as I greatly feared that, when I came to examine the wounded on the following morning, I should find that those whose wounds I had failed to treat with boiling oil had died from poisoning. I arose at a very early hour, and was much surprised to discover that the wounds to which I had applied the egg and turpentine mixture were doing well; they were quite free from swelling and from all evidence of inflammatory action; and the patients themselves, who showed no signs of feverishness, said that they had experienced little or no pain and had slept quite well.

On the other hand the men to whose wounds I had applied the boiling oil said that they had experienced during the night, and were still suffering from, much pain at the seat of the injury; and I found that they were feverish and that their wounds were inflamed and swollen. After thinking the matter over carefully, I made up my mind that thenceforward I should abstain wholly from the painful practice of treating gunshot wounds with boiling oil.

In 1545, when he was about twenty eight years of age, Paré was sent as a military surgeon to Boulogne-sur-Mer, which at that moment was being besieged by the French. In 1544 the city had been captured by the army of Henry the Eighth of England, and fighting of a desultory character was in progress between the besiegers and the besieged at the time of Paré's arrival. He had not been there a long time when he was asked to see professionally Francis of Lorraine, Duke of Guise, who had been seriously wounded by a lance in a recent encounter with the enemy. The metal head of the weapon, under the impulse of a glancing blow, had penetrated the skin just above the right eye, had then traveled toward the left side and in a slightly downward direction, along the surface of the skull, and had finally come to rest at a point behind and below the left ear, near the nape of the neck. When the lance had penetrated thus far the wooden shaft broke in two, leaving the metal head in its entirety and a part of the shaft so firmly lodged in the wound that great force had to be employed before it was found possible, with the aid of strong pincers, to extract it from its bed. An examination of the injured parts then showed that there had been some fracturing of the bony structures and extensive laceration of the arteries, veins, nerves, etc., but that the left eye had apparently not been seriously damaged. The onlookers were naturally impressed with the belief that the Duke could not possibly recover from such a slashing of the face and head; and Paré himself was careful at first not to commit himself to a prognosis of too favorable a nature. However, he treated the wound with the greatest care and in the course of a few weeks had the satisfaction of seeing his patient restored to perfect health, but with a deeply scarred face.

As can readily be imagined, this experience proved a splendid triumph for Paré, and speedily brought him into great favor at Court and among the nobility throughout France.

For several years subsequent to these events, Paré continued to serve actively as a surgeon in the frequent wars which took place between the royal troops of France and the armies of other European monarchs. In 1552, when he was thirty-five years of age, his rank in the army was raised to that of "Surgeon to the King," the entire medical staff of that period consisting of twelve surgeons of this rank. In 1554 he was admitted to the *Collège de Saint Côme* in Paris, the highest professional honor to which a barber surgeon might aspire; and in 1563, after the siege of Rouen, he received the appointment of "First Surgeon to Charles the Ninth." After the latter's death, Henry the Third also appointed Paré to the same position in his Court. Thus, from almost the very beginning of his professional career to the time of his death, Paré was honored in every possible way by four successive Kings of France. It was Charles the Ninth, however, who appears to have taken a greater interest in Paré's prosperity than did either of the other three Kings. It was at Charles the Ninth's request, for example, that the brother-in law of the Duke of Ascot, the Marquis of Auret, sent for Paré to undertake the treatment of a wound which he had received from a harquebus ball seven months previously. Paré gives the following account of this interesting case which foreshadows—for example, in the changing of the patient's bed and linen and keeping him entertained during convalescence—the best modern hospital nursing:—

> On arriving at the Chateau of Auret, writes Paré, which is located not far from Mons in Belgium, I learned that the harquebus ball had entered the thigh near the knee, had done considerable damage to the soft parts, and had fractured the femur. When I was ushered into his bedchamber, I found the Marquis very much emaciated, his eyes deeply sunken in their sockets, his skin hot and of a yellowish hue, and his voice feeble like that of man very near to death. . . . . The leg was drawn up against the wall of

the abdomen, and two large bedsores were visible posteriorly—one near the root of the spine and the other somewhat higher up. Thus it was impossible for the patient to assume any posture in which he would be free from suffering. . . . . All things considered, it did not seem to me that the Marquis could possibly recover from such a combination of bodily ills. Nevertheless, to give him some encouragement,—for he was very low in spirits,—I told him that, with the aid of God and the assistance of his regular medical attendants, I would soon have him on his feet again. . . . . .

After dinner, in the presence of the Duke of Ascot, a few friends of the family, and the assembled physicians and surgeons, I expressed considerable surprise that free openings had not been made in the Marquis's wounded thigh, in which bone caries and decomposition of the resulting discharge were already well established. The medical attendants replied that the patient was unwilling to submit to any such measures, and that he had even forbidden them to substitute clean linen bedclothes for those which were soiled and which had not been changed during the previous two months. . . . . .

When the consultation had come to an end and the local medical attendants had given their full approval of the different measures which I recommended, ... I proceeded to carry them out without further delay.

Two or three hours after the completion of this operative work I instructed the house servants who were in immediate attendance upon the Marquis to place alongside his bed a second one equipped with a soft mattress, over which a fresh linen sheet, etc., had been spread. The transfer from one bed to the other was easily effected by a strong attendant, and when the change had been made the Marquis manifested great contentment. Two feather pillows were so placed under his back and loins that no pressure whatever would be made upon his bedsores. A refreshing sleep of four hours' duration followed the adoption of these different measures, and there was much rejoicing in the entire household.

After a course of treatment lasting several weeks, Paré says:—

Under this treatment the fever steadily diminished, the pain grew less and less, and the patient's strength increased. When the proper moment arrived, I advised the Marquis to engage the services of some musicians (players on stringed instruments) and one or two comedians, in order that his spirits might be cheered by occasional entertainments of this character. Already at the end of one month

we found it practicable to carry him in a chair into the garden and as far as the entrance gate, where he could watch the passers-by. When it became known among the peasants that he was in the habit of sitting close to the highway, they came from far and near to sing and dance in groups for his entertainment. He was greatly loved by both the common people and the nobility.

At the end of six weeks the Marquis was able to get about on crutches, and two weeks later still I bade him good bye and returned to Paris. Before I left he presented me with a gift of great value, and the Duchess of Ascot insisted on my accepting a beautiful diamond ring as a mark of her appreciation of the services which I had rendered her brother.

Among the varied experiences which fell to the lot of Paré during his association with Charles the Ninth, there is one which throws a little additional light upon the man's manner of promptly dealing with an event which, without such promptness of action, might have led to serious consequences.

He was passing through Montpellier one day in company with the King, when he stopped for a few minutes at the shop of an apothecary for the purpose of ascertaining how he preserved alive the vipers which he used in compounding the remedy which is called "theriaca," and which has been used from time immemorial as an antidote to the poison of venomous serpents. The apothecary placed before him a glass jar in which were kept a number of these reptiles; and, when Paré took one of them up in his fingers in order to obtain a better view of his fangs, the reptile bit him near the tip of his index finger, between the nail and the flesh. The pain which immediately followed was severe, partly, as Paré explains, because the tip of the finger is a very sensitive part, and probably also on account of the irritating effect of the venom. Then, to quote Paré's own words, "after making firm pressure upon the soft parts above the wound, to prevent the poison from traveling upward, I crowded the skin downward in the hope of forcing as much of the venom as possible out of the finger. While doing these things I instructed the apothecary's assistant to mix some old theriaca with brandy, and then to apply a pledget

of cotton, saturated with the mixture, over the wound. In the course of a few days, and with no other treatment, all effects of the bite disappeared."

In 1536, two years after his first experience with actual warfare in the vicinity of Susa, Italy, and while he was still very young to assume so great a responsibility, Paré—as we learn from the text of Chapter 28, Book X., of Malgaigne's edition—performed the operation of exarticulation of the elbow joint (the first recorded instance of this operation, says von Gurlt). The case was that of a common soldier who had been shot through the forearm, a little above the wrist, who had been treated unsuccessfully by other surgeons, and who, at the time when he came under Paré's care, was suffering from a variety of complications—viz., gangrene extending as high up as the shoulders, extensive inflammation of the integuments on the adjacent side of the thorax, and other symptoms that pointed toward a fatal issue. To complicate matters, it was winter and the only approximately warm shelter available was a cow-stable. At this early date, in the history of surgery, the practice of ligating the blood-vessels which had been divided in the course of an amputation had not yet been adopted, and consequently the red-hot cautery had to be employed for arresting the bleeding which followed the operation. (See also page 512.) In addition to the amputation it was found necessary to make a number of long and deep incisions into the inflamed tissues and to apply the actual cautery freely "for the purpose of drying up and destroying the virulent matters that had penetrated these parts." Then, fourteen days later, the patient, who had been lying all this time, exposed to draughts of air, upon a receptacle intended for the storage of grain, and who was protected from the cold by only the scantiest coverings, developed trismus (lockjaw). When this new complication appeared Paré, already at his wits' end to find means with which to overcome the difficulties which surrounded the case, decided first to have the man removed to an adjacent stall in which there were several cows, the presence of which in such a confined space might be counted upon to increase appre-

ciably the warmth of the surrounding air. Next, he gave orders to rub briskly the back of the patient's neck, as well as the shoulders, the uninjured arm and the legs, with heated cloths which were immediately afterward to be wrapped around him; and then, for an outside covering, he utilized the straw and cows' dung which were plentifully within reach. In addition, two braziers which had been procured from a neighboring dwelling, were charged with coals and kept burning close to him. During three successive days and nights these measures were kept up faithfully, and from time to time a mixture of milk and soft egg was introduced into the patient's mouth through a suitable tube, after the jaws had first been pried open by a bit of willow wood. The effect of these measures was to make the patient perspire copiously and to induce a gentle action of the bowels; and, as a further effect, the trismus was also overcome. For some time afterward, in addition to the ordinary dressing of the healing wounds, it was thought best to apply the red-hot cautery regularly at certain intervals to the end of the bone of the upper arm. (This practice was abandoned by Paré at a later date.) Final and perfect healing took place after several large splinters of bone had been exfoliated.

At the end of his account of what one is tempted to call the wonderful victory of a surgeon over the death that threatened to carry off this gravely wounded soldier, Paré adds one of his characteristic appeals to the oncoming younger generation of physicians:—

> Both God and Nature constantly remind the surgeon that, no matter how poor, in a given case, the prospect of a cure may seem, he should not for one moment cease doing his full duty; for Nature often accomplishes what the surgeon believes to be impossible. Cornelius Celsus [about the time of Jesus Christ] says: "*Contingunt in morbis monstra, sicut et in natura.*" [Marvels are observed in diseases, very much in the same manner as they are frequently encountered in nature.]

In the two preceding histories of actual cases treated,—one of these patients being a wealthy officer of high rank and birth, and the other a common soldier of the peasant

class,—we obtain the best of evidence that Paré was not influenced by the wealth, rank or social position of his patients. Upon both classes he bestowed freely the fruits of his knowledge, experience and skill.

The first mention, in medical literature, of a fracture through the neck of the femur close to the joint, is to be found in Chapter 21, Book XIII., of Paré's treatise (page 753, Vol. II., of Malgaigne's edition). Furthermore, the first published account of a case of diaphragmatic hernia is that given by Paré. (Von Gurlt.)

