



[From Erastus: *Varia Opuscula Medica*. Francofurdi, 1590.]

# ANNALS OF MEDICAL HISTORY

NEW SERIES, VOLUME III

JANUARY, 1931

NUMBER I

## THE RISE OF MEDICINE AT SALERNO IN THE TWELFTH CENTURY\*

By GEORGE W. CORNER, M.D.

ROCHESTER, N. Y.



IN the fourth decade of the eleventh century, Christians and Saracens faced each other across the Mediterranean. In the capitols of the Arab Caliphates, at Bagdad, Cairo, Cordova and Seville, there was all the splendor of Oriental courts and a civilization in which art, science and philosophy were flourishing. In these cities, medicine was an important and highly developed profession. For centuries the eastern physicians had been translating the ancient books of medicine, Hippocrates, Galen, Orbasius and the rest, from Greek into Syriac and then into Arabic. Upon this foundation the more recent Saracens had erected a considerable structure of medical practice and literature, culminating in the great medical en-

cyclopedias of Ali Abbas, Rhazes and Avicenna. The "Canon of Avicenna" was written about the year 1020, scarcely fifty years before the rise of Salerno.

At this same time, the map of Italy was cut up like a picture-puzzle into a number of small states, relics of the empires which had formerly controlled the peninsula. At the toe of the boot Calabria and Apulia remained in the hands of the Byzantine Empire, forming an outpost of Greece. Bordering this territory on the north lay three semi-independent duchies, Benevento, Capua, Salerno. These were fragments of the Lombard kingdom, cut off from Lombardy by the expanded Papal States, chiefly inhabited by a Latin-speaking people, and ruled by ducal families descended from the old Teutonic conquerors.

Sicily was now in Saracen hands, sharing the stability and prosperity of the Moslem Empire. This island

\* Lecture delivered March 5, 1930, on the William Snow Miller Foundation established by the Phi Beta Pi Medical Fraternity at the University of Wisconsin; and subsequently at the Mayo Foundation and the Universities of Minnesota and Iowa.



formed a natural meeting place for all the Mediterranean peoples; its checkered history had made it a melting pot of the races, and the three chief languages, Greek, Arabic and Latin were all freely spoken there.

The city of Salerno, on the Gulf of Paestum, and its surrounding territory had been an independent Duchy during a hundred and fifty years. We can imagine it as a small walled town, with a few churches, a market place, and a little harbor fortified against Saracen raids. Of its intellectual and medical history before 1070 we know little, except that it had a reputation all over Europe for the practical skill of its doctors. A kind of legend has grown up that in some way the spirit of classical Greek medicine had never died out in this place. To quote the late Dr. J. F. Payne: "The broad stream of Greek medicine was reduced to a narrow rill, but it was still unpolluted." This is more poetic than true. A more accurate simile would be that of a clear mountain torrent pouring on to the sterile sands of a desert. The stream dries up and diminishes until at the end there is only a trickle of muddy water, laden with extraneous debris picked up on its way from the mountains.

In the monasteries, where scholarship had been kept alive during the Dark Ages, and possibly also in the possession of the lay doctors of Salerno, there was a handful of Greek and Latin books, including the "Aphorisms" and "Prognostics" of Hippocrates, and a few fragments of Galen. They had also a number of formularies of Galenic herb-medicine, and one book on practice called the "Practica Petrocelli," which was put together in the tenth or eleventh century from degenerate Greek sources. From

the scantiness of this literature we may conclude that theoretical medicine was not developed farther at this town than elsewhere in Europe, until after the Normans came.

About the year 1030 the Normans began to filter into southern Italy. At first pilgrims, then military adventurers, they took part as mercenaries in petty wars between the Lombard dukes, began to acquire lands and castles and finally turned upon their hosts. In 1046 Robert Guiscard arrived from Normandy, took command of the Norman bands and undertook a general conquest. By 1060 he held Calabria, and began with his brother Roger the conquest of Sicily.

Returning to Italy the brothers took Apulia in 1068 and besieged Salerno in 1075. The little city held out for eight months, but finally capitulated, giving the Normans command of all the territory later known as the "Two Sicilies." Robert Guiscard was a cruel fighter, but at Salerno he proved to be a strong and useful ruler. One of his first acts was to build the cathedral of St. Matthew, which still stands. Its contemporary *ambo* or pulpit, a masterpiece of craftsmanship, illustrates how well the fierce Normans could foster art during the century of peace they brought to Salerno.

The city now became more than ever a center of trade; it had large warehouses and its ships plied between the mainland and Sicily. Thus by the currents both of war and trade the Latin and Arabic cultures were mingled in the Norman land. Under these circumstances not only men and goods, but *ideas* were bound to interchange.

About the time when Salerno was captured, there appeared in the city



a man named Constantine Africanus. We know little of his origin; perhaps he had come up from Sicily with the army of Duke Robert. He seems to have lived in Salerno for a time, and then became a monk at the near-by Abbey of Montecassino. Whatever his history, Constantine was able to read Arabic, and he made it his life work to translate the great classical books of Arabic medicine and philosophy into Latin of the kind spoken in his day. The list of his writings comprises thirty-seven titles of books, large and small, which he translated. These include the "Aphorisms" of Hippocrates, two of the therapeutic works of Galen, and above all a complete translation of the large encyclopedia of medicine which Ali Abbas had written in Arabic at Bagdad about a hundred and fifty years before. This book, known in Arabic as "Al-Maleki," (The Royal Book), was called by Constantine "Pantegni," (The Whole Art).

