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GIOVANNI MARIA LANCISI (1654–1720)

Pathologist, Clinician, Sanitarian and Epidemiologist

BY JOHN FOOTE
Washington, D. C.

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With kindest regards from

John A. Foote

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The year 1700 is more than a milestone of the ages, the beginning of a century. It marks one of those crises in the habits of thought and modes of living of people and of nations which we are accustomed to designate as historical epochs. Fading into an afterglow, with all its splendid viciousness, was the glory of the Renaissance, and soon to pass away was that epitome and ultimate expression of monarchical absolutism typified in the brilliant, extravagant, and corrupt court of Louis XIV. The Grand Monarch, the last of the Bourbons, who had brought France to the zenith of her greatness with an almost heroic disdain of the essential rights of the people, was now an old man, beset at home with poverty and discontent among his subjects, and faced abroad with enmity of that Grand Alliance which had waged, and was still to wage against him, ruthless and devastating war.

Old dynasties were tottering; new empires were in the making. But a year or two before, Peter Romanoff, after an apprenticeship in the Holland shipyards, had gone back to his rude Russian kingdom to shape the destinies of the great nation that was to be moulded under his hands from the barbarous and uncouth tribesmen of the steppes. And at this time Frederic III, Elector of Brandenburg and grandfather of Frederick the Great, was persuading the Austrian Hapsburg Emperor, Leopold, to establish the house of Hohenzollern by crowning him Frederick I, King of Prussia.

Charles II of Spain had died without an heir, and left his kingdom, and a war, to Philip of Anjou, a grandson of the unpopular Louis XIV. This action was bitterly resented by the Emperor Leopold, whose second son, Charles, Archduke of Austria, was a claimant to the throne. And so a second Grand Alliance was in process of formation against the War Lord and his kingdom of France—the ancient contest of Hapsburg against Bourbon.

The course of history might have been changed had Austria known that a certain Cardinal Albani prevailed upon Pope Innocent XII to favor Philip's cause, when the matter was presented to him for decision. But Austria did not know this, and before the War of the Spanish Succession had even begun, many things happened—Pope Innocent died; after a session lasting 46 days, with many deadlocks, the College of Cardinals elected Cardinal Albani to the papal throne, and Austria did not exercise her right of veto.

Almost by an accident, then, was history given the pontificate of Clement XI, one of the most advanced and fearless, as well as one of the most materially unfortunate, occupants of the chair of Peter—a philosopher, a man of letters, whose patronage of the arts and sciences would alone have made a niche for him in the history of the advancement of learning, but who has a special claim on our attention because he chose Giovanni Maria Lancisi as his friend and physician.

Catholic reformers greeted the accession of Clement XI with enthusiasm because of his pronounced stand against nepotism, and his subsequent career justified their satisfaction. As a civil governor he proved capable and efficient, charitable to the poor, a pioneer in prison reform, sympathetically aiding Lancisi in his schemes for sanitation, and being unusually successful in securing food for the populace in time of need. Artists praised him for having prohibited the exportation of ancient masterpieces; scientists, especially, when he commissioned Bianchini to lay down on the pavement of Santa Maria degli Angioli the meridian of Rome known as the Clementina. Few men had his capacity for work. He slept only a few hours, and ate so little that a few pence a day supplied his table. He had tremendous vitality, and, in spite of the prodigious amount of detail work which he insisted upon doing personally, he also preached frequently and performed his routine of priestly duties.

One of the first public acts of the new Pope was to protest against the assumption by the Elector of Brandenburg of the title of King of Prussia. Clement regarded the extension of Prussian dominion as a menace to the peace of Europe—he had a vision that was denied the Emperor Leopold. Buffeted between Bourbon and Hapsburg, forced to recognize one and then the other of the aspirants to the throne of Spain, plundered and despoiled of the Papal provinces of Sicily, Parma, and Piacenza, he still worked unselfishly for the good of his