In 1538, during a visit to Turin in the capacity of surgeon to the Mareschal de Montjean, Paré was asked by the latter to take charge of one of his pages who had been wounded by a stone which struck him on the right side of the head, causing a fracture of the parietal bone, with escape of a portion of the brain substance from the external wound. The subsequent history of this case is given by Paré in the following words:—

> As soon as I fully realized the true nature of the injury and had examined the mass of tissue (about the size of a small nut) which had been expelled from the wound, I predicted that the patient would probably not recover. A young surgeon who happened to come into the room at this moment, examined the mass of tissue which had escaped from the wound and at once pronounced it to be fat. I assured him that, if he would wait until I had finished dressing the patient's wound, I would prove to him that the mass was in reality cerebral tissue and not fat. . . . . If this substance, I said, is fat, it will float on the water; but, if it is brain tissue, it will sink at once to the bottom of the dish. And, again, if it is fat it will promptly melt on exposure to heat, whereas brain substance will simply become desiccated. These tests were applied and it was shown that the tissue consisted, as I had declared, of brain substance.
>
> Notwithstanding the apparently serious damage which had been inflicted upon his brain the page made a good recovery, but remained permanently deaf in the right ear.

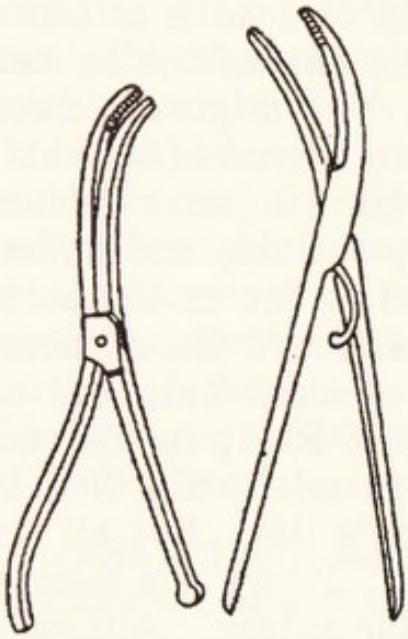
Among Paré's numerous reports of cases there is one which possesses, as I believe, sufficient interest—as well from the viewpoint of the pathologist as from that of the

surgeon to justify me in reproducing it, in a somewhat condensed form, in the present chapter.

Henry the Second, King of France, while tilting (June 30, 1559) with Gabriel, Count of Montgomery, an officer of that sovereign's Scottish Lifeguard, received injuries which soon afterward proved fatal. Montgomery's lance—so Paré's account states—struck the King's vizor and, breaking off at the spot where the metal tip or head is attached to the wooden shaft, carried away this part of the helmet. Then, impelled by the force which had originally been communicated to the lance, the splintered end of its shaft struck the King's now unprotected head with great violence just above the right eyebrow, tore up the skin and underlying muscular tissue of the forehead as far as the outer angle of the left orbit, and finally destroyed the adjacent eye. Five or six of the most experienced surgeons of France were immediately summoned, and Philip the Second, King of Spain, sent Vesalius from Brussels to aid them in their efforts to save the injured King's life. But all the measures adopted proved of no avail. Henry the Second died on the eleventh day following the injury. Although in the published account no statement is made to the effect that Paré was one of the surgeons who attended the King during his illness, Malgaigne expresses the opinion that he was probably present in the capacity of a consultant; and the interesting comments which he (Paré) makes on the nature and extent of the injury inflicted certainly justify this opinion. No evidence of fracture of the skull was discovered either before death or at the postmortem examination, and the most conspicuous symptoms appear to have been fever and a comatose condition. At the autopsy there was found, on the left side posteriorly, in the occipital region, a clot of blood lying between the pia and the dura mater. The brain substance in the immediate vicinity of the clot was of a yellowish tinge and showed evidences of having already begun to undergo decomposition. Paré's diagnosis, in this case, was that of violent concussion of the brain with rupture of meningeal vessels by *contre-coup* at a point opposite to that at which the blow

was originally inflicted by the lance. He did not believe that the immediate damage done to the frontal portion of the cranium and to the left eye had anything to do with the fatal issue.

One of the greatest discoveries made by Paré in the domain of surgery is his method of promptly, effectively and safely arresting the bleeding from the divided vessels of the stump after the amputation of a limb. This discovery was made between the years 1552 and 1564, before which period it had been customary to arrest the bleeding by applying the red-hot cautery iron to the exposed ends of the divided vessels. The new method consisted in tying a ligature (preferably doubled) around the free or cut end of the blood vessel, and allowing it to remain undisturbed *in situ* until, as the result of a localized suppuration, it should be cast off. The accompanying cuts (Figs. 23 and 24) which have been copied from an earlier edition (1585) of Paré's work, represent the kind of forceps which he employed in separating the free end of the artery or vein from the soft tissues in which it was imbedded—a preliminary procedure which enabled him to tie the ligature firmly around the vessel. The earlier pattern of forceps (Fig. 23) was not equipped with a spring, the purpose of which was to keep the opposing blades separated, but the later pattern (Fig. 24) has this useful addition. Another instrument which owes its origin to the inventive genius of Paré is the grooved director—an instrument that is of great value to the surgeon, particularly in operations for the relief of strangulated hernia.



FIGS. 23 AND 24.

FORCEPS DEVISED IN 1552 BY AMBROISE PARÉ FOR DRAWING OUT THE CUT ENDS OF ARTERIES AFTER THE AMPUTATION OF A LIMB, AND HOLDING THEM WHILE THE LIGATURE IS BEING APPLIED.

(From von Gurlt's *Geschichte der Chirurgie*, Berlin, 1898.)

FIG. 23 represents the earlier; FIG. 24 the later pattern (see text.)

Besides the two inventions to which a brief reference has just been made, Paré describes and pictures in his great treatise scores of instruments and apparatus of all sorts, many of them doubtless products of his own inventive genius. But to assign to these contrivances their true value calls for a degree of expert knowledge which I do not possess. Rather than to attempt any such appraisal, I prefer to furnish here a summary of the more important of Paré's achievements in surgery; for such an enumeration—although it may prove to be in some measure a recapitulation of things that have already been mentioned in the preceding account—may be found useful for purposes of reference:—

The discovery of improved methods of caring for the wounded on the battle-field and of transporting them to a hospital or other refuge; the introduction of better methods of treating wounds inflicted in warfare—especially gunshot wounds; the correction of the idea, universally accepted at the beginning of the sixteenth century, that bullets are sufficiently hot, upon penetration of the skin, to affect injuriously the wounds which they inflict;[1] the substitution of ligation of bleeding vessels (of an amputation stump) for the prevailing practice of applying to them the red-hot cautery iron; the abandonment of the practice of applying the heated cautery iron to the surface of section of a sawed bone; the performance, for the first time, of exarticulation of the elbow-joint; the demonstration of the usefulness of more frequently employing orthopaedic apparatus and prosthetic contrivances; and the introduction of improvements in the operation of trephining the skull.

It was a very common practice among the medical authors of the sixteenth century—and, indeed, among authors generally—to utilize the writings of their predecessors without giving them proper credit for their work; and Paré, it appears, was not entirely free from this fault. von Gurlt mentions a few of the more glaring instances of such sinning, and among them the following: Paré's two chapters on tumors are taken from the "*De institutione*

[1] The fact that bullets are not hot when they inflict a wound was proven experimentally by Bartolommeo Maggi several years earlier, but Paré makes no reference to this fact.

chirurgica" of Jean Tagault (Paris, 1543), who in turn is charged with having borrowed the data from Guy de Chauliac's treatise; in his chapter on wounds in general, Paré has also borrowed largely from the same work; and the chapter which he devotes to the subject of special wounds is taken from the writings of Hippocrates; and, finally, he has transferred almost bodily Philippe de Flesselle's "*Introduction pour parvenir à la vraie cognoissance de la chirurgie rationelle.*" Before we condemn Paré for plagiarism, and although the facts as stated by von Gurlt are undeniable, we should take several things into careful consideration. It is fitting, for example, that we should make some sort of an estimate of the value of the text thus appropriated, in order that we may be able to measure the seriousness of Paré's sinning; and, if we do this, we cannot fail to be struck with its insignificance in comparison with the admittedly valuable character of all the remaining text of these three huge volumes—text which bears every mark of being the product of Paré's brain. Paré himself, in speaking of his borrowings from other authors, says that his acts of this nature are "as harmless as the lighting of one candle from the flame of another." Then, again, there are several of these borrowings which are evidently the handiwork of a rather dull person, and this fact alone makes one bold to assert that Paré, who was certainly not lacking in brains or in a desire to follow the golden rule in his treatment of the property of such writers, could scarcely have been guilty of such clumsily contrived interpolations. Inasmuch, however, as many important facts bearing upon the question at issue are not within my reach, I am obliged, in my attempt to defend the memory of Paré, to fall back upon speculative reasoning. The medical profession at large has long since heard this charge of plagiarism and it refuses to attach any importance to it as affecting the personal character of Paré. It prefers to believe that he is guiltless and that somebody else—at a time, perhaps, when Paré, being well advanced in years, was too ill to revise the manuscript of the "Collection of his Writings" edited by Guillemeau—thoughtlessly yielded to

FIG. 25. AMBROISE PARÉ. THE FAMOUS FRENCH SURGEON OF THE SIXTEENTH CENTURY.

(From von Gurlt's reproduction of the portrait published by Le Paulmier, Paris, 1885.)

the impulse to remedy, by borrowing from other sources, the trivial defects or omissions noted in the text. In any case, whatever the actual truth may be, I am, I believe, justified in maintaining that Paré is not rightly chargeable with the guilt of plagiarism.

Strange as it might appear, if history did not furnish many examples of the same character, Paré's merits as a man and as a surgeon were not as fully appreciated as they deserved to be until after the lapse of nearly two centuries. In 1812 the *Société de Médecine de Bordeaux* offered a prize for the best eulogy of Ambroise Paré, and it was awarded to Vimont. Finally, in 1840, a fine bust of the distinguished surgeon was completed by the sculptor David of Angers, and set up in bronze in Laval, Paré's birthplace. The portrait here reproduced from the engraving in von Gurlt's work represents the bust in question (Fig. 25).

A complete collection of the writings of Paré has been prepared by J. F. Malgaigne, the distinguished French surgeon, and published in three very large volumes (Paris, 1840-1841). This collection is based on a careful comparison and collation of all the previously published editions. The contents of these volumes cover very nearly the entire range of surgery.