The "Pantegni" contains chapters on anatomy, the pulse, fevers, symptoms and crises, on prognosis and on surgery. There has been a good deal of discussion as to Constantine's qualifications as a translator. Not only is his Latin very crude, but he does not always find equivalents for Arabic words and idioms. I once took the time to compare part of the chapters on anatomy with De Koning's French translation of the original Arabic of Ali Abbas and found them to agree very well. We must remember that Constantine's task was very much like that of our friend Randolph Shields and the other good men out in China who have been translating Gray's "Anatomy" and Osler's "Practice" into Chinese; he had to make up his vocabulary as he went along.

With the appearance of Constantine's translations the doctors of Salerno found themselves in possession of a whole medical library, enormously larger than anything they had known before. They did with this new information just what enthusiastic physicians always do under such circumstances: they began to teach it and to write it down. At least fifty new books on medicine appeared at Salerno during the century after Constantine.

Let us digress from our story at this point to consider briefly the manner in which these books have come down to us. A few of them remained in active use as long as five hundred years, until the Renaissance, and so were printed. Among those which reached the printing press were the books of Constantine himself. A fairly complete edition appeared at Lyons in 1515 under the title "Opera Ysaac." This is unfortunately one of the rarest of medical books; there are, so far as I know, only three copies in the United States, one in the Army Medical Library, one in the library of the Jewish Theological Seminary of New York, and one at the School of Medicine and Dentistry of the University of Rochester. A less complete edition was printed under Constantine's own name at Basel in 1536-1539. "The Surgery of Roger," the textbook of obstetrics and gynecology called "Trotula," the book "De modo medendi," the so-called "Anatomy of Copho," and others were also printed. Most of the Salernitan books, however, were superseded in a century or two, the manuscripts were shelved, and many of them no doubt discarded and lost.

In 1837 A. W. E. T. Henschel found in the Magdalener Gymnasium



in Breslau a manuscript volume which is now preserved in the Breslau Municipal Library. It is the "Codex Salernitanus," a volume written about the year 1170 by two doctors of Salerno. This manuscript contains a score of books and several collections of recipes and similar memoranda. At the time of Henschel's discovery there were three other scholars interested in the early history of Salerno, namely the Frenchmen Daremberg and Baudry de Balzac, and Salvatore de Renzi of Naples. The notes and transcriptions of all four were worked up by de Renzi in his "Collectio Salernitana," published at Naples in five volumes in 1852-1854. This is our chief source of Salernitan history. Unfortunately de Renzi's books are marred by very bad printing and editing; the transcriptions are not very accurate and de Renzi himself was an unreliable historian. He was altogether too ready to attach names and dates to the various books and even to draw up family trees of the Salernitan authors. A great deal of imaginative untruth about Salerno began with these books. In 1898 Piero Giacosa collected a volume of previously unprinted manuscripts. During the last twenty years Sudhoff has taken up the work. His pupils among the Leipzig students have one by one edited and published the Salernitan texts until now almost all the "Codex Salernitanus" is in print in correct transcription, and so far as I know there are not many of the other Salernitan manuscripts still left unprinted in one form or another.

A complete library of Salernitan medicine is thus a very incongruous shelf-load, with the "Opera Ysaac" of 1519 at one end, scarce as an auk's egg and costing its weight in silver

at least, de Renzi's sloppy but invaluable volumes in the middle, and at the other end a score of recent German M.D. dissertations.

From the Salernitan books we learn the names of about thirty individual writers; and one can in many cases guess their approximate dates, or at least the order in which they wrote. A few years ago there turned up in the archives of the Cathedral at Salerno a book containing a register of deaths in the Cathedral parish since the tenth century, and a membership list of the confraternities or men's brotherhoods of the church. In these lists the names of scores of physicians are entered, among them many of those whose names are attached to the medical texts; but the entries are only records of enrollment or of death. We have no personal histories and no portraits by which to distinguish the names: Platearius, Maurus, Archimatthaeus, Copho, Roger, and the rest. Their works alone speak for them, proving the motto of Vesalius: "Vivitur ingenio, caetera mortis erunt."

The earliest effects of all this new science from the Orient are very well illustrated by two little books on anatomy which were written in these first days of the new Salerno. The Salernitan doctors seem to have had a teaching exercise, a dissection of the pig, accompanied by reading of a brief lecture of ancient origin. We have no copy of this original lecture, but we have a revised version of it, the so-called "Anatomy of Copho," which has a curious mingling of old post-classical Latin words and the new terms introduced by Constantine. The writer of this lecture was so uncertain of his terms that he mentions the omentum, for example,



twice, once under its Latin name and once under the Arabic (*Zirbus*) without any sign that he knew these two words mean the same thing. We can imagine, if we like, a slightly confused old-timer trying to bring his lecture notes up-to-date. The other Salernitan anatomy, the "Second Salernitan Demonstration," is not only influenced by Constantine, it is actually copied from the "Pantegni," almost every word of it. The old tradition is gone for good.

We shall see that medicine and surgery, as well as anatomy, were revolutionized by the new books. From 1080 on, medicine at Salerno was a product of the mingling of south Italian tradition and Arabic scholarship. The Salernitan contribution was a direct, practical attitude and a simplicity of mind best described by the word *naiveté*; the Arabic was characterized by systematic formalism, attention to detail, and a great respect for authority. Let me read two passages from the "Second Salernitan Demonstration." The first is really copied from Constantine's "Pantegni."