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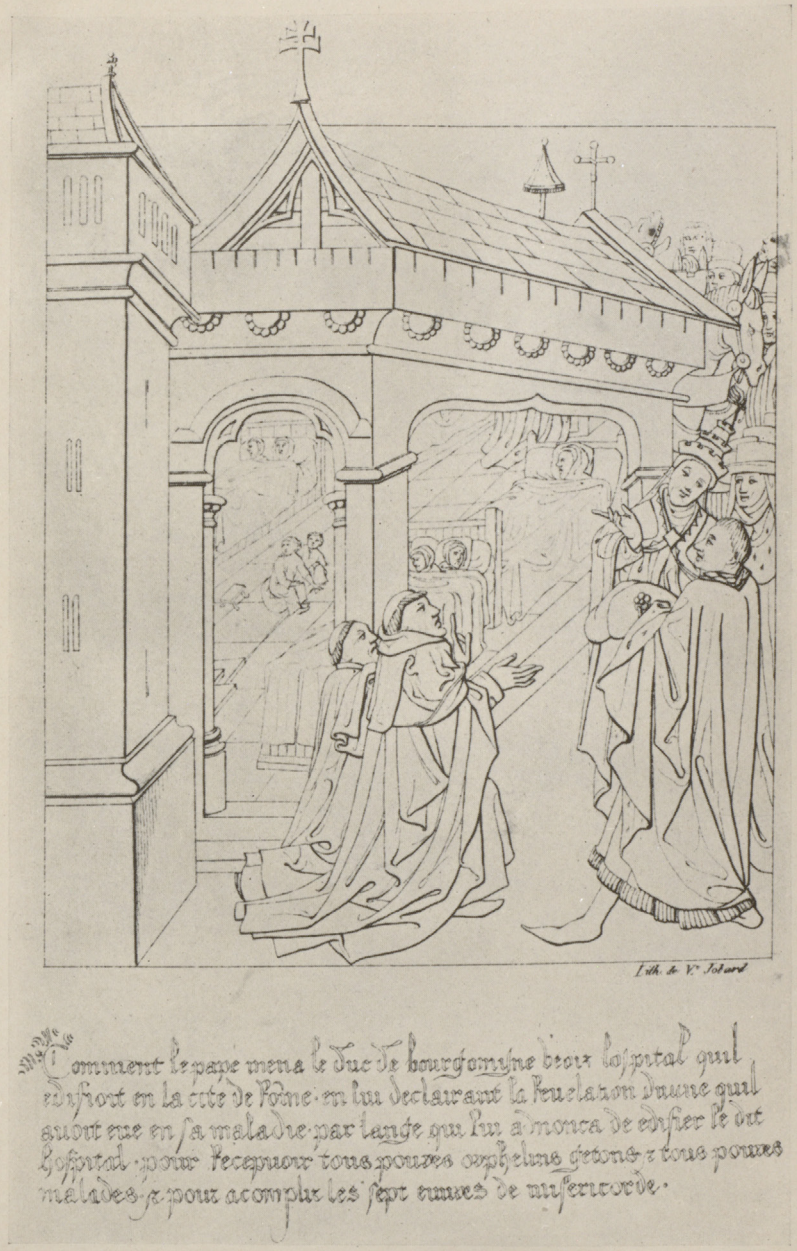
FIG. 1.

A MATERNITY HOSPITAL, by Andrea del Sarto (1487–1531).

This gives some idea of the older Italian hospitals of the sixteenth century. There was little change in those of Lancisi's day.
(Photo copy by Martin, National Geographic Magazine.)

FIG. 2.



THE SANTO SPIRITO HOSPITAL IN THE THIRTEENTH CENTURY.

The Visit of Pope Innocent III and the Duke of Burgundy to the Santo Spirito Hospital, about 1204.

The Santo Spirito Hospital of Dijon was founded by Philip the Good, Duke of Burgundy, in 1204, after he had visited the hospital in Rome. The print is taken from a manuscript of about 1513, "Histoire de la fondation Des Hôpitaux du Saint Esprit de Rome et de Dijon," republished and edited by M. G. Peignat, who discovered it in the library of the hospital at Dijon. (Photo copy by Martin, National Geographic Magazine.)

Church and Christianity, helped with money and ships to repel the Turkish invasion of Europe, assisted artists and scientists, and sent Joseph Simeon Arsermani to Syria and Egypt, where his researches unearthed many manuscript treasures for the Vatican library. Such was the career and the character of the singularly blameless and unfortunate, though not unhappy, pope who was the patron of Giovanni Maria Lancisi.

Lancisi was born in Rome in 1654, the son of parents of the middle class, who were of more than average intelligence and education. He took the usual college course, and at first prepared to study theology. Later he turned his attention to the medical branches, studying geometry, anatomy, botany, and chemistry at the Collegio de Sapienza. He graduated with the degree of doctor in 1672, when he was eighteen years of age.