CHAPTER XLI

SURGERY IN GREAT BRITAIN DURING THE SIXTEENTH AND SEVENTEENTH CENTURIES

In Great Britain the cultivation of the science of medicine began at a much later date than it did on the continent of Europe, and, so far as may be judged from the facts within our reach, there were, in the early part of the sixteenth century, very few Englishmen who could justly lay claim to the possession of more than the rudiments of the art of surgery. Two centuries earlier, as I have already stated in a previous chapter, there were three men in England who gained considerable fame in this department of medicine. They were Gilbert "the Englishman" (1210), John of Gaddesden (1320), the author of the famous book entitled "Rosa Anglica," and John of Ardern (*circa* 1350); but afterward, for a period of nearly two hundred years, the records fail to reveal to us a single surgeon of any note. Then during the sixteenth century the only English surgeons whose names deserve to be perpetuated are Gale, Clowes and Woodall, of whom I shall presently give brief accounts. They were all at one time or another, as in the case of the leading continental surgeons of that period, officially connected with the army. Some idea of the unsatisfactory state of the medical service in the English army of that period may be gathered from the statements made by Gale regarding this matter. From his account it appears that in 1544 the army was accompanied by a miscellaneous crowd of men who were supposed to be in some measure physicians, but who in reality were uneducated quacks, vendors of all sorts of dressings and washes for wounds, of infallible cures for gunshot injuries, etc. The mortality

in the English camp was, as might readily be expected, very heavy. The same state of things existed, at a somewhat later date, in the fleet sent against the Spanish Armada. It is not to be wondered at, therefore, that very few of the educated surgeons were willing to accept service in the English army or the English fleet, especially as the pay which they received was no greater than that of the drummers and trumpeters. Toward the end of the century much greater attention was paid to the care of the wounded and crippled, and, in corroboration of this, it may be stated that Henry the Fourth, King of France,—who, it may safely be assumed, was influenced to take this step by the enlightened advice of Ambroise Paré,—ordered the establishment of military hospitals for the use of the army which was at that time besieging Amiens. And again, at a later date (1603), there was established at Paris a retreat for old and infirm or mutilated officers and soldiers.

It is an interesting fact that during the year 1544, while Henry the Eighth of England, in alliance with the German Emperor Charles the Fifth, was carrying on the war against Francis the First, King of France, there were present, on the soil of the latter country, all the leading European surgeons of that period—viz., Ambroise Paré, with the French army which was laying siege to Boulogne-sur-Mer (captured a few months earlier by the English troops); Thomas Gale, the most famous surgeon of that day in England, with the army of the besieged; and Vesalius and Daza Chacon with the troops of Charles the Fifth at Landrecy (near the Belgian boundary, south of Brussels) and at St. Didier (in the northeastern part of France). I have already, in preceding chapters, given brief accounts of the lives and professional accomplishments of all these surgeons with the exception of Gale, and it only remains now to supply such information as may be obtainable concerning the latter and also concerning his contemporaries, the English surgeons Clowes and Woodall.

Thomas Gale.—Thomas Gale was born in London in 1507, practiced medicine for some years in that city, and then, in the capacity of a surgeon, entered the service of the army

under Henry the Eighth. At a later date he joined the army of Philip the Second of Spain. In 1544 he was present at the battle of Montreuil in France, and he was also present at the siege of St. Quentin, in 1557. Two years later he returned to London and became a member of the Barber-Surgeons' Company. His death occurred in 1587.

Gale was the author of several books on surgical subjects, the most important of these works being that which deals with gunshot wounds. His views regarding wounds of this nature agree in the main with the teachings of Ambroise Paré; and yet, according to von Gurlt, he appears to have formed his opinions independently, for he does not once mention that surgeon's name. He was not only a skilful surgeon, but also a man of scientific and literary tastes, as shown by his translations of some of Galen's writings and of Giovanni da Vigo's treatise on surgery, and also by his own published works. His book on gunshot wounds, to which reference has already been made, is the one which reflects the greatest credit upon the author. One of its chief merits is to be found in the fact that it enabled the physicians of England to keep in some measure abreast of their brethren on the continent, at least in the matter of treatment by surgical means. In one part of the work he makes reference to the belief, which was held at that time by many surgeons, that the bullet not only scorched the flesh of the wound which it inflicted but also introduced into it a poisonous element. I quote here one or two extracts from the comments to which I have just referred:

> The usuall Gonnepowder is not venemous, nother the shotte of such hoteness as is able to warme the fleshe, much lesse to make an ascar. . . . . Hange a bagge ful of Gonnepouder on a place convenient: and then stand so far of as your peece wil shote leavell, and shute at the same, and you shall see the Gonnepouder to bee no more set on fyer with the heat of the stone [used as a bullet] than if you caste a cold stone at it.

An English translation of Paré's book, says von Haller, was not published until 1577. It is therefore not strange that Gale, whose book was printed fourteen years earlier

(*i.e.*, in 1563), should have made no mention of that author's method of applying ligatures to the bleeding vessels of an amputation stump. The first reference (in English) to this plan of preventing hemorrhage from the divided blood-vessels in an amputation stump occurs—so far as I have been able to discover—in the treatise published in London by William Clowes, in 1588, under the title "A prooved practise for all young chirurgians etc." Clowes, however, erroneously gives the credit for this important procedure to Guillemeau, one of Paré's pupils.

In one of his writings Gale states, after witnessing the surgical practice at the Royal hospitals of St. Bartholomew and St. Thomas in 1562, "that it was saide that Carpinters, women, weuvers, coblers and tinkers did cure more people than the chirurgians." (South.)

William Clowes.—William Clowes was born, about the year 1540, at Kingsbury, in Warwickshire, and received his early training in surgery under George Keble of London. In 1563 he accepted the position of surgeon in the army which was under the command of Earl Ambrose of Warwick and was stationed at that time in France. Six years later he settled in London, and was made a member of the Barber Surgeons' Company. In 1575 he received an appointment on the Surgical Staff of St. Bartholomew's Hospital and six years later still he was promoted to the rank of full surgeon, a position which he already held in Christ's Hospital. In 1585 he resigned his appointment at St. Bartholomew's and accepted an invitation to serve in the Earl of Leicester's army, which was at that time in the Netherlands. During this war Clowes acquired a rich and varied experience in the treatment of wounds. Soon after his return to London in 1588 he joined the fleet which vanquished the Spanish Armada. Later, he was given the appointment of Surgeon to the Queen. His death took place at Plaistow, County of Essex, in August, 1604. Von Gurlt does not hesitate to qualify him as one of the most distinguished English surgeons of his day.

Of the four surgical treatises which were written by Clowes, and of which several editions were published

between the years 1575 and 1637, there is only one to which I shall refer in this brief account, viz., that which, in the edition of 1637, bears the title: "A profitable and necessarie Book of Observations, for all those that are burned with the flame of Gun Powder." This book is full of brief histories of cases which came under the author's personal observation, and it therefore furnishes an excellent and truthful picture of the kind of wounds which the highwaymen and soldiers of that day inflicted, and of the treatment which was employed by the best English surgeons. The following may serve as sufficient examples:—

(1) A clothier, who had been assailed by robbers, received a dangerous wound in the left thigh. It was about four inches long and of such a depth that "the rotula or round bone of the knee did hang downe very much." Clowes first removed a clot of blood from the wound and then, "with a sharp and square pointed needle, armed with a strong, even and smooth silke thred, well waxed, introduced five stitches, one good inch distant betweene every stitch, leaving a decent place for the wound to purge at." He then applied a suitable bandage. The patient's friends were not at all pleased that Clowes, having pronounced the wound dangerous, should not have been willing to state how much time would elapse before it would be healed. So they called in a charlatan, who on the following day removed the dressings and cut through all the stitches. Seven days later, Clowes was once more asked to see the case. He found the wound gaping widely and in a bad state. After adopting such measures as were most urgently required, he brought the edges of the wound together by the application of three strips of sticking-plaster. In due time healing took place, "but the motion perished: for the patient had the imperfection of a stiff knee, which constrained him to use a leather strap, fastened unto the toe of his shooe, and again made fast unto his body; and so he remaineth unto this day."

(2) The history of the second case may be given here in the following brief outlines. The patient, a ship's gunner, was wounded in the lower part of the abdomen by

what was probably a partially spent ball. The wound made by the missile was of such a nature that it permitted a large portion of the "zirbus" (omentum), together with some of the intestinal canal, to protrude from the opening. After making a careful examination of the parts, Clowes was satisfied that the intestine was still uninjured.

> Then with a strong double thread I did tie fast the zirbus as close unto the wound as possible wel I might, and within a finger bredth or thereabouts I did cut off that part of the zirb that hanged out of the wound, and so I cauterized it with a hot iron almost to the knot; all this being done, I put again into the body that part of the zirb which I had fast tied, and I left the peece of thred hanging out of the wound: which, within four or five days after, nature cast forth, the thred as I say being fast tied; then presently I did take a needle with a double strong silke thred waxed, wherewith I did thrust thorow both mirach [skin, adipose layer and muscular tissue] and ziphach [peritoneum] on the right side of the wound, but on the left side of the wound I did put the needle but thorow mirach only, and so tied these three fast together with a very strong knot, and presently I did cut of the thred. . . . . All which is according to Weckers[1] and other learned men's opinions and practices, who also say that the stitches of the one side must be higher than on the other side. [The usual dressings were afterward applied and were renewed three days later. At the end of twenty-one days the wound was found to be completely healed.]

In chapter 27 of the same work there is given a list of the medicaments and instruments with which a field- or ship's-surgeon should be equipped before he engages in active service. From this list I select the following items as showing—at least in some measure—in what respect the tools employed by surgeons four hundred years ago differ from the modern ones of a similar character: "Small and long waxe candles to search the hollownesse or depth of a wound." "Small buttons or cauterizing irons meete to stay the flux of an artery or veine." "A trepan." "Needles two or three, some eight inches, some ten or twelve inches in length, having a decent eye in it guttered like a Spanish

[1] Johann Jacob Wecker (1528 1586), born at Basel, Switzerland, and author of a treatise entitled "*Practica medicinae generalis*" (Basel, 1585).

needle, and point or end blunt or round, that it offend not in the going in of it, made fit to draw a Flammula, or a pece of fine lawne or linnen cloth through the body or member that is wounded." "As for stitching quils and other instruments, that a Surgeon ought always to carry about him, I leave unspoken of."

In praise of one of the plasters enumerated in the list, Clowes narrates the following incident which occurred near Arnheim in the Netherlands: "A horseman was wounded with a pike neere the middle of his right thigh; the weapon so passing upwards that by good fortune it rested upon the os pubis, otherwise he had been slaine." As the first step in the treatment, the copious bleeding was arrested; after which warm *oleum hyperici* [oil of St. John's wort] was injected into the wound, then a short tent was introduced, and the sticking plaster was applied on the outside. "Thus he was cured in fourteene days, and so was ready to serve in the field again."

John Woodall.—John Woodall or Woodhall was born in England about 1569, and was sent as a military surgeon to France by Queen Elizabeth with the troops which Her Majesty placed at the disposal of the French King, Henry the Fourth. After his return to England, Woodall was made a surgeon of St. Bartholomew's Hospital and also Surgeon-General of the East India Company. He was already at that time a member of the Company of Barber-Surgeons of London. Woodall must have had a very extensive experience in the practice of surgery, for he states that he had performed the operation of amputation of a limb more than one hundred times. The date of his death is not known.

Von Gurlt calls attention to the fact that the first notice printed in English of Ambroise Paré's method of ligating blood vessels after an amputation is to be found in the treatise written by John Woodall and published in London in 1639, under the title: "The Surgeon's Mate, or Military and Domestic Surgery." As the first edition of this book, which was published in 1617, says nothing about Paré's method, it seems permissible to infer that the news of this

improvement, one of the most important made in surgery (1552), reached England from France only after the lapse of eighty-seven years! There can be scarcely any doubt, however, that individual English surgeons had already learned about Paré's improved method at a much earlier date.