There are three general operations, with three corresponding instrumental members, namely, animal, spiritual, and natural. The animal members are created for sensation and voluntary motion in all animals; also in some animals for imagination and memory. The spiritual members are for protecting the channels of breath and natural heat. The natural members are nutritive and generative. The nutritive are for the reintegration of bodily loss and waste and for the alteration of materials permuted from evil to good. The generative organs are made for the specializing of general substance and for the individualizing of special substance. In each of these systems there is one principal organ with

others protective, expurgative, and adjuvant or accessory.

Among the animal organs the brain is principal, because the animal force is principally located in it, and from it arise the other structures such as the nerves; and it is provided with others protective, expurgative and adjuvant or accessory. The protective are the pia mater, which, by enfolding the brain like a devoted mother, protects it from the harshness of the dura mater; the dura mater, which protects the brain and pia mater from the harshness of the cranium; and the cranium which protects all of these from outward harm.

This is pure Arabic scholasticism.

The second passage is the Salernitan himself speaking:

Next you will find the hair-like veins in the convexity of the liver, where the vena cava is, in this way: Near the beginning of the vena cava break off a bit of the liver substance and rub it between your fingers and the veins will appear; they are small, round, and narrow like hairs. Somebody who wanted to criticize, last year after we had done a dissection, said these were nerves—a statement which we did not refute at the time. To confute his opinion we now exhibit, before you all, these vessels, red and full of blood, with their beginnings at the origin of the vena cava.

This simple picture of the teacher of anatomy heckled by a student and returning to confute him a year later, is something very different from the academic subtlety of the Arab.

We know little about the actual methods of teaching, beyond the fact that instruction was given both in groups and by individual precept. It is reasonably certain that there was no formal medical school, in anything like the modern sense, during the twelfth century. Medicine as taught by the masters of Salerno rested upon



a very simple basis. The anatomy was, of course, purely Galenic, but so much simplified that Galen would scarcely have recognized it. The important thing is that the Salernitans taught by actual dissection. They killed a pig and pointed out all the viscera. Those present asked questions and even disagreed with the lecturer. This was very crude, but it was better than no dissection at all, and it led after two hundred years to the resumption of human dissection.

The physiology and the pathology were based on the theory of the four humors. I have never seen a better concise statement of this theory than that given in one of the Salernitan books:

There are four humors in the human body, namely, blood, phlegm, yellow bile and black bile. They are mixed in such a way and in such quantities that normally man retains his health. If, however, they are diminished, or superabundant, or thickened, or retained, or if they escape, become bitter, leave their normal regions, or enter unusual situations, various diseases occur in mankind. Sometimes it is necessary to nourish the humors, sometimes to dilute them, sometimes to compensate, and sometimes to moderate them.

The four humors have their seats in four parts of the body: blood dwells in the arteries and veins; phlegm in the brain; yellow bile in the liver; black bile in the spleen. Blood, however, resides partly in the heart and partly in the liver, and therefore it dominates in the right side where the liver is situated. The same is true of yellow bile. In the left side where the spleen is situated, black bile dominates. A part of the phlegm dominates in the bladder, another part in the chest.

Blood has a ruddy color, phlegm white; yellow bile is reddish; black bile is black and thick. Their qualities are as follows:

blood is moist and warm; phlegm cold and moist; yellow bile warm and dry; black bile cold and dry. Therefore blood is bitter by nature; phlegm salt and sweet; yellow bile sharp; black bile strong and sharp. It is obvious that these humors rule differently in different ages. In infants yellow bile and blood are more important; in adolescents, black bile; in the mature, blood; in the old, phlegm. In spring, summer, autumn, and winter, different humors dominate. In the spring blood abounds; in the summer yellow bile; in the autumn black bile; in the winter phlegm.

We may add that the different humors act in the following way: blood makes the spirit wilder; yellow bile makes it bolder; black bile, firmer; phlegm, sluggish. Therefore, infants are ruddy and cheerful; young people, romantic, quick and bold; mature people are grave; and the senile, slow and immoveable.

The humors cause variation in mood as follows: blood makes man benevolent, jolly, simple, moderate, bland, and sleepy or fat; yellow bile makes man unperturbed, just, lean, a thorough masticator, and of good digestion; black bile makes a man wrathful, grasping, envious, sad, sleepy, and critical; phlegm makes man vigilant, thoughtful, prudent.

In the sick the humors have the following effects: the blood when it is overabundant produces alienation of the mind as evidenced by laughter and singing; when there is too much yellow bile they suffer great tribulation in mind; when black bile is in excess the mood is taciturn and sad; when phlegm, they suffer with anorexia.

Phlebotomy is the beginning of health. It strengthens the mind and memory, purges the bladder, dries out the brain, warms the spinal cord, clears the hearing, restrains tears, relieves anorexia, purifies the stomach, invites digestion, induces sleep, is believed to favor longer life, and drives away disease. Phlebotomy should be done with caution, and the amount of blood withdrawn is large or



small according to the strength and age of the patient, the time of year, and the state of his bodily heat. If the blood runs black at first, bleed until it becomes red; if thick or greasy, bleed until it has the consistency of water; but the bleeding should not be allowed to run until the patient is overtaken by lassitude or weakness of the stomach.<sup>1</sup>

Owing to the fact that disease is always associated with abnormal amounts of one or more of the humors in the body, a method of diagnosis is ready at hand. The superfluous humors cause fevers and alter the pulse, and when they are excreted they cause discoloration of the urine. Medical diagnoses are therefore made from pain, fever, pulse, and urine.

