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Islamic Medicine
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Kuwait Foundation for
Advancement of Sciences
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Vol. 2

Proceeding of
The Second International Conference on

Islamic Medicine

No. IV

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and
"Abul Qasim Al-Zahrawi"

Supervised by
H.E. Dr. Abdul Rahman Abdullah Al-Awadi
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PART FIVE

SEMINAR ON IBN NAFEES

CHAPTER ONE

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REPORT ON THE SECOND SESSION

This session was a seminar on "IBN NAFEES", which was held from 11.30 a.m. to 1.30 p.m. under the chairmanship of Prof. Hamdi Al-Sayyed with Mr. Ibrahim Al-Shatti and Dr. Mohammed Salehia as co-chairman and moderator respectively. First of all, the chairman gave his opening remarks and then five renowned scholars read their papers whereas two learned professors gave comments on the presented papers. Later on general discussion was allowed in which the participants took part and expressed their views. After the closing remarks of the chairman, the session was adjourned.

Editors.

OPENING REMARKS OF THE CHAIRMAN

Prof. Hamdi Al-Sayyed

Now, we are starting the Seminar on Ibn Nafees. Perhaps, we will be having a small introduction and we want to say that Dr. Mohyuddin al-Tatawi, the Egyptian physician was the first one to introduce Ibn Nafees at Berlin library in 1924, after which he continued his efforts at Phiberd city in the same year. He was the first to tell us that, Ibn Nafees by the beginning of the 7th Hijri century, started working in Damascus, after which he lived in Cairo, where he died at the age of 80. His name is Allauddin Abul--Hassan Ibn Hazam al-Qureshi al-Damashqi al-Masri. He was born in 1210 and Adel Saifuddin al--Ayyubi, was then the king and he studied medicine. He was taught medicine by Mohazabuddin and Imran al-Israili, who gave it to a great number of wellknown physicians at that time. We don't know exactly, but we think that in 1236, Ibn Nafees left for Cairo, lived there and he was a physician and a teacher of medicine. He became the head of the eye department in the Bemaristan al-Mansoori, which was the main hospital and Badaruddin Hassan, Aminuddaula, al-Dumyati, Abul-Fadal al-Iskandaria were among his pupils. Besides medicine, he was teaching languages and Figh also. He was not married and he was said to be very tall, handsome, courteous and he received many physicians at his house. He was devout and it was said , that before his death, some of other physicians said to him, "Why don't you have some alcohol to help you out of this disease?" And he said, "No, I cannot meet God the Compassionate, with a drop of alcohol in my body". He died in Cairo at the age of 80, in 1288 and the king Qarawon, gave all his wealth and books and belongings to Bemaristan al-Mansoori. Now we start our seminar.

THE WEST DENIES IBN AL-NAFIS'S CONTRIBUTION TO THE DISCOVERY OF THE CIRCULATION

Dr. Paul Ghalioungui

EGYPT

Few would doubt today that Ibn al-Nafis was the first to describe the lesser circulation. But this contribution was much wider. It included:

1. Denying the existence of any pores through the interventricular septum.

2. The flow of blood from the right ventricle to the lungs where its lighter parts filter into the pulmonary vein to mix with air.

3. The notion that blood , or spirit from the mixture of blood and air, passes from the lung to the left ventricle, and not in the opposite direction.

4. The assertion that there are only two ventricles, not three as stated by Avicenna.

5. The statement that the ventricle takes its nourishment from blood flowing in the vessels that run in its substance (i.e. the coronary vessels) and not , as Avicenna maintained , from blood deposited in the right ventricle.

6. A premonition of the capillary circulation in his assertion that the pulmonary vein receives what comes out of the pulmonary artery , this being the reason for the existence of perceptible passages between the two.

This is the minimum that could be granted to this genial physician. But even this bare minimum has been hardly acknowledged by the West as its debt to Arabian medicine. Western authors seemed indeed infuriated at seeing the credit of such a momentous discovery escape from its scholars in favour of an Arab, and they were particularly intent at denying any connection between Ibn al-Nafis and Harvey, going as far as asserting that even Arab authors, his contemporary or followers, were totally ignorant of his discovery, and that Harvey and his Italian predecessors had arrived independently at the same conclusions.

Sarton[1], after reading Meyerhof's publication of Ibn al-Nafis's manuscript[2] seemed to doubt even this German authority: "If the authenticity of Ibn al-Nafis' theory is confirmed his importance will increase enormously for he must be considered one of the main forerunners of William Harvey and the greatest physiologist of the Middle Ages. But we need confirmation. The relevant Arabic text was edited (on the basis of Berlin MSS) together with a partial German translation full of mistakes, by an Egyptian Physician...." as if the mere fact that the author was Egyptian threw doubt on its authenticity. Ralph Major[3] stated that the admirable observation of Ibn al-Nafis remained unknown to the Western world during seven centuries, that is, until a copy of Ibn al-Nafis's manuscript was discovered by Tatawy. Cisneros[4] wrote that Ibn al-Nafis wrote commentaries on Galen, Hippocrates and Avicenna, in one of which he denied the existence of interventricular passages and outlined a description of the circulation, but that this was not known to the West . Temkin, likewise, denied any connection[5] . Even Meyerhof[6] who recognised that the text of Servetus was nothing more than a faithful extract of the writings of Ibn al-Nafis, was of the same opinion.

Were the teachings of Ibn Al-Nafis really forgotten both in our countries and abroad until Tatawy rediscovered them in 1924?

In Arab countries it would have been extraordinary indeed for a physician who attained such fame to

have sunk into total oblivion.

The first argument brought forward was the absence of any mention of Ibn al-Nafis in Ibn Abi-Usaybi'a's collection of biographies. This was based on Muller's edition, and it was suggested that professional jealousy between the two Arab physicians was the reason of the biographer's omission[6]. It is known now that Muller's edition, published in 1882, was incomplete for Dr.Youssef Ish[7] discovered in 1947 a fragment of Ibn Usaybi'a's work unknown to Muller, in which the greatest respect for Ibn al-Nafis is expressed.

As to ignorance of Ibn al-Nafis's discovery by his contemporaries, incontrovertible evidence was recently found that proved that he was fully acknowledged[8].

1. Ibn al-Nafis's theories are repeated almost word for word in a manuscript by Zain al-Masry, in which the reasons why they were apparently forgotten are explained. It is known that Ibn al-Nafis wrote a commentary of the whole canon in parts, each dealing with a particular subject. Zain al-Masry stated that Ibn al-Nafis wrote his commentary on anatomy only after terminating the other parts, shortly before his death. After he died, his disciples hoarded it to the point that when Qutb al-Din al-Shirazy attempted to obtain it he received a reply that Ibn al-Nafis had died without completing it. Qutb al-Din had to repeat his request but he could get it only a few days before his death after the Sultan had personally insisted that it be sent to him.
2. Nevertheless, a word for word copy of the same commentary is found in *Sharh ul-Kulliyat* that was completed by Kazrouny in 1344 A.D., less than sixty years after Ibn al-Nafis's death.
3. In addition, a detailed expose of Ibn al-Nafis's theory, with a most laudatory comment is quoted in a 17th century manuscript by an unknown author (Paris Ms.5776)[9].

The rigid belief in the ignorance of Arab authors in respect of the work of Ibn al-Nafis cannot therefore be maintained. As Iskandar [8] to whom we owe the previous knowledge commented: these discoveries may serve to reopen discussions..." The question now is: Did the Latin West have access to Ibn al-Nafis?

Around the end of the fifteenth century, the Italian Physician Andrea Alpago spent many years in Damascus and in the Arab East to learn the language and study the Arab manuscripts, among which there were possibly copies of the commentaries of Kazrouny and Zain al-Masri. On his return he published (in 1547) in Venice that then ruled Padua a Latin translation of the part of Ibn al-Nafis's commentary dealing with pharmacopeia. He might conceivably have translated also the rest of transmitted, orally or in hitherto unknown writings the rest of the Commentary to his colleagues in Italy, specifically in Padua, where a sudden explosion of this knowledge was soon to happen.

From the death of Ibn al-Nafis in 1288 to the date of the publication of Harvey's De Motu Cordis in 1622, Arab authors used Ibn al-Nafis's Commentary. Around 1500, Alpago was back in Italy. In 1543, Vesalius in "De Corporis humani fabrica" denied the existence of pores in the ventricular septum. In 1547, Alpago's translation was published in Venice. Six years after him, in 1553, the Spaniard Miguel Servet published in his theological work "Christianismi Restitutio" his view that blood passes from the right to the left ventricles not through the septum as was commonly believed but by a lengthy passage through the lungs in the course of which it becomes elaborated and acquires a crimson colour. In spite of the Spaniard's statement to the contrary Serveto was not the first to notice this change in colour for it was already known to Galen[9].

Six years after Serveto, in 1559, Realdo Colombo in "De Re Anatomica" wrote: "There is a septum between the ventricles through which it is thought that blood from the right ventricle passes to the left; but they are very much in error, for the blood is carried by the pulmonary artery to the lungs, from whence it passes with the air by the pulmonary vein to the left ventricle of the heart".

Another twelve years and in 1571 Andrea Cesalpino wrote in "Questionum Peripateticarium" that the notion of the circulation of the blood from the right ventricle to the left ventricle through the lungs conforms to facts that are apparent from dissection. He then described the systemic circulation, using the word circulation in that connection for the first time. In this book, he also described experiments with vein ligature that are identical with those that Harvey published in "De Motu" 51 years later, and we know what Harvey owed to his Paduan masters.

1288: Death of Ibn al-Nafis
14th: 17th centuries: Arab commentators
1500: Alpago back in Italy
1543: Vesalius: "De humani corporis fabrica"
1547: Alpago's translation
1553: Miguel Serveto's Christianismi Restitutio
1559: Realdo Colombo's De re anatomica
1571: Cesalpino's Quaestionum Peripateticarum
1597-1602: Harvey at Padua
Fabrizio defines the role of the venous valves in "De venarum osteolis"
1616: Harvey lectures on his theory
1628: *De Motu Cordis*

But the most venomous denial came from Curiese del Agua who, in a totally biased attempt to vindicate the priority of his countryman Servet[10] blindly denied the very existence of Ibn al-Nafis. He started with the usual argument of his like, flatly denying any original contribution of the Byzantine or the Arabs to medicine who, he said, were mere compilers and copyists and were content to follow the doctrines of Plato, Aristotle, and Galen without, to his knowledge, adding a single new observation, as could be seen by reading Oribasius, Tralles, Paulus Eginetus from Byzantium, Avicenna of Baghdad (or so he says), and Abulcasis, Averroes, and Maimonides from Cordoba. He admitted that they enriched the materia medica but he claimed that they eliminated from medicine any original interpretation or new clinical observation and were not even allowed to own any philosophical treatises owing to the despotic fanaticism of the rulers.

He then denied the very existence of Ibn al-Nafis on grounds that prove his monumental ignorance. His arguments were the following:

1. The name of Ibn al-Nafis is sometimes given as Ali, at others as Abul-Hassan. He obviously knew nothing of the Arabic usage of the *kenia;* and he then coldly assured us that he was well aware that *Abu* and *Ibn* both meant son.
2. Ibn al-Nafis lived in the twelfth century (he actually lived in the thirteenth century) when Damascus was under Ottoman rule. He was, therefore, a Turk, not an Arab, since the Seljuk Turks ruled this city until it was reconquered by Saladin in 1174. Our author seems totally unaware of the difference between the Seljuks and the Ottomans and of the fact that Ibn al-Nafis lived and died (1210-1288 ca) in Cairo when Damascus was under the Ayyubids and the Mameluks.
3. The silence of 13th and 14th centuries and the absence of evidence that the manuscript of Ibn al-Nafis was ever published. We have already answered these two points.
4. If we deny that Servet discovered the circulation on the basis of a manuscript of doubtful authenticity (sic!) we would have even more reasons to deny that Vesalius discovered the impermiability of the septum, which would be a historical heresy. In fact any statement to the contrary is a heresy.
5. It seems difficult to believe that the supposed Ibn al-Nafis could describe the circulation without performing discussions that he denied ever having performed. In answer, we would point out that there

is nothing to prove that Servet carrired out any dissections of his own, since his argument was purely theological.

I would like to pause here and try to prove that Ibn Al-Nafis did dissect animals if not human bodies, even if he had to perform them with the same secrecy as his Renaissance colleagues who were permitted only one cadaver a year, and even if he had to declare that he did not dissect out of religious obedience, exactly as did Galileo, and Kepler and Copernicus declare their adhesion to beliefs that they denied for fear of the Inquisition.

The Arabs were greatly interested in anatomy but we often misunderstand them because the Arabic word *tashrih* means both anatomy and dissection, like its counterpart anatomy in Greek , French and English. But Ibn al-Nafis, in his introduction, while discussing the utility of *tashrih* , the knowledge of function by *tasrih,* the anatomical difference between animal and man , discussed the instruments used in *tasrih,* the different ways of preparing anatomical preparations , and distinguishes between the art *(fann)* and the science (ᶜelm) of *tashrih* , especially saying that he wished to help his readers in perfecting their knowledge of the art of *tasrih* (el*ᶜelm bi fann al-tashrih).*

There are further statements that support my assumption, e.g. the heart contains no more than two ventricles and there is no opening between them for *tashrih* contradicts Avicenna's statement to the contrary. Moreover, where could he get the notion of the compactness of the septum when all books maintained the contrary, except from personal observations?

The second statement concerns the nourishment of the heart that, he stated, reached it from the blood that flows in the vessels that run through its substance. No arm-chair theorising could lead to such a discovery that is usually attributed to Harvey.

The Arabs had a deep respect for anatomy. Haly Abbas, discussing the ancients, strongly criticised them, specially Paulus Aeginetus for their little interest in that branch of knowledge. Ibn al-Nafis when he declared his reliance on Galen, qualified his statement by saying that he relied mostly on him *(akhtar ihtimamina)* except in some minor matters that he thought resulted from copyists' errors or from Galen having recorded them without assuring himself of their truth; and he added that he relied on his own observation, whether these agreed or not with his predecessors.

Del Agua then proceeds to say that Ibn al-Nafis did not describe the circulation since he did not point out to any communications between the branches of the pulmonary artery and the pulmonary vein, and that he did not know that the ventricles contracted. This, of course, is not true.

He further wrote that Ibn al-Nafis never carried out any personal observations, since he did not mention the fundamental notion of the change in colour of the blood. Here, too, our valiant Spaniard showed his ignorance, for Galen already had described this change[11].

Finally, in an ultimate convulsion of chauvinism, Del Agua argues that since at that time there was an intense commercial and cultural exchange between Arabs, Jews and Venice, why not assume that an Arab or a Jew acquired a Latin copy of Servet and made an apocryphal translation of which he attributed the authorship to an invented Ibn al-Nafis, to exalt Arabian medicine.

Thus far from proving his point Del Agua proves ours. Such exchanges were indeed common place and as at that time the Arabs had much more to give than to receive, knowledge ran from the East westwards, rather than otherwise. This is proved by the numberless translations of Arab authors and, in this case, by Alpago's translation of Ibn al-Nafis that preceded Serveto. It is thus much more likely that Serveto translated Ibn al-Nafis or another Arab than otherwise.

We already stated that had Ibn al-Nafis given as much attention to the peripheral circulation as he so brilliantly gave to the lesser one, he would have built unaided a complete theory of the circulation.

In *maqala* 2, *fasl* 12 of his "*Al-ᶜUmda fi Sinaᶜ et il-Giraha*[12], he stated that the reason of the near constant proximity of arteries and veins is to connect them so that veins gain from arteries heat and life, and veins derive from arteries the thin vaporous blood through communicating pores. Sami Hamarna [12] who published Ibn al-Quff's study commented that in this passage Ibn al-Quff saw the conducting pores linking arteries to veins, and had a clearer view than Harvey of the capillary vessels that Malpighi discovered four centuries later.

Ibn al-Quff was, of course, preceded by Erasistratus and Galen who both admitted the passage of blood between the two systems, but both wrongly believed that blood flew from veins to arteries.

In explaining what I believe is misjudgment on the part of the Western scholars, I shall not accuse them — except one or two — of pretence or bad faith. I shall quote Iago Caldston, a distinguished historian who, in an essay entitled "Dark Corners and Obscure Alcoves in Medical History" wrote:

"Except by a few, rather esoteric medical historians, the Arabist period is treated cavalierly. The Arabists, it is said, were copyists, collators, commentators. They disdained anatomy. They were dabblers in drugs, interested in the exanthemata, and in diseases of the eye. I know that in the Western realm, good Arabists are rare and that this handicaps deep and extensive research in Arabian medicine.

"Yet, even that despite, I fear that some of the Christians' disdain for the infidel taints our evaluation of the Arabists and of Arabic medicine[13]".

This conscientious scholar ended by stating that on re-reading an article of his own which highly praised Rhazes, Haly Abbas, Avicenna, he realized that these were but names to him.

We have a legacy and a reputation to defend. I must praise this country and this centre for undertaking this sacred task. It is not my purpose to disparage Harvey's immortal work. But before and during the Renaissance the movement of the blood and similar anatomo - physiological subjects were the topic of many scientific discussions. Immediately before Vesalius a few anatomists in Italy, of whom Marcantonio della Torre and Berengario da Carpi had attempted a new approach to anatomy. In 1535 Andres de Laguna expressed his disagreement with Galen's view that the pulmonary vein carried blood and air. The glory of uniting into a single stream all the rivulets that his predecessors had failed to bring together, undoubtedly belongs to Harvey, but it does not diminish his debt to his numerous masters and precursors, among whom one should place the forgotten genius, ᶜAla'ul-Din Abdul ᶜEla ᶜAly Ibn-abil Hazm al-Qarashy al-Damashqy al-Masry, better known as Ibn al-Nafis.

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IBN AL-NAFEES
DISCOVERER OF THE PULMONARY BLOOD CIRCULATION ☆

Dr. Abdul Kareem Shehada

SYRIA

ABSTRACT

His full name is Ala-Uddin Abul Hassan Ali Ben Abil Hazm al-Qurashi al-Dimashqui, better known as Ibn al-Nafees. He was born in Damascus in 607 Hijri (1210 A.D.). He studied medicine at al-Nouri al-Kabeer Hospital in Damascus where he was tutored by the two well-known professors Muhathabul--Din al-Dakhwar and Omran al-Israili. Later, he moved to Cairo where he took up medicine as a career, practising and teaching it. In the latest years of his life, he became the chief of physicians. He died in Cairo at the age of 80 in 687 Hijri (1288 A.D.).

Ibn al-Nafees was not only a physician but he was a philosopher, a linguist and a jurisprudent as well. He was an encyclopaedic type of scientist, so prolific that he was credited for a voluminous variety of books in various disciplines, especially in medicine. In his medical writings and researches he followed a special method based on accurate observation. He never adopted anything said by his predecessors until he went through a painstaking process of ascertaining it. With all due respect to such staunch physicians as Galinus and Ibn Sina he never hesitated, when necessary, to oppose and criticise them.

He is, therefore, truly considered one of the pioneers of medical sciences and a revolutionist who refused to blindly follow the same line of thinking of others or imitate them. This is what led him to dramatic medical discoveries at the top of which is the discovery of the pulmonary blood circulation. With this discovery he scooped such renowned Renaissance scholars in Europe, especially in Italy, as Servitus, Fesalius. Columbo and Sesalinu by three centuries. We intend to prove this by quotations from Ibn al-Nafees's manuscripts available in libraries all over the world. We shall also prove that these writings had been translated into Latin since 1547A.D. and were later disseminated in the Italian universities which were the centre of scientific activites during the Renaissance.

We shall also see that the English physician, Harvey, who was the first to discover the blood circulation in 1628 had been influenced by Ibn al-Nafees's ideas when he studied medicine at the University of Padova in Italy.

For all this, we can proudly acclaim the Arab and Muslim physician , Ibn al-Nafees, to be the first and real discoverer of the pulmonary blood circulation.

☆ As the English translation of the full text could not be made available, we are publishing here the abstract only.

Editors.

IBNUL-NAFEES HAS DISSECTED THE HUMAN BODY

Dr. Sulaiman Qataya

FRANCE

Ibn Sina's "Canon of Medicine" was the main textbook prescribed for many Arabic medical schools all over the Islamic Empire. Those schools were located in the Bimaristans (university hospitals). However the book was shunned and criticised by many scholars such as Ibn Zuhr who preferred to it the Arjozah (Poem on Medicine), and Abdul Lateef al-Baghdadi who considered it the nonsense he could at last get rid of. Among the book's critics was also the Swiss physician, Paracelse (1493-1541) who burned it along with other books at Bal in Switzerland where he was studying medicine and got dismissed for it. Yet, the book enjoyed a high prestige and was taught up to the 18th century. The last school of medicine where it was used as a textbook was at Tuvan in Belgium. Even today it is still being studied and applied in India by Hakims who practise Unani medicine.

The Canon was the work of a genius who put into it all the medical information available at his time in an exquisitely logical order. As it was beyond the comprehension of beginners the book had to be explained by successive scholars. Therefore, summaries, comments and interpretations of the book abounded.

When Ibnul-Nafees (1211-1288) became well known as a scholar and a professor he, too, had to explain the Canon and write a summary of it. "Sharhul Kulliyyat" (a commentary on the general principles) and "Sharhul Tashreeh" (Commentary on Anatomy) were the two works he wrote about the Canon. About "Sharhul Kulliyyat" he said: "I have written it in the same order of al-Qanoon except where it comes to anatomy and pharmacopeia. I have seen fit to set aside a special book for anatomy to follow commentaries on the other topics of (al-Qanoon) Canon's first volume known as the General Principles".*

Thus Ibnul-Nafees explained the first and third volumes because Ibn Sina had divided anatomy into two parts:

First: What may be called general anatomy, i.e. skeleton, muscles, nerves, etc.

Second: Special anatomy, that is anatomy of each individual member of the body before dealing with its pathology.

"Sharhul Tashreeh al-Qanoon" by Ibnul-Nafees was similarly divided into two parts: the first comments on anatomical topics discussed in Canon's first volume, and the second on Canon's third volume.

Ibnul-Nafees's book was not confined to providing explanations, but also contained critical comments on the anatomical information given by Canon. The criticism was levelled at both Galin and Ibn Sina, and even at all preceding writers on anatomy. Sometimes he criticised anatomists without identifying them.

I think that Ibn Sina had seldom practised dissection, whereas Sharhul Tashreeh contained a great deal of new information in addition to scientifically objective criticism, which indicates that Ibnul-Nafees must have actually practised dissection.

It is curious and worth noting that he says in the book, "The most important muscles of a human body total 529, details of which you will read in a book we are writing on medicine with full investigations into their shapes, functions, tendons, and origins. The forthcoming book will also contain details about proper anatomy since what is said about it here, is short and brief".[2]

* He reaffirms the same idea when he says, "In the major book we are writing about the medical profession we intend to simplify talk about this and similar matters.

Ibnul-Nafees, then, had better things to say about anatomy in another book, which could be "al--Shamil" (the comprehensive) said to be written in hundreds of volumes 80 of which had been in fair copy at the time of his death.

Some volumes in Ibnul-Nafees's own handwriting are still kept at the library of Cambridge University in England waiting for the investigator who would shake the dust off them and present to the world the fruit of the genius of this Muslim Arab scholar. There is so much that can be said about Sharhul Tashreeh. But I have just finished editing the book and am in the process of writing a whole book about it. So, under the pressure of time limit I will have to content myself with taking up one important issue: has Ibnul-Nafees dissected the human body?

There are three different views about this question. The first denies that Ibnul-Nafees or, for that matter, any other Muslim Arab scholar has ever practised any sort of dissection. According to the second view, Ibnul-Nafees has practised dissection, but only of animals, just like Galin. The third view holds that Ibnul-Nafees has dissected the human body.

Among advocates of the first view is the German orientalist, Max Mayerhoff (1874-1945). He said, "In the earlier days of Islamic Shariah, the study of virtually all sciences was permissible. But since the appearance of the renowned Islamic Theologian and philosopher, al-Ghazzali (1111 A.D.), a religious clamp down was imposed on such studies as they allegedly might lead to scepticism in the basic tenets about the origin of the world and the existence of the Creator." [3] Yet, he admits that "this situation was not sufficient to preclude the emergence of scientific thinkers. But the religious oppression was undoubtedly an important factor in stifling their voices".

Mayerhoff, then, asserts that:

1. Islamic Shariah per se did not prohibit the pursuit of knowledge at all. The fact is that nothing in its two sources, the Quran and Sunna, specifically prohibits dissection of the human body for scientific purposes.

2. The reason why scientific studies at the time were meagre was the emergence of Ghazzali and his teachings. It is true that he wrote his famous book entitled "Tahafutil Falasifa" (the collapse of philosophers) but the freedom enjoyed at that time by the scholars prompted Ibn Rushd (Averroes) to issue his rejoinder "Tahafutil Tahafut" (the collapse of collapse). Ibn Rushd (1126-1198) was a philosopher and a physician. In his book "Faslul Maqal" (the last word or the final decision) he says, "Knowledge of the ways of creation leads to intimate knowledge of the Creator. The better you know these ways the more intimate your knowledge of the Creator will be. The canonical law of Islam has urged people to ponder everything in existence". [4] "Practice of dissection strengthens the faith," is also a well known quotation from Ibn Rushd.

3. According to Mayerhoff, Ghazzali's teachings did not stand in the way of free thinkers like Ibnul--Nafees.

As a matter of fact, the idea behind prohibiting the dissection of the human body emanated from the common people's reverence of their ancestors and their dead. It had nothing to do with true religion. This is what we can deduce from notes written by Klut Bey, Mohammed Ali's physician, who established Abu Zaabal's School of Medicine in Cairo. There was a strong opposition to including dissection into the school's program and Klut Bey had to take the matter up in a meeting he held with Sheikh Arousi, a leading religious figure at that time. From the notes he took down about that meeting it became obvious that the reason behind prohibiting dissection was fear of stirring up public feelings. In his notes, Klut Bey says, "I think his hesitation to approve (of dissection) was caused by his fear to run up against traditional beliefs more than by scepticism in a line of thought he was half convinced of. What confirms this

is that he gave me implicit approval to go ahead with the course but not before making me promise that I should take every precaution to do it in discreet secrecy".[5]

I can personally see a strange similarity and complete identity between the attitudes of both Sheikh Arousi and Ibnul-Nafees. Both approved of dissection but "with great precaution and discreet secrecy" for "fear of running up against traditional beliefs". That is why Ibnul-Nafees said in the introduction to Sharhul Tashreeh, "We have been dissuaded from actual practice of dissection by fear of violating the Shariah and on account of the mercy that is inherent in our manners".[2]

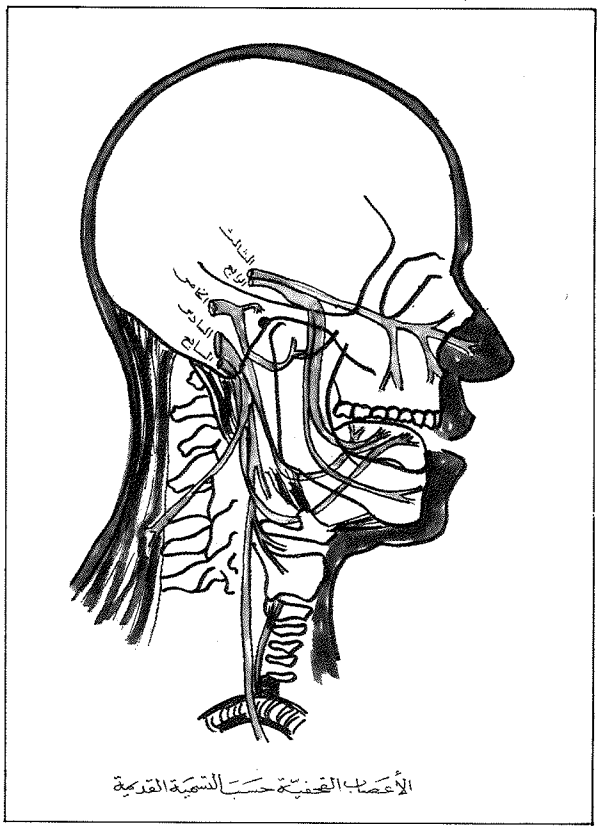
It is well known that an author writes his introduction only after finishing his book. Ibnul-Nafees might have noticed that the information provided by his book would clearly indicate that he must have based it on personal experience. Hence, he must have deemed it proper to disclaim any such practice right at the outset by writing this statement in his introduction, especially as the book was esoteric in nature and the few available copies would probably be read by only a small minority of interested people. Mayerhoff, Shacht and others considered this statement as a clear evidence that Ibnul-Nafees had never practised dissection. However, a thorough reading of the book would undoubtedly refute the statement. And when Mayerhoff came to the pages where Ibnul-Nafees described the heart anatomy and the pulmonary blood circulation he did not have the courage to admit his mistake. Instead, he sought a way out by saying that the discovery was the result of a happy hypothesis "which luckily coincided with the facts".[6] Shacht interpreted Ibnul-Nafees's discovery of the minor blood circulation as a result of clever deduction from theoretical argumentation.

Let's now go back to what Ibnul-Nafees said about heart anatomy. He said, "But there is not a vent between them (the heart ventricles). The mass of the heart there is thick with neither an apparent vent, as some thought, nor with an invisible vent through which blood might pass as Galin believed."[2]

I do not want to proceed any further with what is known only too well about the heart anatomy. Suffice it to quote Charles Leschtantiller, professor of medical history at Lousan and Hamburg. He said, "Nobody could have given such a full description unless he had actually put his finger in the heart cavities."[8]

In the following section Ibnul-Nafees gives himself away when he says, "Their claim (meaning preceding physicians and anatomists) to have dissected and seen what they say they have seen, is something that I do not believe or can be certain about. On many occasions I have seen what disproves their claims which are based on what they have allegedly found out by repeated dissections."[2] Here he asserts beyond any doubt that he has seen "differently from what they said about dissection".

The second team of research workers, including colleague Dr. Abdul Kareem Shehada and Dr. Amin As'ad Kheralla, say that Ibnul-Nafees did dissect, but only animals.[6] Galin had previously done that. He based his books of anatomy on what he had found out when he dissected animals. He says, "The system of the animal's body whose members we can identify through dissection looks very close to that of a human body. However, we can easily presume that the bodies of certain animals are by far very dissimilar to man's body. These would include birds, fish, snakes, worms, wasps and bugs."[6] Galin meant that if he dissected animals whose bodies were closely similar to human bodies, he could get a fairly good idea of what a man's body looked like. Galin, therefore, asserts that his anatomical description is, in a way, humanitarian. He says, "It is for man that we have written this book. Our aim is to describe the morphology of his body..."[10] Again he says, "As for man, for whose sake we have written this treatise..."[10] and "One day we may talk about other animals. As for man to whom we have devoted this book..." The book he meant is "The Functions of the Members" translated by Hunayn Ibn Ishaq. In this book he says, "I do not intend to describe the odaxetic members existent in all animals because I have not in fact mentioned the morphology of any of their members (meaning the animals) unless it was extremely necessary and as a point of departure to describe the members of man's body. If we are not



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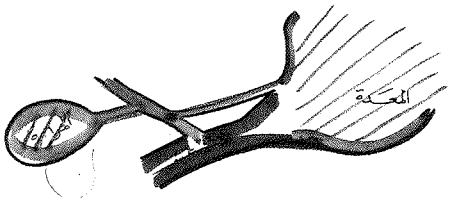

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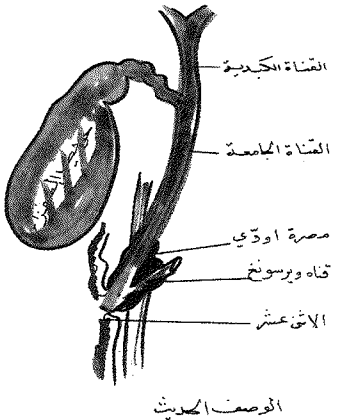

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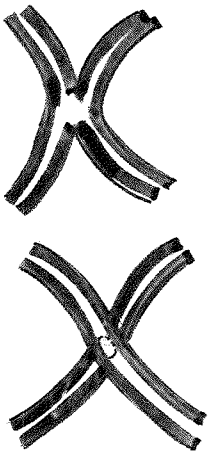

حسب ابن النفيس

interrupted by the fate of death we will deal one day with the constitution of animals' bodies with an accurate anatomical description of each member of their bodies along the same lines as we are now following with respect to man's body". Evidence of Ibnul-Nafees's dissection of animals can be found in his criticism of both Galin and Ibn-Sina concerning what they said about bones in the heart. Galin says, "The bones that some people think are found only in big animals and not in all animals are in fact found also in other animals, though they are more like cartilage than real bones."[12]

Ibn Sina reiterates the same view adding, "Bones have been found in bulky animals, especially in bulls. This bone is rather cartilage-like with larger and stronger types found in the hearts of elephants." [13] Galin had mentioned the elephant's heart saying, "A big elephant was slain in Rome not long ago. A large number of physicians gathered around it to study its anatomy and to determine whether its heart was with one or two caputs and with one, two or three cavities. Before they went ahead with actual dissection I had asserted that they would find the same anatomy as that to be found in all air-breathing animals, which was later established by the dissection they had undertaken. I also found quite easily the heart bones."[14]

But Ibnul-Nafees proved both to be wrong. He says, "This is not true. There are absolutely no bones beneath the heart as it is positioned right in the middle of the chest cavity where there are no bones at all. Bones are only found at the chest periphery not where the heart is positioned."[2]

The advocates of the theory that Ibnul-Nafees has dissected animals thus thought that this excerpt confirmed their view. The fact of the matter is that there is nothing that looks like bones inthe hearts of animals except in anomalous cases which were considered exceptions to a rule. Cuvier, the renowned French zoologist, says, "But this bone is not found in all specimens of the same species of animals. It is nothing more than organic anomaly and cannot be considered a rule."[15]

The third team, including me as well as Dr. Haddad, are of the opinion that Ibnul-Nafees has dissected the human body. Sharhul Tashreeh abounds with examples some of which we cite here for the purpose of illustration.