State of Surgery in England During the Seventeenth Century.—Before I pass on to the consideration of the state of surgery in England during the seventeenth century it seems desirable that I should say a few words with regard to the relative standing of the two branches of the medical profession—the physicians and the surgeons—in the esteem of their fellow Englishmen at this period of history. In France, it will be remembered, a surgeon was looked upon, even as recently as during the first half of the sixteenth century, as a man of inferior social standing, perhaps a shade better than an apothecary, but certainly far below his more highly educated associate—the physician. The favors extended by French Royalty to Ambroise Paré and the very high esteem in which he was held by French society in general effected a great change in the relative status of the two classes of practitioners in France; and, as a result of this change in public opinion, medical practitioners, subsequent to 1560 or 1570, were led to realize that a surgeon, if sufficiently educated, if earnestly devoted to his professional work, and if intent upon helping his fellow men rather than upon accumulating a fortune, might confidently aspire to a position of equality with the best physicians of the community in which he lived. In England a similar change of opinion in regard to the honorableness of the career of surgeon took place about this time, probably in consequence of the great reputation gained by Gale, Clowes and Woodall. In both countries the change occurred slowly, and in France what was gained during Paré's lifetime seemed afterward to be lost for a period of several years. But eventually the prevailing opinion again became favorable to the surgeons, and from that time to the present they have enjoyed an ever-increasing esteem in public opinion. But there was a brief period, early in the seven-

teenth century, when it must have been very galling to the pride of an honorable and experienced surgeon to be placed as it were under the tutelage of the physicians who were his official associates in certain hospitals—as, for example, in St. Bartholomew's, London. The following extracts[2] from the "Orders" or "Articles" of that institution (1633) explain more precisely what is meant by the use of the word "tutelage":—

9. That no surgeon or his man do trepan the head, pierce the body, dismember or do any great operation on the body of any but with the approbation and by the direction of the Doctor (when conveniently it may be had) and the surgeons shall think it needful to require.

13. That every surgeon shall follow the directions of the Doctor in outward operations for inward causes, for recovery of every patient under their several cures, and to this end shall once in the week attend the Doctor, at the set hour he sitteth to give directions for the poor.

(From St. Bartholomew's Hospital Reports, Vol. XXII., 1886.)

Among the English surgeons of the seventeenth century there appears to have been only one who attained some degree of eminence, viz., Richard Wiseman, who is often spoken of as the Ambroise Paré of England. Haeser mentions 1625 as the date of his birth, and at the same time states that he was in the service of the Stuart Kings from Charles the First to James the Second. It seems to me highly probable that this statement regarding the date of Wiseman's birth is erroneous; for if it be accepted as correct, then he (Wiseman) must have been only fifteen years of age when he first started out with the prince (in 1640) on the latter's wanderings through France and the Low Countries. On the other hand, if Wiseman was really born in 1625, then we shall be justified in assuming that he traveled with the prince at first simply as his companion and not in a professional capacity; and we shall be further justified in assuming that he acquired his medical and surgical training during his residence on the continent.

[2] In this instance I have thought it best to modernize the spelling of several of the words.

In 1650 Wiseman returned with the prince to Scotland. At the battle of Worcester he was taken prisoner by the Parliamentary army under Cromwell and did not regain his liberty until 1652, at which time he settled permanently in London. After the Restoration in 1660, his practice increased very greatly and, so far as one may judge from the large number of cases which he reports in his work on surgery that was first published in 1676, it must have been very extensive and of a most varied character. I have read many of these reports of cases that occurred in Wiseman's practice, and have been much impressed with the thoroughly practical character of the treatment which he adopted in the majority of instances, and also with the very clear and concise manner in which he narrates the attendant circumstances—the nature of the malady or of the injuries received, the treatment which he adopted, and the final results attained. In the belief that they may furnish corroborative evidence of the statements which I have just made, I now take the liberty of reproducing here two of these reports of cases:—

(1) Whilst I was a prisoner at Chester (1651), after the battel of Worcester, I was carried by Colonel Duckinfield's order to a man that out of much zeal to the Cause, pursuing our scattered forces, was shot through the joint of the elbow; the bullet entering in at the external part of the *os humeri*, and passing out between the *ulna* and *radius*. He had been afflicted with great pain the space of six weeks. I found the wound undigested,[3] and full of a loose, soft, white flesh, the bones fractured, and not likely to unite, many shivers lying included within the joints, and incapable of being drawn out. The lower part of the arm was oedematous to the fingers' ends as full as the skin could well contain, and the upper part was inflamed; also about the *os humeri* and *axilla* a perfect phlegmon was formed. The patient thus tired with pain, desired to be cured or have his arm cut off. To which purpose he had procured the Governor's leave for my staying with him. But, while that phlegmon was upon the upper parts, there was no hope of a prosperous amputation, nor of cure while those shivers of bone lay pricking the nervous parts within the joint. The phlegmon

[3] Not healing in a healthy manner.

was too forward for repercussion,[4] and yet not likely to suppurate in less than a week's time. Wherefore I endeavored by emollients and some discutients to succour the grieved shoulder and parts thereabout by hindering the increase of the phlegmon, and to give some perspiration to the part. Then with good fomentations I corroborated the weak and oedematous member below; in which end I also raised his hand nearer to his breast. Also by detergents and bandage I disposed the wounds and fractured part to a better condition, made way for discharge of matter, and endeavored to extract the shivers of bones; then applied medicaments to remove the *caries*. After some days the abscess suppurated in the upper part of the shoulder and in the armpit; and while the matter discharged from thence, the tumour discussed, and that upper orifice cured soon after. But the continual pain in the fractured joint kept that opening in the axilla from healing. The patient growing weaker, and without hopes of cure, I was necessitated to proceed to amputation. To which purpose I sent to Chester to Mr. Murry, a knowing chirurgeon (since Mayor of that city), to come with instruments and other necessaries, whereby I might the better do the work. He accordingly came, and we prepared dressings ready; which were stupes or pledgits of fine short tow well worked, some like *splenia* [bandages], others were round, and bigger or less. We wetted them all in oxycrate [water and vinegar], and dried them; et cetera. . . . . .

The apparatus thus made, and the patient some while before refreshed with a good draught of caudle [a hot drink made of spiced and sugared wine], his friends took him out of his bed, and placed him in a chair toward the light. One of his servants held his arm; another of his friends held his other hand. Then Mr. Murry drew up the skin and musculous flesh of the arm towards the shoulder, whilst I made a strong bandage, some three or four fingers' breadth, above the affected part. Then with a good knife I cut off the flesh by a quick turn of my hand, Mr. M. pulling up the flesh, whilst I bared the bones.[5] After which, with as few motions of my saw [as possible], I separated the bone[s], the patient not so much as whimpering the while. After this Mr. Murry thrusting his hands downwards with the musculous flesh and skin which he had drawn upwards, I passed a strong needle and thread through the middle of the flesh and skin on both sides, within half

[4] Driving back.

[5] Haeser speaks of Wiseman as having gained considerable distinction by the careful manner in which he made provision for the flaps in his amputations.

an inch of the edges, and brought the lips close within a narrow compass; and having tied that ligature fast, and cut off the string, I passed the needle again through the two contrary sides, which I tied as close; then loosened the ligature above, and applied the little round stupes of tow spread with a quantity of Galen's powder mixed with egg albumen. The long pledgits were applied from the middle of the stump each way upwards along the arm, over which I put on a bladder and a cross cloth, then rowled up the stump, and made the bandage [pass] under his other arm and over his neck. . . . . He being thus dressed up, we put him into his bed. The third day we took off his dressings, and found the stump well digested, and at least two spoonfuls of matter discharged. . . . . During which the bone exfoliated, and the stump soon after cicatrized. Then having procured a pass to come to London, I hastened away.

(2) A lady coming to town with a swelling in her left breast, consulted some of our Profession, and at last me. She said she had some years since kernels in her breast, which were judged the "King's Evil"; upon consideration of which she was presented to His Majesty, and touched. In progress of time they swelled, and her breast being extremely painful, she desired my judgment of it. The swelling was large and round, and greatly inflamed, under which it was soft and seemed to have matter in it. The parts more distant were hard, and several tubercles lying under the skin made it unequal; yet the breast was not fixed. She urged me instantly to deliver my thoughts of it; which to decline I turned from her, and told her friend it was a cancer, and that I saw no hopes to save her life but by cutting it off. He wished me to consider how I delivered such judgment of it, two chirurgeons having lately assured her the contrary, they taking it for a phlegmon. But I, not being used to guide my judgment by what others delivered, confirmed to him what I had before said by a sad prediction, which befel her in few weeks after. And indeed there was no way then to deal with it but by cutting off her breast.

One is not a little startled, after reading a number of case histories like the two which I have just reproduced, to discover other portions of text (Vol. I., pp. 384 and 385) which show clearly that Wiseman, although a surgeon of the most practical character and a man equipped with excellent reasoning powers when he was placed in the presence of most of the problems which are constantly

being submitted to physicians for solution, was nevertheless the victim of a belief that supernatural powers may reside in certain human beings. Speaking of the cure of the "King's Evil"—also called by him "struma" and "scrofula"—Wiseman, in the chapter which he devotes to this subject, makes the following statement:—

> But when upon trial he (the chirurgeon) shall find the contumaciousness of the disease, which frequently deluded his best care and industry, he will find reason of acknowledging the goodness of God; who hath dealt so bountifully with this Nation in giving the Kings of it, at least from Edward the Confessor downwards (if not for a longer time), an extraordinary power in the miraculous cure thereof. . . . . I myself have been a frequent eye-witness of many hundreds of cures performed by his Majesty's touch alone, without any assistance of chirurgery; and those, many of them, such as had tired out the endeavors of able chirurgeons before they came thither.

Some years before his death, which occurred in 1686, Wiseman was given the title of Serjeant-Chirurgeon to King Charles the Second.

CHAPTER XLII

REFORMS INSTITUTED BY THE ITALIAN SURGEON MAGATI IN THE TREATMENT OF WOUNDS.—FINAL ENDING OF THE FEUD BETWEEN THE SURGEONS AND THE PHYSICIANS OF PARIS.—REVIVAL OF INTEREST IN THE SCIENCE OF OBSTETRICS

Reforms Instituted by Magati.—Cesare Magati, who was born in 1579 at Scandiano, in the Duchy of Reggio, studied medicine at the University of Bologna and received the degree of Doctor of Medicine from that institution in 1597. Immediately afterward he went to Rome and devoted himself particularly to the study of anatomy and surgery. Then, upon his return to his native land, he quickly acquired so great a reputation as a surgeon that the Duke of Bentivoglio, who was a man of enlightened views and ambitious to promote in every possible way the best interests of the University of Ferrara, offered Magati the Chair of Surgery in that institution. The offer was accepted in 1612, and Magati continued to hold the position for several years, his services being highly appreciated both by the authorities of the university and by the students. But, when his health began to break down,—he was affected with stone in the bladder,—he decided that his best course was to resign his professorship, retire from active practice, and become a Capuchin monk. When he took this step he obtained permission from the head of the Chapter to which he belonged, to resume in a limited measure the surgical work which he was so well fitted to do. But in the year 1647 his sufferings became so acute that he was obliged to

visit Bologna in the hope of obtaining relief through operative interference. The operation, however, did not prove successful, and death occurred shortly afterward.

Magati effected, in a quiet and unostentatious manner, a number of desirable reforms in surgical procedures. Thus, for example, he pointed out how undesirable it is, in most cases, to change the dressings of a wound so frequently as was, at that period, the common practice. The process of cicatrization, he insisted, is not effected by the efforts of the surgeon, but is fundamentally the work of Nature. Then, in addition, he protested against the practice of introducing wicks and pledgets of lint into wounds. These criticisms and this advice, says von Gurlt, had been given many times before by different ancient authors, but they undoubtedly had to be repeated from time to time.