Four years later we find him one of the assistant physicians in the famous old Santo Spirito Hospital—the hospital founded originally in the thirteenth century, at the instigation of Innocent III, by Guy of Montpelier. He enjoyed a reputation even then for unusual powers of observation, and won the praise of the chief physician, Tiracoda. Two years later he was made a canon of the Church of San Salvatore College, where he taught and made a study of the medical classics for a period of five years. In 1684 he was appointed Professor of Anatomy in his alma mater, the Collegio di Sapienza. He taught anatomy for thirteen years, and then until his death was Professor of the Theory and Practice of Medicine.

His course in anatomy, according to Desgenettes, was very superficial, and was more showy than useful, "as had always been the case at this particular school." The professor gave fifteen lectures, each followed by a practical demonstration by the prosector. The viscera were placed beside similar organs from animals in order to cultivate a taste for comparative anatomy. The professor, attired in a huge toga, read or declaimed his classical Latin lecture with much ceremony and pomp. At the beginning of the course the doors of the lecture-room were decorated, and the nearby streets adorned with flowers in order to attract auditors. Those who attended the opening lecture were given bouquets and oranges. After the conclusion of the course the professor invited his students to a meeting, at which prayers were said for the souls of such bodies as had been dissected. But,

the biographer adds, "it would be a mistake to suppose from this that anatomy at this time was not studied in Rome, for it was pursued with great zeal in several institutions, notably the Santo Spirito Hospital, which possessed, before 1789, a beautiful and complete collection of anatomical and pathological specimens."

The relation of anatomy to sculpture and painting was especially evident in Rome. Lancisi, who appreciated the importance of this relation, persuaded Bernardino Genga, a celebrated master of design, who was also Professor of Anatomy and Surgery at Rome, and a surgeon to the Santo Spirito Hospital, to publish his studies of anatomy, made from the ancient works of art and the cadaver, for the use of students. This beautiful work appeared in 1691. Lancisi published and edited an edition of the wonderful anatomical plates of Eustachius in 1714, which had lain unused in the Vatican library, the expense being borne by Pope Clement XI.

Innocent XI appointed him a papal physician in 1688, and, to show his esteem for him, made him a Canon of the Chapter of St. Laurence. He also attended the succeeding pope, Innocent XII, and Cardinal Alteiri, president of the Apostolic Chamber, made Lancisi his vicar for the installation of doctors in medicine, an office which he retained until his death.

On the death of Innocent XII, in 1700, Lancisi and Sinibaldi, another physician, entered the conclave, which lasted 46 days. Cardinal Albani, whom he had known for years, first as rector of St. Peter's, next as Secretary of Papal Briefs, was the choice of the conclave, and Lancisi was made First Physician and Papal Chamberlain with Free Access.

Lancisi's biographers say of him that he was small and well formed, was lively in expression, and had exuberant spirits. His mind was very active and very versatile, yet no one was more diplomatic than he, nor more able to conduct a matter with prudence. He was unusually industrious and persevering—hard work or difficulties did not discourage him from any undertaking. He was eloquent and impressive in public, but in private life was very sociable and jovial in his manner. He seems to have been unusually polite and affable and farseeing, and had such "a way" with him as to win over even his adversaries. He had a passion for the advancement of physics and anatomy, and while he followed the sect of Sylvius, even in the era of

FIG. 3.

LANCISI

Two engravings showing Lancisi at the maturity of his powers. The one in which he holds a pen is the earlier picture. (Photo copies by Martin, National Geographic Magazine.)

Sydenham and Baglivi, his practice was always dictated by prudence and good sense.

He amassed a library of 20,000 volumes, which he gave while still living in 1711 to the Santo Spirito Hospital for the use of young physicians and surgeons. This, the Biblioteca Lancisiana, is one of the first, if not the very first, *public* medical libraries—the great collection of the Paris Faculty having in 1733, 22 years later, only 32 books, as compared with its 1,250,000 books and pamphlets to-day. The Abbé Carsughi, in a work in four volumes published in 1718, commemorates this gift, and includes a treatise on "The Proper Use of a Library." Lancisi's library contained many valuable books and manuscripts. Even King Louis XIV, hearing of the master's fame, had sent him several precious books. To maintain this library and his cabinet of physics, Lancisi left an ample legacy. In addition, he persuaded Pope Clement to build and improve a new anatomy pavilion at the Sapienza, and left a legacy for the establishment of a pavilion for the diseases of women.