Galin says, "The blood reaches the brain itself at the section called forebrain through the dura--mater which divides the vault longitudinally into two equal halves at the sagittal suture."[16]

Ibnul-Nafees's reply to that is that, "The blood (animal soul) permeates first to the back ventricle (hindbrain) then to the other two ventricles. Dissection confirms this and disproves what they say. The permeation of arteries into the cranium is well known not to be from the front ventricle." [2] Which is quite true.

Another example:

The ancient anatomists considered the cranial nerves to be seven beginning with the optic nerve as they did not consider the olfactory nerve to be a nerve at all, but part of the brain. To them, the fifth pair of nerves is in fact the confluence of facial nerve (seventh in modern numeration) with the sigmoid nerve (8 th) That is, these two nerves constituted to them only one nerve, the fifth pair. The sixth pair is the confluence of three branches: glossopharyngeal (9 th), vagus (10 th) and accessory (11 th). According to the ancient anatomists the three formed one nerve, the sixth pair. Ibn Sina says, "After arising from the hindbrain, the sixth nerve is so firmly attached to the fifth through membranous facia that both nerves look like one. After a short distance it leaves the fifth nerve and emerges as three branches from the (jugular) foramen at the lower end of the (occipitomastoid suture, a bifurcation of) the lambdoidal suture."[17]

Translating this into contemporary scientific terminology, it means that the ninth, tenth, and eleventh nerves arise from the nerve ganglion. They are attached to the seventh and eighth nerves through membranous facia so that these five nerves look like one nerve emerging as three branches from the

back foramen lacerum. Criticising this, Ibnul-Nafees says, "About what he said (meaning Ibn Sina) concerning the sixth nerve being attached to the fifth through membranous facia, I have not so far found a good reason for that attachment, and I have not even verified it. This sixth pair both arises and emerges from behind the fifth, so there is no way it could be attached to it."[2]

The criticism is well founded. We should take note of the part where he says, "I have not verified it", which indicates that he must have looked and searched but found it was not true. In other words, he must have dissected that part of the brain and discovered the mistakes of both Galin and Ibn Sina.

I do not think Ibnul-Nafees's description applies to the brain of a sheep as some would like to think that he dissected that and not a human body.

Another example:

Galin says about the anatomy of the bilious canals, "You will find on dissection that the canal extends from the gall bladder to the onset of the duodenum, a little beneath the portal vein. In some animals, you can see the spot where the end of the small intestine gets enlarged around the portal vein. At the same time you will see a small canal going down with the vein extending to the duodenum." [18] Ibn Sina says the same thing, adding, "Most tributaries of this (bilious) canal go to the duodenum. A little sub-branch might be attached to the lower part of the stomach".

If we turn back to the book written by A. Vesalius [19] (1514-1564), who is considered by the West to be the founder of anatomy, we will find that he made the same mistake. So did Leonardo Da Vinci [20] (1452-1519) in his paintings. They all reiterated what Galin had said, but they were all mistaken except Ibnul-Nafees who says in criticism of Galin, "He (Galin) claims that another canal goes from the gall bladder to the intestinal cavaties. This is completely wrong. We have seen the gall bladder several times and failed to see anything going from it either to the stomach or to the intestines." [2] And he is right. He had thus corrected Galin several centuries before Western anatomists.

Another example: The crucifix crossing of the optic nerve:

Describing this nerve, Galin says, "The (optic) nerve which comes from the right side of the brain goes to the right eye, and the nerve which comes from the left side goes to the left eye." [21] After reviewing Galin's description, Ibnul-Nafees comments by saying, "In fact it is not like that", but, "each nerve goes to the opposite side".

CONCLUSION

The examples I have cited here are very few. Sharhul Tashreeh, indeed, abounds with criticism, remarks and sights of the anatomy of almost all parts of the human body: bones, muscles, intestines, sensory organs, etc. Each example cited here deserves a detailed and extensive study. However, we can safely say:

1. Ibnul-Nafees has actually dissected the human body, but in secret for fear of stirring up public feelings.That is why I described in the scenario of the film about Ibnul-Nafees a scene that confirms this.

2. All papers presented so far about Ibnul-Nafees's discoveries are confined to the minor blood circulation. But Ibnul-Nafees has in fact many other discoveries about the bilious canals, the esophagus, the stomach, etc.

3. As said by Ibnul-Nafees himself, Sharhul Tashreeh is only a short and brief outline of his views. Further research, therefore, must be carried out to find his other works, edit them and have them published.

4. I believe that Ibnul-Nafees's genius was not less, if not more, than that of Ibn Sina or al-Razi. He was perhaps ahead of them when it came to discoveries and innovations. He seems to have said, "By

God, had I not known that my books would be read for the coming two millennia I would not have written them". I think he was not wrong there, because we shall continue for a long time to study his works and will always find in them something new.

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THE COMPREHENSIVE BOOK ON THE ART OF MEDICINE BY IBN AL-NAFĪS

Dr. Albert Zaki Iskandar
U.K.

Historians of medicine do not know the exact date of birth of ᶜAlā al-Dīn Abu'l-Hasan ᶜAlī Ibn Abi'l-Hazm al-Qurashī, known as Ibn al-Nafīs.[1] His *nisba,* al-Qurashī, is from his birthplace 'al--Qurashiyya', a village on the outskirts of Damascus. His name 'Ibn Abi'l-Hazm' is recorded in many sources. Some historians, however, claim that they have read 'Ibn Abi'l-Haram'.[2] One may find some justification for their claim: Ibn al-Nafīs, like many other authors, did not place the diacritical points carefully on the letters, as is shown in his autograph of the *Comprehensive Book on the Art of Medicine:*

"... The thirty-third volume of the *Comprehensive Book on the Art of Medicine,* written by ᶜAlī Ibn Abi'l-Haram *(sic)* al-Qurashī, who is in need of Allah the exalted; may Allah forgive him..."[3]

"... Treatise on plants: the forty-second volume of the *Comprehensive Book on the Art of Medicine,* written by ᶜAlī Ibn Abi'l-Haram *(sic)* al-Qurashī, who is in need of Allah the exalted; may Allah forgive him..."[4]

In the above two extracts, Ibn al-Nafīs had neglected to place the diacritical points in each of the following words: kitāb, al-sināᶜa, al-tibbiyya, al-Hazm, maqāla, al-nabāt, kitāb, al-tibbiyya, taᶜāla, and Ibn Abi'l-Hazm.

Conclusive evidence that his name is Ibn Abi'l-Hazm (with a *fatha* on the letter *hā* and a *sukūn* on the letter *zāy)* is derived from his own handwriting: He wrote his name with the diacritical points and vowels clearly placed, in an *ijāza* which he had recorded at the end of his well-known book *Commentary on Hippocrates' Book 'Nature of Man'.* This *ijāza* (testimony) runs as follows:

"The eminent Shaykh, physician-philosopher, Shams al-Dawla Abu'l-Fadl Ibn al-Shaykh Abi'l-Hasan al-Masīhī, may Allah grant him eternal happiness, discussed with me all the contents of this book of mine, which contains my commentary on the book of the leader Hippocrates, that is his book known as *Nature of Man.* This discussion has revealed the clarity of his mind and the straightforwardness of his thought; may Allah the exalted [help] him to make use [of my book] and render him useful [to mankind]; and so writes ᶜAlī Ibn Abi'l-Hazm al-Qurashī, a practitioner, who is in need of Allah the exalted. Praise be to Allah for His graces; may He bless His best Prophet Muhammad(ﷺ) and his people; twenty--ninth Jumādā I of the year six hundred and sixty-eight."[5]

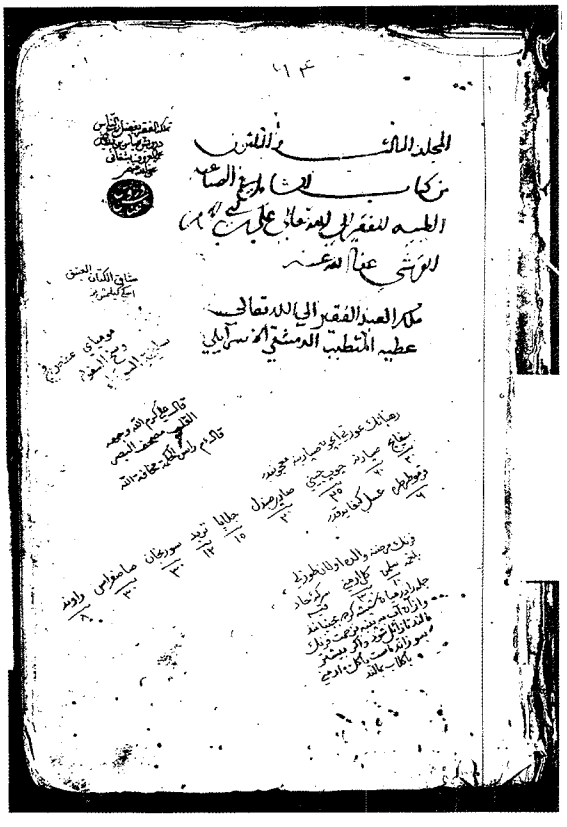
In the colophon of Ibn al-Nafīs' *Commentary on Hippocrates' 'Nature of Man',* in this particular manuscript, the following note by the copyist reveals that he had copied directly from Ibn al-Nafīs' own autograph:

"... [Transcription of] this book has been completed — from a copy in the author's own handwriting — may his life be prolonged *âlā manzilat al-lubūna* [*sic*], on fourth Rabīᶜ I of the year six hundred and sixty-eight.

This was written as an exhortation to myself: Abu'l-Fadl Ibn Abi'l-Hasan al-Kātib, a practitioner..."[6]

Ibn al-Nafīs was a great physician and a prolific author. He was also a famous jurist. This paper merely presents extracts from his *Comprehensive Book on the Art of Medicine.*

Ibn al-Nafīs studied medicine in Damascus, at the Great Nurī hospital, which was founded by Prince Nūr al-Dīn Mahmūd Ibn Zankī in the sixth century A.H. / twelfth century A.D.[7] Muhadhdhab al-Dīn ᶜAbd al-Rahīm Ibn ᶜAlī al-Dakhwār (d. A.H. 628 / A.D. 1230) was one of Ibn al-Nafīs' teachers in Damascus.[8] Another pupil of al-Dakhwār, also in Damascus, was Muwaffaq al-Dīn Abu'l-ᶜAbbās Ahmad Ibn Qāsim



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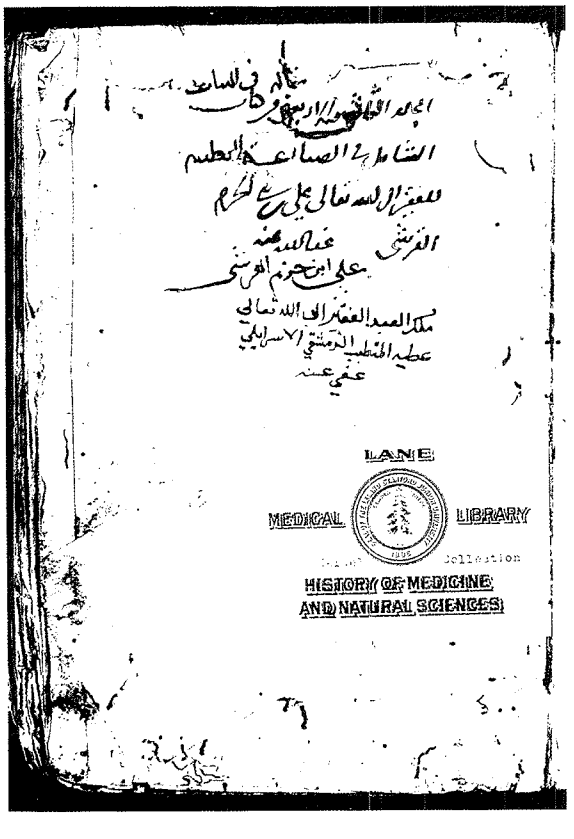

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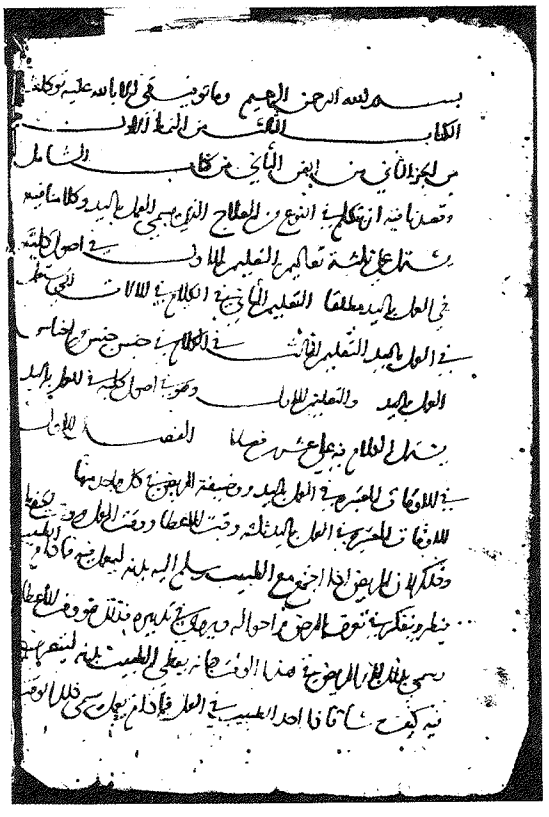

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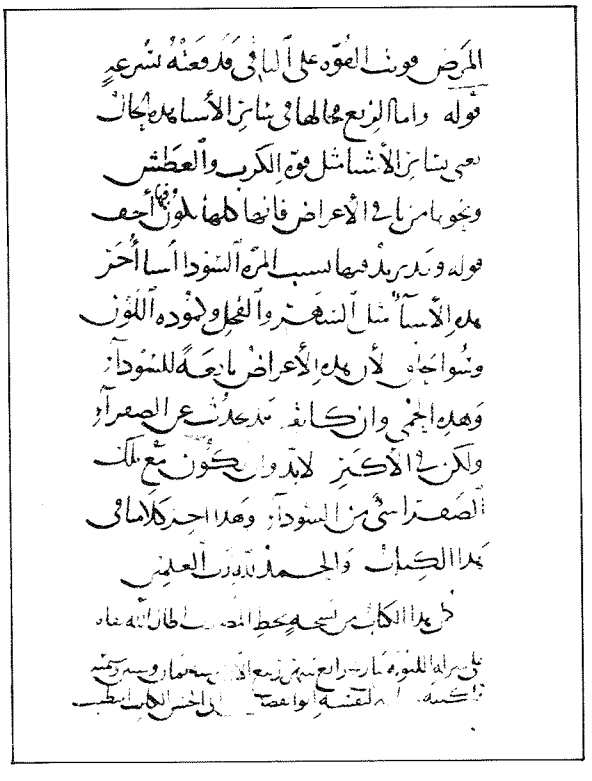

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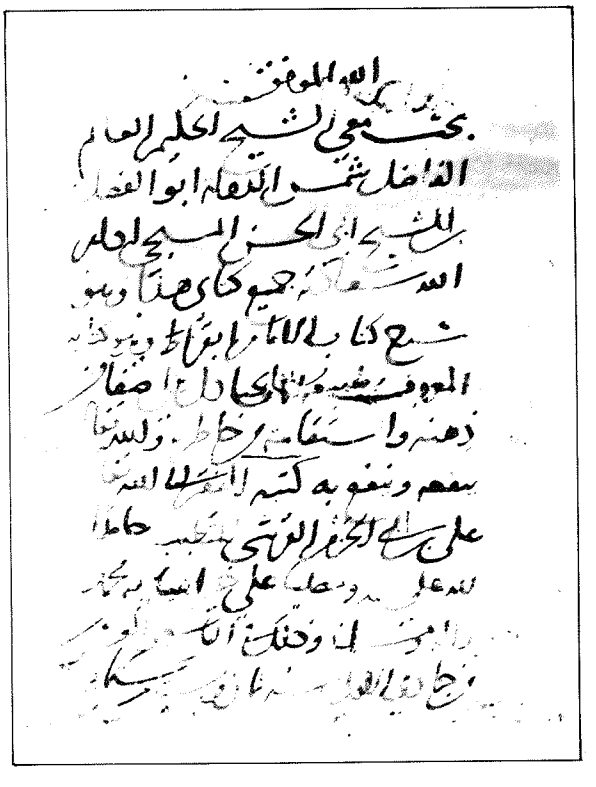

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Ibn Khalīfa al-Khazrajī, better known as Ibn Abī Usaybi ᶜa (d. A.H. 668 / A.D. 1270).[9] It has been established that Abu'l -Faraj Ibn Yaᶜqūb Ibn Ishāq Ibn al-Quff Amīn al-Dawla al-Karakī (d. A.H. 685 / A.D. 1286) studied medicine under both of Ibn al-Nafīs[10] and Ibn Abī Usaybiᶜa.[11] It is therefore surprising that Ibn Abī Usaybiᶜa should fail to include a biography of Ibn al-Nafīs in his well-known book: *ᶜUyūn al--anbā fī .tabaqāt al-atibbā* . The short account which is to be found at the end of *ᶜUyūn al-anbā* , only in one manuscript (at the Zāhiriyya Library, Damascus),[12] seems to have been written at a later date, and in the past tense. This also shows that the writer of Ibn al-Nafīs' biography was not a contemporary of Ibn al-Nafīs. It is very likely that a former owner of this Zāhiriyya manuscript had recorded the biography of Ibn al-Nafīs in order to make his own copy more useful. He made a mistake in mentioning the *nisba* of Ibn al-Nafīs as follows:'... al-Qarashī, with a *fatha* on the letter *qāf* and a *fatha* on the letter *rā* , from a village near Damascus...'[13]

Ibn al-Nafīs was a private physician to the Mamluk ruler al-Zāhir Baybars al-Bunduqdārī *(regnabat* A.H. 658 / A.D. 1260-1277),[14] who appointed Ibn al-Nafīs as 'Chief of physicians', and eventually gave him 'authority on all physicians in Egypt'. This post was not merely honorific but vested him with full authority to punish practitioners for any slips due to carelessness.[15]

So far students of Arabic medicine have not found evidence from manuscripts that would connect Ibn al-Nafis' name with the Nāsirī hospital of Egypt, which is also called the Old hospital, that was founded in A.H. 577 / A.D. 1181 by the King al-Nāsir Salāh al-Dīn al-Ayyūbi (Saladin, *regnabat* A.H. 564--589 / A.D. 1169-1193).[16] It is worth mentioning that Ibn Abī Usaybiᶜ a was an oculist at that hospital during the one year (A.H.634 / A.D. 1236-1237) he had spent in Egypt.[17] When Ibn al-Nafīs retired, due to old age, he bequeathed his house and private library — which was full of his own written works — to Dār al-shifā (House of recovery)[18], also called Qalāwūn hospital or al-Mansūrī hospital[19], after the name of its founder in A.H. 683 / A.D. 1284, the Mamluk al-Mansūr Sayf al-Dīn Qalāwūn al-Alfī *(regnabat* A.H. 678-689 / A.D. 1279-1290),[20] I have already published a list of Ibn al-Nafīs' medical writings, and referred to the manuscript-numbers of some of his books that are extant in different libraries all over the world.[21].

In addition to practising medicine, Ibn al-Nafīs lectured on *fiqh* (jurisprudence) at al-Masrūriyya school,[22] founded by the eunuch Masrūr Shams al-khawāsī of the Court of Salāh al-Dīn al-Ayyūbī.[23] Ibn al-Nafīs also wrote a book on the principles of jurisprudence, entitled *Sharh al-tanbīh,* being a commentary on *al-Tanbīh fi'l-fiqh* of al-Fīrūzābādī (d. A.H. 476 / A.D. 1083).[25] The inclusion of Ibn al-Nafīs' name in the *Tabaqāt al-Shāfiᶜ iyyīn al-Kubrā*[26] of al-Subkī (d. A.H. 771 / A.D. 1370) indicates his eminence in religious law.

Furthermore, Ibn al-Nafīs wrote *al-Risāla* al-*K¯amiliyya fi'l-Sīra al-Nabawiyya,* known by the title *Fādil Ibn Nātiq,* a counterpart to Ibn Tufayl's (d. A.G. 581 / A.D. 1185)[28] *Hayy Ibn Yaqzān.* In *al-Ris¯ala al-Kāmiliyya,* Ibn al-Nafīs contemplated the creation of a human being within a cave in an uninhabited island, in a way similar to that of the emergence of a chich from an egg. The four elements: air, water, earth and fire are acted upon by the four qualities: the hot, the cold, the dry and the wet, and result in the spontaneous generation of man. Ibn al-Nafīs' purpose in writing this book is to show the ability of such an isolated man to discover the sciences and wisdom, then to know about the prophecies, the noble conduct of the Prophet Muhammad, (ﷺ) and the legal customs.

In this paper I give a short reference to Ibn al-Nafīs' great discovery of the pulmonary circulation.[29] It is not at all important whether his great discovery was the result of practising anatomy or using the method of speculation and the correct method of scientific thinking. What concerns us, as historians of Arabic Islamic medicine, is that Ibn al-Nafīs had discovered the pulmonary circulation, thus defying the doctrines of Galen himself. Moreover, this discovery of Ibn al-Nafīs took place — at least — forty-seven lunar years (forty-six calendar years) before his death. I have found the pulmonary circulation in a copy

of Ibn al-Nafīs' *Sharh tashrīh al-qānūn li'Ibn Sīnā* (Commentary on anatomy in Ibn Sīnā's 'Canon'), in MS Ar. 80 (at the University of California, Los Angeles)[30], dated 25th Jumādā I 640/20th November 1242. I have also provided evidence that some Arab physicians had accepted Ibn al-Nafīs' blood circulation, since I found it recorded in *Sharh al-qānūn* (Commentary on [Ibn Sīnā's] 'Canon') by Sadīd al-Dīn Muhammad Ibn Masᶜūd al-Kāzarūnī, who completed his commentary in A.H. 745 / A.D. 1344.[31] A few years later, the same pulmonary circulation was also recorded in ᶜAlī Ibn ᶜAbd Allāh Zayn al-ᶜArab al-Misrī's *Sharh al-qānūn* (completed in A.H. 751/ A.D. 1350).[32] As to the accounts of Servetus (d. A.D. 1553)[33] and Colombo (d. A.D. 1559),[34] these were recorded more than three centuries later than Ibn al-Nafīs' discovery. Historians of medicine should, in fact, look for a satisfactory answer to the following question: Did the Latin West have access to Ibn al-Nafīs' pulmonary circulation? It is a well-known fact that Andrea Alpago of Belluno (d. A.D. 1520) had lived in Syria for about thirty years, during which he had actively collected and translated Arabic medical heritage. He translated into Latin Ibn al-Nafīs' *Sharh al-adwiya al-murakkaba* (Commentary on compound drugs), printed in Venice (1547), which is a part of Ibn al-Nafīs' *Sharh al-qānūn li'Ibn Sīna* (Commentary on Ibn Sīnā's 'Canon'). On folios 24 *verso* to 30 *recto* of Alpago's book, which I mention in the following marginal note, the author gives some information concerning Galen's doctrines on the heart and the blood vessels, and adds Ibn al-Nafīs' criticism of these doctrines.[35]

THE COMPREHENSIVE BOOK ON THE ART OF MEDICINE

In his book *al-Wāfī bi'l-Wafayāt,* Khalīl Ibn Aybak al-Safadī writes that Ibn al-Nafīs "is the author of the *Comprehensive Book on the Art of Medicine.* According to its index, it consists of three hundred volumes... out of which eighty volumes were written neatly by him. These are now [extant], by religious bequest, in the Mansūrī hospital in Cairo.,"[36] This statement of al-Safadī is also supported by al-Subkī, who writes in his book *Tabaqāt al-Shāfiᶜ iyyīn al-kubrā* that Ibn al-Nafīs "wrote on medicine, besides what we have already mentioned, a book entitled the '*Comprehensive [Book]*', said to have consisted of three hundred volumes had it been finished; out of these eighty volumes were completed."[37]

Dr. N.Heer made an interesting study of this book[38], and published an article in which he listed its contents and gave references to some manuscripts of the *Comprehensive Book on the Art of Medicine* extant in Public libraries.[39] In his paper, he mentions MS Z 276 (at the Lane Medical Library, Stanford University, California). All this manuscript is in Ibn al-Nafīs' handwriting. It contains the thirty-third, the forty-second, and the forty-third volumes of the *Comprehensive Book on the Art of Medicine.* Some folios of this manuscript are possibly misplaced. It also seems that there are gaps in the text. (I have transcribed a large section of this manuscript).

In practising medicine, Ibn al-Nafīs preferred the Hippocratic method to the methods of other physicians. He wrote interesting commentaries on some Hippocratic books,[40] but he did not write commentaries on any of Galen's works. Ibn al-Nafīs' discovery of the pulmonary circulation was by way of criticism of Galen's doctrines.[41] In a section devoted to surgery, in the *Comprehensive Book on the Art of Medicine,* Ibn al-Nafīs selects some subject-matter from the Hippocratic book, *In the Surgery,*[42] then he clarifies the selected excerpts through his detailed commentary.

Ibn al-Nafīs believes that for the success of any surgical operation, full attention should be paid during three stages: In the first stage, which he calls the 'time of presentation', the surgeon diagnoses the affected place. It is called the 'time of presentation' because the patient submits his body to the surgeon, to deal with it in the way he sees right. In the second stage, which he calls the 'time of operative treatment', the surgeon repairs the affected organs. The third stage, called the 'time of preservation', refers to the post-surgical care, a phase during which the patient should take good care of himself. It is also the duty of the nurses and servants to watch over the patient during this period, until he recovers,

by the will of God the exalted. For each of these three stages, Ibn al-Nafīs gives a detailed record of the role of each of the surgeon, the patient, and the nurses. He also gives a detailed description of the manipulation of surgical instruments, how these should be properly maintained, and the like. Ibn Sīnā had some influence on Ibn al-Nafīs: this is apparent from the logical way of presentation of subject-matter in the *Comprehensive Book on the Art of Medicine.* Following are: the first five *fusūl,* of the third *taʿlīm,* of the third *kitāb,* of the first *namat,* of the second *juz* , of the second *fann,* of the *Comprehensive Book on the Art of Medicine.* It is edited here, for the first time, from the autograph of Ibn al-Nafīs:

Lane Medical Library, Stanford Univeristy, MS Z 276, fols. 1b, line 1-fol. 7a, line 11 (see Photographic Plate, no.3)

"In the name of Allah the merciful, the compassionate; from Him I have succour, and on Him I rely:

The third *kitāb* of the first *namat* of the second *juz* of the second *fann* of the *Comprehensive Book on the Art of Medicine.*

In this book, our purpose is to discuss the kind of treatment that is called surgery. It consists of three *taʿālim.* The first *taʿlīm* is concerned with the general and absolute principles of surgery; the second *taʿlīm* is concerned with surgical instruments; and the third *taʿlīm* examines the types of surgical operations, one by one.

The first *taʿlīm,* which is concerned with the general principles of surgery, comprises twenty chapters.

Chapter one. On the different stages of surgical operations, and the role of the patient in each stage.

The different stages in surgical operations are three: the 'time of presentation', the 'time of operative treatment', and the 'time of preservation'. The first is called the 'time of presentation', since it refers to the time when the patient entrusts his body to the physician. As long as the physician is examining the patient, and is thinking about diagnosis and therapy, it would be the 'time of presentation'. It is called the 'time of presentation' because the patient entrusts his body to the physician to deal with it as he sees right.

As soon as the physician begins to operate, and as long as he is operating, this is called the 'time of operative treatment', which is an obvious matter.

But as soon as the physician finishes the operation and departs, leaving the patient, who should remain in the same condition that was brought about by the doctor, this is called the 'time of preservation'. Both the physician and the patient have specific roles in each of the three stages. Here, we review the role of the patient in each stage separately. As to the role of the physician, this will be dealt with in the next chapter.

As to the patient's role during the 'time of operative treatment', it is also twofold. First, he should expose to the physician all the affected parts of the body, concealing nothing from him. Secondly, he should inform the physician of all the circumstances related to his disease, even if he thought they were very far removed. Thus, of necessity, the physician would have greater and more perfect knowledge of the disease.

As to the patient's role during the 'time of operative treatment' it is also twofold. First, he should comply with all the instructions of the physician, and should not abstain from following them. Secondly, he should keep his body in the same posture that was assumed at the beginning, and throughout the time of operative treatment, not altering the position of any part whatsoever. If, however, the patient could not keep still because of the intensity of pain or because he is an infant or a child, and so on, he should be held in a fixed position by somebody else. If it is difficult to keep him still, and it is feared that

the patient's disturbance may disrupt the operation — or he may inflict harm upon himself in any other way — then he should be tied down in the most favourable position. For example, during the couching operation of the eye, if it is feared that the tip of the needle may penetrate and disrupt the humours of the eye, and in like cases, it would be necessary to tie the patient down in the most favourable position.

As to the patient's role during the 'time of preservation', he should safeguard the physican's treatment, in that he should not bring about any change, even if it was very trivial; trivial changes may result in great harm.

Chapter two.On the role of the physician during the time of presentation',the 'time of operative treatment', and the 'time of preservation'.

We have already reviewed the role of the patient during these three stages. As to the role of the physician, we say the following:

The role of the physician during the 'time of presentation' is twofold. First, he should do all he can in order to diagnose the disease and its condition. He should exert the utmost effort in trying to learn about this art [of diagnosis]. If he cannot emulate Hippocrates and Asclepius in this art [of diagnosis], then, as the leader Hippocrates has said: "He should know the things that all other people know, that is, what all the people can possibly know". The word 'people', [according to Hippocrates] means all the men who practise this art [of medicine]. Secondly, he should exert effort in deliberating about the treatment of disease. He should bring his treatment to perfection, so that his therapy may be in the best possible way.

As to the role of the physician during the 'time of operative treatment', he should refrain from performing any act that would justify the statement "treatment would have been better had he left this thing undone', nor should he leave something out that would justify the statement "had he performed this act, treatment would have been more perfect". What is needed is that men who practise this art [of surgery] should do what we have already mentioned; their [performance] will be in accordance with their experience and the efforts they spend.

As to the physician's role during the 'time of preservation', this is limited only to the initial stage, after which he is no longer present [at the bedside], and would be no longer able to pursue the patient's case. At this initial stage, he should recommend to the patient and his relatives: the things that ought to be done and those that ought to be avoided, as well as the patient's diet, how to keep him away from all harmful acts, and to preserve the [surgical] condition as it was left by the surgeon. They should help prepare the patient for the surgeon's following visits, by [doing such things as] washing the patients extremities, applying bracing perfumes to his nose, and the like. They should administer to the patient those medicines they can easily handle, as for example, instillation of oil of roses and egg yolk into the patient's eye, after the [operation of] excision of a pannus, and the like. The physician should first instruct them about the method [of applying medicines] and the [proper] time [of applying them], and so on.

Chapter three. On a detailed discussion of the role of the physician during the 'time of presentation'.

We have already mentioned that the physician's role during the 'time of presentation' is to do his best in diagnosing disease, and in deliberating on a genuine treatment. Diagnosis is reached through indicative symptoms. Such symptoms may be auditory, such as the indications obtained from coughs, hoarseness of the voice and its roughness, and so on. Other symptoms are olfactory, such as the indications gained from the smell of the mouth, perspiration, and so on. Other symptoms are visual: these are recognized by looking at the patient.

Disease either affects an external organ, thus appearing to the senses, or an internal organ, such

as the liver or the spleen and similar organs, and also general diseases which affect the whole of the body, as in fevers.

If a disease is specific to an external organ, the physician should first examine and investigate the condition of that particular organ. If not, the physician should first examine the patient's face, since it is the best indication of the condition of the body and the internal organs. Whether he examines the face or another organ, he should first find out if it looks the same as that when he was in good health or not. If it looks the same as that when he was in good health, the condition of his health would not have changed considerably, and accordingly, his disease would be slight and benign. But should it have been changed considerably, this would be due to something that had engendered this considerable change from its healthy condition, which would necessitate a stronger and more intense disease. The leader, Hippocrates said: "First examine the patient's face. Does it particularly look like the faces of healthy people? Does it appear as it formerly looked? If it does, he is in the best condition. But the face which appears to be the opposite of what it formerly looked is the worst." By this statement, [Hippocrates] wishes to refer to diseases which do not affect external organs. He also said "First of all, what does it look like and what does it not look like? This is the greatest and the easiest thing; the things that are certainly recognizable in all their types are those that can be sensed by sight, touch, and hearing, the nose, the tongue, and the reason." This means that you should examine the afflicted organ: in what way does it look like or differ from the healthy organ? Primarily, you should do this; for these signs are among the greatest indications, and the easiest of all things. You should also gather indications from all the things that are, of necessity, recognized from all the types [of signs]; these are the things that are sensed by sight, touch, and hearing; by the nose, the tongue, and by reason. An example of this is the case of a person who suffered an injury that caused dislocation of some of his fingers. The physician should, therefore, examine his fingers by looking at them.The one which is to be found protruding in the palm of hand and depressed on the outside of the palm is the dislocated finger, since it would look different from the healthy one. Dislocation of the finger occurs when its root has been moved from its [proper] place into the ventral side of the palm, thus protruding at that place and [leaving] a depression on the other side. One knows that the other fingers are not dislocated, because they are in the same condition as the healthy ones. This matter can be ascertained by examining each finger: is its condition similar to that of its counterpart in the other hand? If so, one knows that it is not dislocated; but if it does not resemble [its counterpart], and its position looks different, one knows that the finger is injured.