The treatise in which Magati has written these things bears the following title: "*De rara medicatione vulnerum, seu de vulneribus raro tractandis, libri duo,*" Venice, 1616 and 1676; also Nuremberg, 1733.

Final Extinguishment of the Long-standing Feud between the Surgeons and the Physicians in Paris.—At several points in the course of this sketch of the history of medicine, I have called attention to the fact that, during the centuries preceding those which are reckoned by certain authors as belonging to modern times, surgeons as a class were generally looked upon, especially in the larger cities of France, as decidedly inferior to physicians. The first attempt at something like systematic instruction in surgery was made by the Brotherhood of Saint Cosmas and Saint Damian at Paris. This organization, which was founded by Jean Pitard about the middle of the thirteenth century, was composed of a group of barbers who felt a strong desire to secure for themselves a better training than was obtainable by the generality of barbers in those days. The latter were known as "surgeons of the short gown," while the more ambitious men, who belonged to the group mentioned above, were known as "surgeons of the long gown." With the progress of time this smaller group of barbers really succeeded in making better surgeons of themselves, but in

accomplishing this they intensified at the same time the jealousy which the physicians as a class felt toward them, a jealousy which repeatedly manifested itself in the form of downright persecution. The data for a complete account of this persecution, that persisted through centuries, are lacking, and even if I possessed them I should not care to devote the time that would be required for a proper presentation of the subject. It is pleasant, however, to be able to record the fact that these plucky barbers never entirely lost courage, but fought on, year after year, until they eventually succeeded—with the help of a strongly sympathetic public—in making the St. Côme Medical School the nursery of some of the best surgeons in France during the sixteenth and seventeenth centuries. It was here, for example, that Paré, Guillemeau, Thierry de Héry and other men of distinction obtained their early training, and it was doubtless through their influence that some of the wealthy patients whom they had treated successfully, were induced to contribute liberally to the support of the school. The final event in the history of this institution was the complete overthrow of the opposing physicians and the merging of the two surgical schools—that of the regular Faculty and the St. Côme School—into one, under the direction of de Lapeyronie, of whom I shall now furnish a brief sketch.

François de Lapeyronie.—François de Lapeyronie was born at Montpellier on January 15, 1678, and he enjoyed the privilege of receiving a most careful preliminary education. He was only seventeen years of age when the academic degree which corresponds to our Master of Arts was bestowed upon him. As the next step he visited Paris for the purpose of perfecting his knowledge of surgery, the branch of science in which he was specially interested; and upon his return to Montpellier he began giving instruction in anatomy and surgery. In a short time he was chosen Surgeon-in-Chief of the Montpellier Hôtel Dieu. In 1714 he was called to Paris to take charge of the Duc de Chaulnes, whose malady had not yielded to the treatment adopted by the surgeons of that city; and in this case the measures which he employed proved so efficacious that de

Lapeyronie decided to settle permanently in the metropolis. He taught anatomy in the Collège de Saint-Côme, and in a short time was chosen Head Surgeon of the Charité, one of the largest hospitals of Paris. In 1731 he became one of the founders of the Royal Academy of Surgery, and he took a most prominent part in the struggle which was then actively going on between the physicians and surgeons of Paris,—one of the last and most serious of the attempts made by the former to render the surgeons subordinate to the physicians. The surgeons won the battle (April 23, 1743), and Dezeimeris says that the part taken by de Lapeyronie in this struggle may be looked upon as one of the most honorable achievements recorded in the history of medicine. De Lapeyronie died on April 25, 1747, after a long and painful illness. In his will he made most liberal provision for the promotion of medical science; establishing funds for the giving of annual prizes, for the founding of a medical library, for the building of an anatomical amphitheatre, etc. In his treatise on anatomy Hyrtl, the distinguished professor at the University of Vienna, makes the following brief statement with reference to a certain dissecting room in Paris, but he does not state in what part of the city the room in question is located, nor does he mention any other facts that might enable his readers to fix its location. In the absence of more precise information concerning this matter, I shall take the liberty of suggesting that Hyrtl's discovery was made in the Anatomical Institute which de Lapeyronie founded. Hyrtl's statement reads as follows:—

> Over the entrance doorway of a dissecting room in Paris I read this inscription: *Hic locus est ubi mors gaudet succurrere vitae.* [Here is the spot where Death rejoices to render assistance to Life.] No more beautiful or fitting words could be employed for inspiring the student, upon his first entrance into the room, with respect for the work in which he is about to engage.

And yet, a few pages beyond that on which the above statement is printed, Hyrtl quotes Vicq d'Azyr as saying: "Among all the sciences anatomy is perhaps the one the

usefulness of which has been most highly lauded, but at the same time the one for which the least has been done to favor its advancement."

The Revival of Interest in Obstetrics.—With Soranus, the early Greek writer on obstetrics, this science seemed to come to a standstill, and during all the intervening centuries, up to the sixteenth, not a single work of any special value was published on this subject; for it is safe to say that nobody would claim for the one or two obstetrical treatises that were written by teachers in the Medical School of Salerno during the ninth or tenth century, that they contributed materially to advance our knowledge in regard to this branch of medicine. It therefore seems fitting, as suggested by Haeser, that during the century which gave birth to such immortal works as those of Vesalius and Paré, there should appear somebody who possessed the inclination to stir once more into life the dying embers of the science of midwifery; and such a man was found in the person of Eucharius Roesslin, the elder, more commonly known—says Dezeimeris—by the Greek name of "Rhodion." He lived during the first half of the sixteenth century, his death occurring about the year 1526, and his was the first modern treatise especially devoted to obstetrics. He began the practice of medicine in the city of Worms, in the central part of Germany, and then moved to Frankfort-on the-Main, where he filled the salaried office of City Physician. Midwifery, at that time, was left entirely in the hands of ignorant old women; and it was only in response to the wishes of Catherine, the Duchess of Brunswick and Lüneberg, that Rhodion undertook to prepare a manual from which these ignorant and careless women might learn to conduct their midwifery work in a more efficient, safe and acceptable manner. This little treatise, which was first published at Worms in 1513, passed through a number of editions and was translated into Latin, French, Dutch and English. Von Siebold says that Rhodion compiled its text from various ancient sources, and added practically nothing from his own experience. The woodcuts,

which are supposed to represent the different positions of the foetus in the uterus, are not at all in accordance with the truth, and show the most marvelous products of the artist's fancy. Von Siebold states, however, that the prejudices which at that time existed in the minds of the people against the slightest participation of males in the operations of midwifery were so strong that Rhodion would not have been permitted to do anything toward learning the truth by the employment of direct observation and careful examination—the only possible way in which the actual facts might have been learned.

Rhodion's book, notwithstanding the defects to which I have just referred, accomplished much good. It also restored the operation of podalic version to the position which it deserved, and it improved the service of the midwives,—which was what the Duchess chiefly desired, and it undoubtedly emphasized the fact that the time had arrived when obstetrics should receive the same degree of scientific study that was being bestowed on all the other departments of medicine.

The title of Rhodion's (or Roesslin's) little book reveals the fact that he possessed no small degree of humor. It reads: "Garden of Roses for Pregnant Women and for Midwives," Worms, 1513.

The Operation Known as Caesarian Section.—The fol lowing statements relating to the operation known as "Caesarian section" have been compiled from Haeser's *Geschichte der Medicin:*—This operation, which owes its name to the erroneous idea that Caesar was brought into the world by its aid, is commonly believed to have been practiced on different occasions throughout antiquity, but there has not yet been found in the records of history any account which shows clearly that the operation was per formed upon a living woman, and also that the incision extended not merely through the abdominal integuments, but also through the actual uterine wall. At Siegershausen, in Switzerland,—according to the report of Caspar Bauhin in the treatise ("*Gynaecia*") which he published at Basel in 1586,—a man named Jacob Nufer performed (about

1500) what was believed to be a Caesarian section on his own wife, and delivered a living child. Both mother and child did well; the child growing up to the age of seventy-seven and the mother giving birth to living children, *per vias naturales,* several times afterward. In this instance it is generally believed that the case was one of abdominal pregnancy and that the wall of the uterus had not been incised.

The first separate treatise on Caesarian section was written by François Rousset, and in it are reported several cases in which the operation was said to have been performed successfully. But both von Siebold and Kurt Sprengel do not seem willing to accept these reports as genuine, and we are therefore compelled to assume that the first trustworthy account of a Caesarian section successfully performed by a Dr. Trautmann of Wittenberg (in 1610) is that given by Sennert in a communication which was printed early in the seventeenth century.

Invention of the Obstetrical Forceps.—After the publication of Roesslin's "Garden of Roses," the book of which I gave a brief sketch on a previous page, nothing worthy of special note was done for a period of several years to advance the existing knowledge of midwifery or even to systematize that which had already accumulated. Then there began to appear evidences of an awakening among those physicians who recognized the importance of this department of medical science, and as a result there were soon placed upon record accounts of two or three advances of real and permanent value. One of the first of these gains, for example, was the revival and general acceptance of the practice of podalic version, or version by internal manipulations,—that is, the operation of changing the faulty position of the foetus *in utero* in such a manner that the feet shall be the parts which protrude into the vagina. Podalic version—as it appears from the account given by von Siebold—was known to the ancients, both Celsus and Aëtius having described it in their treatises, but it was afterward forgotten or neglected until Ambroise Paré, in 1550, again recommended it in one of his writings. At the

same time Paré states, at the very beginning of his monograph on this subject, that his colleagues, Thierry de Héry and Nicole Lambert, had both of them already carried out the method in certain cases. This fact, however, does not detract from the credit due Paré for having been the first, after the lapse of several centuries, to bring the operation to the knowledge of the medical profession; and from that day to the present it has held a fixed place in the science of obstetrics. As will be readily understood, this is not the proper place in which to furnish details with regard to the operation itself. When Paré was asked whether it would be permissible for the midwives to undertake this operation of podalic version, he replied that it would be, provided the individual who assumed this responsibility felt convinced that she possessed the requisite degree of skill and experience in work of this nature, and provided also that—as soon as she began to suspect her inability to finish the operation successfully she would promptly call to her aid a skilful surgeon, one who had acquired considerable experience in obstetrical operations. Paré's favorite pupil, Jacques Guillemeau (1550 1630), a native of Orleans, France, made several important additions to our knowledge of the operation of podalic version, and he was also in other respects an important promoter of the science of operative obstetrics. His treatise on this branch of practical medicine, which was originally written in French and published at Paris in 1609, was soon translated into English ("Childbirth, the Happy Deliverance of Women," London, 1612). In the opinion of von Siebold, podalic version may justly be considered the most important contribution that was made to obstetrical science during the sixteenth century.

One of the French midwives of this period, Louise Bourgeois (or Boursier), attained considerable celebrity by the excellence of the treatise which she wrote on obstetrics. She was born at Paris about the year 1564. In 1588 she began to fit herself for the career of midwife, and in the course of a few years, after passing successfully the required examinations, she was admitted by the authorities

as a "sworn midwife" of the city of Paris. She gained steadily in experience and public favor, and the record states that already as early as 1601 she had the good fortune to officiate at the delivery of Henry the Fourth's wife (Marie de Medicis) of a son—the Dauphin (later, Louis the Thirteenth). Her royal patrons were much pleased with the services which she rendered on this occasion, and, as a further evidence of the confidence which she inspired, they asked her—as each of these occasions approached—to preside at the births of five other children.