The casting of urine was a very complex matter, in which the physicians had to consider the color, odor, density, and translucency of the urine, the sex, age, diet, and complexion of the patient. Eighteen different colors are specified. I translate a paragraph: On tertian fever in summer:

When the urine is pale pink or pink, and thin in summer, it signifies tertian fever. In autumn when it is yellow from the middle up and very thin and limpid, it signifies an irregular or false quartan from over-heated bile or unnatural black bile. In autumn or winter especially, the black bile is too warm, sharp, and dry, and this causes the aforesaid color, and by the dryness the substance is modified. Following are the acute symptoms of this fever: The patients suffer from thirst more than those whose bile is normal. Sometimes the bile putrifies outside the vessels in different places and at different times. This causes a double tertian, of which the rubric is as follows:

Rubric of double tertian:

The urine is pale pink, or pink, thick above, thin below, becoming gray or dark toward the surface. The grayness and obscurity is caused by the over-heating of the material. The symptoms are these: pain of the head, especially in the temples, sourness of the breath, pains in the back from bile descending to the loins and kidneys, with paroxysms every day or every second day, usually coming on after dinner time. Sometimes the bile putrifies only in the location named, together with some other humor, for example, phlegm or black bile. If the bile putrifies internally and the phlegm externally, it makes a minor semi-tertian. If the bile outside and the phlegm inside, it causes a median semi-tertian, of which the following is the rubric:

The urine is pale pink, or pink, thick above, thin below, and green toward the surface. This signifies a semi-tertian fever, or pleurisy. But if it does not show green unless the hand is placed behind the bottle, it is a median semi-tertian. If distinctly green without the hand, it is obviously pleurisy. Both in double tertian or in median semi-tertian, a moderately thin urine signifies undigested material, but moderately thick urine signifies digested material. I say this to prevent any mistake.<sup>1</sup>

The chapter on uroscopy in the "Breslau Codex" goes on like this for eighteen closely written leaves, as much as forty printed pages.

It may be interesting to know what diseases were recognized and differentiated. The great compilation "De aegritudium curatione," put together from the writings of seven physicians, lists nine general febrile diseases, and 145 local diseases. The general are as follows: quotidian fever, quartan, ter-

<sup>1</sup> Translation of "De quatuor humoribus ex quibus constat humanum corpus," de Renzi, ii: 411-413.

<sup>1</sup> Excerpt from "Liber de urinis" of the "Codex Salernitanus" from the text of Kadner, 1919.



tian, semi-tertian, ardent fever, fevers of long cycle (quintan, sextan, hebdominal), continuing fever, and hectic fever. From the 145 local diseases I name a few of medical interest: mania, insomnia, epilepsy, paralysis, quinsy, scrophula in the throat, asthma, peripneumonia (i.e. dry pleurisy), empyema, phthisis, indigestion, migraine, syncope, hemoptysis, gout, leprosy, inflammation of the joints.

Descriptions of disease are in general sparse and sketchy. One of the strongest arguments for the statement made earlier in this lecture, that the "broad stream of Greek medicine" had almost dried up by the time it reached Salerno, is given by the total absence of the Hippocratic method from the Salernitan semeiography. There are no vivid, clean-cut observations of the clinical picture such as those found in the "Epidemics," but mere lists of relevant and irrelevant symptoms.

The classification of fevers is purely diagrammatic. There are three kinds of fever; ephemeral, caused by disturbance of the vital spirits; hectic, due to disease of the organs; and putrid, from disease of the humors. It is very interesting that the acute exanthemata were not recognized. If Constantine had chosen to translate Rhazes instead of Ali Abbas, the Salernitans would perhaps have been able to classify their cases of smallpox and measles.

The doctrine of the four humors afforded a basis for treatment as well as for diagnosis. There are two ways in which the doctor may restore the balance of the four humors; he may cut down an excess at its origin, by changing the diet, or he may reduce it by purging and bleeding. Blood-letting was complicated by a good

many rules. The operator had to choose which of about two dozen veins to incise, then he had to decide whether to bleed by metacentasis (that is, on the same side as the disease), or by antipasis. He had also to consider the time of year, the age and state of the patient, and the quality of the blood. Magister Maurus, one of the best of the Salernitan physicians, directs that in acute fevers the patient should be bled to unconsciousness.

Treatment by purging was likewise a fairly complex matter. Each of the four humors was to be purged according to its principal seat. Magister Ferrarius wrote a small book on this subject, in which we learn that phlegm is to be drawn from the brain through the mouth or nose by gargles, from the stomach by vomits, and from the intestines by laxatives. Blood is, of course, purged by phlebotomy. Yellow bile and black bile are drained through the intestines by vegetable laxatives.

Treatment of disease by drugs, like that by purging, goes back to the same basis of the four humors, but it is complicated by classification of drugs not only into hot, cold, moist and dry, but also into attractive, laxative, constrictive and thirty-five other groups.

It would require much investigation to discover just how much of the pharmacopeia was local in origin or derived by direct tradition and how much was brought in by Constantine. Certainly the extant texts are largely dependent on the Arabic source. There are a few special features of the Salernitan pharmacy which are worth mention. It is almost entirely free of superstition and astrological lore; its spirit is Galenic; the drugs are mostly vegetable and mineral. Compound



prescriptions are fairly simple, containing only a few ingredients. They seem pleasant to use, and the directions for making them are clear and practical. Disagreeable substances such as animal feces, human saliva and sweat are not often mentioned and then almost invariably for external applications only.

I quote such a prescription:

For haemorrhoids: take some of the little worms which are found under stones, the kind that are rough on the outside with a great many feet, but roll up into a ball when you disturb them. Boil them in linseed oil and apply the oil to the place.

As the Arabic influence grew stronger the Salernitan formularies favored syrups more and more as against ordinary decoctions. Alcohol in the form of distilled liquor was not used in the Salernitan pharmacy until late in the twelfth century. Wine was, of course, used as a very frequent medium in fluid drugs.