Chapter four. On relating the things to which the physician should pay attention during the 'time of operative treatment'.

Since it is the physican's obligation — during this time [of operative treatment] — to do what must be done with regard to afflicted organs, then this, of necessity, would be possible if each of the [parties concerned] is in the most favourable condition: the physician, the patient, and all the other things that are required in operative treatment. The leader Hippocrates determined seventeen conditions that should be considered during operative treatment. We recount here these [seventeen conditions]. He said "as to the things that [should be considered] when the surgeon performs operations in the surgery, these are: 'the patient', 'the surgeon', 'his servants', 'the instruments', 'the tools', 'the light', 'where', 'the quality', 'the quantity', 'in which things', 'in what condition', 'at what time', 'the body', 'the vessels', 'the period', 'the direction', and 'the place' ".

By his statement 'his servants', he means those who serve the patient as well as those who serve the surgeon. Both [parties) should respond to the expert surgeon.

By his statement 'the instruments' he means the medicines that he applies in surgical treatment, such as ointments, the [types of] kohl and powders, and the like.

By his statement 'where' he means where in the afflicted organ should operative treatment be conducted.

By his statement 'the quality' he means the quality of operative treatment: how it should be conducted.

By his statement 'the quantity' he means the extent of surgical treatment, or the number [of operations], and the like as we shall explain later on.

His statement 'in which things' means in which organs.

By his statement 'in what condition' he means: what should be the condition of the organ on which he would operate; or [the condition of] the instruments which he would use, and so on.

By his statement 'at what time' he means the most appropriate time for surgical treatment.

By his statement 'the body' he means the human body: this means that his humours, and the like should be in the most suitable [condition] for operative treatment.

By his statement 'the vessels' he means the containers in which the surgical instruments should be placed as for example the bowl of scalpels and so on.

By his statement 'the period' he means the period of disease, one of the four stages of disease.

By his statement 'the direction' he means the area on which he should act, as for example the area on which cupping instruments are to be placed so as to draw [humours], and so on.

By his statement 'the position' he means on which area he is going to operate. When we deal with each [of the above-mentioned items], we shall explain the necessary considerations that pertain to each item in surgical treatment.

Chapter five. On the patient's posture during surgical treatment.

The posture of the patient during surgical treatment varies according to each case. In some cases, the patient should be kept standing, as for example in reducing a dislocated foot. Likewise, some people prefer to administer cupping on the legs while the patient is in an upright position, so as to allow the humours to move towards the legs, and then they can be extracted in the process of cupping. Such an action, however, could weaken the patient considerably. Hence it should be restricted to very strong patients.

In some operations, the patient should be in a sitting position, either on the ground, as in cases of the couching operations of the eye, in ophthalmic surgery, and during the administration of cupping on the nape of the neck and so on; or else sitting on a chair as in the extraction of stones, and aborted foetuses, and so on.

In some operations, the patient should be in a reclining position, as in cases of the excision of the pannus and pterygium, and in instilling eye-drops, and the like. In administering blood-letting, it was thought better to keep the patient in a reclining position: in this way, the patient's strength would be better preserved.

In other operations, the patient should lie down in different postures: in administering enemas, some patients should lie on their side, others should kneel on their thighs, and [others] should lie on the belly.

During an operation, the patient should lie in a [certain] position which, if maintained, or if the patient is moved to another posture, this will not bring about any changes in the surgery, already performed by the physician. Besides, the patient's position should be favourable for the physician to operate, and for the patient himself. Furthermore, such a position should allow him, after the operation, to do the necessary things, such as eating and defaecation, and so on. The patient's position should also be

one that does not conceal any part on which the physician needs to operate, otherwise he would be hindered from performing at his best. The leader Hippocrates has said: "As to the patient, he should assist the surgeon with the other parts of his body, standing, sitting, or lying, so as to maintain most easily the proper posture, on his guard against slipping, collapsing, displacement towards the side, pendency, so that the form and kind [of potion] of the part treated may be properly preserved during the [time of] of presentation, operative treatment, and the state of preservation afterwards."[43] This is what he has said.

We say: by [Hippocrates'] statement 'he should assist the surgeon with the other parts of his body', he means that the patient should not keep any part of the afflicted area out of reach of the surgeon's inspection, but should reveal the entire area to its last part, to be within the hands of the surgeon. By this I mean, the last part of the afflicted place.

By his statement 'so as to maintain [most easily] the proper posture', he means [exactly] what we have already mentioned with regard to the necessity of preservation of the patient's posture throughout all the times [of presentation, operative treatment, and preservation].

By his statement 'on his guard against slipping', he means the slipping of the [reduced] organ, thus remaining diseased, [,in the dislocated] position.

By his statement 'collapsing', he means the organs which should be made to settle in place [by means of] splints, and so on.

By his statement 'displacement towards the side, [and] pendency', he means that some of these things could change their normal positions. The things that are displaced towards the side are the splints, and the bandages; and the things that are exposed to pendency are the bandages which frequently become pendent and lax. This is because organs are mostly finer at the lower parts than at the upper parts. Accordingly, bandages slip downwards in most cases, thus causing relaxation of their tightness. It is impossible for a bandage to slip [from a finer part] towards a thicker part.

By his statement 'so that the form and kind [of position] of the part treated may be properly preserved, he means that the form and kind of position, brought about by the surgeon, should last during the three times [of presentation], operative treatment, and preservation].

Ibn al-Nafīs died at dawn Friday, 21st Dhu'l-Qaᶜda 687, in Cairo[44]. (17th December 1288). His friend, Ibn Yūhannā Ibn Salīb al-Nasrānī, an Egyptian Copt, lamented his death, in an eulogy. Here are a few lines of his poem:

> "Someone asked ifk one scientist [remains] or an eminent learned man or one who occupies a high-ranking position, after the death of ᶜAlā ; I replied, while suffering from burning fire within me: Cut it short! Since ᶜAlā 's death, highranking [people] ceased to exist.

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13. Ibid., see photographic plate no.7, 1. 4-5.
14. *EI*, vol. 1, pp. 588-589.
15. AL-DHAHABĪ, "*Tārīkh al-Islām*" (Bodleian Library, MS Laud Or. 279) fol. 170a; see also; MEYERHOF AND SCHACHT, "*The theologus autodidactus*", op. cit., p.18.
16. ISSA, "*Histoire des bimaristans*", op. cit., pp. 36-39; *EI*, vol. 4, pp. 84-89.
17. ISSA, "*Histoire des bimaristans*", op. cit., p. 38. See also AL-ZIRIKLĪ, "*al-Aʿlām*" (vol. 1, o.188); he mentions Ibn Abī Usaybiʿa's visit to Egypt in 634 A.H.
18. AL-SAFADĪ, "*al-Wafī bi'l-wafayāt*" (British Library, MS Or. 6587), fol. 20b, 1. 10-12, and fol. 21a, 1. 1-3. Shāfiʿ Ibn ʿAlī al-ʿAsqalānī (died 730 A.H. / 1330 A.D.) also says a lot about the foundation of AL-MANSŪRĪ hospital in "*al-Fadl al-ma thūr min sīrat al-Sultān al-Malik al-Mansūr*". See manuscript Marsh 424 (Bodleian Library, Oxford).
19. ISSA, "*Histoire des bimaristans*", op. cit., pp. 45-54.
20. *EI*, vol. 2, pp. 685-687; new ed., vol. 4, pp. 484-486.
21. DSB, vol. 9, pp. 604-605.
22. AL-SAFADĪ, "*al-Wāfī bi'l -wafayāt*" (British Library, MS Or. 6587), fol. 21a, 1. 5.
23. AL-MAQRĪZĪ, "*Khutat*", Cairo (Būlāq), 1270 A.H., vol. 2, p.378; AL-NUʿAYMĪ, "*al-Dāris*", vol. 1, p. 455.
24. AL-SAFADĪ, "*al-Wāfī bi'l-wafayāt*" (British Library, MS Or. 6587), fol. 20b, 1. 18, and fol. 21a, 1.6.
25. TĀJ AL-DĪN AL-SUBKĪ, "*Tabaqāt al-Shāfiʿiyyīn al-Kubrā*", Cairo, 1324/1906-1907, vol. 3, pp. 88-111; Ibn al-ʿImād, "*Shadharāt*", vol. 3, pp. 349-351; HĀJJĪ KHALIFA, "*Kashf al-zunūn*", vol. 1, p.490. See also gal , vol. 1, p. 484; "S", vol. 1, p.669; EI, vol. 4, p. 377.
26. AL-SUBKĪ, "*Tabaqāt*", vol. 5, p.129.

27. The Arabic text is edited and published together with an English translation by: MEYERHOF and SCHACHT, "*The theologus autodidactus*", op.cit.

28. "*EI*, vol. 2, pp. 424-425.

29. For research published on Ibn al-Nafīs' discovery of the blood circulation, see "*DSB*", vol. 9, pp. 605-606.

30. To appear soon: A.Z. ISKANDAR, "*Descriptive list of the Arabic manuscript on medicine and science at the University of California, Los Angeles*". (E.J. Brill).

31. A.Z. ISKANDAR, "*A catalogue of Arabic manuscripts on medicine and science in the Wellcome Historical Medical Library*", London, 1967, pp. 50-51.

32. Ibid., pp. 47-50.

33. *DSB,* vol. 12, pp. 322-325.

34. *DSB,* vol. 3, pp. 354-357.

35. "Consideratio sexta de pulsibus assumpta ex libro Siraxi arabico, & in latinum conversa per Andream Bellunensem physicum". In: "*Avicenna philosophi praeclarissimi, ac medicorum principis libellus de removendes nocumentis quae accidunt in regimine sanitatis*", Venice, 1547. See C.D. O'Malley, 'A Latin translation of Ibn Nafis (1547) related to the problem of the circulation of the blood', *Journal of the History of Medicine and Allied Sciences,* 19857, 12 (2), pp. 248-249.

36. AL-SAFADĪ, "al-*Wāfī bi'l-wafayāt*" (British Library, MS Or. 6587), fol. 20b, 1. 10-12.

37. AL-SUBKĪ, "*Tabaqāt al-Shāfi ʿiyyīn*" ... vol. 5, p.129.

38. N. HEER, 'Thalāthat mujalladāt min kitāb al-Shāmil li'Ibn al-Nafīs', "*Majallat Maʿhad al-Makhtūtāt al-ʿArabiyya*', 1960, 6: 203-210 + 3 photographic plates which are reproduced here.

39. See also: *DSB*, vol. 9, pp. 603-605.

40. From these commentaries, we mention:
Sharh Abīdhīmyā li-Buqrāt
The Egyptian Library (Tibb, Talʿat no. 583)
Aya Sophia, Istanbul (no. 3642, fols. 1-200).

Sharh Taqdimat al-maʿrifa li-Buqrāt
The University Library of Leiden (no. Oriental 49/1, fols. 1-98).
The National Library in Paris (no. 2844/2, fols. 99-185)
(Gotha) Forschungsbibliothek (no. 1899)
British Library (no. Oriental 5914/2)
Aya Sofia, Istanbul (no. 3644, fols. 110-224)

Sharh Tabīʿat al-insān li-Buqrāt (see reference no. 5).

Sharh al-Fusūl li-Buqrāt
Aya Sophia, Istanbul (no. 3554, fols. 35-137, and no. 3644, fols. 1-109)
The Egyptian Library (1448 Tibb)
(Gotha), Forschungsbibliothek (no. 1897 and 1898)
(Berlin) Deutsche Staatsbibliothek (no. 6224)

41. AL-SAFADĪ says in "*al-Wāfī bi'l-wafayāt*" "Ibn al-Nafīs detested Galen's views, referring to the prolixity of his style which he described as faulty and futile". See manuscript no. Or. 6587 (British Library), fol. 21a, 1. 3-4.

42. In English it is called *In the Surgery,* see the Greek text together with an English translation in: W.H.S. JONES, "*Hippocrates, with an English translation*" (vol. 3 by E.T. Withington), London, New York and Cambridge (Mass.), Loeb Classical Library, 1923-1953, vol. 3, pp. 53-81.

43. Ibid., pp. 60-63: 40-46.

44. AL-SAFADĪ, "*al-Wāfī bi'l-wafayāt*", manuscript no. Or. 6587 (British Library), fol. 21a, 1. 7-8.

45. Ibid., fol. 21a, 1. 8-11.

IBNUL-NAFEES AS A PHILOSOPHER

Dr. Abu Shadi Al-Roubi

EGYPT

I hope my speech is not a discordant voice in this harmonious song commemorating our great Arab physician, Ibnul Nafees. We live in an age when most doctors know nothing except medicine, and are known by nothing else. Not so were the physicians of the past when a doctor was a "Hakeem"[1] in the full sense of the word combining a general background of knowledge, especially of philosophy, with his medical study and practice.

There is a well known classification of Arab physicians dividing them into the physician-philosopher category, such as Al-Razi, and the philosopher-physician category, such as Ibn Sina. In this paper, I will not try to force Ibnul-Nafees into one or the other of these two categories. All I aim to do is to cast light on part of his life and thought that was not adequately covered by research work. Ibnul-Nafees was not only a great physician and discoverer of the minor blood circulation (pulmonary circulation), but he also had many interests, views and works about many other branches of knowledge. Historians credit him for two books on logic. In the first he explains two of Ibn Sina's works: "Al-Isharat" (The Signs), and "Al-Hidayah" (The Guidance). The second book is entitled "Al-Wurayqat" (The Little papers) which is a summary of Aristotle's Organon and Rhetoric. On linguistics he wrote "Tareeq Al-Fasaha" (Road to Eloquence) and an explanation of "Al-Fusous" (The Segments) by the linguist, Said bin Al-Hassan Al-Rab'i Al-Baghdadi. His books on Shari'a are "Al-Mukhtasar fi Ilm Usoulil Hadith" (A Short Account of the Methodology of Hadith), and an explanation of "Al-Tanbeeh" (Exhortation) by Al-Shirazi, besides "Kitab Fadel bin Natiq" or "Al-Risalah Al-Kamiliyyah fil Siera Al-Nabawiyyah" (The Kamiliyah Treatise on the Prophet's Biography).

It is this last work that will form the main topic of my speech today. I intend to use it as an introduction to Ibnul-Nafees' thoughts and as the window through which we can have a look at his philosophic views which are very interesting. I have relied in my treatment of this treatise on the very accurate re-edition by Max Mayerhoff and Joseph Shacht of two MSS one of which is at the Egyptian Public Library and the other at the Sulaimania Library in Istanbul. Their work was published in 1966 by Oxford University under the title: "Theologus Autodidactus".

Since the thoughts of a thinker are, to some extent, the reflection of his times and surroundings, I deemed it necessary to pave the way for my article with a brief account of Ibnul-Nafees's social, political and academic background.

You all know that Ala-u-ddin Ibnul-Nafees, also known in the biographies as Ali bin abil Haram Al-Qurashi Al-Dimashqi, lived and died in the 7th century A.H. (13th century A.D.). He lived to be around 80. He was brought up in Damascus where he studied medicine under the city's great physician Muhazzabul-Din Al-Dikhwar. Then he departed to Cairo where he stayed for the rest of his life in a house of his own. He took up the medical profession and proved to be so talented that he became Chief Physician in Egypt and the court physician of its ruler, Al-Zahir Beibars I-Bindaqdari. He used to teach medicine at the Mansuri Bimaristan (Hospital), established by Al-Mansour Qalawoun, the army leader who succeeded Beibars on the throne. In the meantime, he taught Shari'a and jurisprudence at the Masruriyyah School about which Al-Maqreezi said in his "Khutat" (Layouts) that it was established by Shamsul Khawas Masrour, one of Salahu-ddin's followers.

No wonder, then, that Ibnul-Nafees is referred to as one of the leading jurisprudents of the Shaf'i rite of fiqh in Tajul-din Al-Subki's book entitled "Tabaqat Al Shaf'iyyah Al-Kubra" (The Upper Levels of

the Shaf'i Rite).

At that time, Egypt and Syria were united into one country ruled successively by the Fatimids, the Ayyoubis, and the Memlouks. Among these were Qutuz who conquered the Moguls at Ein-Galout, Beibars and Qalawoun who descended from the Turks of South Russia and Caucasian tribes known as the Kipchak. During their reigns there were ambassadorial and trade relations with Barakah, the Khan of the Golden Horde.

We now turn to Ibnul-Nafees's "Kamiliyah Treatise" for a summary of its history and outline before going into details about the thoughts and views expressed therein.

Ibnul-Nafees wrote this treatise, also known as "Fadel bin Natiq", not as a parody of "Hayy Ibn Yaqzan" by Ibn Sina as stated by Al-Safadi in his book "Al Wafi Bil Wafiyat". In plot and content it is more similar to "Hayy Ibn Yaqzan" written by the Andalusian physician and philosopher Ibn Tufayl a century earlier. Undoubtedly, Ibnul-Nafees must have read it and been influenced by it.

A contrastive study of these three treatises will cast an illuminating light upon Arab thought in its golden age which, as you well know, was preoccupied with reconciliating religion and philosophy and revealing the common grounds between Shari'a and wisdom as Ibn Rushd says in his Faslul Maqal (Final Conclusion).

Therefore, we find that Ibnul-Nafees attempts in his treatise to establish that the human mind in its logical thinking and without any other agent is capable of deducing the necessity of God's existence and the successive messages of the prophets till the last one of them. Furthermore, it is capable of predicting the life story of this last prophet ﷺ including his birth, emigration to Mecca, His jihad (holy war) and death in addition to the jurisprudence, Shari'a and transactions contained in His message. Even more, Ibnul-Nafees claims that by sheer reflection it was possible to expect the disputes that arose between the Khalifas of this last prophet ﷺ and the multiplicity of sects and methods in his religion. It was also possible to expect the aggression suffered by his followers at the hands of the atheists and how they would finally repulse it. Then Ibnul-Nafees extends his view to the far future (or, perhaps, the near future) to describe in pure mental terms the end of the world, doomsday, resurrection and the Hereafter.

This, then, is a tour de force around the realms of natural philosophy, the philosophy of history and sociology, and the philosophy of religion. In this treatise there is a bit of everything: biology, geology, cosmology as well as futurology.

Ibnul-Nafees has equipped the hero of his treatise, Kamil, with such mentality. Kamil, so the story goes, is a man brought forth to this world by spontaneous generation and lives on a deserted island in utter seclusion. As for "Fadel bin Natiq", it is only a narrative of Kamil's life and views.

There are many similarities and dissimilarities betwwen the two treatises of Ibnul-Nafees and Ibn Tufayl; between Kamil's thoughts as narrated by Fadel bin Natiq and the thoughts of Hayy Ibn Yaqzan. Both try to establish that a spontaneously generated human being living on a deserted island is capable of hitting upon the natural, philosophical and religious truths of this universe through the sole agent of his mental contemplation. It is thus an attempt to bring religion in harmony with philosophy as we said before. To do this, however, both authors had to postulate two things unacceptable to true religion: the possibility of originating life on earth through a process of spontaneous generation, and the possibility of reaching the truths of religion through sheer contemplation without any other agent.

As for the dissimilarities between the two treatises, they are quite a lot. Ibn Tufayl's hero begins as a baby brought up by a female gazelle. Kamil, on the other hand, begins his life at the age of puberty. The former discovers by himself the use of fire, cooking, and dressing himself in clothes; the latter learns about these things from visitors who come to his island and tame him. Here Ibnul-Nafees makes a point of stressing that civilization comes as a result of human contacts. The advent of visitors to the

deserted island is used by both authors for different purposes. While Ibn Tufayl makes them bear witness to the truth of what his hero managed to learn independently through his own thinking and contemplation, Ibnul-Nafees makes them the means of Kamil's passage to the outer world where the scope of his vision becomes wider and where he can see the confirmation of what he has individually learned.

In general, we can safely say that Ibn Tufayl was inclined in this treatise towards Sufi contemplation, whereas Ibnul-Nafees's tendency was towards mental philosophy. But the distinguishing feature of Ibnul-Nafees's treatise that makes it more peculiar is its outlook to the future and its delving into matters of human destiny. It is not merely a treatise on the biography of the prophet, but goes far beyond that to the wider range of the human biography; the Homo Sapiens; his past, his present, and his future.

So much for a comparison between the two treatises. Let's now turn to a more detailed review of Al-Kamiliyah Treatise. Ibnul-Nafees says:

> "My purpose in this treatise is to relate what Fadel bin Natiq narrated about a man called Kamil with regard to the prophet's biography and the norms of the canonical law in general terms, ordering my narration into the following four arts:
> First, the way this man called Kamil took shape and came to know about the truths and prophetships.
> Second, how he got to know about the prophet's biography.
> Third, how he came to conclusions about the norms of the canonical law.
> Fourth, how he could predict what would happen after the death of the last Prophet, ﷺ and upon all His predecessors.

FIRST ART

In the first chapter Ibnul-Nafees tells us how the man called Kamil takes shape by spontaneous generation. He says: "Once upon a time there was a huge inundation in an island of mild weather, lush with fruitful trees. The torrential stream carried with it multifarious muds washed out of a variety of soils that were flooded by it. Part of the stream water seeped into a cave in a mountain and filled it. Under the heat of the cave, the water which mixed with the soil reached the simmering point until it thickened into clay from which various limbs and organs could take shape owing to the variety of the soil from which the clay was formed. From this heated clay vapours emanated. From one of these vapours, which was as mild as air, a human soul was formed giving a human being his complete and final form."

"But that human being spontaneously generated in a cave is different from any one born in a womb in that he has been feeding and growing in the cave for a much longer time, just as a chick feeds in an egg. So he emerges from the cave a full grown boy with a strong body and sharp perception."

This, then, is Kamil, the hero of the story. How he gains knowledge and wisdom is dealt with in the second chapter which Ibnul-Nafees sets aside for what is termed in philosophy as "epistemology" conceived of by Ibnul-Nafees as a blend of empiricism and teleology. When Kamil gets out of the cave he beholds the vast space, the dazzling light and lush trees. He hears the singing birds, the rippling water and the rustling wind. He smells the fragrant flowers and tastes the delicious fruits and feels the hot and cold air. In short, his first contact with his surroundings is through his five senses and what they perceive of the outer world. Soon, he turns to experimentation. "He ripped open the bellies of such animals as he could lay his hands on or those that he found dead. He did that with no other tool except his finger-nails or sharp-pointed stones. Thus he learned a lot about the functions of the animal organs (physiology). Then teleology followed, through which he learned that each part of an animal or plant was there for a specific purpose and nothing was there purposelessly."

"Then he began to wonder if the existence of these creatures, so perfectly designed, was of their own making or the making of a Creator. If it is by a Creator, who this Creator is and how He looks like.

Following a logical line of thought he came to the conclusion that the Creator of what is possible must be impossible to create. That is, He is a Creator whose existence must be prior to anything that exists; and He must be omniscient and omniobservant. "Otherwise, there would be an infinite chain of causes and effects."

It is clear how much Ibnul-Nafees depends on Greek philosophy for proving God's existence. He employs the notion of "the prime mover unmoved" and cautions against falling into the contradiction labelled by logicians as "infinite regress". In general, he argues from the premise known by theologians as "The Argument from Design".

In the third chapter Ibnul-Nafees resorts to a narrative technique that enables him to tackle sociology after covering nature and epistemology. He says: "It so happened that a ship packed with merchants and other passengers was stranded on that island. Waiting for the dented ship to be repaired, the passengers had no other alternative but to stay on the island. They fanned out in search of wood for their fire and fruits for sustenance. Catching sight of them, Kamil shyed away at first. They offered him a piece of bread and a little of the food they had carried along with them. Nibbling at this, Kamil liked the taste of it especially as he had never experienced man-made food before.

Gradually, he began to feel at ease with them. They dressed him in clothes and laboured to teach him their language. By and by he picked up a lot of it. It was then possible to tell him about their cities and ways of life, at which he was utterly amazed as he never imagined there could be land beyond his island. He became so curious to know more about their world that he wished to go with them. They took him to a town near the island. He lived among the people of that town, eating their food and wearing their clothes. He felt so happy especially when he recalled the coarse and primitive life he had led on the island. The experience taught him a lot. He learned that living alone without such man-made food and man-made clothes could not be a pleasure. He learned that in order to be civilized man must live in a community of inter-dependent people some of whom would undertake to till the land, others to cultivate it, others to bake and others to make clothes, and so on."

Here is a clear difference between Ibn Tufayl and Ibnul-Nafees in how each views "Robinson Crusoe". Ibnul-Nafees stresses that for man to be civilized he must live in an integrated community where individuals must share work responsibilities.

This opinion is as old as the Greek thought voiced before Ibnul-Nafees by Al-Farabi in his Utopia and later adopted by Ibn Khaldoun when he described man as civilian by nature.

After establishing the logical necessity of deity, Ibnul-Nafees goes one further step to establish the necessity of prophetship.

"In this contemplation, Kamil said to himself: If for a nice life one needs this (i.e. living in a community), then one will inevitably need to have various transactions with others such as selling, renting, etc. Such transactions must eventually lead to disputes with personal interests subjectively used as the only criteria for determining what is right and what is wrong. Therefore, in addition to living in a community, happiness cannot be realised unless this community is governed by established laws that are accepted by everybody and by which everybody abides and every dispute is settled. Now, for these laws to be unquestionably accepted by the community, everyone must firmly believe that they are enjoined by God the Almighty. For people to believe that, it must be told to them by a person whose truthfulness nobody doubts.." Describing this person he goes on to say: "He must be a person of such miracles as would make people feel that what he says cannot be false but true revelations from God the Almighty. The person that fits that description must be the Prophet, BPUH, as it would be inconceivable that God neglects the creation of this prophet of such immense benefit when He cares to create, among other things, the pubic hair of much less importance!"

At this juncture, I would like to set on record an opinion mentioned by Mayerhoff and Shacht to the effect that by claiming that man can spontaneously, and without any agent, get to know about God's existence, and by stressing the necessity of prophetship, Ibnul-Nafees adopted the Matridian point of view; and by so doing he was closer to the Hanafi rite of fiqh than to the Shaf'i rite to which he actually belonged and which was nearer to the Ash'ariyah.

SECOND ART

Ibnul-Nafees devotes the second part of his treatise to the biography of the last one in the string of prophets: his ancestral line, birth place, upbrinqing, description, age, and offspring. He tries to establish how Kamil managed by pure mental contemplation to determine the attributes of this prophet until he comes to the 9th chapter about the name of this prophet when Kamil was almost certain that the name must be "Muhammad" ﷺ

It will not be possible, spacewise, to review this part in great detail. So, a brief presentation may suffice for following the logical sequence of Ibnul-Nafees.

About the genealogy of this prophet, Ibnul-Nafees says that he must be of such noble origin as would make people submissive and obedient to him. Now, there can be no nobler origin than that of God's Messengers, and no better one of those than that glorified uniformly by all religions, namely, Ibrahim (ﷺ).Therefore, the Seal of the prophets, Muhammad(ﷺ), must descend from him and not from Jacob or Jesus as he should belong neither to Judaism nor to Christianity; otherwise, people would reject him as a blasphemous innovator. The Seal of the prophets, then, must descend from the offspring of Ismael. The noblest of those are the Hashimites to whom his lineage can directly be traced.

As for his birth place, it could be deduced by Kamil through an interesting chain of syllogisms:

1) Bedouins, or Arabs of the desert, are of less developed minds than those who live in cities. Therefore, this prophet must be a city-dweller.

2) Cities compare favourably with desert areas in such matters as mild weather, low prices, abundance of food and water, etc. But the greatest advantage that tips the balance towards a city is religious grandeur in the hearts of the people specially if that city contains a sacred place of worship. Now, the best and oldest such shrine is Al-Kaaba honoured as the first House of God laid for people. It follows, then, that the Seal of the prophets must be born in Mecca.

3) If the prophet died in Mecca and was buried there, then visiting his grave would look as if it was secondary to visiting Al-Kaaba. In the course of time, people would think that pilgrimage to Mecca was for the sole purpose of circling Al-Kaaba and would eventually forget about the prophet and his mission. Therefore, it stands to reason that his grave should be in another city so that travelling to it would be for the sole purpose of visiting his grave, and his greatness would thus be preserved.

4) The prophet's departure from Mecca cannot be of his own choice; it must be out of necessity. Nor can it be a kind of banishment or the result of defeat in war as it does not become a great man. It could only be an emigration to evade a conspiracy to kill him in secret by the atheists.

5) To which city should he emigrate? Undoubtedly to that city where his father died so that if he himself died there his grave would be near that of his father. The city, then, must be Yathrib.

To be short, this is a model of the logical sequence of finality used by Ibnul-Nafees through personifying the character of Kamil in order to reach these conclusions.

Using the same method, and from the premise that this prophet must be extremely moderate in temperament and manners, Kamil comes to the following conclusions:

1) The prophet's father must die first, to be followed by his mother, so that he could be fostered by a

woman other than his mother and brought up by his grandfather and uncles. All this must happen to make his temperament and manners influenced by his foster-parents.

2) The prophet must be physically symmetrical with a smiling and cheerful face. He must be of sharp perceptions, intelligent, and eloquent as these are the attributes of moderate people.

3) A body of medium strength is usually more susceptible to sickness. The prophet, therefore, is liable to frequent ailments, but his diseases would be short-lived and easily curable.

4) As for his age, he must reach full maturity so that his prophetship may take the required time. Yet, he must die before reaching the age of senility when judgement is impaired. In moderately tempered bodies this optimal time of death is put at the age of 62 or 63.

5) As this prophet is of moderate temperament, he must beget sons and daughters. The sons should not live long enough to reach the age of prophetship; for they cannot be prophets when their father is the Seal of all prophets. However, not to be prophets would undermine their father as most of the prophets' sons were themselves prophets. As for the daughters, they might live as long as they could because women were not entitled to prophetship.

THIRD ART

In this section of the treatise Ibnul-Nafees discusses, through Kamil of course, the essence of the religious creed. He says: "The prophet should tell the people that they have a Maker, and that this Maker is infinitely magnificent and glorious and must be obeyed and worshipped. He should tell them that there is no God but He and that there is nothing like Him, the All-hearing and Omniscient. He should tell them all the attributes of God indicating His Supremacy and complete Ability. But since the prophet will be addressing himself to a majority of common people he should not delve deep into details beyond their understanding such as saying to them, "God the Almighty is neither inside this world nor outside it. He is not an object, nor is he a tangible form. He is not in a certain direction, nor can he be perceived by any one of the senses. "Such talk would necessarily make people confused and disarrayed, which defeats the primary purpose of prophetship. Therefore, the prophet must refer to these matters in general terms leaving out details. However, he should not neglect details per se but should make his words lined with such esoteric symbols and indications as would give the small circle of disciples and followers an inkling to the full details, yet on the face of it his words would not lay demands on the modest understanding of the common people.

It is clear from the above that Ibnul-Nafees takes it for granted that there are common and special people, So, in matters relating to exegesis of the Quran he steers a middle course between two schools of thought in Islam: al-Zahiriyah, characterised by giving the apparent, literal meaning, and al-batiniyah, characterised by divining the hidden, secret meaning in the revealed texts. Yet, he does not indulge in Sufi contemplation as it is the case with Ibn Tufayl.

Then Ibnul-Nafees takes up the question of Resurrection. He says that Kamil thought that the prophet should mention it. But he was not sure how it should be presented to the people. Should the prophet say it will be a resurrection of the soul, of the body, or of both. At this juncture, the author faces a problem that is as old as philosophy itself; namely, the relation between mind and body, or between spirit and matter. Kamil says that the prophet should not make resurrection purely spiritual as most people would fail to conceive spiritual joys and pains. Meanwhile, resurrection should not be presented as purely physical as it would deny both happiness and misery. It should be a resurrection of both body and soul.

I would like here to quote Ibnul-Nafees concerning this problem which still preoccupies philosophers even today.

"Kamil said to himself that man must be made up from a body and a soul. The body is that perceptible object, but the soul is what a person refers to when he says "I". This referent should not be the body or its parts as everyone necessarily knows that he is what he is throughout his life, which cannot be said about the body or its parts. Man's body during childhood is not that of old age. The same applies to the parts of the body. Both the body and its parts are in a continuous state of dissolution and nourishment, so they are inevitably undergoing permanent change. As for the referent "I", it is a constant. The corollary is that one's soul must be something different from one's body which is a tangible object whereas the soul is an abstract substance that can never be a form; for the body can be valued only by itself, but forms cannot be valued except by substances."

You can see how much novelty and peculiarity this line of reasoning carries with it. But I would like to draw your attention to that part of the quotation which says: "Both the body and its parts are in a continuous state of dissolution and nourishment, so they are inevitably undergoing permanent change"; for this has become now a granted fact in physiology and biology expressed by the term "metabolism" which comprises the two processes of: catabolism, by which living matter is broken down into simple substances, and anabolism, by which food is built up into living matter.

Philosophers have always tackled the dichotomies of matter and mind, body and soul, form and substance, the perceptible and the conjectured, the concrete and the abstract. But talk about philosophy always takes on a special flavour when the speaker is a scholar or a physician.