Lancisi was a friend and correspondent of the most famous literary, artistic, and scientific men of his day. In medical teaching he introduced the clinical method of Boerhaave, with whom he corresponded, and he was an ardent and enthusiastic advocate and a pioneer of the objective method. In 1715 he published a treatise on "A Correct Curriculum of Medical Studies," [1] in which he emphasized the need of preliminary education, travel to other clinics, and said "Surgery offers more promise than medicine." In the same year appeared a treatise on proper methods of describing pathological conditions. A bibliography of his numerous writings is appended. He was a sanitarian, a historian, and a forest conservationist—urging the conservation of forests near the Capitol, in order to dry up the marshy lands. He died January 21, 1720.

Hirsch, in his biographical dictionary, refers to him as one of the most distinguished of the Italian practitioners, who contributed much to enrich the sciences of anatomy, medicine, and hygiene.

In examining his works we find that he was a voluminous writer on all sorts of subjects, from classical historical orations to epidemics in domestic animals, from researches into the causes of malaria to studies in pathological anatomy. His work on the causes of sudden

[1] Dissertatio de Recta Medicorum Studiorum, etc., Rome 1715, Avignon 1716.

death, "De subitaneis mortibus," is celebrated. It appeared in 1707, in two volumes. In this he paid especial attention to pathological lesions of the brain and heart which he had discovered at autopsy. The work itself was inspired by the terror that seized the Roman public as a result of the great number of sudden deaths which occurred in 1705. His work in epidemiology and climatology is evidence not only of the investigating bent of his mind, but also of the fact that earnest efforts were made by his patron and himself to improve the public health of Rome. His "*De Nativis et Adventiis Æris Romani Qualitatibus*" (1771), a treatise on the climate of Rome, his "*Historia Epidemiæ Rheumaticæ* (Influentiæ), *quae per Hieman Anni 1709 Vagata Est*" (Geneva, 1713), an account of a rheumatic or influenzal epidemic, which was probably an aftermath of the great Pan-European epidemic of 1703, and his classical "*De Noxiis Paludum Effluviæ Eorumque Remediis*" (1717), a treatise on the causes and prevention of miasmatic fevers, in which for the first time is enunciated the hypothesis that the diseases might be caused by the injection into the blood of organized matter from the mosquito, show the preponderance of his inclination toward problems of public health. Nor was his inquiry limited to the diseases of human beings, for in 1715 he wrote his "*Dissertatio Historica de Bovilla Peste,* etc.," a study of two epidemics, one of equine and the other of bovine pest. A work which perhaps gained him greatest fame in his generation was his "*De Motu Cordis et Aneurysmatibus,*" two essays, one on the motion of the heart, a physiological treatise, the other on "*Aneurisms of the Heart and Blood-vessels,*" based on a wealth of clinical and pathological observation. This latter work is a classic and is mentioned by every writer who studies the development of our knowledge of heart-disease. Philipp says of it: "This . . . must be considered as *the* work which more than any other has contributed most to the emancipation, if I may so express it, of our understanding of heart-disease." It was not only because Lancisi studied thoroughly one form of heart-disease, but because he proved his case so well and so simply, that interest in the study of the pathology of the heart was stimulated. His observations, says this writer, "serve in part as the foundation walls of the structure of knowledge which has in course of time been developed and carried further toward completion. How immeasurably this systematic treatise surpasses

the contribution of Vieussen, *who rarely ventures beyond the narrow circle of medical casuistics,*" [2] he adds.

By aneurism of the heart Lancisi meant the passive aneurism of his great successor Corvisart—our dilatation, in which an enlargement takes place with rarefaction of the walls. Dilatation with thickening of the walls, eccentric hypertrophy, he differentiated specifically, saying: "*Neque autem intelligimus hic promolis augmento solum cavorum dilatationem, sed fibrarum crassitiem et solidatem.*" The association of hypertrophy with dilatation is observed and measured. He believed the study of aneurism, or dilatation, to be of especial value, he said, "because the condition is more important than most physicians believe, and must be considered the cause of many obscure indispositions, as well as of circulatory congestions, obstinate oppression, palpitation, pulmonary œdema, and many cases of sudden death." Numerous case-histories are given in considering the etiology of dilatation. In connection with heredity he mentions a family in which four successive generations were afflicted with heart-disease.