The third method of treatment, by diet, based like the others on the humoral physiology, is expounded in a book called "Flores dietarum" ascribed to John of St. Paul. It is taken from two Arabic sources, namely, the fifth book of the "Pantegni" (Pars theorica) and Isaac Judeus "De diaetis particularibus." The theory is as follows: all foods are either heating or cooling, moist or dry. Each of the 4 humors, as described in the passage I read to you, has also 2 of the 4 basic qualities. Choose your foods properly, therefore, and you can either reinforce or weaken the store of humors in the body. In addition, you need only take account of the fact that some foods are coarse, some middling heavy, and some light. Radishes, for example, are heating

to the third degree and dry to the second; it is obvious that they will be good for excesses of moist, cold humors, as found in the bladder and kidneys, and because they are also very coarse in quality, they are good to break a stone in the bladder. Assuming the theoretical basis, this method is not without logic; in fact, the diet list of John of St. Paul gives much the same impression of dull practicality as a table of calories. I ought to add that from the books on practice as against those on theory of diets, I have the impression that the Salernitan doctors and nurses often departed even more widely from theory than the moderns. Invalids in Salerno were actually rather comfortably fed.

As an example of how all this was applied in practice, let me quote the section on pleurisy with effusion in "De modo medendi," ascribed to Archimatthaeus.

Pleurisy sometimes occurs on the right side and sometimes on the left. When it is on the left side, the patient cannot lie on his right side, and conversely if it is on the right.

The urine is thick and rather dark and livid near the surface. This disease is caused by a flux of the brain, for the brain is dissolved by heat and constricted by cold, and thus the humors which normally drain from it collect under the ribs and generate pleurisy. Therefore if the patient has thick urine until the eleventh day, and the matter is purged through the urine, it is a good sign. If the accumulation continues with pain, and the urine begins to thin on the sixth day, it is bad. If diarrhea comes on at the third or fourth day it is good, if on the eighth or ninth it is bad. If the disease occurs in spring the patient may be bled from the median vein on the side of the disease, but according to Constan-



tine the bleeding should be done on the opposite side. Often a single bleeding cures the attack. Put the patient near the fire, avoiding smoke, in order that the heat may attract air. Rub him with dialthea (ointment of marsh-mallow), butter, and warm ointments. Forbid him the use of wine and cold water. Let him have wheat flour, and bran water or barley water containing pine nuts. Or you may do the following: cook a chicken in water until the meat separates from the bones, strain the juice and make a broth of it with wheat flour, etc. If the disease is complicated by coughing it is important to promote expectoration. The discharge may be promoted in this way: take mastix, olibanum, dragon's blood, and bolus terrae; mix them with rape-juice, rose oil, or rose water; moisten cloths with the mixture and place them on the temples. For insomnia you may prescribe somniferous drugs as mentioned in the section on acute diseases; the best is *diadragantum*, which is made from gum tragacanth, gum arabic, wheat flour, etc. If the disease culminates with empyema, you may permit a fuller diet, such as well-cooked chicken, light wine, and things of that sort. Rhubarb may be given in season; it will help the cure. In winter and autumn warm the sick-room with a large fire in order to hasten maturity of the disease. Note that if the fluid collects on the right side, the urine will be thick and deeply colored, if on the left side it will be thick and paler; if on one day the urine is pink and thick and becomes thinner on the following day, it signifies that the disease is clearing up, but if it becomes thick and white, death threatens. Sometimes the accumulation of fluid tends to become chronic; then you should take linseed and fenugreek, boil them in water, and three or four times a day apply it to hasten maturation. Let the diet be barley water with milk of almonds and strained bran water. Sometimes these patients are afflicted with obstinate constipation. This should be treated with juice of Euphorbia

and with barley boiled in water, strained and sweetened, or diluted honey may be given. Sometimes they cough and vomit. Treat this with the ashes of horehound, hyssop, pennyroyal, and catnip, administered in summer with syrup, and in winter with honey.<sup>1</sup>

I have dealt at some length with Salernitan internal medicine, because of its bearing upon the question of sources which always arises in the study of medicine in the Middle Ages. Where did the Salernitans obtain this great body of practical and scientific information?

It is obvious that there were three possible sources. Most of what I have described is clearly of ancient origin. The diagnosis and treatment of pleurisy, for example, is very reminiscent of Hippocrates and Galen. This ancient Graeco-Roman medicine may have come down directly from Roman times in southern Italy, by tradition and in the few books which were compiled in the Dark Ages, or on the other hand it may have come from Arabic sources through Constantine's translations. In addition, there may have been a local element, methods of thought or of practice originating in southern Italy in times previous to Constantine. It is the historian's problem to discover which of these sources are important. This is no easy task; it requires a great amount of study and comparison of the available texts.

I have shown in my book on the anatomical texts, that the anatomical information of twelfth century Salerno was entirely copied from Constantine. Before Constantine the Salernitans had undoubtedly been in the habit of dissecting a pig from

<sup>1</sup> Translation of passage on Pleurisy from "De modo medendi," de Renzi, iv: 41-42.



time to time, and they had some sort of a simple anatomical text. When Constantine gave them the Arabic theoretical anatomy they began at once to fit it to the specimen, but the Arabic knowledge was so much superior to their own that it was adopted outright.