Reflecting on the worships, Kamil thought that the prophet should enjoin that his teachings be repeatedly mentioned so that they remain alive in the minds and hearts of his followers. This repetition can be effected in five ways: individual utterance of the two Islamic doctrinal formulas (That there is no God except Allah,and that Muhammad ﷺ is His Messenger); through a pure physical act such as prayer; pure physical abstinence such as fasting; or the act may be purely financial such as alms-giving; or combining physical with financial such as pilgrimage.

Of these five pillars of the religion, pilgrimage is the most onerous, so doing it once in a life time will be quite enough. Prayer is the easiest, so people can be made to repeat it several times a day to be reminded of God and His Messenger ﷺ. Fasting and alms-giving are midway between these two extremes; so each should be enjoined only once a year.

Kamil applies the same rationalism when he considers the financial transactions among the people. He says that a male's share in what is inherited should exceed that of a female though men are normally better able to earn money than women. But when a woman gets married it is the husband who supports her. Concerning marriage, Kamil thought that female polygamy would naturally lead to confusing lineage whereas male polygamy will not. Therefore, the prophet should legalize polygamy for men and prohibit it for women.

FOURTH ART

This fourth and last section of the Kamiliyah Treatise is found only in the MS kept at Istanbul, but missing in the MS of the Egyptian Library. The Egyptian copy, which is much earlier than the Turkish one, is believed to have been written in Ibnul-Nafees's life time. This fourth part might have been deliberately dropped as it dealt with politics and the rulers.

In the initial chapters of this section, Kamil predicts the events that will take place after the death of the Seal of the Prophets. First, there will be a power struggle among the prophet's companions. Secondly, there will be difference in opinions, multiplicity of methods and division of the prophet's creed into various sects each having its own methodology on which books are to be written and for which schools of thought will be established. Thirdly, there will be deviations from the teachings of this prophet who prohibits liquour drinking, as it is hazardous to mental health, and forbids women to appear unveiled

before strangers. Finally, there is the punishment for this deviation which will take the form of raids on the followers of this religion by the atheists.

In all these predictions and their underlying rationale, Ibnul-Nafees emerges as a philosopher who believes in historicism or historical determinism. It means that history is moved by irresistible forces and takes directions that can be logically explained. As you know history has as many interpretations as there are schools of thought to do it. Interpretations could be economic, social, biological, psychological, ideological, etc. For interpreting history, Ibnul-Nafees used more than one point of view. Consider, for instance, his geographical interpretation of the identity of the atheists who would overrun the followers of the prophet's religion. He says that "They do not belong to any creed and the prophet's religion has not reached them yet. Therefore, they must be living in remote areas far away from civilized countries. They cannot be living in the Southernmost areas as inhabitants of such areas are weak in hearts because of the sweltering heat in their countries. Therefore, they must necessarily be from the Northernmost areas as these would be daring and ruthless. Yet, they cannot be from the North-west as that area is very thinly populated with most inhabitants living on scattered islands unlike people of the North-east. Thus, by sheer geographical reasoning Ibnul-Nafees was able to narrow it down to the source of aggression: the North-east, i.e. the Tatars and Moguls. Through Kamel he goes on to say:

"When these atheists overrun the countries near them in the North where followers of the prophet's religion live they do not bother to change that religion since they have no creed of their own to impose on the people. On the contrary, when they mingle with the followers of the prophet's religion they come under the influence of that religion and become affected by it to the extent of embracing it and fighting for it. Thus, they will turn out to be a great asset to that religion.

People in countries too far to be seized by the atheists would need to brace up for resisting the enemies and repulsing them. They can do that only if they manage to mobilize strong armies under the leadership of a brave Sultan. Mobilization of armies would necessarily require increased expenditure the brunt of which will have to be borne by the population. This will inevitably lead to scarcity of cash and less bread-earning opportunities among the people.

As for the Sultan, he should fear nothing, yet be feared by all his subjects. Therefore, he must be intrepid and ruthless. A man of these qualities cannot be of an urban area. He must be from a desert area in the North-east where people are notorious for courage and cruelty.. Thus, Ibnul-Nafees would not even allow the Egyptians the luxury of boasting that their courageous leader is one of them. His contention is that only iron can serve to dent iron. But we have to bear in mind the time and place of Ibnul-Nafees's attempt to interpret the past and justify the present. As mentioned before, the better part of his life in Egypt coincided with the reign of Al-Zahir Beibars, and he was still alive when Beibars' successor, Qalawoun, took over. Both rulers were Memlouks with origins extending back to the Kipchak tribes in Caucasia and South Russia. When Ibnul-Nafees describes his sultan in the Treatise as "a man who should be of a hot temperament, dark red face, and a hairy body. He should prefer cold food, jump up in his sleep and see horrendous dreams and get into fits of vomiting and diarrhea," he is in fact describing Sultan Beibars whom he knew only too well as he was his court physician.

Ibnul-Nafees carries on about his sultan: "Every now and then, he must get away from his seat of power and go to the atheists' quarters with the intention of intimidating them and filling their hearts with fear. So, he naturally needs someone to take over and act for him during his absence." Describing this Deputy, Ibnul-Nafees says: "The Minister who deputizes for the Sultan must combine courage with kindness and patience; for he has to be pretty sure that God, the Sultan, the people and the military are all pleased with him." In saying this Ibnul-Nafees must have had in mind Qalawoun, Beibar's army leader who succeeded him on the throne of Egypt and who was reputed for being just and merciful. About him, Ibn Tughri Burdi said in his book "Al-Manhal As-Safi" (The Pure Spring): "He was gener-

ous, impartial, and righteous. He was the kind of man to loathe the sight of spilt blood and tend to do good and be virtuous. He put an end to many wrongs such as squeezing merchants out of cash every time an army was despatched to the battle front".

The last two chapters of the Treatise can be described as "Science Fiction". From interpreting the past and justifying the present , Ibnul Nafees shifts to the future in a bid to predict it leaning heavily for that on cosmology.

In chapter nine he tells us about what will happen in the upper space. He says: "When the one called Kamil thought of the sun's movement he noticed that it came nearer to the North during summer and went farther away from the south in winter, yet its daily orbit was of the same circumference over the north and south. The same thing could be said about the planets in the solar system. He further noticed that at the North and the South the distance between the sun and the upper space was gradually decreasing, and knew that there would come a point when the sun would be orbiting the earth nearer to the high atmosphere.. Now for this to happen a number of things must obtain: 1) the moon must get farther away from the sun increasing the number of crescents. 2) The sun and all the planets must then rise in the west. 3) The sun will always orbit the earth over the equator causing day and night to be of equal duration in all the countries of the world. 4) The seasons will cease to exist leaving areas that are remote from the equator in a constant state of severe cold and the equator itself with the adjacent areas in a constant state of blistering heat. Climatic conditions will thus be extremely adverse to human life and consequently the people's temperament will be abnormal with evil and crime rampant everywhere.

In the 10th chapter Ibnul-Nafees describes the impact of these space events on people's lives on earth. When the sun shines permanently over the equator making tropical areas unbearably hot and other farther areas unbearably cold, people's temperament will become abnormal. They will grow weak of hearts and sudden death will become a common occurrence. They will deteriorate in terms of manners and exchanges and will fly to arms at the most trivial cause. The evil people will take the lead, relegating the good ones to the back seats. People's minds will so rot that they will not be open for learning. Even their images will undergo change with most of them looking beastly. As the death toll in wars will claim the lives of men, women will have to fall back to lesbianism. Areas with relatively mild climate will become attraction points to people of extremely hot or extremely cold countries such as the Sudan, Turkey, the Tatars, Yagoug and Magoug, upsetting the balance of supply of vegetables and fruits and the demand for them with the concomitant rise in prices. Farther deep under the ground, hot winds and fumes are generated and pushed up in the tropical areas whereas they thicken and get trapped in the cold areas. The subterran at the two poles will then become much heavier than at the central areas of the earth. This imbalance will cause mountains to collapse and sea water to inundate the land. Earthquakes will result as well as eclipses causing the trees to dry up and fire to break out in the sulphuric land of Yemen extending until it overwhelms the equatorial areas. The atmosphere will then darken with nothing to illuminate it except lightening and thunderbolts.

With this hair-raising image, Ibnul-Nafees depicts the end of the world and Doomsday. The image is derived from knowledge of astronomy and geology available in his age. How, in the light of this image, will the resurrection be? In answer to this question Ibnul-Nafees says: "After the cessation of the sun's declination, another declination must obtain for the movement of the fixed stars to be maintained. Upon the increase of this fresh declination the earth will be back to normal and the atmosphere will be suitable for animal life. If much rain falls in winter and the water mixes with the soil under the heat of the sun producing fungi it will be good for generating the bodies of men and animals. The human soul will then be able to nourish that tiny particle called "coccyx" which is what remains of the body after it dies and degenerates. The soul will then inhabit that particle and people will thus be resurrected into their pre-

vious forms. This is resurrection, and praise be to God, the All-Able, the Omniscient."

Thus ends our tour of the past, present and future with Ibnul-Nafees. He tries to convince us that things could not be better, and that all creeds could be deduced mentally from the facts of the sciences. Hence, no contradiction between religion and science, or between the ordained laws and wisdom.

It is worth noting that he used in this Treatise the same methodology that had led him to discover the pulmonary blood circulation, namely the teleological methodology. His hero, Kamil is nothing more than the embodiment of the perfect man in Islam.

At the outset of this speech I said that I had no intention of classifying Ibnul-Nafees into the philosopher-physician or the physician - philosopher category. I will make do with two opinions about him mentioned by the two most important biographers of the man. In "Masalikul Absar" (The Ways of Visions), Al-'Amri says: "Although Ibnul-Nafees was fully acquainted with (theoretical) medicine with all its ramifications, he was not that brilliant in matters relating to treatment. His prescriptions were not outstanding."

Commenting on Ibnul-Nafees's Treatise, Al Safadi said in his "Al-Wafi bil Wafayat" (Comprehensive Reviews): "I have read a little book by him in which he parodizes the Treatise of Hayy bin Yaqthan which he entitled "Fadel bin Natiq". In this little book he advocates Islam and its views on prophetships, laws, physical resurrection and the end of the world. By God, he did so well and proved to be an able writer, a deep thinker and a master in secular sciences." After all, I leave it to you to make your own judgement.

COMMENTATOR'S SPEECH

Prof. Osama Abdul Aziz

EGYPT.

It might be a good idea that I talk about Ibn Nafees, the arch of doctors in Egypt at that time. When I comment on one of the greatest commentators on modern history, Ibn Nafees, whose object was to comment on what was written by Ibn Sina. In fact, it is a criticism to what had been written by Ibn Sina. It is a tragedy that Ibn Nafees be a critic of two scientists of his age and of two of the arch scientists, they are Galin and Ibn Sina. It is very difficult and hard indeed, that man should pose to criticize two forward scientists and ideas of Galin had lasted for 1000 years, before Ibn Nafees criticized them. Galin's theory of the visible symptom force, that the blood penetrates from right side to the left side through the invisible hole, this idea remained for 1000 years and Ibn Sina had accepted it. He did not criticize it until Ibn Nafees had come up and said that the theory of Galin and the acceptance of Ibn Sina were wrong. This is the grandeur of manner.

Ibn Nafees was born in Damascus, was educated in Egypt and practised medicine in Egypt. And they said he was the arch doctor in Egypt, and this is one lesson of co-operation and the science has un-limited geographical areas. In fact, I can begin with the idea, the theory of Galinoos and the injustice inflicted upon Ibn Nafees by the Western World. Perhaps it was intendedly or mal-intendedly. It was approved, that there were some translations of the works by Ibn Nafees, but after 300 years, after the death of Ibn Nafees and his works, Michael Servetus came to say that there is the pulmonary circulation. Ibn Nafees and his work has given evidence of rightness.

SLIDE I: This is the philosopher of his age, Galin, who was opposed by Ibn Nafees. It was very hard that a man be set against one of the giants of science of his time.

SLIDE II: This is one of the translations made by Andrew Ronald. A book of main ideas which deals with this issue and is written in Arabic and English and it is about the works of Ibn Nafees. This book is mainly on the theory of pulmonary circulation which has been mentioned before.

SLIDE III: This is the book on law by Ibn Sina. It is a new copy, just to remind us of the works of those giants. These books must be translated and preserved in our libraries.

SLIDE IV: Then Michael Servetus came up to prove or to say, after the lapse of 300 years from Ibn Nafees, about "The blood circulation". This is found in his book "Christianismi Restitutio", or degradation from Christianity. In fact, this book was the reason for burning him down in Geneva, because his views were opposed to the prevalent ideas of that time and you see how the scientists had suffered during those ages.

SLIDE V: This is a copy of Christianismi Ristitutio , which is degradation from Christianity and that was the reason of burning him down.

SLIDE VI: This is the stone which shows the place, where Michael Servetus was burnt down and where he was burried. This stone is found in Geneva, taken as an indication of the sufferings of the scientists of that time.

SLIDE VII: William Harvey. After Michael Servetus, by 100 years and thus we have at least a gap of 350 years between Ibn Nafees and William Harvey. William Harvey has proved by experiment what Ibn Nafees said, as we heard, had dissected the corpse of man.Otherwise we would not have come to this reality. In fact, William Harvey had proved experimentally the blood circulation and there is a flow of blood.

In conclusion I want to say that Ibn Nafees was a very great scientist, who set himself against that engulfing and ravishing currents, to establish the fact which is known to us now-a-days and justice must be made to him by us as the researchers had already made to him.

لو خلط بالدم . . . . وهذا التجويف هو التجويف
الأيمن من تجويفي القلب و إذا لطف الدم في هذا التجويف فلا بد من نفوذه إلى التجويف الأيسر
حيث تتولد الروح ولكن ليس بينهما منفذ فان جرم القلب هناك مصمت ليس فيه منفذ ظاهر
كما ظنه جماعة ولا منفذ غير ظاهر يصلح لنفوذ هذا الدم كما ظنه جالينوس فان مسام القلب هناك
مستحصفة وجرمه غليظ فلا بد وأن يكون هذا الدم إذا لطف نفذ في الوريد الشرياني إلى
الرئة لينبث في جرمها ويخالط الهواء ويتصفى ألطف ما فيه وينفذ إلى الشريان الوريدي
ليوصله إلى التجويف الأيسر من تجويفي القلب . . . . . . : : : . . . . :

Figure 4. Pulmonary circulation. A page from the manuscript of Ibn Nafis. *"The blood (of the right ventricle) passes through the vena arteriosa (= pulmonary artery) to the lung, spreads through its substance, mixes with the air and becomes completely purified; then it passes through the arteria venosa (= pulmonary vein) to reach the left chamber of the heart."*

القانون في الطب
لابن سينا

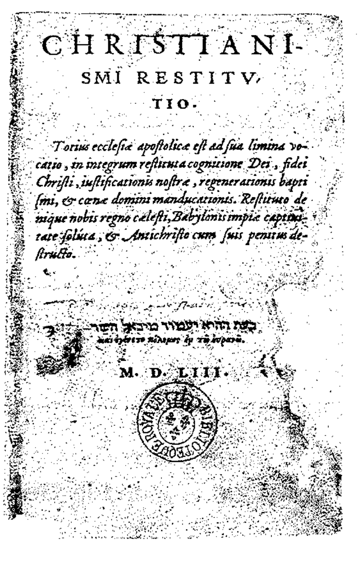
طبعة روميه ايطاليا سنة ١٥٩٣ ميلاديه
كتاب الادوية المفردة والنباتات

شرح وترتيب
الأستاذ جبران جبور

قدم له
الدكتور خليل ابو خليل
رئيس دائرة الارشاد الصحي
في وزارة الصحة العامة . بيروت

تعليق
الأستاذ الدكتور أحمد شوكت الشطي
رئيس منظمة
الهلال الأحمر العربي السوري

منشورات
مكتبة المعارف
ص.ب: ١١-١٧٦١
بيروت


CHRISTIANI-
SMI RESTITV-
TIO.

Totius ecclesiæ apostolicæ est ad sua limina vocatio, in integrum restituta cognitione Dei, fidei Christi, iustificationis nostræ, regenerationis baptismi, & cœnæ domini manducationis. Restituto denique nobis regno cælesti, Babylonis impiæ captiuitate solúta, & Antichristo cum suis penitus destructo.

M. D. LIII.

COMMENTATOR'S SPEECH

Prof. Hasan H. Ali

U.S.A.

I congratulate the members, who participated in the Seminar on Ibn Nafees through the realities that have been mentioned in the framework of the history of his scientific achievements. Can you show the slides, please.

SLIDE: This is the picture of Ibn Nafees, that I have obtained from one of Egyptian magazines, published by the end of the 60's and I do not have the reference. I think this had been drawn when he was in Cairo in the 13th century. I think that this is the re-production from a drawing, found in Cairo during the 13th century.

I have got some brief comments to make and in the end of my speech, I will try to sum up what has been said in this seminar. It was said that Ibn Nafees said that the heart is not moving and this was among the things that incited people to say that he imagined things and did not prove any thing. He said that the function of the heart is to create a spiritual substance as well as distributing it to all the other members and the tissues of the body; and this gives the light to what Meyerhof said when he affirmed that Ibn Nafees had said that the heart is not moving. Another point is that in the introduction of شرح تشريح القانون, Ibn Nafees said that what stopped them from doing any dissection work, was the Islamic law but if you look it into his service, works and as Dr. Qattaya has said, we find evidence proving that Ibn Nafees has carried out dissection and that the Arabs themselves have practiced the science and it is not true that the Arab physicians built their knowledge of the scientific sciences upon theoretical bases and they did not do any dissections and we got certain examples that prove to the contrary of the assumption.

For instance,

(1) how Dr. Razi found the Recurrent Laryngeal nerve without dissection.

(2) Arab physicians speak about dissection as a proof to what they have written and done. But they were not courageous enough to say it publicly, because this was contrary to beliefs and laws.

(3) Abul Qasim al-Zahrawi, one of the most famous Arab surgeons during 10th and 11th century, wrotè in the introduction to his book al-Tasrif (التصريف لمن عجز عن التأليف) that the practice is the basis of surgery and he encouraged experimental and practical surgery and since then it has acquired its independence as a scientific field.

(4) Ibn Nafees himself has said in شرح تشريح القانون that the dissection gives the light to the assumption to those who said that the inter-venticular septum has pores in it. All what has been mentioned before, confirms rather than denies what they said that the discovery of pulmonary circulation of Ibn Nafees was based on imaginative conjectures rather than practice.

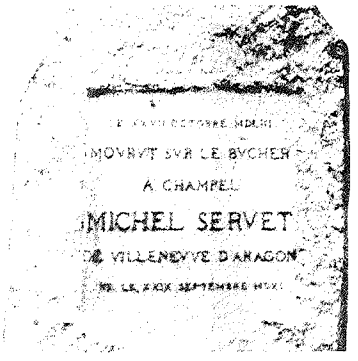
SLIDE: When we say this, we should remember Dr. Suleiman Sami Haddad and Dr. Ibrahim Harrallah, (both dead now), the latter was director of the manuscript center. I got this manuscript from Harvard University. This is the first page of the book شرح تشريح القانون.I was very happy because for the first time in my research activities, I found this page and one of the books of cardiology and circulation and that is the famous book in the field of heart and the circulation which is well known in United States and the Arabic text was translated into English by translator Nishaat (نشأت) and I was very happy to see this explanation of the blood circulation from the right ventricle to the lungs and its mixture with Oxygen.

SLIDE: Again a copy of the same book. The slide you see now, is the description of lung dissection, where he explains the air changes, where the Oxygen is changed into the blood. This is the description

of the blood vessels, where he spoke about pulmonary veins and arteries. This is a description of the heart, where he says that the coronary arteries feed the heart and not the pulmonary arteries.

Now I will be summing up what has been said this morning:

1. Ibn Nafees carried out comparative study of anatomy between animals and human beings and he said that more than one time (ten times).
2. He practised dissection.
3. Ibn Nafees was a free scientist, guided by his brain and his observations and he did not take for granted any or the previous health opinions.
4. He spoke about the exchange between oxygen and blood in pulmonary arteries.
5. He gave a full description of the pulmonary circulation and mentioned it five times in his book.
6. He said that the heart depends on certain arteries to be fed and they are coronary arteries.
7. and finally, the Egyptian Dr. Mohyuddin al-Tatawi was the first physician, in 1964, who discovered the encyclopedia of Ibn Nafees, where he described the blood circulation, to be found at Berlin Library in Germany.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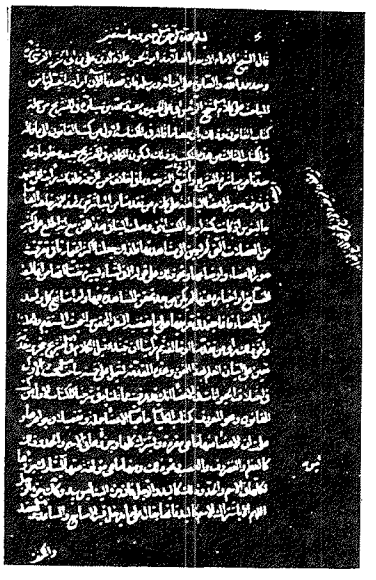
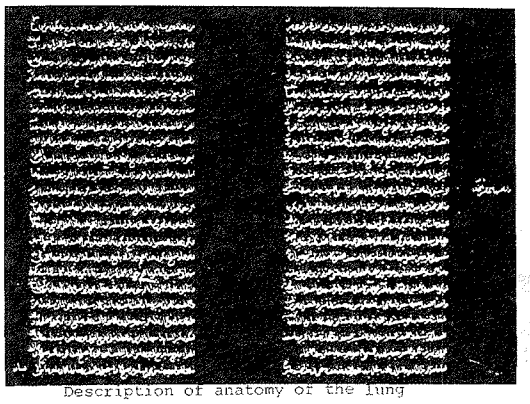
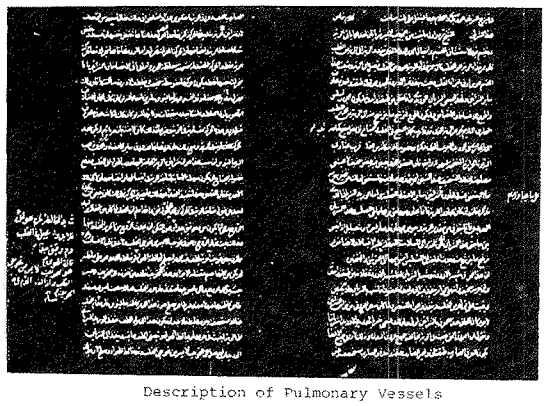


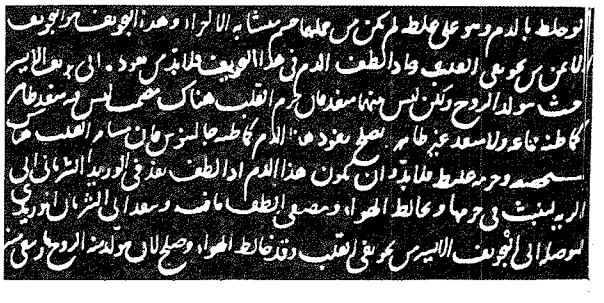
The introductory page of Ibn Nafis's Commentary on the Anatomy of the Canon

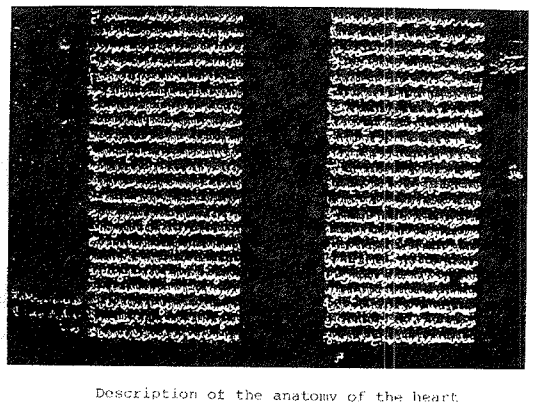


Description of anatomy of the lung



Description of Pulmonary Vessels





Description of the anatomy of the heart

GENERAL DISCUSSION

Dr. Hamadi Al-Sayyed (Chairman)

I thank Dr. Hassan Ali. I feel that we are running short of time and I feel most of people have left. We have a very good film regarding Ibn Nafees, carried out at Halab (Aleppo) University. I would like to expose it for the maximum number of audience. In fact, some people have asked to take the floor and we will start by that and if we finish that, then we can. I prefer to show the film to the audience in the hall.

Dr. Mohd. Salehia,

I will be driving my message home and I like to try to comment on the researches, because this is taken as granted. We have something that is obviously very important and that is we should not over interpret the facts. When we deal with our Heritage, we should interpret it as it is, not over interpret it. Do not suppose that the people will follow you in your course without real thinking. What I am saying now, is addressed to my friend, Dr. Sulaiman Qataya. What I want to say is هيئة التشريح تصدق ذلك. In the 7th century of the Higra, هيئة is a body in modern Arabic, التشريح dissection and another thing is لم أتحقق . Actually Ibn Nafees himself said, that he did not prove it, so, do not tell me that he carried out dissection. He might have and he might have not. He said, I did not prove its truth. Other point is, that we have seen the bladder many times and so what it means when we slaughter the animals or sheep, we see their bladders. I do not want to suppose that it is the human bladder. So with respect to evidence presented by Dr. Sulaiman Qataya, I want real proof.

Now, I address Dr. A.Z. Iskandar, whom I respect and who is my teacher, about these slides' carbons. I am asking him to prove, when was the word (مجلد) used? In our Heritage, we use the words of second book (الكتاب) and (الجزء) part. Now, the word (مجلد) I don't know when was used by the writer himself, because I see that he said الكتاب الثاني من الجزء الثاني من الكتاب الثالث So, these discussions are really regarding the linguistic aspect. Third point, regarding the way, it was then, in the first slide the handwriting is different than that which we find in slide two. In slide two, we find that there is a difference between the signatures in the second and third and fourth slides and I think that the handwriting, which I am referring to, is to be dated in the 9th or 10th century and I believe that this can be a fault of the copier. Of course, Dr. Albert Zaki is our professor. Now, regarding ابن أبي الحرب أو ابن أبي الحزم , this is a problem created by orientalists, but we have lots of biographies and I am asking my professors to prove three names as we have almost 18,000 stories about those who wrote biographies مثل بشر ابن الحافي أو ابن الحافي أو ابن الجافي So, why we enter into these details. The fourth observation, I am asking him to take into account that we have a book by غيات الغيث who wrote a book named الشامل في الصراع الطبية We have a copy at the Zaheri Library (مكتبة ظاهري) under a given number and I will give it to Dr. Albert Zaki Iskandar and there is another copy in Iran, named تشريح كتاب التافيسي and in the first page we find that they chose the name of ابن أبي الحزم .

Dr. A.R. Hijazi,

This is a comment regarding what Dr. Shehada has said after his thesis. The physicians had told him, that the works of Ibn Nafees will be revised and published and he told us that they carried out what they have said. I think this is a bit exaggerated and I believe that the situation has changed very much since 1951, because it is true, few orientalists know what was the Arab medical contribution. It is true that medical students study the course which does not mention the role of the Arab medical sciences and I think we can safely say that in France, nowadays, there are very few people who know what has happened and most of them ignore our role. Some of them give to the Arab medical sciences a very secondary role. I am not trying to say, that they are to be blamed. We can not possibly ask them to publish our traditions in their countries, but this is a task, we should shoulder, and our scientists should shoulder it as should our specialists, too.

Dr. Said Ashour,

I will be brief, Mr. Chairman. I would like to answer the observations and the criticism. First of all, I like to thank you all and I say very sincerely, that I have highly profited from all the contributions that I have heard here. I thank all the physicians and distinguished delegates who contributed their part, I am not saying that it is not their field of specialization, but it is of great importance, because it touches upon different aspects and I am very grateful indeed.

Now, regarding the criticism made by Dr. Salehia, I know that he started lately to contribute to the field of manuscript and because of his dealings, he is trying his best, but I hope or rather we are all trying to be scientists and we hope, that the methods we use to criticise each other should be less crude and anyhow, the main thing is to try. Regarding the point Mujallad (مجلد) which is a term. I like to say that this word has been used since the 4th century of the Hijra and the reason was that the Arabs started to use skins to bind the books, specially in Qurtaba (قرطبة) and there were pressed parts and apparent parts. The pressed parts were decorated by gold and book binding in this manner was considered to be one of the famous Islamic Art. Now, regarding the difference of hand writings between one century and another; Dr. Salehia might be right, but , I personally , and after having spent more than 20, or 25 years, I cannot, simply by looking at the slides, decide what kind of handwriting I have. Before I pronounce, my point of view, I have got to look meticulously in each letter and the kind of ink that has been used, the kind of paper etc. This is the scientific approach. We are here in a scientific symposium. Now, I think of course, we can be right concerning the difference of the names, (ابن الحرم أو ابن الحزم), but we can not spend all our time on such minor differences.

As for Dr. Albert Zaki Iskander, he mentioned all the points concerning the word Mujallad and as I read in front of you, he does not mention مجلد . He says, الكتاب الثالث من النمط الأول من الجزء الثاني الخ . فكلمة مجلد موجودة in the bibliography. He said 300 terms Mujallad Safari (مجلد سفرى). That was what he said, but the word Mujallad (مجلد), I did not see in the book. Now, concerning Ibn Al-Haram or Ibn Al-Hazam (ابن الحرم أو ابن الحزم), I corrected it and lot of them said his name is Ibn Al-Hazam (ابن الحزم) and some of them said Ibn Al-Haram instead of Ibn Hazam. Two contemporary experts or scholars in 1968 published something and said that it is Ibn Haram. So, we say ابن الحزم and who says ابن الحرم he is wrong, so that we don't repeat that mistake. Now, concerning the handwriting, if this treatise was published, it will be published with the slides and at that time you can look at the handwriting and I did look at the (م - ر) etc., and all other letters. I would like to see the difference between two things, the writing of Ibn Nafees and then what we call التمليك that is to say are made in different writing. So, I could not mention whether that was writing of Ibn Nafees or writing of others. So, there is no manuscript without the entry, without التمليكات and this shows well when the manuscript is old.

Dr. Hamadi Al-Sayyed (Chairman)

I give right to Dr. Salehia to say what ever he said or what ever he wants. I give the floor to Dr. Suleiman Qataya.

Dr. Sulaiman Qataya

First of all, I am astonished that Dr. Salehia, who is one, in his own capacity of Arabic language, uses the word (أن اضرب), that means 'I criticize'. Of course, here we are not in an arena, we are discussing only. And I am astonished that a scholar like Dr. Salehia asks me about the meaning of word هيئة which means 'a body', nowadays. I think that even if he talks to a secondary school student about the word هيئة التشريح , he would say 'A group or the team incharge of the dissection', and then

when Ibn Nafees said that, 'We saw the bladder'; it means he saw the bladder of the human being. We know that Ibn Nafees was not dealing in science only, but even philosophy also, He was a scientist and he had scientific thinking and so when he says the word and repeats that word; he knows what he means. So, he says شاهدنا , that means he saw that with his own eyes and touched it with his own fingers.

Dr. Abdul Karim Shehada,

I think that Dr. Qataya has defended us enough and quite adequately.

Dr. Mohd. Salehia,

Once more, I say the word هيئة . Is this a group of people or if there was a group هيئة , why did this group work and how it worked. I know that we talk about United Nations etc. So, the discussion over the word هيئة is in Arabic. We probably need another Conferrence in order to discuss this. We should treat each other as scholars, who discuss scholarly discussions. A gentleman who says that this will take time and that in a short review we cannot check, we can not decide. There is a paper that will be presented and to say whether this writing was from the 7th century or another century.

Dr. Hamadi Al-Sayyed (Chairman)

Now, there is no time but I promise to Dr. Sulaiman Qataya to show the film later , but if he wants to show it now, we apologize. We are all friends and we hope to continue the discussion after lunch.

PART SIX

SEMINAR ON ABUL QASIM AL-ZAHRAWI

CHAPTER ONE

(Papers Presented)

1. REPORT ON THE THIRD SESSION.
   Editors.
2. OPENING REMARKS.
   H.E. Dr. Hussein Al-Gazaery.
3. SURGERY OF ABUL QASIM AL-ZAHRAWI.
   Dr. Ahmed Mukhtar Mansour.
4. ABUL QASIM AL-ZAHRAWI AND HIS INFLUENCE ON EYE SURGERY.
   Dr. Mohammad Zafar Wafai.
5. CONTRIBUTION OF ABUL QASIM AL-ZAHRAWI IN THE MANAGEMENT OF FRACTURES.
   Dr. Qazi Mohammed Iqbal.
6. ABUL QASIM AL-ZAHRAWI THE MOST FAMOUS SURGEON OF THE MIDDLE AGES.
   Dr. Simon Hayek.
7. THE PHYSICIAN-SURGEON AL-ZAHRAWI AND THE NATURAL ORIGINS AND MANUFACTURE OF DRUGS. DISCUSSION AND EVALUATION OF THE 28TH TREATISE.
   Prof. Dr. Sami Khalaf Hamarneh, et al.
8. AL-ZAHRAWI (ABULCASIS) THE PHARMACIST.
   Dr. Mohd. Zuhair Al-Baba.
9. COMMENTS.
   Dr. Maher Halawa.
10. GENERAL DISCUSSION.

REPORT ON THE THIRD SESSION

This session, which was a seminar on "ABUL QASIM AL-ZAHRAWI, was conducted by H.E. Dr. Hussein Al-Gazaery, Minister of Public Health, Saudi Arabia as chairman and Prof. Rushdi Rashid as moderator. In this session, which was held from 6.30 p.m. to 8.30 p.m., six papers were presented, on which one commentator gave his comments. Later on general discussion was allowed.