"A great number of men," he concludes, "come into the world with hearts the walls of which are too thick or too thin, either on one side or both." Mechanical obstructions are given an important place in the etiology, and Lancisi speaks of ossification of arteries and heart-valves, valvular-insufficiency, constriction of the apertures, chronic bronchial catarrh, asthma, palpitation, and long-continued depressing emotions. The fear of earthquakes, then prevailing in Rome, gave him a basis for his inclusion of anxiety in the etiology. Corvisart made a similar observation concerning the Reign of Terror. Undoubtedly dilatation is often brought about in previously damaged hearts through mental anxiety or shock, and Lancisi's observation was well founded. It will be noted that Lancisi's consideration of etiology necessarily included few of the primary factors of causation—the infections, etc.—yet his work is a marvel of clear inductive reasoning on premises founded on experience. He found dilatation more frequently in the auricles than in the ventricles, and of the right ventricle more than the left. He was the first to call attention to a clinical sign of importance, for he observes that patients with a marked turgescence of the cervical veins always are found to have a dilatation of the right heart.

[2] Philipp, J. J., *Janus*, Breslau, 1848, vol. iii, 316–326.

In his work on "The Causes of Sudden Death," the chapter, "*De causis improvisiarum mortium ex dilatationem magnorum vasorum,*" deals with hypertrophy (*nimis aucta molis*) and dilatation (*Aneurisma cordis*) of the heart as causes of sudden death. He distinguishes three groups of conditions as causative—in the first recorded attempt to etiologically group and classify heart-diseases:

1. Defects of structure, including wounds and aneurisms of the heart and great vessels.

2. Mechanical obstacles in the heart or vessels, as polypi, vegetations, tumors, exostoses.

3. Neuroses, as syncope.

In this chapter are described, for the first time, the wart-like excrescences on valves. He writes of "*Valvulis cartilagineis, osseis, exesis, phlogosi affectis aut cum sanguiferis varicosis,*" as of matters of common observation and well known, while Vieussens still marvels at the ossification of the aortic semilunar valves as something unique. And, finally, a note on the value of percussion of the sternum to determine dilatation makes him almost a rival of Auenbruger in the application of this method.

In view of the really astonishing amount of original work done by this great pioneer in pathology, it is all the more remarkable that we have learned so little about him. His works have never been translated into English, and only a portion of his "Sudden Death" and "Aneurisms" has been reviewed in German by Philipp in an article appearing in *Janus* in 1848. Doctors Garrison and Allemann, of the Surgeon General's Library, have translated, but have not published except in certain quotations, some portions of Lancisi's treatise on "Effluviæ," and to this the writer is deeply indebted. Incomplete synopses of his works appear in Desgenettes's sketch.

The essay on swamp emanations, "*De Noxiis Paludum Effluviæ Eorumque Remediis,*" was published in 1717, when the teacher was at the zenith of his career. As an example of pure inductive reasoning it is unsurpassed. The various theories maintained up to and after that time concerning the causation of malarial fevers by noxious miasmatic vapors, etc., were examined and discussed by Lancisi, and given a certain amount of credence, *not because he really was convinced by them, but because they had authority behind them and he could not disprove them.*

The possibility, or rather the probability, of the infective agent being animated and organized and microscopic in size, rather than a gaseous matter, was maintained by him—and he speaks of "worms" or "bugs" and discusses the various ways in which these organisms might enter the body, distinguishing carefully between organic and inorganic effluvia. Another observation is that gnats and mosquitoes breed in great abundance in swampy regions where malaria is found and contaminate the water. The fact of infection by drinking such water is discussed. He mentions the itch mite and the African worm—as evidence that insects do enter the body or place their ova under the skin. But having established the fact: (1) that insects like mosquitoes breed in malarial neighborhoods; (2) that they infect water and may be taken into the nose or mouth and so produce disease; (3) that they may burrow into the skin or in wounds and infect in this way; (4) that the proboscis of the stinging animal may contain some form of disease-producing material, he proceeds to give the results of his post-mortem investigations. He confesses never to have found any "worms or bugs" in the stomach or intestines or in other parts of the body which could be properly identified as causative of malaria. But he had a theory, which he refuses to absolutely sanction lest for want of anatomical proof he be considered a "seer rather than a scientist," and that theory is that malaria may be caused by organisms so small as to be difficult to see with the microscope of that day, perhaps ova or organisms produced by the gnats and mosquitoes that breed in swampy places. Plague is said to be caused by minute worms in the blood-vessels, he says, but he *can not prove by experiment* that "worms" cause either camp fevers or plague, so he is content to believe that swamp air laden with organisms is the likely cause, leaving the causation of plague to others.