One of the meritorious features of the treatise which Louise Bourgeois wrote,[1] says von Siebold, is to be found in the fact that she championed most earnestly podalic version. The book was translated into both German (1644) and Dutch (1658).

François Mauriceau (1637-1709), who was indisputably the most distinguished writer on obstetrics of the seventeenth century, was born in Paris. During the early part of his career he was simply a general surgeon, but, after the lapse of a few years, he gave up all his other work and confined himself strictly to midwifery. For quite a long period he held the position of Chief Obstetrician at Hôtel-Dieu, and at the same time he conducted an extensive private practice in cases of confinement. Worn out by the excessive amount of work which he performed during the most active period of his career, he was finally obliged to retire from practice several years before his death.

Mauriceau did not invent any remarkable obstetric instruments or procedures, but he was the first to set forth in clear and precise terms the principles of this science and art and to expound the rules required for putting them into practice. The titles of his two most celebrated treatises are the following: "*Traité des maladies des femmes grosses,*" Paris, 1668; and "*Observations sur la grossesse et l'accouchement,*" Paris, 1695. In 1706, three years before his death, he also published "*Dernières observations sur les maladies des femmes grosses.*"

The first of the three books mentioned passed through five

[1] "*Observationes diversæ sur la stérilité, etc.,*" Paris, 1609.

editions during Mauriceau's lifetime, and there were two reprintings after his death. A noticeable feature of the work, says von Siebold, is the care which the author takes to preface all his lectures with a detailed exposition of the anatomical relations of the region concerning which he is about to speak; and this custom, which he was the first to introduce, has since then been followed by the great majority of those who have written on the subject of midwifery.

In the book which bears the title "*Observations sur la grossesse, etc.,*" Mauriceau gives an account of his first and only interview with the English obstetrician, Hugh Chamberlen, to whom is commonly accorded the credit of having invented the first pattern of the obstetric forceps. From this account it appears that on August 19, 1670, Mauriceau was called to see a primiparous woman, thirty-eight years old, who had already been in labor for several days, but who had not yet been able, owing to the extreme narrowness of her pelvis, to give birth to her child. (The case was one of head presentation.) As Mauriceau was not at all willing to perform a Caesarian section,—which alone, as he believed, promised a way out of the difficulty,—Chamberlen, who happened to be in Paris at that moment, was asked to see the patient. He came at once, made a hasty examination, and declared that he needed only six or seven minutes for effecting, by means of the method which he had invented, the delivery. The patient was placed under his charge and he proceeded to apply his method. Instead of a few minutes, he spent three hours in the attempt to accomplish this purpose, but without success; and then admitted that it was impossible, in this particular case, to effect delivery. At the end of twenty-four hours the woman was dead. A postmortem examination revealed the fact that the uterus was torn in several places and perforated at one spot, all of which lesions had evidently been produced by the instrument or instruments employed by Chamberlen. "To complete this story," adds Mauriceau, "it should be remembered that, six months before the occurrence of the events just narrated, this physician had come to Paris

from England, and boasted that he possessed a secret method by means of which he could, even in the most desperate cases of labor, promptly effect the delivery of the child, and had told the King's Physician in Ordinary that he would sell the knowledge of this secret for the sum of 10,000 Thalers (about $7500)."

One naturally hesitates about giving any measure of credit to a physician whose professional conduct, as revealed in his relations to Mauriceau's patient, is clearly that of a charlatan. At the same time we are obliged to bear in mind that in 1670 it was still possible for a physician or surgeon to own a secret method of treatment and yet not forfeit all consideration on the part of his professional brethren. But at no time in the history of medicine has such conduct as that attributed to Hugh Chamberlen (apart from the question of ownership of a secret process) been considered otherwise than reprehensible. However, as there does not appear to have been an earlier claimant for the honor of having invented the obstetric forceps,—crude as it must have been in its first form,—it seems only fair that Chamberlen should be granted undisputed possession of this honor. During the eighteenth century—a period with which the present volume has no concern—the obstetric forceps underwent many alterations, and finally was given, by Levret and Baudelocque in France, by Smellie in England, and possibly also by Palfyn in Holland, practically the form which it possesses to day.

Before I finally dismiss the allied topics of obstetrics and gynaecology, it seems desirable that I should add a few remarks concerning two French surgeons who attained considerable eminence in this special field, viz., Portal and Dionis.

Paul Portal.—Paul Portal, a native of Montpellier, France, was a contemporary of Mauriceau and an excellent obstetrician. He received his training under the best teachers at Paris, and more particularly under the guidance of René Moreau, Dean of the Paris Faculty of Medi cine (1630 and 1631) and Royal Professor of Medicine and Surgery. He died in 1703. In the treatise which he pub-

lished at Paris in 1685 ("*La pratique des accouchements, etc.*") he lays down very strongly the maxim that the surgeon or the midwife who has charge of a case of labor should make no attempt to accelerate the efforts of Nature until it becomes plainly evident that artificial assistance is absolutely necessary. Portal cultivated the art of digital exploration to a very high degree of excellence. In Chapter VI., according to von Siebold, he expounds with great clearness the dangers which result from a prolapse of the umbilical cord. When this condition is discovered, no time should be lost in delivering the child. "In narrating some of his most remarkable cases Portal uses very simple and clear language, and he puts on record many things which in later years have been published as entirely new discoveries. But, unfortunately, his immediate successors were not disposed to profit from Portal's admirable teachings." (Von Siebold.) The only translations of his treatise into foreign languages that have been published are one in Dutch (1690) and another in Swedish by Van Hoorn (1723).

Pierre Dionis.—Pierre Dionis, who was born at Paris in the early part of the seventeenth century, was in some degree related to Mauriceau, the famous Parisian accoucheur. In 1673 he was appointed Royal Demonstrator of Anatomy and Surgery at the institution known as the "*Jardin du Roi,*" and from this date onward, up to the year 1680, he gave instruction regularly in these branches of medical knowledge to large classes of students. He was particularly distinguished for the clear and methodical manner in which he handled the subjects upon which he lectured. In the year last mentioned he was called to Vienna to fill the position of Physician-in-Ordinary to Maria Theresa, Empress of Austria, but von Siebold, who is my authority for the present sketch, does not say for what length of time he continued to hold this position. His death occurred in 1718.

The earliest work published by Dionis bears the title: "*Histoire anatomique d'une matrice extraordinaire,*" Paris, 1685. (Description of a case of extra-uterine

pregnancy.) Five years later he published the treatise on human anatomy (*"L'anatomie de l'homme, etc.,"* Paris, 1690) upon which his celebrity largely rests. This book passed through numerous editions and was translated into Latin, Dutch and English (1723), and also Chinese; this last piece of work being done by the Jesuit missionary, Father Parrenin, at the request of Cam-Hi, Emperor of China, who died in 1723. Another treatise, which perhaps contributed, even more than did his Anatomy, to render Dionis celebrated, is that which bears the title: *"Cours d'opérations de chirurgie démontrées au Jardin-du-Roi,"* Paris, 1707; and later translations into German, Dutch and English. This book covers the entire field of operative surgery, and its subject-matter is most methodically arranged. It contains a large number of precepts which are as sound to-day as they were two hundred years ago. From the frequent mention which Dionis makes of the diseases to which the teeth are liable, and from his descriptions of the operations that may be performed for the cure or relief of these disorders, one is justified in drawing the conclusion that, at that early period, this branch of surgery was not, as many suppose, abandoned entirely to charlatans.

CHAPTER XLIII

THE FIRST APPEARANCE OF SYPHILIS IN EUROPE AS AN EPIDEMIC DISEASE.—MEDICAL JOURNALISM.—THE BEGINNINGS OF A MODERN PHARMACOPOEIA.—ITINERANT LITHOTOMISTS

Toward the end of the fifteenth and during the early part of the sixteenth centuries accounts concerning syphilis began to be published in the medical literature of Spain, Italy and France. The word "syphilis," it is true, does not appear in any of these records, for it had not yet been coined; but the accounts themselves leave no room for doubt that this was the disease to which the authors of these records referred. The prevailing views with regard to the origin and nature of syphilis differed somewhat in the three countries named. In Spain, for example, it was a common belief that the disease originated in an unfavorable conjunction of the stars[1] and yet at the same time it was generally admitted that it was a disease which belonged in the category of luxuries and might be avoided if one were careful not to have intercourse with dissolute women. For a brief period of time there were physicians in all three of the Latin countries who maintained that syphilis had been imported, in the first instance, from America by the men who made the voyage with Columbus and by the earliest Spanish explorers of South America; but it was soon shown that this theory was not compatible

[1] For a confirmation of this statement see the poem on syphilis (*"Enfermedad de las Bubas"*) written by the Spanish physician Francesco Lopez de Villalobos and published by him in 1498 at Salamanca. The employment of mercurial inunctions is also mentioned in this poem.

with certain known facts—such, for example, as the published reports made by the Spanish physicians Pintor and Torrella,[2] who describe cases of syphilis which they had treated prior to 1493 (the year in which the first discoverers returned from America). In Italy, according to Giovanni da Vigo, the author of an excellent treatise on surgery (*"Practica in arte chirurgica copiosa,"* Rome, 1514), the disease was first observed in Europe in December, 1494, soon after the arrival of Charles the Eighth's (France) army at Naples; and only a short time elapsed before there developed, as a result of this great accession of French soldiers, a veritable epidemic of what then began to be known quite generally as *"morbus gallicus"* or "the French disease." The King himself, it is stated, was among the number of those who contracted the infection.

So far as I am able to discover, the term "syphilis" was first introduced into medical literature by Fracastoro, the distinguished physician of Verona, who published in 1530 a Latin poem bearing the title: *"Syphilis sive morbus gallicus."* These verses were received everywhere with great favor, were translated into several modern languages, and speedily put an end forever to the employment of the insulting term *"morbus gallicus."*

A few more words with reference to the origin and distribution of syphilis throughout the world may not seem inappropriate in this place. J. K. Proksch, the author of the most recent history of this disease,[3] says it has been fully proved that syphilis existed among the inhabitants of India as long ago as during the Middle Ages, and he adds that the evidence thus far collected justifies the further belief that it was not an uncommon malady among the ancient Greeks and Romans, and even among the Babylonians and Assyrians. Doubtless a good deal of what was called "leprosy" in early times was in reality syphilis. Another syphilographer—Raphael Finckenstein makes the following sensible remarks about the

[2] Physicians who had served at Rome as the regular medical attendants of Pope Alexander the Sixth.

[3] "Die Geschichte der venerischen Krankheiten," Bonn, 1895.

efforts that have been made to ascertain the precise date when this disease first appeared in Europe:—[4]

> It is just as foolish to suppose that the date of the first appearance of syphilis may be discovered as it is to hope that the disease will ever entirely disappear. As long as wealth and idleness continue to exist, as long as there are men who remain unmarried and women whose moral character is of a yielding nature, and as long as it is not possible for the police to creep into every nook and corner, just so long will licentiousness and indulgence in fleshly lusts continue to disturb the peace of the community. These are the conditions necessary to the development and spread of syphilis.