Editors.

OPENING REMARKS OF THE CHAIRMAN

H.E. Dr. Hussein Al-Gazeery

Today, we would like to start this seminar on 'Abul Qasim Al-Zahrawi', one of the Arab surgeons, who has greatly contributed to the enlightment of medicine and science during his age and in all ages. There are many papers which will shed further light on Abul Qasim and we hope, we would be listening to all these lectures and valuable papers during the time limit we have, after which we should adjourn the meeting

SURGERY OF ABUL-QASIM AL-ZAHRAWI

Dr. A.M. Mansour

EGYPT

While Arabic medicine was at its peak in the East, thanks to al-Razi (Rhazes) and Ibn Sina (Avicenna), it was achieving tremendous advances in the West, where a great surgeon, Abul-Qasim al-Zahrawi was born in Andalusia in 936 A.D. His name is associated with one of the great treasures in medical history "al-Tasreef". In the last section of this medical encyclopedia, he deals with many branches of surgery. It also contains detailed illustrations of many surgical instruments. It remained the backbone of surgical teaching and practice in European Universities, almost till the close of the 18th century and in fact it laid the solid foundations of what has become nowadays a monumentous achievement of the art and science of surgery.

Al-Tasreef contains about 200 surgical instruments clearly described and illustrated, many of which were of his own design, for he was a great advocate of creativity and invention.

His book is widely acclaimed to be the first illustrated treatise in the history of surgery. It is lucidly written, unambiguous and is an enjoyment to read even nowadays.

The first 56 chapters of al-Tasreef deal with cautery, but we will confine ourselves to very few examples, not only for their historical importance but also to dissipate many illusions which link all progress in medicine with the last 100 years.

In chapter 28, a specific clinical condition - Liver abscess, is described, for opening which al--Zahrawi describes an instrument designed in a particular shape together with its canula. In this way, al-Zahrawi combines the qualities of cauterization, piercing and drainage of pus in one instrument. (Fig. 1)

As a matter of fact, no real improvement on this method of treatment of liver abscess was achieved till the beginning of the 20th century, when Rogers[4] introduced emetine salts for its treatment.

In chapter 51, al-Zahrawi establishes an important basic principle of surgery, and this is dependent drainage of pus, using for this purpose a specially designed cautery. (Fig. 2).

Chapter 56, "On Cauterization in haemorrhage arising from a cut artery" tells more than what the title denotes, for the author mentions ligature of blood vessels, for the first time in the history of medicine - as one of the methods of arresting haemorrhage. Harvey[2] states that the most important reason for Ambroise Pare's fame in the sixteenth century was his invention of ligatures for arresting haemorrhage instead of cautery in amputations.

In the field of general surgery, al-Zahrawi in Chapter 40 deals with "Perforation and Incision of Tumours", basically he deals with inflammatory swellings and he establishes three important principles of surgery:

1) *First,* the importance of early incision of peri-anal suppurations.
2) *Second,* that incisions should be situated in the most dependent part of the swelling.
3) *Third,* The necessity of using a drain.

If we carefully read Chapter 44, "On cutting upon the tumour which occurs on the outside of the throat and called Elephant of the Throat", it becomes obvious that he deals with thyroid swellings, "for it may reach a large size, is of the same colour of the body", i.e. it is not an inflammatory swelling "and it commonly occurs in women", a statistical fact. "It is of two types, congenital and acquired. The acquired is of two kinds, one resembles lipomata, the other resembles a tumour arising from an arterial

aneurysm and is dangerous to incise".

It is clear that the condition last described is that of thyrotoxicosis and he advises not to operate on it. From the text, it is also clear that he operated on thyroid nodules.

Samuel Cross, the famous Philadelphia surgeon wrote in 1866 "Can the thyroid gland in case of enlargement be removed? Emphatically experience answers No. If the surgeon is foolhardy to attempt it, lucky it would be for him, if his victim survives till the end of this horrid butchery. Any sensible and honest surgeon should avoid it."[1]

Nine centuries elapsed since al-Zahrawi first operated on the thyroid gland, before any real progress occured in the field of thyroid surgery at the hands of Halstead who acknowledged his debt to al--Zahrawi and Theodor Kockher.

If we now move on to chapter 49, "On opening a tumour arising from a blood vessel, called aneurysm", we find that al-Zahrawi was aware that trauma can cause an aneurysm and that thrill is one of its signs. Al-Zahrawi also described in detail a method for proximal and distal ligation of arterial aneurysms. Eight centuries later, John Hunter became widely famous for a similar procedure.

Chapter 65 deals with treatment of intestinal hernias. As we go along it, we get surprised by his accuracy and attention to details. Soon it becomes obvious that he was able to distinguish between direct and indirect inguinal hernias. This, and his awareness that the contents may be intestine or omentum and that incarceration could cause obstruction, must have been attained through his vast experience.

Al-Zahrawi's description for the surgical treatment of hernia closely resembles the herniotomy of today, except that we do not remove the testis. Herniorrhaphy was introduced by Bassini[3] in 1884, 9 centuries later, when the anatomy of the anterior abdominal wall became thoroughly understood.

In Chapter 54, we find an accurate description of tapping of ascites, using a *pointed scalpel* followed by the introduction of a canula (Fig. 4, 5, 6,). This description makes it clear that he intended a valvular incision.

Chapter 85 deals with "Abdominal wounds, protrusion of the intestine and suturing them". He advises using warm water sponges to facilitate reduction of bowel to the abdominal cavity, if this is still difficult he advises opening up the wound, with a *curved scalpel* (Figure 7) whose sharp edge lies on the inner side.

For the first time in the history of surgery, al-Zahrawi describes bladder wash out and invents an instrument for this, made of silver or ivory, hollow with a long fine tube. "The hollow part containing the plunger is exactly of a size to be closed by it, so that any liquid is drawn up with it when you pull it up, and when you press it down it is driven in a jet, as is done by the projector whereby petrol is thrown in sea battles". (Fig. 9)

It is obvious that this instrument is the ordinary syringe, if a needle is added to it, it becomes possible to introduce drugs parentrally.

Al-Zahrawi, starts Chapter 60 "On extraction of stones" with very important clinical observations. "A bladder calculus most frequently occurs in boys, and of its signs is that urine may contain sand, the patient keeps on rubbing his penis and many of them get a prolapse of the rectum".

Then he proceeds to describe with great accuracy, the ideal position of the patient during the operation, and the role of assistants. Then he describes the details of the operation and locates the exact anatomical position of the perineal incision, he mentions the difficulties which may arise, and the precautions to avoid them.

It is no exaggeration to state that al-Zahrawi was the pioneer of Plastic surgery. Most of the instru-

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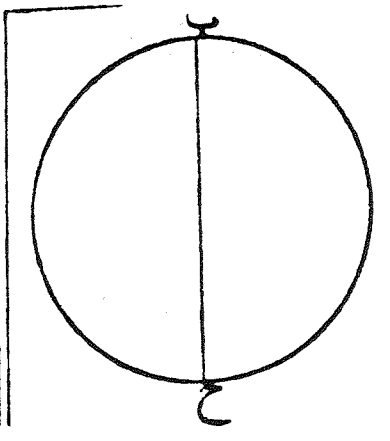

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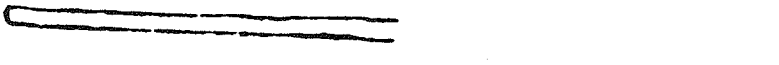

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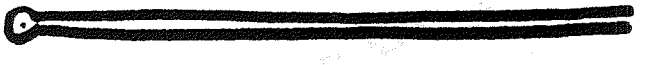

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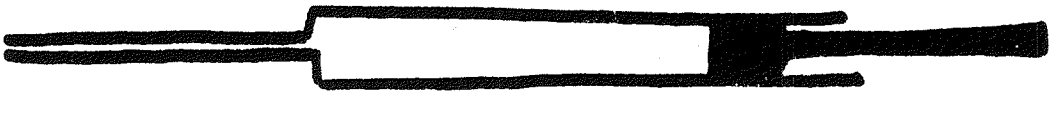

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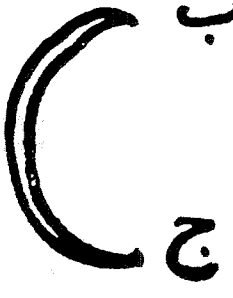

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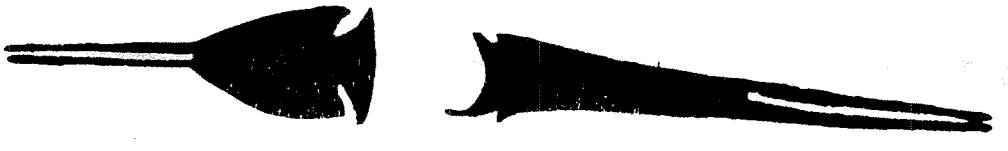

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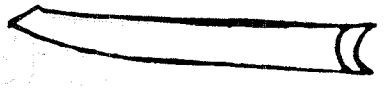

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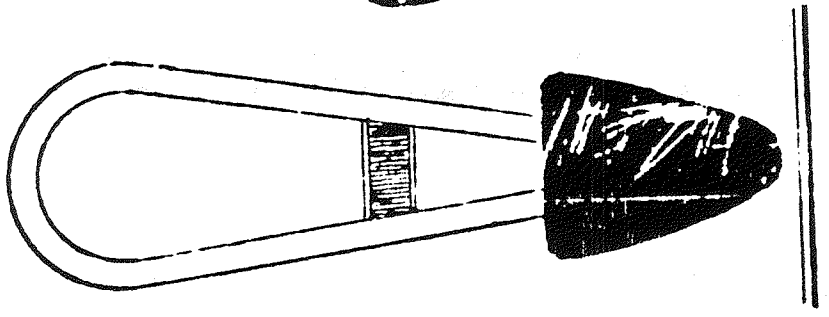

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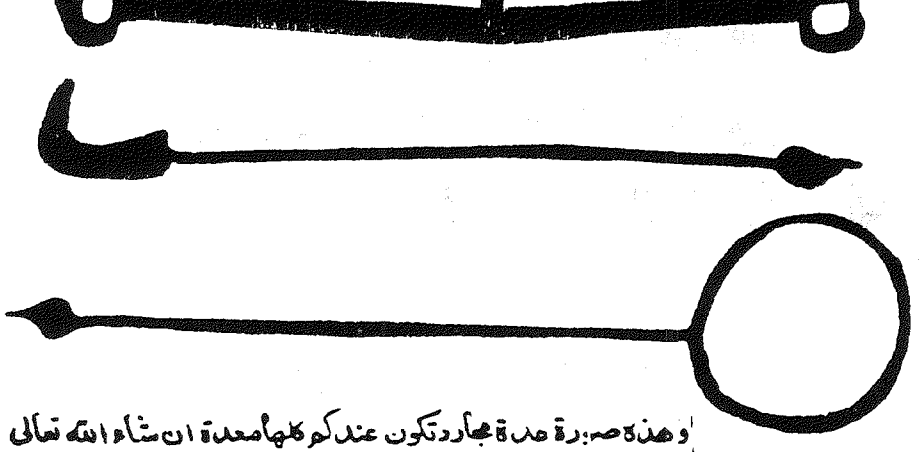

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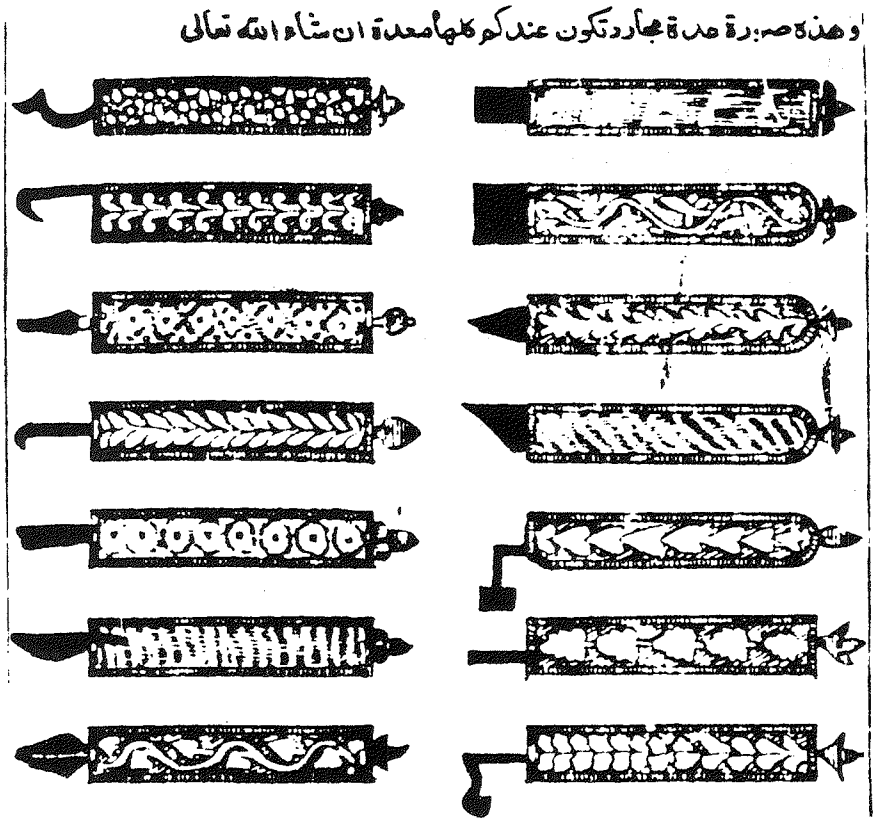

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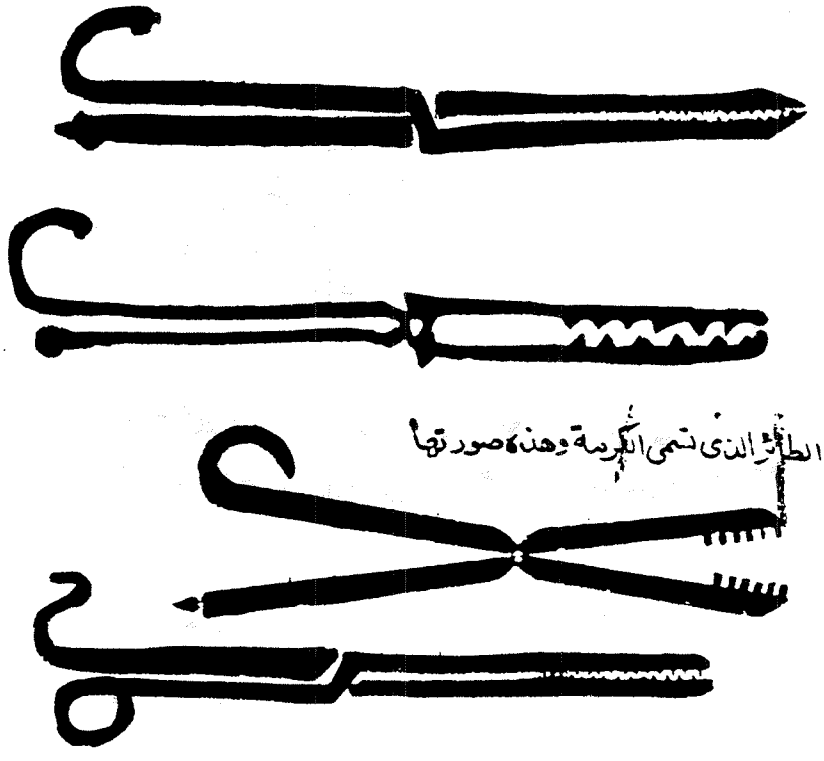

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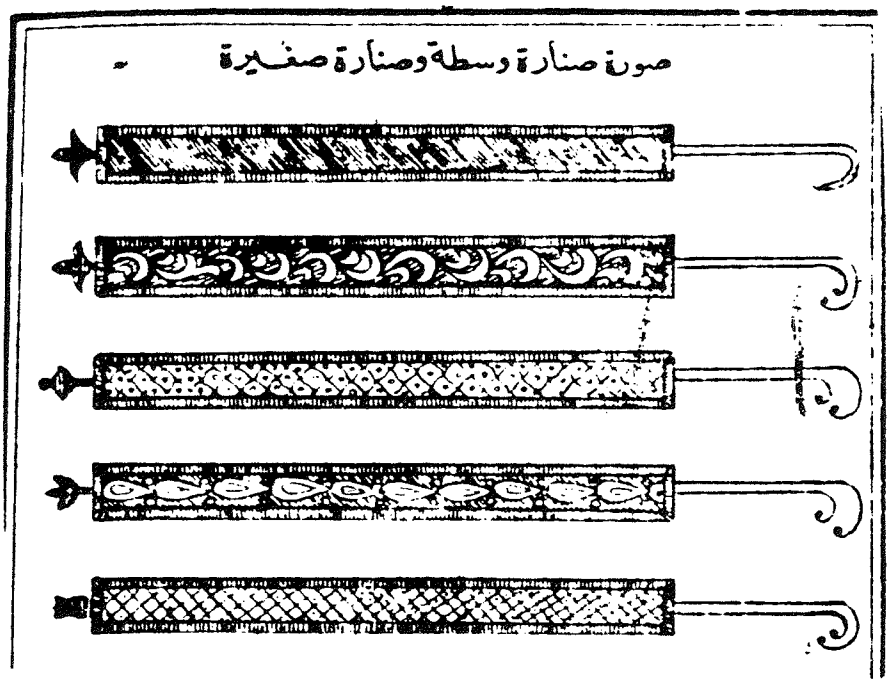

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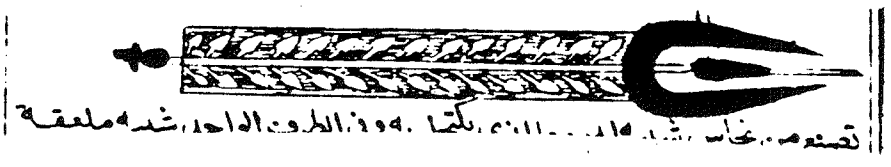

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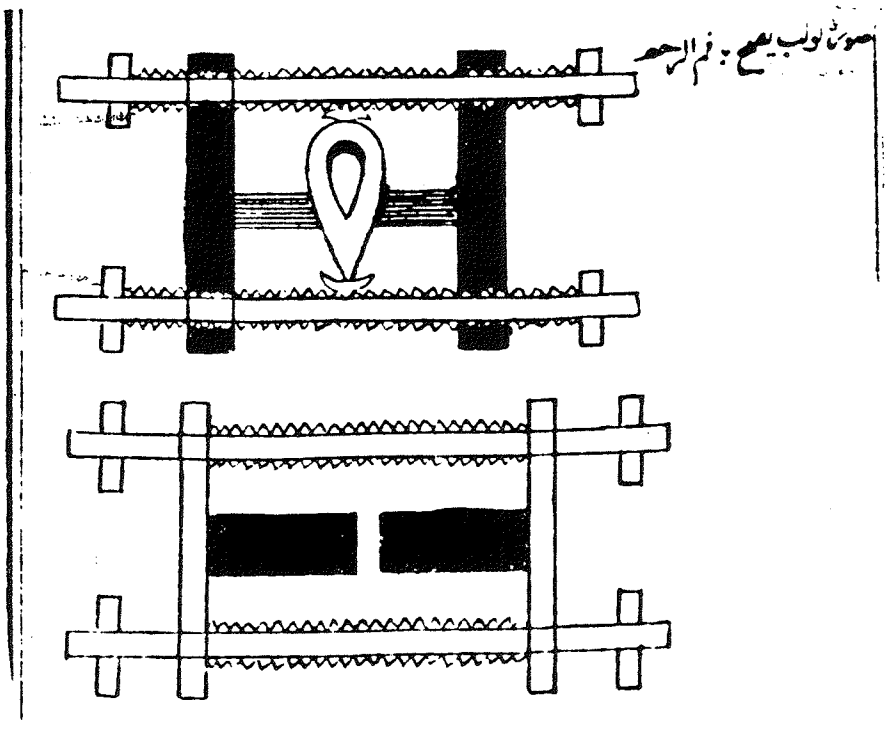

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ments he invented, are still used, but under the name of Surgeons who followed him many centuries later.

Marking the procedure with ink prior to the actual operation is a must in this fine speciality. This step is almost a routine in many of the operations described by al-Zahrawi.

Furthermore, many operative procedures which he described in this field, are still used with some modifications and additions. His description of blepharoplasty, for example, resembles to a great extent what is being practiced nowadays. If we read his account, we immediately realize his honesty, for he acknowledges his debt to the ancients. Then he describes new surgical instruments like the eye speculum with 3 hooks (Fig. 11) to hold up the upper eyelid. These hooks are characterized by olivary ends to avoid damage to the eye. Then he proceeds to describe a pair of fine scissors (fig. 12) This, according to Spink and Lewis,[5] was the first drawing of a true pair of scissors in the history of surgical literature.

Al-Zahrawi also dealt with ectropion. He realizes that it may be congenital or acquired, and although the principle of his operation seems to be rather simple, and that is excision of a triangle of tissues whose apex is directed towards the fornix, yet, it is one of the important basic principles of plastic and reconstructive surgery. With a simple addition, the operation he described is now known under the name of Kuhnt-Szymanowski operation.[6]

In chapter 26 "On suture of nose, lip and ear, when there is discontinuity from a wound or the like" al-Zahrawi lays two important basic principles:

First, that recent wounds should be sutured primarily. *Second,* that in old wounds, the margins should be freshened before any attempt at suturing is made.

Illustrations of many different types of hooks (Fig. 31) abound throughout the book. As usual, these instruments are now known under other surgeons' names e.g. Gillies.

ENT SURGERY

In Chapter 6, many new instruments were described for removal of foreign bodies which may enter the ear. A forceps consisting of two levers connected at the base, with a sliding collar along them, to ensure the meeting of the tips when the collar is advanced away from base is illustrated (F. 16). With progress in industry and metal alloys it became possible to dispense with the collar and we get the ordinary toothed or nontoothed forceps. In the same chapter, he describes a fine scalpel to cut plant grains which may grow or swell inside the auditory canal (Fig. 17). Furthermore, a simple otoscope is illustrated (Fig. 18). The gentle curve proves his accurate knowledge of Anatomy.

He starts chapter 36 by differentiating between inflammatory and malignant swellings of the tonsils and advises not to open a tonsil or abscess until it becomes mature. Then he proceeds to describe tonsillectomy in much the same way as it was performed just few years ago. For the procedure, he describes three important surgical instruments:

1) The Tongue depressor (Fig. 20)
2) The tonsil guillotine (F. 21), it is like a pair of scissors except that the extremities are curved, the beak of each, meeting the other and very sharp.
3) Then a hooked-scalpel is described if the tonsil guillotine is not available. (Fig. 22)

Oral and Dental Surgery

For the first time in the history of surgery, scaling is described and a multitude of instruments illustrated for this purpose. (Fig. 24)

Chapter 31 "On extraction of roots of teeth and of broken pieces of mandible" shows clearly al-Zahrawi's genius and creativity. According to Spink and Lewis,[5] nobody before him wrote on this subject with such detail and accuracy which denotes a vast experience. He describes a very important instrument, the forceps or Kalalib (F. 25) "the point of which resembles a bird jaws having teeth fitting into each other, so that sure and firm grip may be obtained." This instrument he used for root extraction and for removal of broken teeth and sequestrum. Other versions of it were used for extraction of arrows. Some were straight and others were curved. A glance at the illustrations is enough to realize that it was the prototype for the present day artery forceps, Kokher's forceps and many other pedicle clamps. Only minor adjustments e.g. the lock were introduced. However, they are known under the name of Spencer-Wells, Kokher's and many other surgeons. I believe that the word *Clamp* is derived from al--Zahrawi's Kalalib.

Over and over again, al-Zahrawi repeats his advise not to blindly follow the ancients but to think and try to invent the proper instrument which suits a particular situation. In this respect, I find his own words the best to bring this talk to an end. "You should know that dental instruments are very numerous, as are the other instruments, almost beyond reckoning, And the experienced worker with a knowledge of his craft may devise fresh instruments, as his work on actual cases suggests them to him. For there are certain diseases for which the ancients did not mention any instruments.

ACKNOWLEDGEMENT

The author wishes to acknowledge the courtesy of Bodleian Library for providing him with microfilms of two manuscripts of al-Tasreef:

1) H. Huntington 156

2) M. Marsh 54

I would also like to thank the Director General of the Egyptian National Library for providing me with a microfilm of the Oxford Edition (1778) of the same book (Tib-935).

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ABUL QASIM AL-ZAHRAWI AND HIS INFLUENCE ON EYE SURGERY

Dr. Mohammad Zafar Wafai

U.S.A.

He is Abul Qasim Khalaf Ibn Abbas al-Zahrawi born in al-Zahra in Andalus, which was built by Khalif Abdul Rahman al-Nasser (327 A.H. - 936 A.D.). He practiced medicine and surgery at the court of the above-mentioned Khalif and his successor son al-Hakam al-Mustanser (who ruled between 352 and 367 A.H. - 961-976 A.D.). Leo Africanus figured (and rightly so) that Abul Qasim died at 404 A.H. (1013 A.D.)

Al-Zahrawi's book (al-Tasrif li-Man Ajiza an al-Taalif) consists of 30 treatises. Discussed in the first treatise were the element and mixtures, the compounding of drugs and anatomy.

In the second treatise, al-Zahrawi studied the diseases, their symptoms and instructions for their treatment. The following 25 treatises (totaling about 50% of the book) dealt with Materia Medica, the preparations and use of drugs, pills, ointments and plasters, and so on.

The 27th treatise was devoted to diet for both sick and healthy people and was arranged according to the diseases.

In the 28th treatise, al-Zahrawi discussed the improvement of medicines, the burning of mineral stones and the medical use thereof.

In the 29th treatise, he named the drugs in various languages and stabilization of drugs, as well as measures and weights.

The 30th treatise (surgery) is the first rational, complete and illustrated treatment of its subject. He declared that the purpose was to revive the art of surgery as taught by "the ancients".

The following instances merit special attention in this respect. He was the first to describe the tonsil guillotine and its use, the concealed knife and its case for opening abscesses, the trocar for paracentesis. He was the first to describe the scissors, the syringes, the lithotrite. He designed the vaginal speculum. The chapter on gynaecological instruments gives reason to believe that Abul Qasim anticipated Chamberlen's obstetric forceps. He used the animal gut as suture material, he described thrombophlebitis migraines. He described and illustrated the reducing table for extending limbs in order to reduce dislocations or displaced fracture ends and the formula for a kind of plaster casting anticipating the modern plaster cast.

His fame spread rapidly to Europe. Guy de Chauliac (the most celebrated surgeon of the age) ranked Abul Qasim with Hippocrates and Galen. Fabricius Ab Aquapendente (1533-1619) named three authors to whom he owed much of his knowledge: a Roman (Celsus), a Greek (Paulus Aegineta) and an Arab (Abul Qasim al-Zahrawi).

In the 15th century, Sabunju-Oghlu Sharal al-Din Ibn Ali al-Hajj Ilyas translated the book to Turkish.

Johannis Channing edited the book with a Latin translation called Albucasis de Churugia, Arabice et Latine (Oxford 1778). The footnotes show that Channing had an access to the manuscript at or from Aleppo (Syria).

The first translation of the "Surgery" into a modern language was Lucien Leclerc's French version (la Chirurgie d'Albucasis) (Paris 1861).

In 1908, a lithograph of a poor Arabic text with stylized figures of the instruments was published in Lucknow.

The reader of al-Tasrif cannot help but bow respectfully to the genius and the creative mind of Abul

Qasim. I found myself surprised to read the eye sections scattered in his book. I was surprised by his knowledge of anatomy, by his engineering ability, by his creativity to invent surgical instruments and techniques. In his chapter on cauterization of the eyelid to treat ptosis, he did not only exhibit an out-standing knowledge of the thickness of the lid skin, but also designed a cautery with a diameter equal to the diameter of the eyelid and another cautery for the forehead with a diameter equal to that of the orbital rim.[1] In another chapter, Abul Qasim suggested the burning with caustic (a mixture of soap and quicklime) of each weight of a drachm on the lid surface to create a scar which will in turn raise the lid upward, correct the entropion and prevent the lashes from irritating the eye.[2]

Al-Zahrawi in chapter 17 of Book 1[3] describes the hollow cautery (like an eagle quill) to cauterize the lacrimal fistula deep to the bone. If that failed to seal the fistula, he reiterated what was advocated by the ancient physicians, that is the use of molten lead through a very fine funnel and emphasized the importance of keeping the hand steady to prevent the molten lead from damaging the eye. If all failed, al-Zahrawi suggests (and for the first time) the creation of a channel between the lacrimal sac and the meatus of the nose and that proves(without any doubt) that Abul Qasim's knowledge of the anatomy is rather an out-standing one.

The genius and creative mind of al-Zahrawi did not come to a halt at the art of cauterization. The ophthalmic reader can easily discover that by reading his chapters on actual surgery, where he advised cutting the warts and cauterizing their bases to prevent recurrence[4] and the use of the lancet (المبضع النشل) to remove the hydatid and the use of the triple hooks to lift the hydatid without rupturing the membranes in addition to filling the space left by the hydatid with salt and water to prevent abscess formation.[5] In this chapter, Abul Qasim advised for the first time the use of fine scissors.

Al-Zahrawi's surgical approach for blepharoplasty is not too much different (in principle) from the approach we studied in the past few years and we are still practicing on a daily basis;[5] however, his technique of trimming the lid by two bamboo canes is not based on any scientific basis (as far as I am concerned).

In Chapter 12 of Book 2[6], Abul Qasim exhibited a tremendous knowledge of the physiopathology of the trichiasis and advocated the use of the needle and the loop to direct the abnormally grown cilium into a new course and to prevent it from irritating the eye. If the reason for the trichiasis is a scar in the tarsal conjunctiva, he advocates the excision of the scar and keeping the wound open after applying soothing ointments to allow the wound to heal gradually without recurrence of the scar.

Abul Qasim's :echnique to correct the entropoin of the lower lid[7] and the symblepharon[8] are not different from Fox's method[9] or Callahan's[10] respectively.

His classification of pterygium to nervous and non-nervous is pure clinical classification and a non--pathological one. The treatment, however, is basically the same as we use nowadays with the exception that he used the horse or ox hair to dissect the pterygium. Then he described an alternate technique by using the smooth tipped scalpel (المبضع الأملس)[11] and emphasized the importance of preventing corneal perforation to avoid iris prolapse. As far as the protuberance of flesh in the angle, al-Zahrawi advocated the use of the hook and scissors for the excision.[11]

Abul Qasim describes for the first time the use of the single or double hook to excise the pannus in conjunction with the scissors which he described for the first time. He also described here another instrument he called "scraping needle" (المهت) for the same purpose.[12]

Up till now, we reviewed the extraocular surgery described by Abul Qasim. His expertise and creativity also stands out in the intraocular surgery. His clinical observation in differentiating between the hypopyon (الكمنة) and the cataract (الماء النازل الساد) shows what a genius clinician he was. The technique he described to treat the hypopyon is summarized by making small cuts in the cornea inferiorly where the

pus accumulates by gravity and then applying a hypertonic salt and water solution to prevent the recurrence of the hypopyon.[13]

Al-Zahrawi's technique to couch the cataract does not differ from any other oculist of the age, although he mentions the hollow couching needle which was described and used by Ammar Ibn Ali al-Mawsili (المنتخب في علم العين).[14] Al-Zahrawi admits that he had no experience with this new instrument.[15] In his description of the management of staphyloma, he exhibits a rather unusually precise clinical observation by realizing the development of phthisis bulbi after evacuating the staphyloma from its contents (the vitreous).[16]

Few observations in Abul Qasim's book, al-Tasrif, make the researcher stop and think about the logic and rationale behind some of the techniques he described. Among these strange operations is the use of cautery to treat the cataract[17] and the use of the same operation to treat the chronic lacrimation.[18] Even more unusual an observation is his use of the urine of a boy before puberty to mix soap and the quicklime.[2] His technique by cutting the superfluous flesh in the eye and the chemosis is rather unusual and it may cause adhesions between the globe and the lids, in addition to the tendency for massive bleeding due to the hypervascularity in such a congested and inflamed area.[19]

The use of venesection (الفصادة)of the cephalic vein and applying a suction cup to the neck and a pressure bandage to the eye to treat exophthalmos is a rather strange technique, and we find it hard to understand the logic behind it.[20]

In his chapter on the treatment of chronic flux of hot tears into the eye[21] and on the treatment of tears and defluxion in the eye arising from within the head,[22] I personally could not see the connection between the physiological explanation and the logic of the treatment.

Despite the few irrational techniques, one cannot help bowing his head to salute Abul Qasim the physician - the surgeon - the obstetrician - and the oculist, for he had introduced to the art of medicine and surgery (in spite of the lack of technological resources) in the 10th century what is still useful until the present 20th century.

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19. Ibid., p. 57.
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21. Ibid., p. 185.
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CONTRIBUTION OF ABUL QASIM AL-ZAHRAWI IN THE MANAGEMENT OF FRACTURES

Dr. Quazi Mohd. Iqbal

MALAYSIA

It is often difficult to procure evidence upon which a definite answer to the numerous facets of progress of human advancement can be based. However, it is in general acceptance that advancement in knowledge is achieved through a process of continuous occurring of data from all available sources at different times. What is termed Islamic Medicine may be considered to be essentially an amalgam of philosophical theorems and numerous materia medica that had prevailed or were available in areas around the Mediterranean and the adjoining countries of Asia.