He quotes Fr. A. Kircher, the famous Jesuit scientist, as his authority for the parasitical origin of plague and Varro, Vitruvina, Columella, and Palladius for observations on animate emanations from swamps as the cause of various diseases.

He described five epidemics which he studied in the Papal States, analyzing their causes. Haeser, in his history of epidemic diseases, gives Lancisi a high place as an epidemiologist.

His work on "Noxious Emanations of Swamps and Their Cure" is divided into two books, the first dealing with many propositions,

which he takes up, regarding these emanations—the influence of decayed vegetable matter, and of the great flocks of culices (mosquitoes and gnats) which breed in stagnant water. In his index there are nine page-references under the title "*Culices*" and "*Culicium.*" He gives a natural history of the mosquito, describing the larval form and development. And, to show that he actually attaches importance to the mosquito's part in the production of epidemics, he has, even in his index, a reference to "Mosquitoes and gnats appearing in unusual force at Balneoregium *before* an epidemic."

The following is a literal translation of certain portions of the first volume of this pioneer work. It contains much that has never been translated, and the writer wishes to give credit to the scholarship of Doctors Garrison and Allemann and Prof. Henry Shandelle, S. J., of Georgetown University, for invaluable assistance in this labor.

Page 61, Chapter XVII:

"I. The organic and animated effluvia are admitted to those cavities of the body which come in contact with the air, either surrounding or entering our body.

"As the emanation of organic effluvia from a swamp into the air is free and unimpeded, free and unimpeded is also their close or remote penetration into those cavities of the body which, though internal, are yet in contact with the surrounding air; whence they are said to have external surfaces, though they belong to the internal parts.

"II. Close indeed is the contact with the aerial fluid which we carry by successive inspirations through the mouth, nose, fauces, etc., to the lungs. For though it seems that, unless there is an open wound, neither worms (bugs) nor ovules are admitted through the pores of the skin, there is nothing to oppose the penetration of such organisms (corpuscles) through openings, which, from their very nature, have a much greater diameter than the bodies of ovules floating in the air.

"Wherefore not rarely bread-crumbs and even small bones, which are larger than an aerial insect, fall into the larynx or trachea while eating.

"III. Remotely, on the other hand, such animate effluvia enter the stomach with liquids (drinks) and food with much greater likelihood (with much greater evidence). For in a previous chapter I have shown that gnats and other insects make their nests during summer in the water. It can therefore easily be seen that near swamps, where

there are so many kinds of organisms and whence their multitudes are thrown into the surrounding air, the water which the inhabitants use for drinking is infected with those organisms.

"IV. Finally, the entrance of worms and their eggs with the food taken in is evident. For we have seen that the dense multitudes of insects, attracted by the sweetness of the food, congregate on any kind of food, subsist on it, and select a nest for their eggs. Thus are fruits, milk, bread, and all kinds of eatables, especially near swamps, infected with worms in a short time, so that it therefore shows that the food crowded with a large concourse of these organisms necessarily enters our body."

Page 66, Chapter IX:

"Furthermore, there can certainly no controversy arise among professional men concerning the harmful effect which the insects of the swamps, by mixing their injurious juices with the saliva and the gastric and intestinal liquids, inflict upon us. For, as I have shown above at length, their proboscis is always wet, and, as all their viscera are full of deleterious liquids, it is not possible that the juices rolled down with the food and liquids into the stomach are there not mixed with our ferments, and thus damage is inflicted upon us as is done by unhealthy food; thus we can in no way defend ourselves against the food contaminated by so many insects, which—since the fæces emit them too—vitiate our chyle beyond measure, and which—as is moreover very probable—is taken up by these very worms as their proper food; also they harm man; for frequently I have seen minute worms which were ingested by children in fruits and larger ones excreted by the intestines. For this reason we may conclude that the marshy insects are highly injurious to the body of man by the inmixture of deadly juices, as well as by withdrawing the useful ones which are in us."