With regard to pathology and internal medicine, I cannot qualify as an expert, but the longer I study the subject the more nearly am I convinced that here too the Arabic medicine swamped that which survived directly in southern Italy. A large part of all the twelfth century texts are based directly upon Constantine, even to the words and sentences. Even though a statement seems to come from Hippocrates or Galen, we generally find that it actually came from one of the Graeco-Roman books which were translated from Arabic by Constantine. For example, the Hippocratic style in the passage on pleurisy which I quoted comes from the book "Regimen in Acute Diseases," which is among Constantine's translations, not directly from Hippocrates.

In short, nearly the whole of Salernitan theoretical medicine was imported from the Arabic literature. In practice it was applied with a simplicity and often with a common sense which we may credit to the Salernitans themselves; but I must confess I am inclined to think the simplicity was not always the simplicity of wisdom but of ignorance. At any rate, a century later, when new translators brought over the more intricate Arabic medicine and philosophy, Europeans at once showed themselves ready to indulge in scholasticism of a subtlety and complexity outreaching even the Arabs.

The surgery of twelfth century Salerno has a very different history. The ninth book of Constantine's "Pantegni" forms a fairly complete treatise on surgery, which its original Persian author, Ali Abbas, compiled from the sixth book of Paul of Aegina. This chapter of the "Pantegni" seems to have sufficed as a textbook of surgery for early Salerno, but toward the middle of the century some unknown writer wrote out a special surgical book of which about half is directly copied from the "Pantegni"; this is the so-called "Bamberger Surgery," found by Sudhoff in the Royal Library of Bamberg.

At the middle of the century there was a surgeon of specially high reputation in Salerno, Roger Frugardi by name. His teaching was written down, partly from his lectures and partly from private conversations, in a book put out by one Guido Aretino, a teacher of logic, in the year 1170. "The Surgery of Roger" gained at once a very great reputation. At first at Salerno, later at Bologna and other cities, doctors who used it began to write their own notes in the margins of their copies. These notes became incorporated with the text of Roger, and thus we obtained the "Surgery of Roland," the so-called "Surgery of the Four Masters," and others.

Roger's "Surgery" is very much superior, both in arrangement and contents, to that of Constantine in the ninth book of the "Pantegni," so much superior that it raises a very neat question as to where Roger found his information. Here and there one finds a paragraph literally copied from Constantine, and there are other passages no doubt directly based on the "Pantegni" although reworded.



On the other hand, there is much that is not in Constantine at all. This other material is obviously of Greek origin. I think I am correct in saying that almost everything in Roger which is not in Constantine can be found in Paul of Aegina, who wrote in Greek at Alexandria about 640 A.D. The question is: how did Roger get Greek surgery not in Constantine? Paul of Aegina had been translated into Arabic, but so far as we know there was no Latin translation of Paul of Aegina or other Graeco-Roman surgery available at Salerno either directly or through the Arabic; it is highly doubtful, on the other hand, whether Greek manuscripts on this subject were available at Salerno or Montecassino. Roger could hardly have reinvented so much of the best Greek surgery for himself. The question is quite interesting enough to be studied in detail by some one who could run down every section by comparison with Constantine, Paul of Aegina and the Arabic surgery of Albucasis.

Among the notable features of Roger Frugardi's surgery is its bold clear-headed treatment of wounds and fractures of the skull. I quote one of the best passages:

ON MANIFEST FRACTURE OF THE SKULL  
WITH SMALL EXTERNAL WOUND

If the fracture of the skull is large but the superficial wound small so that you cannot be completely certain of the extent of the fracture, a finger is to be inserted in the wound and a diligent investigation made, because there is no better method for recognizing a fracture of the skull than digital palpation. After you have made out the extent of the fracture in this way you should incise the small scalp wound with a razor in the form of a cross and separate the scalp

from the cranium with a raspatory, and if there is not too much blood in the field of operation you should remove any fragments of bone with the small forceps. If, however, the hemorrhage is sufficient to prevent this, you may change your method until you have controlled it, after which you will be able to remove the fragments successfully. With a probe thoroughly and carefully insert a cloth between the dura mater and the cranium and proceed as we said in the previous section. Outside the cranium the wounded scalp is pressed together and the whole wound bound up with a linen cloth previously soaked in white of egg. A pad of cloth filled with feathers is laid over it and bound on according to the region of the head involved, and changed every morning or evening. If, when you dress the wound, you find the flaps swollen, it is a good sign; if, however, they are shrunken and mortified, it is a bad sign. In the course of healing when you find that the skull is entirely healed the dressing is to be reduced in size and the skin flaps are forced back to their proper situation.<sup>1</sup>

The almost continuous warfare between the Normans and their various neighbors gave ample opportunity for practice in military surgery. Roger has a chapter on the removal of barbed arrows by means of a tube inserted in the wound so as to slip over one of the barbs and permit its extraction.

The Salernitan surgeons did not hesitate to remove bladder-stones by perineal incision. Quite in line with some modern practice, they attempted the cure of goiter by medical means, and if that failed resorted to surgery.