With the unparalled progress that accompanied Islam, the Arabs chose to develop their medical heritage based largely upon the accumulated data available within the Greek system of medicine. Islamic medicine did not grow wholly upon Arab soil nor were all great Islamic physicians Arabs. Islamic medicine is better considered as a cultural force which absorbed many different currents within itself and having integrated developed them.

The cultural Islamic respect for the dead is said to have dissuaded the Islamic physicians from undertaking dissection of the human body. Hence, it has been alleged that the anatomical knowledge, so essential to the art of surgical practice, was neither considerable nor original. Enmity, rivalries and prejudices have distorted the truth. The study of osteology by Abdel Latif el-Baghdadi (1161-1231) on a remarkably large number of human skeleton led him to write his book on 'Improved Anatomy'. Unfortunately, this is no longer available. By providing factual observations he concluded that Galen was wrong in many important aspects [5].

The object of this presentation is to give, in as concise a form as is compatible with clarity and accuracy, (and to summarise) the contributions of Abul Qasim al-Zahrawi in the management of fractures. His contributions to medicine in general must not be constrained by a too narrow interpretation of the title of this essay. Most physicians of the time occupied themselves with the science of medicine, or internal medicine as it is known today. There were also those who even considered the surgical art to be inferior and a separate branch of medicine. And orthopaedic was not yet separated from surgery [2]. Hence, with personal interest in orthopaedic and the sustained increase in fracture incidences it seems pertinent to recapitulate the contributions of Abul Qasim, a doyen among the Islamic physicians in fractures; and attempt to evaluate its relevence in the light of contemporary medicinal practice.

Abul Qasim Khalaf Ibn al-Abbas al-Zahrawi, known as Albucasis in Latin Europe, was a practicing physician in Cordova at the time of Caliph Abd-ar-Rahman III. He was born in al-Zahra in 936 and died in 1013. His great work, the Kitab-al-Tasrif in thirty parts dealing with surgery and medicine has become especially well known. A plethora of information is available in this well illustrated medico-surgical encyclopedia. The information presented in this article is acquired from this book taken from the chapter on Surgery and Instruments, Book 3 on Bone setting.

He defined a fracture as a separation or fragmentation of a bone. This may be a clean break without splintering, or along the bone, or with splinters or may involve a wound. Hence, among its clinical features he included, distortion, protrusion and palpable crepitus. In its absence, however, and if pain is not elicited on attempted movement of the affected bone he advised to suspect a crack in the bone, the greenstick fracture in current terminology. He mentioned that there were various types of fractures and well described the two most common clinical types namely the closed and the open fractures.

Bone healing, he believed, was due to the production of something like a glue around the fracture site, with a certain viscosity which helps it join and binds it so as to ensure a firm linkage. This is perhaps what he alluded to the formation of callus through its stages well before the discovery of the microscope. His observations that fractures in the mature and the old cannot mend into original condition on account of the dryness and hardness of the bones; though soft bones, like those of infants unite and heal readily is in consonance with the current understanding of osteoporosis in the aged and the exuberent remodelling ability in the young. His remarkable conclusion that cranial and extremity bones healed differently is in concurrence with our understanding of cartilagenous and membranous bone healing.

In his recommendations on the managements of fractures he advocated manipulative reduction with external immobilisation. If the bones were parted, he said, reduction was to be effected by traction, and counter-traction, using diligent manipulation in order to secure exact reposition of the bones and avoiding violent compression. His classical method of resetting a fractured coccyx was by exerting corrective pressure by a finger introduced through the rectum, a practice not un-commonly used today. In green-stick fractures he practiced immobilisation without manipulation. As to the method of immobilisation Abul Qasim suggested the use of either bandages, plasters or splints. Bandages were cut in different sizes to suit the size of the fractured part. It was used as slabs or applied circumfrentially exerting gentle and even pressure, often in two or three layers and extending beyond the level of the fracture site. Between the layers of the bandage enough soft tow or rags were inserted to help correct any curves of the fracture and mellow the pressure . The current Robert Jones bandage seem to simulate this very closely.

In order to make a plaster, when a stiffenning effect was required on the bandage the recommendation was to treat with mill dust, fine flour and egg albumen. Identical plasters were used in England and in the Napoleonic compaigns. It was to be replaced only by introduction of plaster of paris in 1877. As an alternative method combination of pulse, gum mastic, accacia, powdered clay with water and egg white was also being used. And, in his management of lower jaw fracture with binding of teeth using gold or silver wire or silk ligature in conjunction with external gum mastic plaster is a reminder to the modern management with interdental wiring and the Gunning splint.

Splints were made out of broad halves of cane, branches of palm, or pine wood. They were cut and shaped and made of a size that suited the fractured part. In practice, splints were helped by bandages with the greatest pressure over the fracture site and lessened pressure only from it. They were well padded with soft tow or carded wool to alleviate the pressure points. Other than the construction material there appears to be no substantial differences with the splints of today.

Being aware of the potential dangers of splinting a fractured extremity, he cautioned against: —

1. any loosening of the bandage as it indicated the subsidence of the swelling and the relative inefficacy of the immobilisation.
2. the presence of pain that signified an increase in the swelling of the extremity
3. appearence of swelling distal to the bandage as it suggested too tight a splintage, and
4. itching as this was due to skin intolerence to material used.

In all such cases he advocated immediate removal of bandage and resting the limb until the signs and symptoms abated. Re-application was done only when the safety of the limb was assured.

A remarkable feature in his immobilisation technique, was to defer it in fresh fractures complicated with gross swelling and adopt the practice of "DELAYED SPLINTAGE" only when the swelling had disappeared usually after a period of 5-7 days.

In accordance with the contemporary accepted surgical principles, he advocated that immobilisation

was to be continued until healing had taken place. In his experience, bones of the extremities healed as follows: —

> Scapula in 20 to 25 days, lower jaw in 21, the collar bone in 28 and humerus in 50 to 60 days. In the case of forearm bones, the average time for healing was 30 to 32 days, but in cases with isolated fracture of the ulna the healing tended to be a bit delayed. Almost 900 years later, Sarmiento-et-al in 1976 concluded "Solitary fracture of the ulna shaft has a reputation of non union". [3] London in 1967 stated "it is uniformly agreed that the ulna, although it is called the stationary bone of the forearm, is most likely to fail to heal following a fracture. Even an 'innocent looking' crack across the bone may end in non-union". These reflect the brilliance of the observations of Abul Qasim.

In the lower extremity, the femur took 50, the leg bones 30 and the pelvis 7 days to heal. He further clarified that such healing was influenced by the general constitution of the patient and the local conditions at the fracture site implying thereby the presence or absence of a compound wound.

For compound fractures seen early, he advocated prompt reduction of the protruding bone using moderate extension failing which it was his practice to effect instrumental reduction using his *BARRIMA* commonly known as bone levers. In the event, the extruded bone could not be levered back into its place, cutting of the excess bone with an osteotome was performed and the wound left open, packed with dressing soaked in wine. Splintage thereafter was done in a fashion so as to ensure a *WINDOW* at the site of the wound. If suppuration was to ensue, then it was advisable to place the limb in a position that would encourage gravitational drainage of the pus.

For neglected compounded fractures with established infection of the protruding bone only topical application of the wound was recommended as the bone usually sequestrated within 20 to 30 days. In the main, this is akin to modern day management.

In fracture treatment, the general well being of the patient was not to be overlooked. Nutritious diet in the form of fowl, mutton, trotters, eggs, fresh vegetables and fish with rice and porridge possessing high protein and vitamin C content with abundant restorative properties were prescribed. For the disuse atrophy of the limb, the treatment regime comprised passive massage, contract bath and application of pitch.

Complications of fractures were equally recognised. For post traumatic myositis ossificans limiting the range of motion in a joint when seen early, he advocated immobilisation until the callus had reduced or disappeared. In delayed cases with hard callus he practiced surgical excision.

For malunions he was reluctant to practice refracture and resetting of the bone as the results were generally poor. However, he conceded that if one is forced to undertake the correction of a malunion then perhaps *CHISELLING* (osteotomy) of the bone is likely to confer beneficial *COSMETIC* results.

These are the documentations of an Islamic physician about nine centuries ago. With strict scrutiny the revealing factors that emerge are that his definition, classification and concept of bone healing in days before x'ray and microscope are in general agreement with modern ideas. And, his management regime encompass the three cardial principles of reduction, immobilisation and rehabilitation. Therefore, I conclude that the enormity of the contributions of Abul Qasim in the management of long bone fractures is self-evident in his enunciations that has sustained the test of time for nine centuries.

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ABUL QASIM AL-ZAHRAWI THE MOST FAMOUS SURGEON OF THE MIDDLE EAST

Dr. Simon Hayek

SPAIN

The Arabs have contributed in an essential manner to the different fields of Science and Civilization. If we mention arithmetics and algebra a good example is al-Khawarizmi, in optics Ibn al-Haytham, in medicine al-Razi, Ibn Sina, Ibn Rushd and al-Zahrawi, in philosophy al-Kindi, al-Farabi and Ibn Tufail, and others from other fields of knowledge like al-Bairooni, al-Zarkali, Ibn Wafid al-Ghafiqi, al-Majriti, and so on.

We are here for a Convention on Islamic Medicine in the Middle Ages, and more precisely on a specific branch of Medicine: surgery, represented by the most famous surgeon of the Middle Ages, without any doubt, Abul Qasim al-Zahrawi.

Al-Zahrawi lived between the end of the Xth century A.C. and the beginning of the XIth., in the town of al-Zahra built by Abdel Rahman al-Nasser a few miles away from Cordoba, the Ommeyad capital of al-Andalus. He was the Physician of al-Hakam II, called al-Montassir, and lived during the reigns of Hisham al-Moayyed and Mansour Ibn Abou Amer and he probably died in 1013 A.C.

However, the question of the exact date of his death is not the main issue here as we are more interested in his great book, or more exactly his encyclopedia of medicine entitled, "Hints for those who are not able to invent".

This encyclopedia is made up of 30 books, the last one exclusively on surgery, as if he wanted to show the doctors or the ones who intended to practice medicine, that you first have to study all the branches of medicine very deeply before you are able to be a fairly good surgeon.

I have based my study on a manuscript of the Monastery of el-Escorial, about 50 Kilometers north of Madrid, the capital of Spain.

Here are some Chapters of said documents:

CHAPTER 1. - Treatment of liquid accumulation in babies' heads.

CHAPTER 2. - Section of two arteries located behind the ears and called الخمس

CHAPTER 3. - Extraction of temple arteries.

CHAPTER 4. - Treatment of continuous and constant lachrymal flow.

CHAPTER 6. - Treatment of what falls into the ear.

CHAPTER 7. - Treatment of ear obstruction.

CHAPTER 10. - Treatment of tearing of the upper eyelid.

CHAPTER 19. - Cauterization of a fistula in the mouth.

CHAPTER 20. - Cauterization of loose teeth and gums.

CHAPTER 22. - Cauterization of a scrofula due to phlegms and colds.

CHAPTER 25. - Cauterization of axillae.

CHAPTER 27. - Cauterization of cold liver.

CHAPTER 29. - Cauterization of convulsions.
(Convulsion and inflammation of the nerve)

CHAPTER 30. - Cauterization of the spleen.

CHAPTER 31. - Cauterization of Hydropsy.

CHAPTER 32. - Cauterization of legs and feet.

CHAPTER 33. - Cauterization diarrhea.

CHAPTER 34. - Cauterization of hemorrhoids.

CHAPTER 35. - Cauterization of warts after cutting them off.

CHAPTER 38. - Extraction of a leech appearing in the throat.

CHAPTER 39. - About opening and cutting tumors.

CHAPTER 40. - Cauterization of the hip.

CHAPTER 41. - Cauterization of the sciatica nerve.

CHAPTER 42. - Cauterization of back pains.

CHAPTER 43. - Cauterization of the starting burns.

CHAPTER 44. - Cauterization of the gout and the pain in the joints.

CHAPTER 45. - Cauterization of herniae.

CHAPTER 46. - Cauterization of Elephantiasis.

CHAPTER 47. - Cauterization of Anesthesia.

CHAPTER 48. - Cauterization of Leprosy.

CHAPTER 49. - Cauterization of Cancer.

In this chapter al-Zahrawi says:

When cancer is at its start and you want to stop it, you should cauterize it with a circular plate all around it. Some doctors say it should be deeply cauterized in the center, but I do not agree with this opinion. The correct procedure is to cauterize in a circle or to do it in small subsequent cauterizations all around.

CHAPTER 50. - Cauterization of colics.

CHAPTER 51. - Cauterization of gangrene.

CHAPTER 52. - Cauterization of ingrown corns and others.

CHAPTER 53. - Cauterization in cases of shivers.

CHAPTER 54. - Cauterization of pustules.

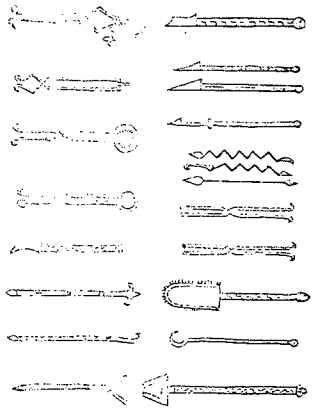
CHAPTER 55. - Cauterization of hemorrhage resulting from the sectioning of arteries.

Some people have criticized al-Zahrawi because he used cauterization too much . However , this is not correct as he followed the principle according to which: "the last remedy is cauterization". Thus he used it when all other means had failed to cure the patient.

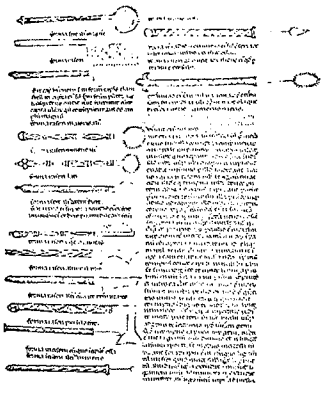
Let us now examine Section II of Book 30 of the medical encyclopedia of al-Zahrawi in which he describes incisions, puncturing, bloodletting and surgery.

CHAPTER 54. - Treatment of children born without a urinary orifice, or when the orifice is too narrow or misplaced.

CHAPTER 55. - About pimples appearing on the prepuce.



Instrumentos quirúrgicos de obstetricia a la izquierda, de oftalmología a la derecha) de los árabes, según Albucasis



Instrumentos de cirugía, de un manuscrito de Albucasis (siglo XIV)

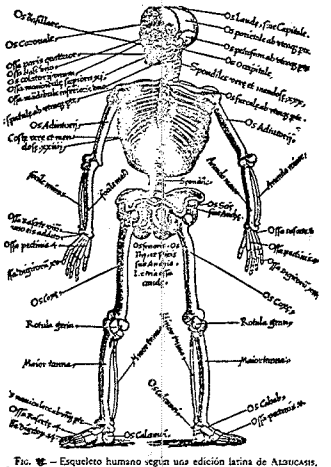
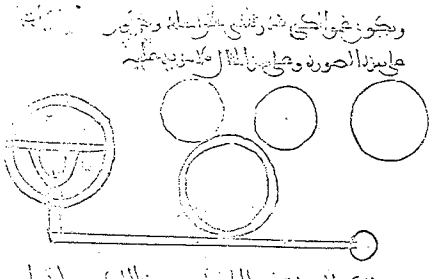
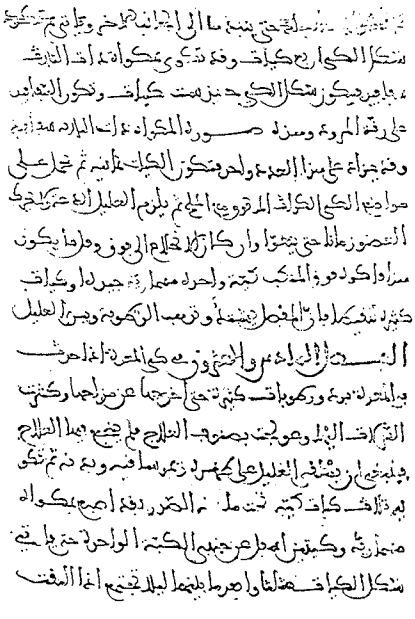


FIG. 8. – Esqueleto humano según una edición latina de Albucasis, Strassburg, 1532, con los nombres de los huesos según la nomenclatura latina medieval.





CHAPTER 56. - On boy's circumcision and errors derived from it.

CHAPTER 57. - Treatment of urine retention in the bladder.

CHAPTER 58. - Injection of the bladder and picture of adequate instruments for this purpose.

CHAPTER 59. - Extraction of gallstones.

CHAPTER 60. - Extraction of Gallstone in women.

He was the first one to dedicate a chapter to this matter, and it might be interesting to give a look to his exposition as he says:

Very few women have gallstones. In case one does she must be treated which is difficult for many reasons: one of them is that a woman would not show herself to a doctor if she is decent or depends on the honor of a doctor, the second is that she may be a virgin, the third one is that there is no woman expert in this matter available, especially in hand operation, and the fourth is that the incision for the gallstones in women is performed far from the place of the stones and is an indecent one which is dangerous; and if needed, it requires an expert woman physician, and this is difficult to find. So if you do not find her, get a decent and benevolent physician and let the woman be accompanied by a woman introduced in woman matters or in some way familiar with them, and instruct her to do everything she is told to find the gallstone first of all. And you should find out whether the woman is a virgin, in such case she should enter a finger in her buttocks and locate the stone. If she does, and presses it with her finger then, instruct her to cut on it. If she is not a virgin or is a widow, instruct the assistant to enter her finger in the patient's genitals and search for the stone after putting her left hand on the bladder squeezing it thoroughly. If she finds it she should push it away from the entrance of the bladder and let it go down until she locates it again at the origin of the thigh, and make a cut towards the middle of the vagina at the origin of the leg in any direction which is convenient or in which she has located the stone, without relieving the pressure of her finger under the stone. The cut should first be small and she should enter the instrument in this small incision, then if she finds the stone she should enlarge it to allow the stone to come out.

You should know that there are many kinds of stones: small and large, smooth and rough, long and round or problematic. Know all about the different kinds of them to find out how to treat them and in case you have trouble stopping a hemorrhage, powder the wound with sulphate and hold it for one hour until the flow has stopped, then go back to work until you extract the stone.

Provide yourself with the instruments mentioned for the extraction of stones in men and use them in your work. And if you have to face a hemorrhage and you deduce from the pulsation it is due to the cut of an artery, put powder on the wound and tie it with bandages and leave it, do not treat it, and leave the stone, do not extract it as the patient might die. Then heal the wound and if the blood flow diminishes after some days and the wound decays, get back to your work until you extract the stone, with God's will.

CHAPTER 82. - On the instruments used for the injection in the anal diseases, diarrhea and colics.

Different Surgeries: For a stone strike, sword or knife cut, arrow or lance wound on the head, neck, chest, abdomen or liver.

Hand Operation and Surgery: Al-Zahrawi says: Hand operation is not currently practiced and has almost disappeared, however we still have some simple drawings in the primitive books that became scattered and subject to errors and confusion which makes their meanings difficult to understand and lessens their utility.

He also says somewhere else: This art has disappeared as I do not find it useful at all and this is due to the fact that the art of medicine is lengthy and one should first practice anatomy as it was estab-

lished by Galen.

This is what al-Zahrawi says about the state of surgery in the Islamic world, or at least in his country, al-Andalus. In the Christian world we can say it was totally unexisting in the Xth. century A.C. and this activity did not start until XIVth century. This is when surgery encyclopedias appeared after the Western countries discovered the books of Galen, Hypocrate, Ibn Sina, al-Razi and other renowned doctors whose works were transmitted to them as we shall see.

Abul Qasim al-Zahrawi reached the West through translation made into Latin in Toledo by Gerardo de Cremona.

Gerardo was born in Cremona in the Italian region of Lombardia and was very fond of science in his childhood. He tried to find the book of Ptolemy "The Almagest" without success, and he was told he could find it in Toledo.

At that time, that is during the first half of the XIth. century, Toledo, in the heart of al-Andalus, had been conquered peacefully by al-Fonso VI, King of Castille, in 1085 and was the meeting point of the three revealed religions: Islam, Christianism and Judaism.

It also gathered a huge collection of scientific manuscripts brought from Cordoba after the destruction of Madina al-Zahra and the looting of the library of al-Hakam al-Muntessir that includes 400,000 volumes. A great portion of these volumes were taken to Toledo in the first half of the XIth. century.

Al-Fonso VI of Castille, after his conquest of Toledo, was not able to erase the Arabic traits of the city; the Arab language was still used for centuries after that and coins with Arab inscriptions were minted and used for trade between Christians and Muslims up to the XIVth. century and even after that.

As we said, Gerardo de Cremona arrived in Toledo in search of the "Almagest" and he found it and translated it into Latin with the help of some Arabists.

The translation from Arabic to Latin, which was the prevailing language at that time, was carried out as follows: The translators coming from Toledo knew Latin and not Arabic, while the Cordovans who were generally Arabs or hebrews spoke Arabic or the colloquial language (Roman) but not Latin. The latter would read the Arabic text in the colloquial language and the translators would put it in Latin. This is how most of the Greek books translated into Arabic and also the original Arabic books written by Arab philosophers, scientists and physicians were translated.

Gerardo de Cremona was not the only one to translate Arabic books into Latin. Many others came from all over Europe to translate the Arabic and Greek texts written in Arabic, into Latin because they were not able to reach the original Greek books directly, for reasons which are not within the scope of this work, and had to use Arabic as an intermediary language.

The translation from Greek to Latin directly did not take place until the second half of the XIIth. century. However, by that time, the original Arabic books and the Greek books translated into Arabic had already been put in Latin and had been of great profit to Occidental scientists.

This introduction was necessary to explain the way in which the Arabic culture was made available to the Occidental.

Let us now go back to Gerardo de Cremona. He was one of many translators who came to Toledo in search of science in the XIIth. century A.C. Gerardo de Cremona was astonished to see the amount of knowledge of all kinds gathered in Toledo, so he learned Arabic until he knew it thoroughly and was able to translate Arabic sciences without any help or just with some counselling when a matter was too difficult. This is how he translated over 60 books of all branches of science before he died in Toledo in 1187.

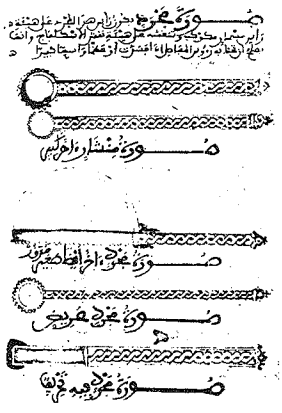
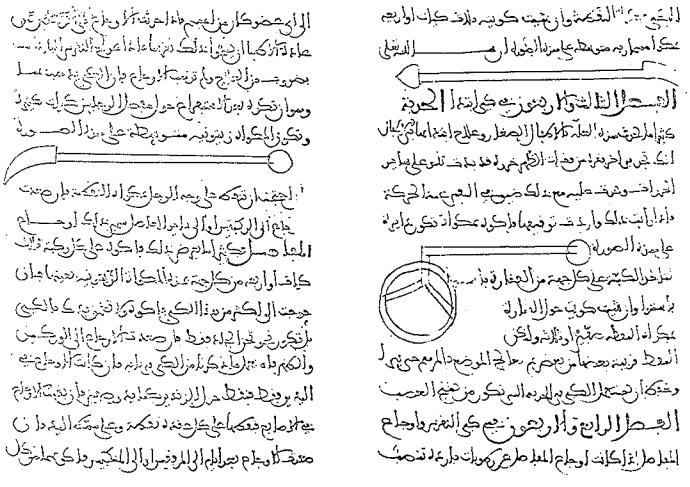


Fig. 55.—Reproducción de una página de una edición veneciana de Abulcasis, interesante porque representa los instrumentos quirúrgicos descriptos en el texto.

algo más tarde, por el toledano Abū al-Mutarrif 'Abd al-Raḥmān Ibn al-Wāfid al-Lakhmī (997 - c. 1074). Desde esta época, así en Occidente como en Oriente se multiplicaron las traducciones y ediciones de Dioskurides, muchas de las cuales magníficamente ilustradas.

De esta época quedó como un célebre cirujano el médico Abū al-Qāsim Halaf b. 'Abbās al-Zahrāwī, de Zahrā, cerca de Córdoba, el Abulcasis o Albucasis de los latinos. Se-

Fig. 56.—Cauterización de lesiones de la lepra; ilustración que se encuentra en un manuscrito turco, obsequiado al sultán Muḥammad II en 1465, y que deriva de una obra iraniana de hacia 1300, que a su vez contiene una traducción de *al-tasrīf*, de Abulcasis. El manuscrito se encuentra en la Bibliothèque Nationale de París.



One of the books he translated was "Hand Operation or Surgery" which is the 30th book of the medical encyclopedia of al-Zahrawi. The title of this book in Latin was: 'Liber Azaragui de Cirurgia' and it was printed for the first time in Venice in 1497 A.C.

In 1471 the 28th book of al-Zahrawi's encyclopedia, which is a treaty on the composition of drugs, was published in Venice. Its Latin title was: 'Liber Servidoris Sive Liber XXVIII Bulchasim Benabaceerin, Interprete Simone Januensi et Abraham Judeo'. This edition was translated into Spanish by Al-Fonso Rodriguez de Tudela and printed in Valladolid in 1516.

The theoretical section of al-Zahrawi's encyclopedia was published by Sigmund Grimm under the title: 'Liber Theoricae nec non Practicae Alsaharavii' and was printed in Augsburg in 1519.

The section on gynaecology was printed by Gaspar Wolf in Basel in 1566 under the title: 'De Gyanciis'. Another edition was also published in Basel 1541 and its title was: 'Abulcasis Methodus Mdendi cum Instrumentis ad Emres fere Morbo de Pictis'.

The last edition of the surgery treaty of Abul Qasim al-Zahrawi with a bilingual Arabic/Latin text appeared in London in 1178.

Aldo Mielli says it is difficult to translate title of the book and he thinks the best translation is the following: 'Concessio ei data qui componere haud valet'.

This book has also been partially translated from Latin to Provencal and then into hebrew and there is no full translation of either the text or the translation, only many partial editions.

Also the surgery section which is Book 30, was published as part of a book written by De Chauliao and printed in Venice in 1497 under the title: 'Chirurgia Parva'.

SURGERY IN THE WEST

Surgery started to develop in the West with a book written by Roger Salerno and entitled 'Practica Chirurgica'. This book was published at the end of the XIIth century, that is after the publication of the translation of 'Hand Operation' by Gerardo de Cremona.

In his book 'Science in the Middle Age'[2] Crombie says that Roger owes the Bysantine physicians more than he owes the Arab physicians. I do not know how accurate this opinion is as all the sciences, hellenic and others, reached the West through the Arabs, and Roger Salerno treated the diseases according to the Arabic way that is by means of ointments, powders, bandages, rags and straps, especially in cases of hemorrhage.

After that, in the beginning of the XIIIth century Rolando di Parma demonstrated great experience in the treatment of head wounds and skull fractures, and he advised the need of cleaning the hands before carrying out operations and warming the patient during the surgery.

Those physicians treated the ulcers according to Galen's instructions as they left the wound suppurate and then used grease and ointments to heal it. And this is what al-Zahrawi did 300 years before them.

Guy de Chauliac (1300-1367) was the first of a long series of French surgeons influenced by al-Zahrawi. He studied in Boulogne, France, taught in Montpellier and then joined the Pop's Court in Avignon. He wrote a book: 'La Pratique en Chirurgie' printed in Lyon in 1478. As for the original Latin version, it was printed in Venice in 1490 and had great influence on the subsequent surgeons as it advised to stop using insecticides and to return to the use of ointments oils and lints following in this way the steps of al-Zahrawi.

We can also mention an Italian surgeon: Guillermo di Saliceto who lived in the XIIIth century and

was the first to be influenced by al-Zahrawi in the treatment of a disease that affects babies and which is called Hydrocephalus. The Italian surgeon says the treatment consists of making a simple hole in the head by means of cauterization to extract the liquid.

Let us now find out what al-Zahrawi says about this disease which he calls; 'Concentration of liquid in babies' heads' in Chapter 1 of Book 30 of his encyclopedia.

Treatment of liquid accumulation in babies' heads.

This disease occurs frequently to babies at birth if the midwife presses violently on the child's head, or can also be caused by some unknown defect which I have never seen in anyone but babies and the ones I have seen affected by it died very promptly. So I stopped intervening in it. I have seen children with their heads full of liquid and growing every day in such way that they cannot sit up any more because of the size of their head, and the liquid keeps increasing until they die.

This humor may appear between the skin and the bone or under the bone on the brain. When the liquid is between skin and bone and the tumor is small you should make only one incision of about two knots in the middle of the head and transversally and let the liquid flow out. And this is the sharp end of the scalpel (picture).

When the accumulation of liquid and the tumor are larger, make two crossed incisions in this way. If the liquid is under the bone and this is shown by the fact that the skull sutures are open in all directions and the liquid diminishes if you press it with your hand, you should make three incisions in the center of the head in this way. After making the incisions extract all the liquid then fill the cuts with rags and cover them with ointments and oil until the fifth day. Then undo the bandage, heal the wounds with lints and ointments and put the head into place. The patient should be fed all kind of dry food low in moistness until head is cured with God's will.

Another characteristic of the incision is that you should locate the place of the liquid accumulation as it could either be more towards the back or the front or the right or left. Thus, you should direct the incision towards the place where the tumor has appeared, within possible reach, making sure no artery may be cut, as the patient could die from a hemorrhage taking place simultaneously with the flow of the liquid.

In the above mentioned book Crombie says the Middle Ages surgeons like Mondino de Luzzi (1275-1326), for example, gave very good descriptions of hernia operations. I haven't read the description of this surgeon but I don't think it al-Zahrawi's description of this kind of operations.

The Arab physician al-Zahrawi, in chapter 45 of Book 30 of his encyclopedia, entitled 'Cauterization of Hernias' says:

If an inguinal hernia appears and a portion of intestines or grease springs up towards the testicles, you should instruct the patient to stop eating immediately and to take laxatives to empty his intestines from excrements.

Let him lay down on his back and instruct him to hold himself until the hernia springs up. Then push it back with your finger and make a mark under it and on the pubic bone in the shape of a semi-circle with its ends heading towards the upper part of the body. Heat a cauterizing instrument with the same shape until it becomes white and sparkles and push the hernia in and let a servant put his hand on the place to prevent it from springing out and let the patient open his legs apart and put a cushion under him. Let another servant sit on his legs and another one sit on his chest and hold hands. Apply the cauterizing instrument on the pubis itself and hold it there until it reaches the bone and if it does not apply it again. While you are cauterizing prevent the intestines from springing out with your hand because if you burn it, it could cause the patient's death or an immense prejudice.

You should know that your work will not succeed unless you reach the bone. For the children use a milder and more adapted instrument, as well as in the case of adults you should use an adequate one.

After three days apply grease on the wound until the burning marks disappear, then treat it with ointments until it is cured. The patient should remain on his back forty days until the wound heals. He should eat laxative food during his convalescence to avoid a reproduction of the hernia when defecating.

If he wants to stand up after forty days, he should use a bandage for another forty days and avoid tiring himself, eating or drinking too much and screaming. If he follows these instructions he will be totally cured with God's will.

And al-Zahrawi says: I shall talk about the treatment of hernias with an incision in the corresponding chapter.

As for the hernia appearing in the rest of the abdomen, when it is at its start and you don't want it to become worse, cauterize it with a round instrument of an adequate size as it should burn only two thirds of it. Then treat it in the described way and it shall not increase with God's help.

This was al-Zahrawi only mentioned in three lines in Abi Usabiaa's book 'Prominent Comments on Doctors' Categories', while the Occidentals have dedicated lengthy comments to him and detailed explanations to his work, after translating it into Latin in the Middle Ages, and have followed his principles until the 17th century and even after that.

Credit to him was justly given.

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THE PHYSICIAN-SURGEON AL-ZAHRAWI AND THE NATURAL ORIGINS AND MANUFACTURE OF DRUGS

Prof. Dr. Sami Khalaf Hamarneh
and Mrs. Nazha Tawfiq Hamarneh.

U.S.A.

PART TWO: DISCUSSION AND EVALUATION OF THE 28th TREATISE

The book of al-Zahrawi *al-Tasrif Liman Ajiza an al-Ta'lif* was considered as a medico-pharmaceutical encyclopedia, and one of the greatest of its time. In spite of its popularity as a whole, however, historians of the healing arts did not give due credit to the twentyeighth treatise, nor the evaluation it deserves. This is, therefore, an attempt to discuss its content and remedial virtues, as relevant to manufacturing and therapy. Indeed the treatise, in three sections, discusses the three natural kingdoms of materia medica: minerals, vegetables and animals and their products. Because of lack of space, only high lights and important examples will be reviewed briefly, hoping for a more comprehensive study at a later date. It is sufficient now to state, the author's approach, methodology and procedures will be followed, beginning with examples on preparing, washing, roasting, burning and storing of some mineral products.[1] Quotations, and exposition, as well as free interline translations of the original texts will be done, in keeping up the meaning clear, but not necessarily verbose or redundant.