Chapter XVIII:

"Here, then, is the question; namely, if in the small wounds, which are opened by the insects in the surface of the body, they always *inject their salivary juices, which are harmful to our nature, and if they also deposit their ova.* For these animals penetrate from the surrounding air into all the openings which have a little larger mouth than is their size; and where they are found to be narrower, by splitting and wounding them after the manner of a wedge, they render

them larger and more suitable to receive their ovules. This conjecture is indeed made probable by the facts which we see arise in those inhabitants of swamp regions who regularly suffer from that host, change their complexion, and are disfigured by various pustules and eruptions. That living corpuscles are carried from without under the skin is clearly shown by the worms which we frequently find in scabies induced by contagion, and by those phenomena which in Africa arise in adults under the name of Dracunculi and in Germany, in children, under the name of Crinon.

"Besides, it seems also probable that these minute animals frequently injure the internal viscera by their bite, as they very often reach the fauces, and especially the stomach and intestines, alive; at the same time they are in every way able to disintegrate the surface of the texture of those minute parts with a mechanical instrument."

Chapter XIX:

"*The question arises* whether amongst the animated effluvia of marshes there are some (*organisms*) more minute than the rest, which are carried to the blood-vessels, there to be multiplied in a manner detrimental (to the host); and what is the difference between the true plague and these other grave pestilences?

"There are not lacking learned men[3] who say that the cause of plague, as well as of other severe pestilences, is a colony of most minute worms which reel through the blood in every direction into the viscera, and which (worms), being endowed with a peculiar size, figure and quality, have penetrated from without to domicile themselves in these vessels and meanwhile, being the ministers of God's most righteous wrath, bear this plague here and there throughout the world. But, while I do not dare to deny that such an hypothesis might have a place in (accounting for) real plague (that is, the disease), propagated by (immediate) contact alone, or by closeness to the openings of the body (of the contagion), which openings can be infected by those worms even though we (they) remain in good air or use proper diet, without any general or common cause, just as vipers attack beasts and men, yet we deem it most probable that pestilent diseases which rage epidemically in certain parts of our province on account of a general

[3] A. Kircherus in "*Pestis Scrutinium*," 1, Chap. 7 and 8. Chr. Langius in *Pathol. anim. Capit.*, 63, Mangetus Biblioth; Med. tom. 4, p. 22, Chap. 1–4. A. Valisnerius, "*Epist. etrusca lingua, de causis contag. morbor in bobus.*"

or common cause existing there, and especially on account of the air infected from marshes, owe their occasion and origin not to these worms which nest in the blood but rather to noxious exhalations and animate organized effluvia. For, while the former make their way into the blood and, finally, even the nerves, the latter do not travel much farther than the nostrils, throat, lungs, stomach, and intestines." It will be noticed that Lancisi groups camp fevers and malaria together. The therapeutic test of cinchona was of not much avail in pernicious malaria, and, in view of our own mistakes in diagnosis even so late as the Spanish-American War, we can not take issue with him. Malaria, typhoid fever, and dysenteries were probably considered as having a common origin. And, since, because he clearly saw that many of these diseases could be traced to water or food infections, and others were dependent on "something in the air," which something, by the symptoms produced in the body, was probaby animate, he could not absolutely convince himself that *all* these were caused by "worms in the blood," the ova of which were introduced by insect wounds. For he notes that the symptoms of these fevers seem localized in the stomach and intestine. This is rather a tribute to his keenness of perception than otherwise. He traces now the difference between plague and these so-called camp fevers.

"II. And we consider the principal difference between genuine plague and pestilent camp fever to consist in this: that the breeding (*seminium*) of the plague is done by virulent worms. These are carried from regions, even those quite remote, and without any general cause and without any infection whatever from the air in the place in which they are, and immediately begin to exercise their pernicious activity. They travel through a porous and hairy body into one similar, so that at last they reach an animal of the kind in whose humors and blood they especially delight and by which they are nourished. On the other hand, we consider pestilent epidemic fevers as arising from a common principle, as from the air, or from food, or from drink, or from all these together, vitiated to produce the disease. These act gradually, polluting the fluids, for the most part, of the first channels (*primarum viarum*), and, if there be anything of a vermicular disease in these (but there is always something like this in marshy places, as we have shown above), this always brings destruction (*tragœdiam exitat*) in the stomach as well as in the intes-