Some account of the treatment of this form of venereal disease comes next in order. It is commonly believed, says the author just quoted, that it was from the Spanish physicians of the sixteenth century that we learned how to treat syphilis by the methodical employment of mercurial preparations. (See footnote at the bottom of page 542.) He adds that there was published by Juan Almenar at Venice, in 1502, a book which bears the title: "A treatise on the Morbus Gallicus, in which it is demonstrated how the patient may be treated in such a successful manner that the disease will never return, nor will any objectionable lesions develop in the mouth; and yet, during the progress of the treatment, the patient is not required to remain in bed." The author of this book, who was a resident of Valencia, Spain, was a man of noble birth. His treatise passed through eight successive editions, the last of which was printed at Basel in 1536. Almenar's plan of treatment was to employ mercurial inunctions in such moderate doses as not to induce salivation. If, at the end of a few days, he saw evidences of an approach of this symptom, he substituted baths and evacuant remedies (rhubarb and senna) for a short time, and also prescribed a more nourishing diet and the taking of various internal remedies. Then, later, the inunctions were resumed. The exact duration of such a course of treatment is not stated. So far as I am able to judge from the account given by Finckenstein, Almenar found it necessary in some cases

[4] "Zur Geschichte der Syphilis," Breslau, 1870.

to repeat the series of mercurial inunctions as many as four times. His aim, in other words, was to accomplish a radical cure of the disease, whereas his contemporaries, who were mainly ignorant and uneducated physicians, were satisfied to carry out a purely symptomatic treatment. Morejon, the historian of Spanish medicine, expresses the belief that Almenar was the first to use steam baths in the treatment of syphilis. Both Hensler and Simon, the best modern authorities with regard to the history of syphilis, agree that Almenar's inunction method of treating this disease forms, notwithstanding its crudeness in certain respects, the basis of all modern methods of the same general character. Unfortunately, the physicians of a later period did not follow the relatively mild and safe inunction method advocated by Almenar, but so modified it for the worse that it became a common thing for men to say that the cure was worse than the disease.

A Few Special Advances Worthy of Note.—The beginnings of medical journalism belong to the second half of the seventeenth century. In 1665, for example, there appeared for the first time, a medical article in the "*Journal des Scavans*," and during the same year similar articles were printed in the "Philosophical Transactions of the Royal Society of London." According to August Hirsch the earliest periodical that was devoted entirely to the interests of the medical profession was the "*Journal des découvertes en médecine*," which was first published in 1679 and continued, in 1680, under the title of "*Le Temple d'Esculape.*" Then followed soon afterward: "*Le Journal des Nouvelles Découvertes en Médecine*" (1681-1683); "*Le Mercure Savant*" (1684); "*Le Zodiacus Medico-Gallicus*" (1680-1685), which was published in Latin in Geneva, by Bonet; etc.

In addition to the more important advances in anatomy and physiology that have already been mentioned on previous pages, the following deserve to receive at least a passing notice: In the department of anatomy and physiology, William Briggs (1642-1704), one of the physicians of St. Thomas' Hospital, London, published at

Cambridge in 1676, under the title of "*Ophthalmographia,*" a most important contribution to the anatomy and physiology of the eye; and there were four other English anatomists who, during the seventeenth century, gained well-merited credit by the original work which they did in the fields of anatomy and physiology—viz., Thomas Willis (1622 1675), Francis Glisson (1597-1677), Thomas Wharton (1610 1673), and Nathaniel Highmore (1613 1684). The part played by Germany in these gains in anatomy and physiology, during the period now under consideration, was chiefly that of a sympathetic recipient; for the political conditions at that time were entirely unfavorable to any active participation on the part of the physicians of that country. Early in the eighteenth century, however, they began in earnest to do their share of work in advancing the science of medicine.

The relationship of the physical sciences to the theory and practice of medicine is not of an intimate nature, and it will therefore not be necessary for me to do more than briefly to enumerate the more important of the discoveries of this character which occurred during the sixteenth and seventeenth centuries.

Galileo (1564 1642), a native of Pisa, Italy, was the creator of the science of motion, and he gave the first satisfactory demonstration of equilibrium on an inclined plane. He devised an imperfect species of thermometer, a proportional compass, and the refracting telescope, by means of which latter instrument he made a number of other important discoveries in the domain of astronomy. His pupil, Evangelista Torricelli (1608 1647), also a native of Italy, discovered the barometer, and in addition arrived at many fundamental truths in mechanics and hydrostatics. Otto von Guericke (1602-1686), a native of Magdeburg, Germany, invented the air pump. Sir Isaac Newton (1642-1727), born at Woolsthorpe, Lincolnshire, one of the world's greatest authorities in natural philosophy, was the first to formulate clearly the law of gravitation. Edme Mariotte (1620 1684), a native of Burgundy, France, was the discoverer of what is commonly known as "Mariotte's

law''—*i.e.*, a law of elastic fluids, according to which the elastic force is exactly in the inverse proportion of the space which the mass of fluid occupies. He also discovered that the part of the retina at which it meets the optic nerve is not capable of conveying the impression of sight. Finally, Denis Papin (1647 1710), a Frenchman, invented the first steam engine, of an embryonic and not very practical type; for in this apparatus the piston floated on the water in a separate cylinder.

The inventions which I have here briefly enumerated represent the more important discoveries that were made in physical science during the sixteenth and seventeenth centuries.

The Beginnings of a Modern Pharmacopoeia, and One of the Last Attempts of the Disciples of Galen to Maintain Their Ascendancy in Therapeutics.—In the domain of pharmacology the first attempt in modern times to organize this department of practical medicine was made by an apothecary in Barcelona in 1497, and was published by him in printed form in 1521. (Von Gurlt.) This pharmacopoeia was doubtless wholly unknown beyond the borders of Spain. Not far from one hundred years later,—*i.e.*, in the early part of the seventeenth century,—Theodore Turquet de Mayerne, who was born in 1573, in a small village near the city of Geneva, made the second attempt in modern times to organize the pharmacological department of practical medicine. After showing quite early in life a fondness for the study of chemistry, he devoted himself particularly to the investigation of the remedies that are produced in the chemist's laboratory; the preparations of antimony attracting his especial interest. A little before this time the physicians of Paris were split up into two strongly antagonistic parties as regards the propriety of administering this metal in any form as a remedy; but those who opposed its therapeutic employment finally managed to secure from Parliament, in 1566, a decree prohibiting its use. While this quarrel was in progress, de Mayerne visited Paris (1602) and established himself in that city as an independent lecturer on chemistry. As

the regular faculty still held the belief that the teachings of Galen were the only safe guide for physicians to follow, de Mayerne's action must have appeared to them like an impudent challenge. In one of his writings he strongly recommended the employment of antimonial preparations,—remedies introduced originally by the much hated Paracelsus,—and he even went so far as to offer some for sale. This was too much for the disciples of Galen to bear without a protest, and consequently in 1603 the Parliament issued a new decree, in accordance with which de Mayerne was prohibited from practicing medicine in Paris. This measure appears to have proved successful in putting a stop effectively to his obnoxious teachings, for we learn that shortly afterward he was known to be living in London, where, in 1611, he was appointed the Physician-in-Ordinary to King James the First, and later to Charles the First. He died in 1655.

Jean Astruc, the distinguished French medical author of the eighteenth century, speaks rather disparagingly of de Mayerne's attempt to organize a pharmacopoeia. An earlier, more successful, and much more creditable attempt of this nature was made by Valerius Cordus, whose "*Dispensatorium pharmacorum omnium*" was first published at Nürnberg in 1535. This work, which subsequently bore the title "*Pharmacopoeia Augustana*," up to the year 1627 passed through at least seven editions and was utilized to a greater or less extent by the authors or editors of nearly all later pharmacopoeias. To go still further back, the most ancient pharmacopoeia of which we have any knowledge is that which bears the title of "*Antidotarium Nicolai*," the author of which work was Nicolaus, the President or Dean of the Medical School at Salerno. The book was written originally during the first half of the twelfth century, but it did not appear in print, at Venice, until the year 1471, and then only in an incomplete form. Quite recently a French translation of the book has been made and published (1896) by Paul Dorveaux, of the Paris School of Pharmacy. Most of the preparations there described have long since been abandoned, but a few of

them—such, for example, as citrine ointment, honey of roses, oxymel, and oil of roses—are still to be found in the pharmacopoeias of some nations.

Itinerant Lithotomists.—For an unknown number of years preceding the sixteenth century it had been a well-established custom for members of the medical profession in France, and also, doubtless, in neighboring countries, to intrust—as the Hippocratic oath enjoined—all cases of stone in the bladder to expert lithotomists. Such special knowledge and skill were not easily acquired, and so it came about that there were very few individuals who were acknowledged to be experts and who were really capable of teaching the art, and these few guarded most carefully the knowledge which they had gained. During the period of time which we are now considering, certain members of the Collot and Pineau families were the most distinguished lithotomists in France, and the records show that in the year 1600 Jehan Paradis and Nicolas Serre petitioned the Government for official recognition of their special rights to enjoy a monopoly of operative work of this character. "We ask that you give orders that all poor patients who may apply to Hôtel-Dieu (the great city hospital of Paris) or to the Bureau-of-the-Poor for relief from stone in the bladder, be turned over to our care for proper treatment. The poor will receive this treatment gratis, and those who can afford to pay will be charged a very reasonable fee. And you will do well if you prohibit all other persons from meddling with such cases in any manner." In a document bearing the date 1646 mention is made of four lithotomists—Philippe and Charles Collot, Jacques Girault and Antoine Ruffin—who had erected in the Faubourg Saint Antoine, Paris, a building which was intended to serve as a hospital "in which, at any time during the entire year, those who are afflicted with stone in the bladder may be lodged, fed, nursed and subjected to proper treatment,—the poor without charge of any kind, and the well-to do at a proper rate of remuneration."

In Franco's time (middle of the sixteenth century) cutting for stone in the bladder was by no means an

uncommon operation, and was almost always performed by itinerant lithotomists (''*inciseurs*''). The Collots had, for many years, possessed almost a monopoly of this business. Laurent Collot, who was the first one of the family to engage in the work, was Royal Lithotomist in 1556, and handed down to his son all the knowledge on this subject which he had acquired through long experience. François Tolet was another of these popular lithotomists who flourished in Paris during the sixteenth and seventeenth centuries. He died in 1724 at the age of seventy-seven. His treatise on lithotomy, which was published in Paris in 1681, and subsequently passed through several editions, is said by Dezeimeris to contain the records of a large number of his own cases and to show clearly that he was a surgeon of sound judgment. No better treatise on this subject, he adds, was published during that period of the history of medicine.

In addition to those whom I have just mentioned there were two French monks who gained wide celebrity as operators for stone in the bladder, viz., Frère Jacques de Beaulieu and Frère Côme. The last named belongs to the early part of the eighteenth century, and should therefore—in accordance with the plan which I have been following—not receive consideration in the present account; but, in view of the fact that these are the only two monks who, during the Renaissance and the period immediately following, gained conspicuous credit for the honorable and efficient service which they rendered, not merely to the science of medicine but also to the cause of humanity, I believe that I cannot do better than to place the two sketches together as if they both belonged strictly to one and the same period of time.

(*a*) Frère Jacques—or Brother James, who was born in 1561 at the village of Létendonne, near Lons le Saulnier, Central France,—learned the art of operating for stone in the bladder from an Italian surgeon named Paulony, and acted as his assistant or associate up to the time when he became a monk of the Order of Saint Francis that is, of that branch of the Order which had its chapter house at

FIG. 26. FRÈRE JACQUES DE BEAULIEU.