Litharge and the Lead Compounds: In the first section of the twenty-eighth treatise, we begin by considering the litharge and the procedures of its isolation, washing and the physical and chemical treatment. The fused, semi crystalline or amorphous lead monoxide = Pbo, is the result of incomplete fusing of the oxide (mainly orange-yellow in color) known in al-Andalus as the golden *(al-dhahabi).* If mixed with ointment it turns whitish, and if "silvery litharge", it turns dark black. For washing it white, "take the best, heavy and pure litharge, pound in a mortar and put in a new pot, cover with water and add a handful of wheat and barley. Transfer all into a fine, thin clean wollen rag, and lay inside near the edge of a casserole, and cook until the grains become tendor. Then lift all in a large vessel, throw away the grains, wash well, and repeatedly with strong rubbing. Take out and dry; transfer and grind into a mortar. Add hot water with continuing grinding, until the resulting powder smoothed out, dissolving in the water. Leave aside until clear, decant for a long while. At evening, repeat grinding, covering with hot water, and leave another while and decant. This is done for several days. Mix with manna and salt, cover with hot water again for the last time. Leave until it becomes white, and dries out as a powder."

For explanation, in fusing the lead by roasting the monoxide, it is thus converted into powder which is insoluble in water. By treating it with an organic matter, such as grains or sugar, it can easily dissolve. The resulting CO2, react to form the basic lead carbonate.

Galena, which is native lead sulphide = Pb S, is the principal ore of lead and it occurs in grayish black crystals. It can be prepared by using high temperature, heating in an oven or furnace with the lead.[2] Indeed galena is widely distributed as an ore in many lands and often mixed with zinc sulphide. It produces considerable amount of lead. When galena is roasted, the sulphide of lead converts into lead oxide in this manner:

$$2\ Pb\ S + 3\ O2 \longrightarrow 2\ Pb\ O2 + S\ O2 \quad \text{then}$$

$$Pb\ S + 2\ O2 \longrightarrow Pb\ S\ O\ 4$$

The roasted ore is then mixed with coke and limestone in a blasting furnace, for the purpose of melting the lead. The formula follows:

$$2\ Pb\ O + Pb\ S \longrightarrow 3\ Pb + S\ O2$$

Litharge is finally used in the reduction of silver, and in industry it is employed for making varnish and paints.[3]

Another lead salt that played an important part in the history of alchemy, pharmacy and industry is the white lead = the basic lead carbonate, 2 $PbCO_3$. Pb $(OH)_2$ a pigment also known as ceruse or cerussa. The author recommends the following: "place one or more wide-mouthed vats or cisterns, wider at top than at bottom, into a cell or dark shed undisturbed by wind, bringing on in it manure or goats dung. Place the manure up to about half way around the vats. Inside the vats put vinegar and dregs or lees. Over to the top add some fully riped white grapes, and tightly cover with rounded sack or pack-cloth or wool. At vat's top, pierce 20 to 30 holes through which strings are suspending to hold plates of lead tied to each, measuring about 6 inches long and one digit (or finger) thick. The plates suspends 3 digits above, then have another covering sack, shut tightly, and close the door real well for about ten days. Thereafter, open and take out the plates carefully to find them covered with black ceruse in color. Return the plates, leave for similar period until all the lead transformed. Put in another batch, and so on, all winter long. Early in spring, gather all the ceruse in a vessel or pot with water, wash and recant, again and again until all turn into white, clean precipitate. Then tablets can be molded by hand, or like a cone or kneaded over a marble top or slate, and dry completely in the sun, undisturbed by wind or dust until result in a very white, bright powder that rubs soft".[4]

When the ceruse is roasted or burnt and powdered, it is put in a deep saucepan or earthenware, heated by fire with continuing stirring, until the powder is completely burned. Take off, leave to cool and store.

To explain, lead acetate reacts with CO_2 produce soft powder of ceruse. In another method, lead salt such as carbonate, reacts with ammonium carbonate to form the ceruse. The procedure was known since Theophrastus (d. 285 B.C.), followed by Dioscorides and Pliny in the first century. Al-Zahrawi and others elaborated influencing the West again. Suspending lead plates in earthenware pots with vinegar, causing fermentation. Lead acetate turns into carbonate with the aid of organic matter, resulting into white powder of ceruse, also used in paint.

Similarly cadmia (Greek *Kadmeia* or calamine which is native zinc carbonate, the best being from Cyprus) can be burned in a furnace, while smoke clings to the walls and are collected. "It is, therefore, known as yellow tuttie. It is formed by burned copper (the scoria). It is known in al-Andalus".

To form red lead, which is lead peroxide, Pb_3O_4, or minium, al-Zahrawi recommends the following: 'take thin plates of lead within new casserole boiler (or earthenware cooking pot) and sprinkle with sulphur one plate after another, until full. Put on fire, burn with flames, stir with an iron handle, until ashes, take off and cool".[5]

Verdigris: A green or greenish blue pigment resulting from the action of acetic acid on copper is known as basic copper acetate, or oxyacetate [green blue needles or scales as $Cu(C_2H_3O_2)_2$, $Cu(OH)\ 2.5\ H_2O$]. In the same manner that cerusa is described above, the author recommends the procedure for verdigris. "Take one or more vats, the top being wider than the bottom, and put in a cell filled with dung. The plates are of red copper about $1\frac{1}{2}$ inches wide, and 6 in. long. Mix grapes with vinegar, and close the vat tight, for ten days", the plates are then taken out, scraped and return until all copper changes into verdigris. Start a new batch once again.[6]

For burning the verdigris, it is recommended that some powder is put into an earthenware on fire with constant stirring. The color changes into yellow. Take down and cool. Dioscorides describes it in the Fifth Book. Al-Zahrawi improved on it, then was carried on to the West and thus continued until the modern times. The acetous fermentation by CO_2, precipitate and scraped gently.[7]

Now we turn to trioxide arsenic, As_2O_3. The author recommends subliming, by grinding well

together with common salt, and putting in two retorts tightly closed and installed on fire for hours. "Sublimation takes place from the lower retort to the top one, take down and cool off". Collect the precipitate and fire again, until the upper retort fills the arsenic carbonate and turns into white powder. Burn in a vat, close tightly to roast over oven for five hours, changing into the red arsenic[8].

Mercuric Salts: "For calcination of mercury", the author recommends "that live, pure mercury free from lead be ground with vitriol, moisten with vinegar and continue to pound until all the mercury integrated. Transfer to the two retorts, close and heat over fire". When reaction is complete, take down and cool. Open the retorts to find the powder in the upper one. Repeat until calcinated that resulted into yellow mercuric oxide.

It can also be made from mercuric chloride with sodium hydroxide giving odorless, yellow-orange precipitate, which dissolves readily in acid. By fire, it turns to red mercuric oxide. In Islam, calomel was widely known and used as non-corrosive, mercurous chloride (Hg Cl) by treatment of mercurous sulphate and common salt.[9]

Cinnabur or vermillion was another mercuric salt known and found abundantly in al-Andalus, as red mercuric sulphide = Hg S. It is found pure in nature as an ore thus become a source for preparing mercury. "It is recommended to take one part of mercury and one part yellow sulphur put in a glazed vessel, close and place over fire, one-third full. Submerge in square-shaped oven and suspend so that two--thirds above the level". Heat gently for 12 hours, take down to cool. When the vessel is broken, vermilion is found.[10]

In relation to this, the author describes the lime, as a natural product found in abundance: in white marbles, egg shells, and shells or marine animals. "To wash lime, one first ground and pass it through sieve, transfer into a clean pot, cover it with water, leave for hours with occasional stirring. After set for a while and decant. Do seven times as such until well washed (calx, lime or quicklime)", with equal parts:

$Ca\ O + 2H_2\ O \longrightarrow Ca\ (OH)_2$ (greyish-white masses or soft, white powder, when exposed absorbes CO_2). Used also as precipitated chalk, which is calcium carbonate a remedial agent.[11]

The Caustic Medicine: A chemical recipe as "A caustic distillate", was recommended by the author, and known in Persian as *al-dik bardik,* meaning an earthenware or urn on top of another (boiler over boiler). Take yellow arsenic and mix with quicklime, verdigris, mercury and al-fali (or kili) one half a pound of each. Add one-fourth pound of sal ammoniac". Grind together with water till the Hg mix thoroughly. Dry and grind again, and put in a special distilling apparatus *(al-uthal).* Take a new urn with mouth up fitted on its top another and close firmly sealed. Put both over a furnace with the "caustic mixture in", heating for six hours. Distilling takes place and the powder collects in two urns. It seems possible that the resulting caustic "medicine" contains corrosive sublimate, and one or two inorganic acids.[12]

Section Two of Liber Servitor: In the second discourse of the 28th treatise of *al-Tasrif,* the author discusses the preparing, correcting and curing of natural substances and materia medica from the plant kingdom. Therefore, briefly here mention will be made for the extracting of juices such as aloes (*Aloe vera* Linn. and other species), absinthium (wormwood), fumitory, Lycium, galbanum, sarcocol and liquorice (roots of glycyrrhizae).[13] Described also, the methods of washing plant products such as acacia (gum arabic), whitening of vinegar, distilling of camphor for aromatic water, ameliorating colocynth with other gums, burning scammony, drying squill, extracting of fleawort, spurge, and opium from the poppy (air-dried milky exudation obtained by incising the unripe capsules of *Papaver somniferum* Linn.), mandrake (the *Mandragora officinarum* L.),[14] cardomom, and lily cooked with honey for medicinal purposes. Mention, likewise, is made of the distillation of sandal and other woods, whitening of olive oil, and extracting and using of liniments (anointing extracted oils).[15]

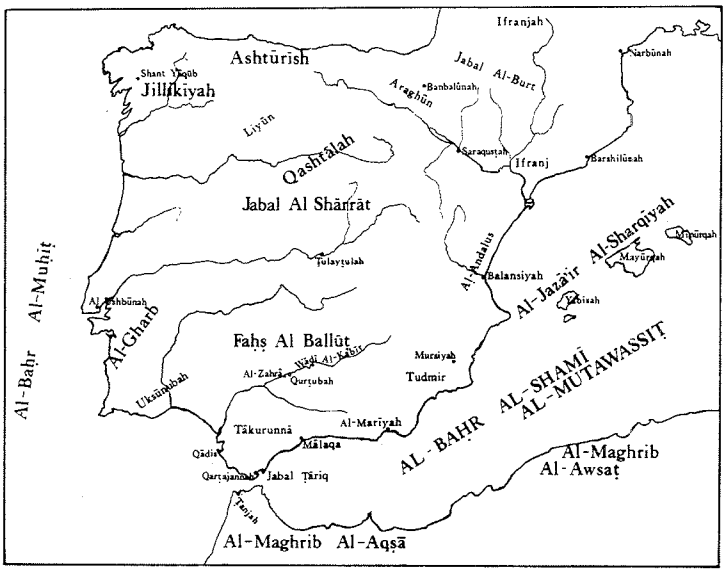

Figure 1:

Map of al-Andalus about 400 A.H. /1009 during the life time of the physician-Surgeon Abu'l-Qasim Khalaf Al-Zahrawi drawn by the Authors.

Figure 2:

Latin incunabula with title page showing part of the medical Encyclopedia, al-Tasrif. It depicts al-Zahrawi in a western garb as a book open before him discussing with the academitians around him

Figure 3:

The introductory page of the 28th treatise of al-Tasrif by al-Zahrawi, showing the titles of the three sections of which the treatise is consisting of; Courtesy of the Sulaymaneyi Umumi Kutuphan. Mud. Istanbul.

Figure 4:

A page from the 28th treatise of al-Tasrif by al-Zahrawi, on the extraction of juices of materia medica and their uses in therapy, Courtesy of the Suleymaniye Umumi Kutup. of Istanbul (Basir Agha ms. no. 502).

Figure 5:

A page from the 28th tratise of al-Tasrif by al-Zahrawi in which two kinds of molds used for the preparing of tablets; courtesy of Ali Emiri-Arabi ms. of the Suleymaniye Library in Istanbul, Turkey.

Figure 6:

A page from the 28th treatise of al-Tasrif by al-Zuhrawi, and depicting three strainers for filtering decoctions and other extracts; courtesy of the Suleymaniye Library of Istanbul.

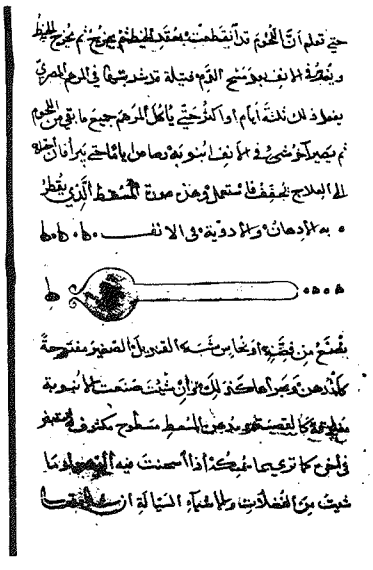

Figure 7:

A page from the 30th treatise of al-Tasrif by al-Zahrawi on surgery. It shows a droper in the nose for medical treatment.

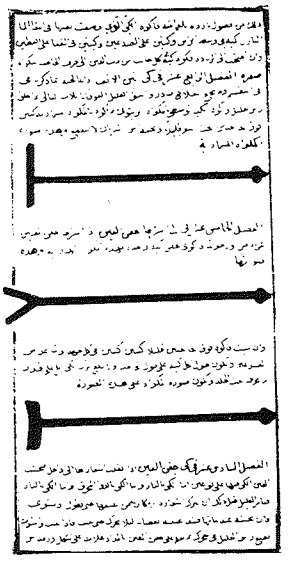

Figure 8:

Depictions of three cauteries in the 30th treatise of al-Tasrif by al-Zahrawi on surgery.

Figure 9:

A page in the 30th Treatise of Al-Tasrif by al-Zahrawi on Surgery. It depicts the obstetrical instrument devised by the author, for aiding in the parturition of infant delivery.

Figure 10:

Several instruments depicted in the 30th treatise of Al-Tasrif by al-Zahrawi on surgery. This was a translation in Latin began by the Italian scholar Gerard of Cremona and edited repeatedly in many presses in Western Europe especially in late 15th and early 16th centuries.

Aromated Water of Roses: In many parts of the Islamic world: in Pakistan, Iran, Iraq, Syria, Morocco and al-Andalus the manufacture of rose water was well known and practiced. It is mentioned in Greek writings as in Theophrastus and Dioscorides.[16] A modified and elaborated method is presented by al--Zahrawi in the following manner; giving other procedures and options. He suggested that in "a large room a cistern or water tank with plate, leaded cover be installed there. It has holes to allow passing of the distilled water leading through a row of 50 to 100 vessels. Outside the room, a large copper vat is placed full of water, and connected with a running stream. The fire oven under the cistern inside, connects with the tank beyond the wall where the smoke also keeps outside".

"Start the fire under the cistern for boiling, and immediately keep the water source running to cool the system. As soon as the water fills the cistern, it pours out through the holes to the outside, and into the distilling glass vessels."[17]

Molds for tablets (lozenges): It is very possible that al-Zahrawi's al-Tasrif refers to the first time in Islam, and indeed anywhere else that tablet molds are accurately described and beautifully illustrated. Here is the explanation. "Take a board or plate made of hard, smooth wood of suitable kind, or ebony, ivory or grindingstone about 2 inches thick, 9 in. long, and 1 1/2 in. wide. Cut horizontally in two halves, and engrave or curve on each side as many as needed or circles, in the right size and shape. On one or both sides, engrave the name desired super-imposed, so that once the tablets are made, the inscription reads properly." Technically, before the mold is closed, it is anointed so that it will not stick or disintegrate. [18] Indeed Arabic pharmacy in the variation of forms and preparations, as well as in the technology it perceived, influenced the professions for several centuries.

At the close of the second section, the author describes decoctions and the stainers. The depiction of the strainers is both useful and meticulous, and executed so clearly, possibly for the first time in pharmaceutical literature. He explains how three stains, one below the other in a row, are shown: The top is the smaller and lighter in texture, such as fibers of palm-trees and wool. The next is larger, and the third still larger, yet less porous. They suspend from a special support. The decoctions are poured in the first, to the second. If it was clogged by sediments or dregs, it will be returned and strained through seive or the like, to the third. When the liquid is clear, it pours to a receiver below. Syrups or honey may be added, to make the decoction more palatable.[19]

The Third (Last) Section: Only few substances from the animal kingdom are reported here, and the methods for their extracting, or preparing for use in medicine and therapy. The author refers to the burning of shells and horns; cloven, split or double hoofs egg shells, various bones, crab and lobsters, scorpions, snakes and hounds. He then describes the Spanish flies (cantharides) which are reddish in colour and which collected in early spring.[20] Al-though in this text reference is made to taking bloods of certain animals, and birds for dietetic values, yet it is interesting to realize, that the Muslims thought of the importance of the structure of blood, in regard to health and healing process as a whole. Several diseases were recommended for therapeutic uses, such as the extracting of bladder and kidney stones, and their importance in sanitation. In addition, other animal products are listed and explained: the extracting of gall bladders of many animals, brains of birds and vultures; the manners of preparing, washing, perfuming and storing of fats, suets and other greases; the tanning, and uses of leathers: purifying of honeys, and its mixing with syrups and other medicinal compounds: and the whitening process of wax. Many of such substances are mentioned by Dioscorides, although in a primitive way.

Finally, the author explains in detail the preparing of sal Ammoniac from the igneous, sedimentory and rubble-stones, scoria or conglomerates, especially in the porches of baths where manure and animal dungs found in plenty. It is recommended that conglomerates are first crushed, and powdered, put in a widemouthed vat, closed tightly covered by an earthenware, preferably glazed. "Make a hole in it at the bottom and seal the mouth of the vat tight. Build an oven in such a way that the vat suspend in the

middle of the oven, that is fire resistant. Then start the fire, and watch closely the hole in the bottom of the glazed earthenware. If the hole emits moisture, then the procedure and the operation is going well, for the hole is unclogged. After the emission of the moist, white sal ammoniac begin to ascend and distill. Thereupon close the hole tight, take away the fire, and leave to cool. Take off the covering plate, and the sal ammoniac will be found in layers covering the plate. Break the plate gently, and collect the sal ammoniac until the time of need".[21]

The author clearly explained the extracting of sal ammoniac, through personal experimentation. The resultant was ammonium chloride odorless, white powder, often in a semi-crystalline form. Al-Biruni suggested that the meaning of the word, "the gentle fire" which derived from its preparation. It is very important in the use of colouring the metals, as well as in dyeing, cleaning metal surfaces, in drug manufacturing, and as an excellent source of ammonia, and other industries. However, al-Zahrawi's method seemed to have continued almost unchanged, up to the late European Renaissance.[22]

This was a brief survey to identify and describe some of the procedures, technologies, and preparations of natural products required for pharmaceutical industries, as well as therapy and iatrochemistry. In this 28th treatise of *al-Tasrif,* originality and ingenuity had been shown. There was in addition personal observations based on experimentation, either by the author himself, or under his own supervision.

Here indeed for the first time in medico-pharmaceutical literature, we have illustrations and depictions of equipment, apparatus and instruments of real historical value. As competent physician--surgeon-pharmacist, the author's prestige and contributions could hardly be over exaggerated. He is worthy of high credit and compliment, as one of the greatest figures in the healing arts in Islam during the Middle Ages, as evident from his own writings.

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8. Trioxide arsenic had a continuous history from the Greek to late Middle Ages, together with the other salts: orpiment (which is arsenic trisulfide, As 2 S3) and the other pigment, realgar (Arabic *rahj al-ghar*), powder of the mine and from which the trioxide is produced. In Islam, these salts were important, to the work and manipulation of the alchemists. See DIOSCORIDES, *Materia Medica, Op. Cit,* p.642 and ROBERT P. MULTHAUF, *The Origin of Chemistry,* London, Oldbourne, 1966, pp. 21, 29, 106-10, 229-31.
9. *Ibid.,* pp. 227-8, through action of mercury the corrosive sublimate of calomel result as a precipitated powder, used as a white, tasteless insoluble powder as purgative.
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AL-ZAHRAWI (ABULCASIS) THE PHARMACIST☆

Dr. Mohd Zuhair Al-Baba

SYRIA

ABSTRACT.

The famous historian Ben Abi Ussaib'a has pointed out in his book that Khalaf Ben Abbas al--Zahrawi was a distinct physician and an expert of simple and compound drugs, well known for therapy and had very well known compilations best of which is his famous book "al-Tasrif".

This large book consists of thirty fascicles dealing with medical sciences. Since the last fascicle specialised in surgery, had been translated into Latin by Gerard of Cremona in the Twelfth Century A.C. and widespreaded in Europe under the name "al-Tasrif" or "LIBER SERVITORIS" . Thus when the name of al-Zahrawi is mentioned most Europeans remember him only as an Arab Surgeon, while he was well known in Orient as a physician expert of simple and compound drugs.

Al-Zahrawi had talked about anatomy, pathology and general surgery in three fascicles whereas to the remaining fascicles, they are all pharmaceutical topics concerned with simple and compound drugs in connection with their specifications, preparation, effect, conservation, durability, substitution, nomen--clature and measures.

These pharmaceutical fascicles, indeed, as a whole constitute an un-paralleled Pharmacopoeia in the history of Medicine of Andalusia.

This paper gives some important description about fascicle No.28. The first chapter is about the preparation of mineral drugs, the second about the preparation of vegetal drugs and the third about the preparation of animal drugs.

Thus this paper clearly describes that al-Zahrawi had dealt with a number of significant topics in al-Tasrif, the Encyclopedia in the field of pharmaceutics and chemistry more than ten centuries ago.

Finally we wonder whether we are entitled or not to call al-Zahrawi. " FATHER OF PHARMACISTS AND CHEMISTS OF ANDALUSIA"?

☆ As the English translation of the full text could not be made available, we are publishing here the abstract only.

Editors.

COMMENTATOR'S SPEECH

Dr. Maher Halawa

U.K.

I will start my comments by saying that the West knows the influence of al-Zahrawi and if we read the Annual of 'Royal College of Surgeons of England' of July 1981, we could know that there is an article regarding the surgical instruments. I remember one of my fellow surgeons, John Kerkup, who said that during the dark ages which followed the pre-historic and Greco-Roman, Islamic scholars kept alive the classical learning and added much new knowledge. In medicine, the work of Abul Qasim on surgery and instruments was the first rational, complete and illustrated. It is true that he has played an important role, but we got to mention also the efforts of those who preceded them, because the Egyptians, the Faraos and I mention here Edward Smith Papyrus, found it 1500 B.C., regarding the spinal cords and of course, the splinting of bones is known since the time of Hippocrates. So, al-Zahrawi, of course, played an important role, but the role of the others also should be acknowledged. What Sovaranto spoke about the fore-arm; this is known since the beginning of the 20th. century and it was previously said by Sir Robert Johns.

Now, we are speaking about Dr. Hamarneh, our teacher, who devoted his life to the study of the History of Medicine and studied each aspect of it. I can not possibly comment on them, but I am expressing the point of view of Dr. Simon Hayek about the translation of Liber Servitoris, 28 made by Simon al-Genewi and Ibrahim Yahudi. Now, where the treatise No. 28 was mentioned and it was never said that it was a translation of the whole book. I will make a very short comment, that it is true that Abul Qasim al-Zahrawi (our ancient professor) mentioned all the aspects of surgery in his comprehensive book and of course, I do not possibly pretend that I am a scientist myself, but he never spoke about anaesthesia. All we know is what Dr. Al-Jasser Mohammed Taha spoke about this particular field, which was mentioned in the Conference on Islamic Medicine History, in 1977.

GENERAL DISCUSSION

Dr. A.R. Hijazi

I would like to add a small observation, regarding the use of Arab Medical books all over Europe. For example, in Salerno, by the end of the 11th and the beginning of the 12th centuries, the medicine curriculum included 7 books, i.e., a medical student, to obtain his licence or to attain the title of Doctor, had to learn 7 books, among which we find 'de Agre de .....', which does not have an author, while the others were well-known books. If we look into it, we will find that the most part of it, is the translation of Razi and Avicenna (Ibn Sina) and there is a chapter written by al-Zahrawi on surgery and pharmacy. In Mount Pelliar, from the 13th century to 16th century, their curriculum included 16 books, out of which 13 books were concentrated on the Arab Physicians, among which we find the book of Abul Qasim al-Zahrawi and (Guy de Chauliac) was one of the well known surgeons in the Mount Pelliar, but she was a pioneer. We find at the de Nationale in Paris, the first 9 books acquired by the library, were witten by the Arab Physicians and 2 of which were written by al-Zahrawi, 'al-Tariaqa' and 'Anti de Parion'. Now these are my comments very briefly regarding al-Zahrawi What was said by Dr. Hamarneh, I will not be speaking about what he said regarding the translation of this book, because it is very wide-spread, but regarding the translation of the book 'Le Science le Claire', I promise him and we have started with this book that I will start translating the book, 'Le Science le Claire' on Arabic Medicine and I am wondering if Dr. Qutaya is ready to help me and if there are other colleagues also, who master the French language sufficiently, so, as to create a committee and a team to translate this very important book.

H.E. Dr. Hussein al-Gazeery (Chairman)

I thank the colleagues and I apologize to those colleagues, who asked to take the floor, but we have passed the time limit by more than 15 minutes and I hope that Arab Medicine, in general and al-Zahrawi in particular will gain all what they are ought to gain.

CHAPTER TWO

(Some Selected Papers — Not Presented)

1. A RECENT LOOK AND STUDY OF SOME PAPERS OF AL-ZAHRAWI'S BOOK "AL-TASRIF".
   Dr. M. Reda Awadain.
2. THE SURGICAL WORKS OF ABUL QASIM AL-ZAHRAWI.
   Dr. Ahmed Abdul Hai.
3. THE PHYSICIAN - SURGEON AL-ZAHRAWI AND THE NATURAL ORIGINS AND MANUFACTURE OF DRUGS. INTRODUCTION AND RELEVANT MANUSCRIPTS.
   Prof. Dr. Sami Khalaf Hamarneh, et al.

A RECENT LOOK AND STUDY OF SOME PAPERS OF AL-ZAHRAWI'S BOOK "AL-TASRIF"

Dr. M. Reda Awadain

EGYPT

INTRODUCTION

In this article we are going to present a short review on the story of evolution of the Arabic medicine. This will be followed by readings in few selected papers from al-Zahrawi's book "al-Tasrif" with some explanations and comments.

Medicine started to develop as early as man started to exist. It showed rapid progress with ancient Egyptians and Babylonians. Whereas the Egyptian medicine was based on experimental bases in most of its phases, the Babylonian medicine was dependent on magic and religious prayings.

> *WERE, NOT SOLOMON, BUT THE EVIL ONES, TEACHING MEN MAGIC, AND SUCH THINGS AS CAME DOWN AT BABYLON TO THE ANGELS HARUT AND MARUT*
>
> (Quran S 2: V 102)

In Greece they selected and quoted many of the Egyptian medicine. They reformed it in a philosophic form which is characteristic of their way of thinking Hippocrates dominated medicine in the Western world for many centuries. Hippocrates and his students gave rise to the "Four Humors Theory".

By the fourth century (B.C.) with the invasion of Egypt and Asia by Alexander of Macedon, the Greek civilization followed him and dominated the thinking in the East as far as India and other Eastern countries. Alexandria by that time had got an important position becoming the centre of all cultural and other activities.

Galen's work represents a synthesis of all Western medical knowledge, and as such it was to be the authority for many centuries. But his coherent philosophical system led him into a finalist interpretation of the human organism. Nature, or God, does nothing in vain; every organ is destined for a precise function, has a special use preordinated by God's supreme wisdom.

ARABIC-ISLAMIC MEDICINE

With the beginning of the Islamic civilization, when the Arabs started to get in contact with other people, the Arabs started to comprehend all available knowledge at that time. They got their information from the invaded countries as well from the Nestorian Christians who had been expelled from the Byzantine Empire.

Medical knowledge grew up at Gondi- Shapur in Khuzustan. Here the main works of Greek science were translated and elements of the Iranian tradition were also adopted, together with certain ideas from India. Moreover, the Caliphs of Baghdad ordered translations to be made of as many of the Greek scientific works as could be found, and built spacious hospitals in Baghdad at a time when nothing comparable existed in the West. Not content with imitations of the Greek authors, they often added clinical observations of their own to the medical treatises inherited from the Greeks. Their vast knowledge in chemistry and Botany has helped much in prescribing many medicaments. To the Arabs all owe the final systematization of the theory of the four temperaments (melancholy, sanguine, choleric, and phlegmatic) which profoundly influenced the Renaissance, and is by no means dead today. The medical knowledge of the Arabs was handed to posterity in encyclopedic compendia by Rhazes, Avicenna, Abulcasis and the great philosopher Averroes. In his De Pestilentia, Rhazes included one of the first descriptions of smallpox, which he carefully distinguished from measles. In Cairo in 1270 Ibn al-Nafis described pul-

monary circulation (lesser circulation) for the first time. Three centuries later Miguel Serveto made it known to the West in his Christianismi restitutio on 1553.

AL-ZAHRAWI AND HIS BOOK "AL-TASRIF"

Abul Qasim Ibn Kahalaf al-Zahrawi (Abulcasis) was one of the first, if not the first, genius Arabic surgeons and one of the most famous Arabic medical men; Rhazes, Avicenna and Abulcasis. He was born in Andalusia in 936 A.C. and died in 1013 A.C. He has many treatises, the most famous of which is the large book "al-Tasrif". This book remained as an important reference of the surgeons in the East and West for many centuries . This book has been referred to and was translated several times under various titles because of the difficulty in translating the original name. The most famous one is: "*Concessioet daraguicomponere head valet*".

This large book comprises thirty articles. The first one includes an introduction on the aim of writing the book, some of his personal experience of the fifty years of medical practice, some anatomical descriptions, few articles on what we call nowadays as Physiology, signs and causes of diseases, examination of urine and pulse and he concluded that article by stating that time is an important item in treating diseases after thorough contemplation and interrogation of the patient. And more important is strict observation of the patient, since many patients cannot express their troubles, even if he is of the highly intellectual group.

The second chapter of the book includes classifications of diseases, their signs and management from head down to the foot.

From the third chapter to the twenty fifth are descriptions of diets of some diseases and foods which should be avoided. About alcohol he says "..and of its complications, in general, especially for those who become addicted to it, are many chronic diseases as convulsions, melancholy, dementia, paralysis, tremors, general weakness of most of the nerves of the body, difficulties in articulation, weakness of voluntary movements, arthralgias, gout, etc.. disturbances of the liver which causes tumours and obstructions which is a definite cause of ascites and general ill health".

However, the last chapter of the book, is the most famous one. It is concerned with surgery. In its introduction he advices any one who wants to practice surgery that he must be acquainted with anatomy, physiology, writings of philosophers interested in that subject, together with continuous trial.

DESCRIPTION OF THE PAPERS FOUND IN THE LIBRARY OF AL-HARAM, EL-SHARIF, MECCA

These papers comprise four hundred papers of the (30 × 20cm), every page includes 23 lines; the average number of the words in the line is eight words. The pages are not numbered. It begins by introduction showing the advantages of medical sciences over other branches of science.

We have selected several paragraphs from the first chapter about some diseases of the nervous system because of its easy understanding by the readers and because of its similarity in many aspects to our recent views.

SELECTIONS FROM AL-ZAHRAWI'S BOOK "AL-TASRIF":

Apoplexy:

This usually presents in three forms; either strong and chronic which is non-curable, or mild which is curable, and this is rare, or very strong and rapidly fatal. It arises from either cold tenacious phlegm or humid tenacious blood. If the brain ventricles become full with any of these fluids, this humidity prevents the spirit from reaching the body. The patient lies down in deep sleep and he does not respond to pain. In the chronic and severe stroke the patient respires with difficulty and the respiration may be interrupted. However, the patient may be still alive. In mild strokes the respiration is easy and regular.

The signs of severe stroke is the absence of intellectual functions i.e. imagination, memory, sensation, paralysis of all the body, weak respiration and presence of froth in the mouth. The prodromata of the stroke are sudden severe headache, visual hallucinations, swollen face and neck, sense of rotation, coldness of the extremities, difficulty in movements, amnesia and mental apathy.

The signs of phlegmatic stroke are obesity, faint colour of the skin, senility, excessive mucoid sputum, slow motion, physical inactivity, and craving for eating cold foods.

The signs of sanguinous stroke include plethoric face, congested neck vessels, the patient's appearance as if he is chocked , and usually the patient is of the type which prefers highly nutrient foods, alcohols and thick syrups containing large amounts of sugar.

Treatment of phlegmatic stroke is to look to the general condition of the patient at first. If his general condition is good give him cathartics as hiera mixed with fat of colocynth or compound purgative pills. Also inject him (most probably rectal enema) with fluids made of centaurium and fat of colocynth, together with gurgling with any substance which helps excretion of sputum. Also give him sernutatories and try as much as possible to open his mouth to help him to vomit, then give the patient small amount (4.4g.) of theriacum mixed with anise water together with honey. The patient is given nutrients as chopped white meat with cinnamon and coconut oil. Also a warm plate is put near to his head to become more hot and his head is bandaged by a mixture of cotton, Myristica officinalis, mecer and cinnamon. After twenty-one days the patient is bathed with massage of all his body and he is encouraged to move if possible. If you find froth coming out from the patient's mouth it is better not to treat him. Similarly do not treat the apoplexy which occurs in young persons particularly if it occurs during the summer months.

As regards treatment of the sanguinous apoplexy if the patient is fit and he is much stuffed with blood, do venesection to him either from the cephalic veins or from the lower limbs. Restrict his food intake and put on his head oil of violet with vinegar. If this is sufficient continue on this treatment. Otherwise, give him rectal enemas and give him cold nutrients until he is cured.

Hemiplegias:

It is obstruction of the nerve pathways in which the spirit passes by tenacious phlegm. If the obstruction occurs on one side of the brain, this side becomes paralysed, either left or right, and the paralysis is called according to the paralysed side. If the obstruction is all over the brain apoplexy will result and all the body becomes paralysed.