tines. Wherefore pestilential fevers arising from the effluvia of marshes, which we are here treating, as they constantly copulate with *intestinal* worms, for the most part bear the type of tertian fevers from the start. The reason of this is that the fermentations of the abdomen (*fermentia hypochondriorum*), perniciously affected by the chyle of the same character which is thence produced, flow more injuriously into the vessels every third day. Hence is deduced the clearest reason why in a genuine plague there is, in averting its cause, hardly any use for those remedies which are employed for the purification of the air. For these, if they are any service (and this is of the slenderest), do this by affording obstacles so that the bodies of the inhabitants may be less disposed to catch the plague. Meantime the population receives most useful advice by which every occasion of external contagion is precluded. In pestilent contagious fever which proceeds from the insalubrity of the air, those remedies are of assistance which are applied either to correct the nature of the atmosphere or to intercept its motion and influence.

"III. Furthermore, I would take the rôle of a seer and not of a philosopher if, without experiments, I should dare to affirm that in camp fevers of this sort the worms penetrate and ascend to the blood-vessels. For it would be necessary (in order to establish this) for those who suffer from marsh fever to have this very blood let, which medical practice would scarcely allow, and then, by means of the microscope, to diligently examine such insects, if there be any. So far we have not been able to do this.[4]

"But, though worms might be seen in the drawn blood, it would still be doubtful if they should be considered the cause of the trouble, especially if they should prove to be—which I consider very probable—the product of the breaking down of the composition of the (blood) fluid, from which all the extremely small egglets (*the blood-cells?*) which before were encircled with particles of blood are now set free, or are supplied from the external air. We can therefore form no opinion from autopsy with regard to these diseases carrying insects in the blood. But being rather content with a candid confession of my ignorance, I must frankly concede that I have neither in abscesses due to nature, nor produced artificially in patients, who came

[4] The microscopes available in Rome at that period had about 32 diameters magnification.

in large numbers from the neighboring swamps to Rome, observed insects in other viscera than the stomach and intestines, where they find room, quietude, and food more easily than elsewhere.

" For the rest, through the high benevolence of the Divine Power, I have never been called upon to treat true plague, and so for this reason I gladly refrain from expressing a definite opinion concerning pestiferous worms in the blood as a thing I know almost nothing about."

In the face of Lancisi's " animate " hypothesis the miasm theory of the causation of swamp fevers held its own fairly well up to the time when it was definitely disproved in the laboratory by Carl Gerhardt, in 1884, while the many vague references to the mosquito as causative of malaria, up to the publication of Nott's essay (1848), were all drawn from Lancisi's work—which holds a secure place in the series of monographs of Fracastorius (1546), Kircher (1658), Rivinius (1701), Plenciz (1762), Heule (1840), Bassi (1846), and J. K. Mitchell (1849).

In the second volume of this work he applies himself to the remedies. Strange to say, his panacea is the same one recently applied in Panama—drainage, and irrigation with fresh moving water, and plenty of trees.

Among the chapter headings are: " The Method of Draining Marshes," " The Best Time to Drain Marshes," " The Benefits from Planting Trees in Groves," etc.

He tells of the connection between stagnant water and mosquitoes by citing an actual happening, when a stream was stagnated by a landslide near a Capuchin monastery. He says: " And from that time the Capuchins saw an enormous number of mosquitoes and clouds of other insects which invaded that spot and which they had never seen before. . . . In spite of efforts to drain, the epidemic persisted, together with the mosquitoes."[5]

In spite of the fact that the Papal States were in an almost continuous turmoil during the War of Spanish Succession, and a consistent policy of internal improvements was not possible at this time, he induced Clement to publish several edicts concerning drainage, sanitation, etc. He attributed many evils of the Roman people to intemperance and the practice of not sleeping in the open air. When the

[5] Lib. II, Chap. III.

bovine pest of 1715 appeared he advocated the immediate slaughter of infected animals—but his advice was not followed, and over 25,000 head of cattle died.

These are a few side-lights on the originality of the genius of Lancisi, one of the most untrammelled and advanced thinkers in the history of the medical sciences, whose authoritative claims to greatness have never received adequate consideration from medical historians.

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