Born in 1651 in the village of Létendonne, Franche-Comté, France.

(From the steel engraving in the treatise *De la Taille Latérale par le Périnée*, etc., by Pascal Baseilhac, nephew of Frère Côme, Paris, 1804.)

Feuillants in Languedoc. He traveled about the country offering to treat gratuitously all persons affected with stone in the bladder who were willing to trust him, and he made it a rule, whenever such a thing was possible, always to operate in the presence of one or more physicians or surgeons. He was also ready at all times to give instruction to those who wished to learn his method of procedure. He never asked to be remunerated, but was always pleased to receive from his patients a written testimonial of what he had done for them. Out of the moneys which he received from the rich he retained only that which he required for his own support and for the purchase of such instruments as he from time to time required; the balance he distributed among the poor. He was very faithful in performing his religious duties, and he succeeded in gaining the good will and esteem of everybody with whom he had any dealings.

For a long time it was customary in France to credit Frère Jacques (Fig. 26) with the invention of the lateral method of operating for stone in the bladder. This, however, was an error, for Franco, on page 95 of E. Nicaise's reproduction of the 1561 edition, describes this operation clearly. It must therefore have been invented a long time before Frère Jacques was born. The text (rendered into English) reads as follows: . . . . . the incision should be made between the anus and the testicles, two or three finger-breadths to one side of the commissure or perinaeum [median line of the perinaeum]." This is said to be the earliest clear description of the first step of the lateral operation of which we have any knowledge.

In 1697, when Frère Jacques visited Paris, he had already attained wide celebrity as a lithotomist; the number of his successful operations—all of which had been performed according to the lateral method of procedure—having reached a grand total of several thousand. He therefore had a right to suppose that his visit would prove acceptable to the physicians of that metropolis; but the published account of this visit reveals plainly the fact that the surgeons of that city were not at all pleased that an itinerant lithotomist from one of the provinces should have the

effrontery to request permission of the authorities to exhibit his method before the Medical Faculty of Paris. His request, however, was granted, and he was allowed to operate on a man, forty years old, at Hôtel Dieu. He performed the operation before a large assembly of physicians, and, after the stone had been successfully extracted, the patient made a prompt recovery. A short time afterward he operated upon another patient at Fontainebleau in the presence of several physicians, one of whom was Monsieur Félix, the First Surgeon of the King, Louis the Fourteenth. In this case also, as well as in several later cases, Frère Jacques was entirely successful, and he now began to be treated by the public with marked consideration. But, in a short time, owing to the jealousy exhibited by a large clique of Paris surgeons, who were encouraged to pursue this course by Mery, the Head Surgeon of Hôtel-Dieu, Frère Jacques was finally forced to leave Paris. I cannot follow him on his further wanderings throughout Europe, from the leading cities of Holland, Belgium and Switzerland to Vienna and Rome. In 1716 he retired to Besançon and lived there quietly up to the time of his death in 1719. But even then his enemies—men to whom he had never done the slightest harm—did their best to destroy the last traces of his existence. A visit made to Besançon by one of his acquaintances not long after our Franciscan monk's death, revealed the fact that his name had been erased from the church registry of deaths. The lateral method of operating for stone, which had been revived and thoroughly developed by him, still finds favor among the best surgeons of our own day; and the names of those mean-spirited men who tried so hard to injure him have long since passed into complete oblivion.

(*b*) Frère Jean de Saint-Côme,—or Brother John of Saint Cosmas,—whose real name was Jean Baseilhac, was born in 1703 at Poyestruc, Department of Hautes-Pyrenées, France. He received his instruction in the principles of medicine from his father and his grandfather, both of whom were regularly enrolled Masters in Surgery. In 1722, when there could no longer be any doubt about young

FIG. 27. JEAN BASEILHAC, COMMONLY KNOWN IN FRANCE AS FRÈRE CÔME.

(From the steel engraving in Pascal Baseilhac's treatise.)

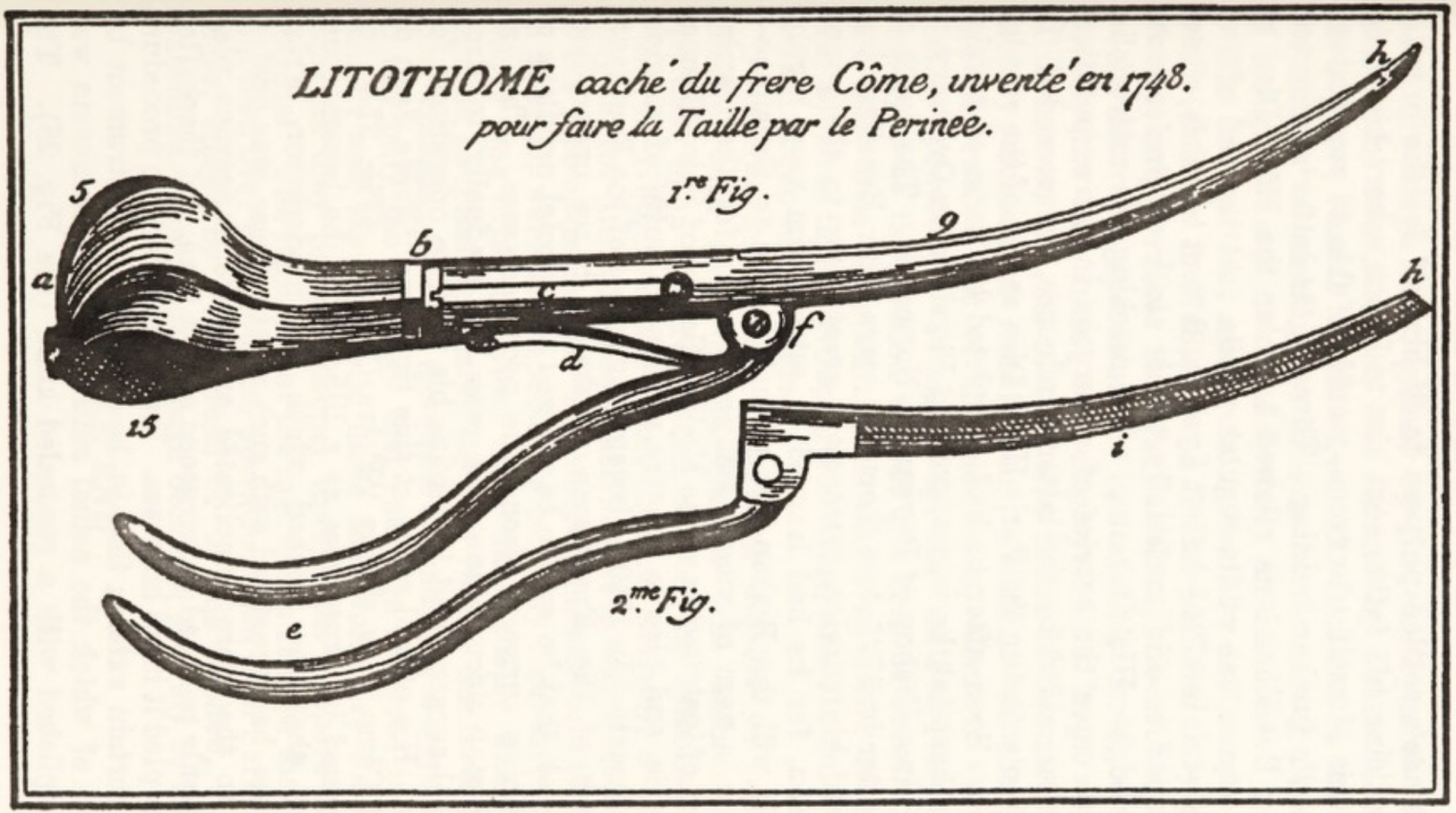


FIG. 28. CONCEALED LITHOTOME INVENTED BY FRÈRE CÔME IN 1748.

(From the steel engraving in Pascal Baseilhac's treatise.)

Baseilhac's settled purpose to fit himself for the practice of medicine, his father sent him to Lyons, where his uncle, who was himself a surgeon, would be able to superintend the boy's further training. Through the latter's influence, young Baseilhac was allowed to enter the Hôtel Dieu of that city as one of its regular pupils. At the end of two years—*i.e.*, in 1724—he left Lyons and went to Paris, where he hoped to add materially to his stock of professional knowledge. His first step, after reaching the metropolis, was to enter the service of a surgeon in active practice; and then, aided by the latter's influence, he succeeded (in 1726) in entering the Paris Hôtel Dieu as one of the regular pupils. Soon after he had completed his term of service at the hospital, he was appointed Physician in-Ordinary to the Prince-Bishop of Bayeux, in Normandy. The death of the latter in 1728, less than two years after Baseilhac had entered his service, came as a great blow to the young surgeon, for he had learned to esteem him very highly. In his will the Bishop left a small legacy to Baseilhac—that is, a sum of money sufficient to pay for the regular course of instruction at the Medical School of Saint Cosmas in Paris, and also to procure a complete outfit of surgical instruments. In 1740 he became a member of the Feuillants Branch of the Franciscan monks, it being understood, however, that he was to be allowed the special privilege of practicing surgery among the poorer classes. Through accidental circumstances he was led gradually to drop general surgery and to confine his work to operations for stone. His official name at this time was "Frère Jean de Saint Côme," or simply "Frère Côme." (Fig. 27.) As he gained in experience as a lithotomist, he became convinced that the method which his predecessor, Frère Jacques, had practiced with such great success, was preferable to the more complicated and more dangerous plan commonly pursued by surgeons at that time, and thereafter he adopted it in all his cases. But he modified the procedure to a certain extent; that is, he invented an instrument by means of which the actual cutting of the perinaeum was accomplished with a concealed knife (see Fig. 28). The

chief advantage to be gained by the employment of this instrument consisted—as was claimed by Frère Jean and his nephew, Pascal Baseilhac,—in the fact that in this way the danger of making the incision in the wrong place, or of too great length, was materially diminished.

The first patient upon whom the new instrument was tried (October 8, 1748), was a dealer in lime, sixty years of age and in rather delicate health. In less than three weeks after the operation, he was entirely cured. Subsequently the instrument was employed in a large number of instances, and the method was found to be most satisfactory; successful results being obtained—on the average—in twelve out of thirteen cases, whereas the best results previously obtained by the method commonly employed at that period was 50 per cent of cures. At a still later date the statistics showed even better results—viz., 96 cures in one group of 100 cases, and 316 cures in a second group of 330 cases.

Owing to the rapidly increasing number of patients affected with stone in the bladder who wished to be operated upon by Frère Jean himself, he established in Paris in 1753, near the Saint Honoré gateway, a special hospital for lithotomy cases, and kept it in active service up to the time of his death. The laboring classes, and the poor in general, were not expected to pay any fees, and indeed money was often bestowed upon these people when they left the hospital, to enable them to return comfortably to their villages; those in moderate circumstances were asked to pay only the expenses that had been incurred in their behalf; and the well-to-do made such voluntary contributions as they thought proper toward the support of the hospital. The registers of the institution showed that, first and last, over one thousand operations had been performed there, either by Frère Jean or by his nephew, Pascal Baseilhac. Our monk's death occurred on July 8, 1781.

THE END

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