ON THE CURE OF GOITER BY INCISION

If the goiter is single, with the aid of a hot iron we put in one seton lengthwise and another from side to side and apply

<sup>1</sup> Passage from Sudhoff's text of Roger, *Stud. Gesch. Med.*, pt. 2, p. 160.



over them a cloth soaked in egg or in lard. Every day, morning and evening, the setons are drawn toward the outside until finally the flesh is cut through. When this is done if any part of the goiter remains, powder it with powder of asphodel and purified in this way the wound will heal like other wounds. If the tumor is not provided with too many arteries it may be removed by grasping it firmly in the hands and cutting the skin carefully lengthwise. The tumor is grasped with a hook and the skin is dissected away. A finger is then inserted through the wound and the goiter removed entirely with its capsule. The wound is lightly dressed with a linen cloth. If the hemorrhage is excessive we apply those remedies which have been described above for this purpose in the chapter on arrow wounds in the neck. These remedies are continued for three days. (Styptic drugs.) Afterward if any of the tumor remains, apply powder of asphodel, following it by egg, and then proceed as in other wounds. The greatest care should be taken to avulse the capsule of the goiter completely so that nothing is left, for if the slightest part remains the patient relapses. When the wound is entirely clean, it may be dusted with red powder and sutured as we have described elsewhere, and it will be cured. If, however, the goiter is very large and the patient weak or elderly, in our judgment it is best to refrain from this treatment. These large goiters usually have several lobes which makes them difficult to dissect away, and we avoid treating them with a hot iron for fear of injuring the arteries or nerves. When, however, it becomes necessary to treat these patients by surgery we tie them to a table and have them held firmly in order that we may see exactly what we are doing.<sup>1</sup>

The only special book on obstetrics and gynecology is that which goes

<sup>1</sup> Passage from Sudhoff's text of Roger, *Stud. Gesch. Med.*, pt. 2, p. 198.

by the name of "Trotula." It is a compilation from Constantine and from a few fragmentary remnants of Greek obstetrics which had lingered on in Latin, chiefly the Moschion version of Soranus. "Trotula" is far inferior to the Greek authors. The only important survival is a method of protecting the perineum. As an example of its poverty of method, the only manipulative procedure recommended in difficult labor is this:

When there is difficult labor with a dead child, place the patient in a sheet held at the corners by four strong men, with her head somewhat elevated. Have them shake the sheet vigorously by pulling on opposite corners, and with God's aid she will give birth.

The rest is all drugs, fomentations and fumigations.

The mention of "Trotula" brings us to the romantic question of the "ladies of Salerne," those wise women with poetic names, Trotula, Abella, Rebecca, Constantia, of whom a kindly tradition has told us. There is an ancient story, at least as old as the twelfth century, that there was at Salerno a very wise woman who could hold her own in debate with the doctors, or could make powerful remedies, or in one way or another wield special power in medicine. For example, in one of the poetical lays of Marie de France, written about 1165, there is a tale of a prince who was ordered by his lady-love's father to perform an impossible feat of mountain-climbing. A sympathetic friend recommended him to a lady of Salerno who knew everything in the way of medicine and could make him a potion to give him strength. These stories seem to have been current not



at Salerno itself, but only in distant places.

The actual women of Salerno seem to have included among their number many who took special interest in medicine and charms. There are about a score of passages in the various Salernitan books, telling what the women of Salerno did for such-and-such a disease. Not only the local authors, but also one Bernard of Provence, a visitor and pupil of Magister Salernus, took notes on the recipes of the ladies of Salerne. These recipes are all simple folk-medicine of no more wisdom than the herb-concoctions of the pioneer women of America, for example. The only really disgusting medicine for internal use which I have seen in the Salernitan literature is one of these home-made preparations, which it is said the women gave their husbands to promote fertility.

No doubt there were many midwives. The book "Trotula" says flatly that there was an expert midwife named Trotula, and narrates a case in which she worked a cure. From these stories and bits of folklore the legend of the wise women of Salerno has grown and grown until we have a list of women who were professors and authors of books, but the Registers and Obituary of the Cathedral, which name many doctors and many women of all ranks, do not apply the title *medica* to a single woman.

I have said nothing thus far of the "Schola Salernitana," the rhyming collection of hygienic rules which more than anything else has kept the name of Salerno alive. This was not put together until the thirteenth century, after the palmy days of Salerno were over; and in the form in which we

have it, contains many later additions. There is no reason to doubt, however, that the use of rhymed aphorisms was very frequent in Salerno as a way by which physicians and laymen might easily recall the precepts of health.

The quaintness of the Salernitan writings, the queer costumes and postures of these pictures, must not leave us with an impression that the Salernitan doctors were mere lay figures of a historical romance. What little we can learn of their personality and social status makes them seem more than ever like ourselves, with problems, troubles, and feelings like our own. I will read a part of the chief record we have as to the doctor's professional approach in the twelfth century:

When you are called to a patient, may the name of God be your help, and may the angel who walked with Tobias be the companion of your mind and body. At your entrance inquire of him who greets you from what disease the sick man suffers and how his illness progresses; this is advisable in order that when you come to him you may not seem entirely uninformed as to the illness . . . Again when you reach the house and before you see him, ask if he has seen his confessor, and if he has not done this, arrange for him to do so, or have him promise to do so, because if the sick man hears talk on this subject after he has been examined and the signs of his illness studied, he will begin to despair of his safety, because he will think that you despair of it. Entering the sick-room you should have neither proud nor greedy countenance; you should repeat the greeting of those who rise as you enter, and with a gesture seat yourself when they sit down. Next you may resume the conversation with a few remarks in which you praise the neighborhood, commend the arrangements of



the house, if it seems appropriate, or compliment the liberality of the family.

Then turning to the patient you may ask how it goes with him, and have him put out his arm. At first there may be differences between your own state and that of the patient, either because he is excited at your arrival, or because he is worried about the size of your fee, so that you find the pulse rather confusing; therefore you should consider the pulse only after the patient has become steadier. Take care that he does not lie upon his side nor has his finger over-extended or flexed against his palm. Support his arm with your left hand and observe the pulse for at least 100 beats in order to feel all its variations, and thus you will be able to satisfy the expectant bystanders with words which they are glad to hear.

Next have the urine brought to you that the sick man may see you study his illnesses not only from the pulse but from the urine. When examining the urine you should observe its color, substance, quantity, and content; after which you may promise the patient that with the help of God you will cure him. As you go away, however, you should say to his servants that he is in a very bad way, because if he recovers you will receive great credit and praise, and if he dies, they will remember that you despaired of his health from the beginning. Meanwhile I urge you not to turn a lingering eye upon his wife, his daughter, or his maid-servant, for this sort of thing blinds the eye of the doctor, averts the favor of God, and makes the doctor abhorrent to the patient and less confident in himself. Be therefore careful in speech, respectable in conduct, attentively seeking Divine aid. If the people of the house invite you to a meal, as often happens, do not seem too much gratified, and do not seek the first place at the table, although it is the custom to give this to the priest or the doctor. Do not criticize the food or drink, and when in the country do not show distaste

for country food, for example millet bread, even though you can scarcely control your stomach.

While you eat you may inquire as to the condition of the patient from any one who is present, for in this way the sick man will confide in you all the more, since he sees that you do not forget him while seeking your own comfort. When you rise from the table you may mention that you have been well looked after; this too will give pleasure to the patient.<sup>1</sup>

We know from various contemporary documents that the physicians were held in great esteem by the laity, who respected then as now the earnest devoted leaders of the profession to which they must perforce trust their lives and happiness. Trusted by patients, beloved by their students, the teachers of Salerno must have been happy men.

Bernard of Provence said of Magister Salernus that he "was called the greatest help to the sick and wounded in all our century." Some one who copied the "Anatomy of Maurus" wrote at the end: "This book, more precious than gold, was given us by Magister Maurus," and when this teacher died, on the twenty-fourth of February, 1214, they wrote in the Cathedral record "Obiit Magister Maurus, optimus physicus," (the best of physicians), an epitaph which the greatest of our own day might well envy him.

In 1194 the town was sacked by Henry VI of Hohenstaufen, who was fighting his way to the throne of the Norman kingdom. At about the same time a still more serious blow at the supremacy of Salerno was being delivered by the translators

<sup>1</sup> Pamphlet of anonymous Salernitan "On the Visit of a Physician to his Patient," de Renzi, ii: 74-75.



of Toledo and elsewhere, who had begun to put into Latin the works of Aristotle, Avicenna, Rhazes, and numerous other Greek and Arabic writers. The rise of Montpellier and Bologna as medical centers began, and by the thirteenth century Salerno was no longer foremost among the Hippocratic cities.

Looking back upon the great days of the twelfth century, what place in history do we grant the physicians of Salerno? Not the first place, which is reserved for the pioneers and discoverers of our art. Their task was to take over the Arabic medical culture and adopt it to the needs of

awakening Europe. While doing this, like the good physicians of all ages, they brought common sense and sympathy to the sick-room, they sought all the knowledge they could find and taught their students to go on seeking.

Modern Salerno does not preserve a single relic of the twelfth century physician. The poor fragmentary traditions of Greek and Arabic medicine, which they so bravely and hopefully gathered up, were soon outgrown, but the greater tradition of faithful service in a hard task lives on, here and everywhere, at the heart of our profession.

## REFERENCES

- CAPPARONI, P. *Magistri Salernitani nondum cogniti*. Wellcome Historical Medical Museum, Research Studies in Medical History, No. 2, 1923.
- CORNER, G. W. *Anatomical texts of the earlier Middle Ages . . . with translations of four texts*. Carnegie Inst. of Washington, pub. No. 364, 1927.
- CURTIS, E. *Roger of Sicily and the Normans in Lower Italy, 1016-1154*. N. Y., Putnam, 1915.
- GARUFI, C. A. *Liber confratrum di S. Matteo di Salerno*. In: *Fonti per la storia d'Italia*. Rome, 1922.
- GIACOSA, P. *Magistri Salernitani nondum editi*. Turin, 1901.
- HARTMAN, F. *Die Literatur von Früh- und Hochsalerno*. Leipzig (dissertation), 1919.
- HASKINS, C. H. *The Normans in European History*. Boston, Houghton, 1915.
- HENSCHEL, A. E. W. T. *Die Salernitanische Handschrift*. *Janus*, 1: 40-84, 300-368, 1846.
- KADNER, A. *Ein Liber de urinis des Breslauer Codex Salernitanus*. Leipzig (dissertation), 1919.
- OSTERMUTH, H. J. "Flores diaetarum," eine Salernitanische Nahrungsmittel-diätetik aus dem XII Jahrhundert. Leipzig (dissertation), 1919.
- HARINGTON, J. *The School of Salernum*. N. Y., Hoeber, 1920.
- DE RENZI, S. *Collectio Salernitana*. Naples, 1852-57, 5 vols.
- SINGER, C. A review of the medical literature of the Dark Ages. *Proc. Roy. Soc. Med.*, 10 (Sect. Hist. Med.): 107-160, 1917.
- SPITZNER, H. R. *Die Salernitanische Gynäkologie und Geburtshilfe unter dem Namen der "Trotula"*. Leipzig (dissertation), 1921.
- SUDHOFF, K. *Zur Regimen Sanitatis Salernitanum*. *Arch. f. Gesch. d. Med.*, 7: 360; 8, 292, 352; 9: 221; 10: 91; 12: 149, 1915. *Beiträge zur Geschichte der Chirurgie im Mittelalter*. Pt. 2, *Stud. z. Gesch. d. Med.*, Nos. 11/12, Leipzig, 1918. *Die Salernitaner Handschrift in Breslau (Ein Corpus Medicinæ Salerni)*. *Arch. f. Gesch. d. Med.*, 12: 101-148, 1920.