Hemiplegia is of two types of origin; either from tenacious phlegm or due to trauma. The signs of hemiplegia caused by phlegm is complete flaccidity of the paralysed side together with other signs of apoplexy. The sign of traumatic cases is complete flaccidity of many limbs of the body if not all of them.

Treatment of phlegmatic cases is hot enemas to withdraw the phlegm downwards. Then give him cathartics mixed with strong aromatic decoction, to be repeated every four days if the patient could withstand. In the other days you give the patient anacardia paste (made of one weight "4.4g." of anacardia mixed with three ounces of anise water together with theriacum of sabin. On the whole these patients are treated as those with apoplexy.

Treatment of traumatic cases includes bandaging with castoreum bandage on the sites of trauma together with hot pastes.

Facial Paralysis:

It arises from either tenacious phlegm obstructing the apertures through which the nerve passes or due to spasm in that nerve. In the former condition the muscles of the face become flaccid and the face is deviated to the healthy side and the patient cannot close his eye on the paralysed side together with

inability of blowing the face of that side. In cases of spasm of the nerve the muscle is deviated to the diseased side.

The signs of paralytic cases are flaccidity of the paralysed side, difficulty in its movement, downward position of the lower eye lid and excessive salivation. In cases of spasm of the nerve the face is withdrawn towards the affected side and diminised salivation, and the patient is usually thin.

Treatment of phlegmatic facial paralysis is emesis and other lines of treatment which has been described in hemiplegia. The face is tied on the paralysed side by a bandage to prevent filling of the mouth and the patient is given gargles made of mustard, piper or pyrethrum. The patient is advised to masticate one piece of Myristica officinalis or of castoreum and is given any of the snuffs which has been mentioned before. His neck is greased with oil of castoreum or oil of cuphorbeum. Treatment of cases caused by spasm of the nerve is to grease the affected side with oil of norcissi together with other lines of treatment which have been metnioned in convulsions.

Convulsions:

It is drawing of one or many organs to their origin. If it occurs in the eye lids, closure of the eye will occur; if in the eye muscles, squint will result; in the seminal vessels insemination could occur; in the whole body, epilepsy will result. If it occurs involuntarily it is called tetany. It results from two causes either from excessive humidity or dryness. The signs of convulsions due to humidity is its sudden onset when the patient is indulged in overeating or alcohol or long recumbency in bed, physical inactivity or luxurious life. It occurs most commonly in those of humid temperament. The signs of convulsions due to excessive dryness is its gradual onset following exhaustion , excessive vomiting, diarrhoea, haematemesis or melaena or fevers.

Treatment of convulsions due to excess humidity is to give hiera together with hot oils, strong emesis and other lines of treating phlegmatic facial paralysis. Treatment of dry convulsions, but its treatment is difficult and its prognosis is very bad , is to bathe him with lukewarm water with greasing of his spine with warm oils as oil of narcissi, oil of chickens or sesame oil. His nutrition includes she-ass milk with almond oil, syrup of barley with sugar, tender meat, chopped white meat and all fatty foods. Dry or acidic foods should be avoided.

Tonic Spasms:

It is a type of convulsions and comprises three types; either in the nerve and the flexor muscles, in the nerve and the extensor muscles or in both. This latter type is which we mean in fact. The cause is either from inside the body or from outside. The former type arises from either excessive fullness or humidity, excessive emesis or dryness. That arising from outside the body is due to many causes; either trauma to the nerve, burning of the nerve., excessive fatigue or carrying heavy objects or excessive lying on hard ground.

Tonic spasms occuring due to excessive humidity are sudden in onset whereas those occurring due to dryness are of gradual onset. In those due to external causes, the cause is usually evident.

General features of tonic spasms:

Breathelessness, prolonged expiration, spasm of muscles of mastication, abnormal facial appearance, i.e. as if the patient is laughing with exposure of the teeth, flushed face, swollen eyes, retention of urine or incontinence of urine which may be associated with blood, retention of stools, severe pains which may prevent the patient from sleeping, tremors and may be convulsions. This disease occurs frequently in children. If the patient is above twenty years of age the hope of cure is minimal. If the convulsions are associated with fever the patient may be cured. But if tonic spasms and convulsions occur following a fever the patient is never cured and is mostly fatal.

Treatment of tonic spasms includes warm enemas and warm ointments, as those made of oil of rue together with castoreum, honey, gum (Assu fortida) and other nutrients as coconut oil, mustard and piper. Treatment of tonic spasm due to dryness is to grease his body with milk together with sesame oil, oil of violet and is given 4 ounces of she-ass milk daily with almond oil and sugar. He is put in a bath containing warm milk. The nutrition of the patient includes barley, sugar and almond oil. Also chopped white meat, made of tender meat and flesh, is given together with honey. Other lines of treatment are similar to that of convulsions.

Flaccidity:

This occurs due to disease affecting the nerves which emerge from the brain or the spine. It is either due to causes from inside or outside the body. The former one arises from four causes: overfilling and excessive humidity, excessive vomiting and dryness, an abscess emerging from any of the various humours. In case arising from outside the body there may be cutting of the nerve, trauma or laceration of the nerve. This type of flaccidity is difficult to treat. The manifestations of flaccidity of dryness is underweight and dry temperament. In cases of tumours it is usually palpable.

Treatment of the humid type is to give drugs which cause dryness together with cathartics or hot oils; otherwise cautery on the site of exit of the nerve or on the flaccid organ as will be mentioned in the chapter of surgery.

Treatment of the humid type is to give drugs which cause humidity. In cases due to abscesses no treatment could be given.

Diminished or absent power of smelling (Anosmia):

This is either congenital, and is uncurable or acquired. The acquired type results from either causes, inside the body or from outside. That from inside arises from dyscraisia of the four humors or obstruction in the cerebral ventricles similar to that occuring in apoplexy and hemiplegia. The obstruction arises from viscid chyme or gases or obstruction of the cribriform plate of the ethmoid bone (it simulates the strainer and is present on the uppermost part of the nose). The obstruction may be due to a fistula or a cancerous tumour or other similar tumours or swellings. Those due to causes from outside the body are either from contact with cold anaesthetic materials, fractures of the skull of trauma of the nose itself which damages the sense of smelling.

In congenital cases the eyes are congested and the patient does not smell from the beginning and this is worst type and no treatment is available. Some patients may smell certain substances only while he cannot smell the others. The manifestation of anosmia due to hot humours is severe inflamation in the front of the head, with fever and preference of cold substances. In cases due to thick humor there is difficulty in blowing of the nose with heaviness of the front of the head. In cases of obstruction of the cribriform bone there is absence of nasal discharge with nasal tone of speech and is usually difficult to treat. If the obstruction is in the nasal passages themselves there is difficulty in the flow of air from the nasal passages and you may meet the swelling itself if you put a probe in the nose. In cases due to contact with anaèsthetics the history is usually evident. In cases of fractures the cause is usually evident. If the trauma is associated with soft wound, it may be followed by fever and he may be delirious. In other traumas of the nose the cause is usually evident.

Treatment of cases due to thick humor is venesection from the cephalic veins if there is no contra-indication. Cathartics are also given as myrobalans and Cassia fistula it the predominant humor is the bile. Foments, made of camomile, violet and barley, are put on the head. The face is exposed to vapours of highly acidic venegar several times. The diet is preferably to be of the cold humidifying foods. In cases of cold humors we give cathartics as compound pills or by giving hiera and is given gurgles which withdraw the phlegm from the head as oxymel and marrubium. Headfoments, made of camomile, mar-

rubium, alum, worm seed, thymus serpyllum and oil of rue. Hot applications are also put on the head with hot substances such as hot salt and millot. Irritant snuffs are given such as sruthium and piper. Cauterization on the occiput and parietal eminences may be of value. Treatment of obstruction secondary to thick chyme is strong cathartics to clean the head together with other lines of treatment mentioned before appoplexy & hemiplegia. Also cauterization over the head is of marked value.

Treatment of obstruction of the cribriform bone is to clear head together with snuffing with nigella dissolved in oil after filling the patient's mouth with water. The patient should put his head as far backward as possible and he take a deep breath until he feels the drug inside his head. This is to be repeated for three consecutive days. Also the patient must snuff oil of violets or norcissi.

Treatment of obstruction secondary to tumours will be described in the chapters of tumours. Treatment of anosmia due to anaesthetic snuffs is sniffling by castoreum, musk, oil of rue, nigella or almond oil. Treatment of traumatic cases will be described in the chapters of traumas.

COMMENTS ON THE SELECTED PAPERS OF AL-ZAHRAWI's BOOK

In these selected papers from al-Zahrawi's book we notice the great influence of the "four humors theory" on all of his writings. He is not unique in that respect because this theory predominated the medical thinking for many centuries. He tried to ascribe all the causes of diseases according to the speculations of this theory. Consequently he tried to treat these diseases according to these presumed causes, such as diminishing the severity of the excess humor by venesection, emesis, cathartics, drugs or foods according to the case. If we exclude this obstacle in our evaluation of these articles, we are going to notice a great accuracy in describing the clinical signs of various diseases. Actually their clinical descriptions are very near to the recent classifications and observations. Also many anatomical findings havebeen referred to accurately, which may impress us that he may have dissected some parts of the body.

In the chapter dealing with apoplexy (he called it the major stroke or major hemiplegia), he classified it into three main forms; the first is the chronic and uncurable, the second is the curable one, and the third which is rapidly fatal. If we compare this classification with the recent thinking we would not find a great difference. Still we classify the cerebral strokes into three types: the chronic type of gradual onset which is usually due to a thrombus in any of the cerebral vessels or atherosclerosis, the curable type which may be due to spasm of any of the cerebral vessels due to either sudden rise of the blood pressure or small vessels thrombus which may be dislodged into a smaller vessel, and the last one is the fatal one which is usually due to cerebral haemorrhage.

Also we notice the accurate clinical description of some important clinical signs as the regularity of the respiration as an indication of the severity of the stroke, his definition of coma as that in which there is absence of the mental faculties i.e. imagination, thinking, memory together with absence of sensation and power of voluntary movement. He also described the prodromata of stroke as sudden severe headache, vertigo, visual hallucinations and presence of froth around the mouth (he considered the latter sign as bad prognostic sign). He also descriminated between simple hemiplegia and that associated with loss of consciousness.

He also described facial palsy, but unfortunately he was unable to discriminate between the sensory nerves of the face and the motor nerve. Nevertheless he described accurately the clinical signs of facial paralysis. He mentioned that the face is deviated towards the healthy side. He also discriminated between facial paralysis and facial spasm. In the latter type he mentioned that the face is deviated to the diseased side.

As regards his descriptions of various types of convulsions he differentiated between convulsions and other types of involuntary movements. He also differentiated between the various types of con-

vulsions and tonic spasms. In this latter type he described a case very similar to cases of tetanus and he referred to the important sign (risus sardonicus), which is an essential diagnostic sign of that disease.

Also he could diagnose causes of flaccid paralysis and ascribed them to cutting of the motor nerves what we call nowadays as lower motor neurone lesion. He also described several causes of interruption of the nerve function including the abscesses of the spine which is usually due to tuberculosis of the vertebral column and we call it Pott's disease of the spine.

In the last paragraph, on anosmia, we notice a very accurate and reasonable classification of the various causes, which closely simulate the recent thinking. He could differentiate between the congenital type of anosmia and acquired forms. He could also follow the olfactory pathway from the orbital surface of the frontal lobe down to its termination in the nasal mucosa. He also described the cribriform plate of the ethmoid bone in which the olfactory nerve fibres pass. This may show that he dissected this complicated part of the head. During his description of the method of putting nasal snuffs and other nasal medicaments he referred to the importance of positioning the head as backward as possible together with deep and strong inspiration until he feels the drug inside this head. This in accord with our recent understanding of the anatomical position of the nasal sinuses and our advice to patient on using nasal drops to adopt this position.

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THE SURGICAL WORKS OF ABUL QASIM AL-ZAHRAWI

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Years ago when some one complimented Newton on his scientific achievements he is reported to have said that if he appears tall it is because he stands over the shoulder of giants. Every field of human endeavour has had its share of these great men and modern surgery will ever remain indebted to its pioneers for all its spectacular advances and achievements of today. One such giant, who more than any one else was responsible for preserving the valuable Greek heritage, greatly enriching it by personal experiences before transmitting it to Europe, appeared on the scene nearly a thousand years ago in the form of Abul Qasim Khalaf ibn Abbas al-Zahrawi.

LIFE SKETCH

Al-Zahrawi was born in the city of Zahra, a little away from the Moorish center of Cordova. His forefathers are said to have migrated there from the holy city of Medina. The date of his birth has been the subject of some controversy but by and large is accepted to be 936A.D. We know next to nothing about his education, his surgical and medical training and his travels. He is said to have been the court physician and surgeon of the Caliphs of his time. Abd al-Rahman III and Hakam al-Mastansir though this too is not authenticated. Although there are reports that he lived to the ripe old age of 101 years, he most probably lived for 77 years and died in 1013A.D. (404A.H.). This date of his death has been mentioned by Leo Africans and is accepted by most authorities[1].

SURGICAL PHILOSOPHY

Though so little is known about al-Zahrawi's personal life one can get a fairly good idea of his surgical thinking and philosophy by glancing through 'al-Tasrif'. The charge that he was a mere copyist of the Greeks (particularly Paulus Aeginata) could not be more incorrect. It is true that al-Zahrawi has gained much from 'the ancients' whom he not only mentions with greatest respect and regard but also repeatedly asks his pupils to refer back to for enlightment. Yet al-Zahrawi is a practising surgeon and he not only described newer operations and surgical instruments and techniques but boldly differs from the Greeks where their theoritization is impractical and does not benefit the patient. While discussing the treatment of abnormal curvature of the spine he mentions "the ancients indulged in lengthy dissertation there on giving many kinds of treatment, the greater part of which is of no use". (book III, Ch.30).

Throughout his writings whenever any difficult operative step is being described, great stress has been laid on a thorough knowledge of anatomy, without which a surgeon (even today) is greatly handicapped. In his very introcuction to 'al-Tasrif' al-Zahrawi mentions, "he who is not skilled in anatomy..... is bound to fall into error that is destructive of life".

Al-Zahrawi personally is a safe surgeon who dislikes and discourages surgery which is rash and impractical even when it appears bold and flashy. "My sons..... show caution and care for yourself and gentleness and perseverence for your patients" (Introduction to al-Tasreef). He asks his pupils to take the "best road that leads to health and a happy outcome". Implying there by that if a disease can be cured by medicine alone or less troublesome procedures it is to be preferred. He cautions his pupils to be ready for eventualities "the more instruments the practitioner has ready by him the more rapidly he operates and the greater his reputation amongst them. So do not neglect to have ready by you a single one of these....." (Book II, Ch.77).

While discussing the treatment of malignancy he mentions that cancer should not be touched with knife unless it is in a part of the body from where it can be removed thoroughly and in its entirity e.g.

breast. The excision should be done with the utmost thoroughness so that "not the least root of it remains" and that surgery should be done in the early stage as late cases with extensive involvement are never cured.

A critical evaluation is essential for any scientific progress. If one is appreciative of his success he should be equally courageous to place on records an unbiased account of his failures. It goes to al--Zahrawi's credit that in an age when introceptive self criticism was not exactly the fashion of the day he boldly puts on record his mistakes and failures, be it the delay in amputating a gangrenous limb or failure of wound healing due to a left out sequestrum.

His deep conviction to proper medical ethics is ever apparent even in small maters. Whenever a female patient is being examined or operated a trained midwife is also available at hand. Although he does caution his pupils time to time from performing operations which will give them a bad name and loss of reputation, the basic thrust is to make surgery patient oriented. In his introduction to Book II he clearly mentions "do not embark upon anything unless you have a positive knowledge of giving the patient a good outcome". He further states, "Let caution be stronger than your greed and desire for gain".

Even a random reader of 'al-Tasreef' cannot fail to notice the author's deep conviction and positive belief in God. The message of "I treat and He cures" is evident in every page and as al-Zahrawi himself puts it "May God inspire you my sons with His guidance and grant that you hit the mark and succeed for success lies in his bands" (Introduction to Book II).

AL-TASREEF:

Al-Zahrawi's 'Kitab al-Tasreef liman ajiza an al-Taleef is today universally accepted as the first rational, complete and illustrated text book of Surgery, and has made for its author an immortal place in the surgical world. The book is a complete manual of the medical art dealing in all its branches. The major part of it (nearly 45%) in the Materia Medica While the rest deals with such deiverse subjects as anatomy, clinical medicine, human temperaments, diet in health and disease, naming and compounding of drugs and the like. It is only the last portion — the 30th Treatise which deals with surgery. What compelled al-Zahrawi to write his book is evident from his own words. The art of surgery is fading away and "the skilled practitioner of surgery is totally lacking in our land". The author also has before him the famous words of Hippocrates for whom he shows the greatest reverence. "Though many are doctors in name, few are in reality, particularly on the surgical side". (Introduction to 30th Treatise).

The 'al-Tasreef' which attained universal fame was first translated into Latin "Liber al-Saharavi de' Cirurgia" at Toledo by Gerard of Cremona in the 12th century. This version was printed from Venice in 1497 with numerous editions in the 16th century. The first, second and 28th treatises of al-Tasreef were translated into Hebrew in the 13th century while a Turkish translation by Sharf al Din Ibn ali al-Hajj Ilyas appeared in the 15th century which not only showed the instruments but also illustrated the patient and the operating surgeon. John Channing in 1778 brought out an Oxford edition while the French edition by Lecien Leclerc 'La Chirurgie d'Albucasis' appeared from Paris in 1861[2]. A lithographic Arabic edition with stylized figures appeared from Lucknow in 1908. An English edition with the original text, translation, drawings of instruments, foot notes and commentary was brought out by Spink & Lewis in 1973[3].

The surgical text is divided into three parts (books). Book I deals with cauterisation, Book II with general surgery including traumatology, obstetrics & gynaecology, urology, etc. and Book III on bone setting. Since its earlies days it has played a great role in shaping European surgery which is aptly borne out by the comments of famous surgeons like William de Saliceto (13th century), Guy de Chuliac (1300-1367), Fabricus Aquapendente (1533-1619) and many others. The Encyclopaedia Britannica (1980)[4] while attributing the earliest known description of haemophilia to al-Zahrawi mentions that his

text book — "stood for nearly 500 years as leading text book on surgery in Europe, preferred for its concise lucidity even to the works of the classic Greek authority Galen". Al-Zahrawi himself while commenting about 'al-Tasreef' mentions, "I have described for you in this book all that my knowledge has encompassed on the subject and that my experience has encountered. I have made it accessible for you and rescued it from the abyss of prolixity. I have made for you many drawings of the instruments that are used in it which is an adjuvant to explanation. And there is no power save in God the High, the Great". (Introduction to Book III).

CAUTERIZATION

Book I of 'al-Tasreef' is entirely devoted to cauterization, a procedure which besides a few exceptions appears to have no place in modern surgery today. As a matter of fact most people today sincerely doubt its efficacy except for its counter irritant effect. If at all this procedure did work modern science is at a complete loss to explain it.

Cauterization could be done by heat (where the tissue trauma was localised) or chemicals - caustics. Al-Zahrawi by and large prefers the former and also discusses the various factors to be taken into consideration. Depending on the disease, the temperament of the patient and the season, various metals can be used like bronze, iron and gold ("a noble metal"?). The shape of the cautery, the site of cauterization, the number of exposures are apparently important considerations. Many of the cauteries are taken from the Greeks but al-Zahrawi is independent of the ancients when he describes cauterization for hare-lip, entropion, pulmonary disease, anal and pre-anal fistula, dislocation of femur, caries spine and corns. Nearly twenty cauteries have been described for specific indications. The olivary cautery for a host of indications including headache, the bolt cautery for migraine, the punctate cautery for ptosis, the probe cautery for fistulae, the tube cautery for gingivitis, the pronged cautery for humeral dislocation, the ring cautery for sciatica, the quill cautery for corns and the like.

Starting from the head to the foot various types of cauterization have been mentioned for every conceiveable disease. As we can see it today only a small percentage of these cauterization are truely useful and they are the ones where a beneficial effect is had by the subsequent cicaterization. The sharp cutting cautery for a hare-lip, the cauterization of haemorrhoids, the crescentic cautery for ptosis of eye lids, the cauterization for enteropion, lacrimal and perianal fistule, are some examples of the beneficial and effective cauterization. The heated cautery for opening a liver abscess also seems to be a genuinely intelligent idea taking into account the available amenities of those days. The cautery as a means of controlling haemorrhage, is in principle, being used today by every surgeon in shape of the electro-surgical unit.

While on one hand the process of cauterization has been greatly maligned there are a few who have over praised it and even compared its effect to that of modern ionizing radiation. In a way it is truly baffling that procedures which were more or less universally accepted by Greeks, Romans and the Arabs, like venesection, cauterization, leech application and cupping not only find no place in the modern medical armamentorium but are looked down with contempt.

One is at times tempted to draw a parallel between cauterization and acupuncture - an ancient remedy which has staged a come back and is being labelled today as a metaphysical form of treatment perhaps to hide our ignorance.

ORIGINAL OPERATIONS AND INSTRUMENTS

There is no doubt that al-Zahrawi was greatly influenced not only by the Greeks but also by the other surgeons of the time including those from India to whom he was exposed directly or indirectly[5]. Islamic surgery which reached its peak during his days was the product of the greatest medical minds of

the time, from Persia, Iraq, Syria, Egypt and India who made their own marvellous contribution to it giving it a universal colour and establishing it from Cordova to Delhi[6]. Spink & Lewis and other scholars[8] who have made a comparative study have attributed a large number of instruments and original operations to al-Zahrawi. The fine pointed scalpel to cut up a swollen foreign body in the ear, eye speculum, fine conjunctival hooks and "Ophthalmic" scissors (Miqass) resparatory for lacrymal fistulae, fine couching needles (Miqdah), scrapers for teeth (Mizrad), forceps (Kalalib) for removal of broken off roots of teeth and mandibular segments , fine chisels (Minqar) and files (Mibrad) for sawing down supernumery teeth, the wiring of teeth and the use of ox bone for artificial teeth are just some examples. The operative removal of a ranula and the use of a tonsil guillotine and mouth gag, in a tonsillectomy are original discoveries of al-Zahrawi.

The doyen of Modern American surgery, Halstead[9] credits al-Zahrawi for performing the first successful thyroidectomy in 952A.D. He also states that "the extirpation of the thyroid gland for goitre typifies, perhaps better than any operation, the supreme triumph of the surgeon's art" - which is indeed a very great attribute.

In the genito urinary side also al-Zahrawi has many originals to his credit. S-shaped catheters had been described by the Greeks but Zahrawi's catheters which are more straight, "selender, smooth and hollow like a birds quill" with a small funnel at the proximal end are certainly an improvement. He also describes a probe for locating a calculus in the female urinary bladder. The first use of a syringe (Mihqan) for bladder irrigation in the cases of cystitis with haematuria and pyuria is credited to him. Although the Greeks were familiar with the piston and the cylinder, they did not use it for surgical ends and the credit for it goes to the Arabs. Al-Zahrawi not only describes forceps for suprapubic cystolithotomy, but advises that unusually large stones may be crushed by them and the fragments then easily delivered - thus foreseeing the modern lithotrite. For impacted stones in the urethra he describes a fine steel drill which can pierce and fragment it, the particles being then flushed out during micturition.

The large number of obstetrical and gynaecological instruments described in the later part of Book II including the modified vaginal speculum, hooks, cephalotribe and obstetrical forceps for extracting an impacted dead foetus bear ample testimony to his originality.

Al-Zahrawi also excells in the field of traumatology and war surgery and his description of wounds of the neck, tracheal injuries, pleural, pulmonary and intestinal trauma with its subsequent grave progress are a classic.

The field of gastrointestinal surgery has equally benefited from his rich experience. He notes for instance that colonic wounds healed more quickly than wounds of ilium, and that jejunal injuries are unlikely to heal at all and usually have a fatal outcome. He mentions about primary intestinal sutures for which cotton, silk and ant heads can be employed. The Arab surgeons were the first to use absorbable catgut sutures and according to Harrison[10] the credit for this goes to al-Zahrawi himself.

The problem of controling haemorrhage and the factors which delay wound healing are also beautifully discussed alongwith the pathogenesis of chronic osteomylitis. He is reported to be the first scientist to describe the rare entity of thrombophlebitis migraines.

Although plaster of Paris was actually discovered much later al-Zahrawi has in mind a similar firm support which he mentions in the early part of Book III. He clearly mentions the neurolcgical deficits following a spinal injury and its poor prognosis, besides discussing individual fractures and dislocations of bones and their treatment including the use of reducing tables.

CRITICISMS AND QUERIES

Today one can criticise al-Zahrawi for a lot of things. His insistence of suppuration as a part of

natural healing, his advice of prolonged immobilization after operative procedures, the repeated stress on venesection and purgatives, and the apparent lack of stress on physiotherapy after orthopaedic trauma are just some examples. His instruments certainly lack 'sophistication and some of the diagrams and descriptions leave a little too much to imagination. But will we be justified if we judge al-Zahrawi's surgery of nearly a thousand years from now on the modern surgical scale of today. Every field of human thinking has seen marked changes and gross upheavals and this perhaps is most marked in the field of medicine and surgery. If one views al-Zahrawi's surgery with this pertinent fact in mind one is able to detect in it, even today, a freshness which a span of a thousand years has not been able to dampen.

A lot of questions still remain unanswered. One is hesitant to believe that such major surgical procedures as described in 'al-Tasreef' could be done with-out employing some form of analgesia or anaesthesia. Unfortunately the surgical chapters of 'al-Tasreef' are entirely silent on this issue and this is a field worth investigating.

Another haunting question is the sudden decline of Islamic surgery. For that matter the entire scientific thrust of the Arabs and the Islamic world which was so energetic and buoyant till the 13th century and which was in the words of Hitti[11] was the main inspiration for the European Renaissance; why did it suddenly go so limp? This decline and fall of Islamic surgery certainly needs a more thorough and detailed analysis.

CONCLUSION

The Encyclopaedia Britannica has called Abul Qasim al-Zahrawi as Islam's greatest medieval surgeon whose teachings shaped European Surgery for nearly 500 years. I will conclude by saying, that be it the field of neurology or transplant surgery, ophthalmology or gastroentrology every speciality of modern surgery today, reflects his great and universal heritage to mankind.

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THE PHYSICIAN - SURGEON AL-ZAHRAWI AND THE NATURAL ORIGINS AND MANUFACTURE OF DRUGS

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U.S.A.

PART ONE: INTRODUCTION AND RELEVANT MANUSCRIPTS

INTRODUCTION:

The only known book published by the physician - pharmacist - surgeon Abul Qasim Khalaf b. (for Ibn) Abbas al-Zahrawi (ca. 328-404/ca936-1013) is his praiseworthy medical encyclopedia, *al-Tasrif Liman 'Ajiza An Al-Taalif.* It was completed shortly before 400/1009, at his home town al-Zahra, the renowned capital of Caliph ᶜAbd al-Rahman al-Nasir and his immediate successors. It was called the Versaille of the Umayyads in al-Andalus. Here al-Zahrawi died during the fall and destruction of the city under the Berbers attack.[1].

The *al-Tasrif* comprised 30 treatise that encompassed the entire medical, dental and pharmaceutical fields then known. Some of the well-known manuscripts of the book include statements by copyists and, assuming accuracy in their labors possibly by the author himself, indicate that the entire encyclopedia can be classified under seven parts or subdivisions. No doubt that, as far as the last subdivision was concerned which comprises the thirtieth treatise on surgery, most historians of the healing arts consider it as being the most important of them all. In its three sections *(babs)* including about 190 chapters *(fasls),* it covers the advantages and disadvantages of cautery and their tools, treatment of the wounds, venesection, cupping, withdrawal of arrows from the injured body, and various kinds of needles and threads for stitching wounds; simple and compound fractures, luxation and bone setting. It also includes about 150 depictions and drawings of tools, surgical instruments, droppers and syringes; descriptions of medico-pharmaceutical technology, and detailed operation of lithotomy. Other figures and procedures deal with dental tools and oral hygiene, as well as dental archies to bind loose teeth, and surgical operations that were clearly recorded for the first time in historical literature. Here, for example, are few original contributions listed by the author: Interdiction of amputations above the knee, and the elbow due to a dangerous situation; clear description of hemophilia; spinal paralysis caused by injury to the medulla or the spinal cord; cranioclastic delivery of a dead fetus; and a clear-cut illustrated description of the so--called "Walcher Position" in obstetrics, involving parturition aided by instruments. [2]

The other six parts, however, also deserve careful attention and investigation.

Part One: incorporates the first two treatises of *al-Tasrif* with meaningful introduction that explains approaches, manners of discussions, and methodology. It shows that for the last four or five decades, the author has been actively engaged in the practice, and teaching of health fields with distinction. His book, as a result of these years of labor, became a standard comprehensive compendium. It was therefore intended to be sufficient in all aspects as far as the daily function and practice of the healing arts are concerned. The reader will "find in it all what he needs, so that he requires to consult none other". He further discusses the features of general medicine; the natural matters as pertaining to body's constitution, and condition; anatomy and physiology; classification of drugs and diseases; clinical medicine, pathology, and the diagnosis and symptoms of diseases, and their treatment; the preservation of health, especially for the children and the senior citizens. He finally elaborated on fevers as symptoms and as diseases, as the case might be. [3]

Part Two: Treatises three to nine inclusive, on the aged fermented pasty-type confection; theriacs;

bitter and sweet-tasting aromatic laxatives, and pills; nauseating and emetic drugs; use of enemas; uses of pessaries and suppositories, and their pharmacological virtues; and recipes of cordial remedies. [4]

Part Three: Treatises ten to eighteen on cathartic nuts; electuaries; aphrodisiacs and geriatrics; fattening and anti-obesity, and galactagogue drugs; ordinary syrups with or without vinegar, and robs; strong and purgative aromatic juices,decoctions, and infusions; sternutatories, inhalers, gargles and medicinal dusting powders, for the treatment of wounds.

Part Four: Treatises nineteen to twenty-five on cosmetics, richly spiced perfumery, toiletories, hair dressing, and delicacy and charmer adornments; eye salves (pulverized as in *kohl,* and in liquid form for drops), collyria and eye compresses; unguentum, unctions, embrocations, balms and liniments; dentifrices; prophylactic and preventive medical remedies; and mouth and gum drugs. It also describes various tumors, lumps and swellings, expectorants and dressings; and the cases of wasting disease, consumption, and phthisis. [6]

Part Five: Treatises twenty-six and twenty-seven on therapy, and the porperties of diets and drugs, and their reparation; restoration, amelioration, and cooking procedures; identifying of cereals, breads, wines, waters, soft drinks, legumes, meats, fishes, and wools; and the suitability of clothing and outfitting of raiments, and colors. [7]

Part Six: concludes with the twenty-ninth treatise on the aging of drugs; medico - pharmaceutical nomenclature, and technology; and weights and measures. However, the little recognized twenty-eighth treatise is the one that holds our attention now, and is the focus of the investigation in this paper. It deserves much credit because of its original and practical application, and authenticity. It is primarily devoted to the preparation, rectification, restoration and corrections of many materia medica simples and compounds, which are derived from the three natural kingdoms: mineral, vegetable and animal, and their restitutional and recovery processes. Nevertheless, due to the lack of time and space, this study must be brief, only highlighted with concise deliberation, and examples. The collected data and information are based on eleven original Arabic manuscripts on microfilm, gathered here from many countries and are evaluated and collated for the first time. [8]

The Manuscripts: Here are the list of the copies (on microfilm), arranged in the following sequence:

1. 'Ali Emiri-Arabi no.2854, housed at the "Suleymaniye Ümümi Kütüphanesi of Istanbul, Turkey. It is written in delicate, clear Naskh in 138 fols. (for folios), 31 lines p.p. (per page), $17^1/_2 \times 28$cm. in size, copied by Ahmad b. Mustafa in the late 17th century. It contains the last three treatises of *al-Tasrif* (28--30), with elegant pictures of the tablet molds, and the filtering funnels. It also describes some 150 depictions showing cauteries, surgical instruments, and the techniques and operations performed on wounds, abscesses, bone setting, splints and bandages; cleaning and extracting of teeth; as well as obstetrical tools. [9]

2. Bankipore ms. no 16, housed at the Khuda Bakhsh oriental Library in Patna, India, inscribed in Maghribi script but poorly kept and some pages are missing. It incorporates 27 treatises (1-27) in 494 fols., 35 lines p.p., and dated 1121/1710. Bankipore ms. no 17 (the register general library no. is 2146) housed at the same above library, however, contains only the last (30th) of *al-Tasrif* on surgery. The three sections are fully represented with the tools, surgical equipment, and the instrumentations drawn in elegant Naskh script and colors. This excellent copy, dated 584/1188, is so far as we know the earliest portion of *al-Tasrif* acknowledged any where and one of the finest, in 248 fols., 16 lines p.p. 14 × 19 cm. in size. [10]

3. Besir Agha ms. no. 503, housed at the Süleymaniye Üm, Küt. of Istanbul. Apparently, it seems to be the most complete known manuscript of *al-Tasrif* as a whole, despite some missing paragraphs and certain illustrations. In this respect it is inferior to the Rabat ms. no 134 (to be described later under

number 6) which is beautifully inscribed, illustrated and adorned with decorative title pages. Bes.Ag.502, however, is written in elegant Farisi Naskh in small characters, and similarly in well preserved condition; in 570 fols., in framed text, 33 lines p.p. and dated 902/1496.

4. Besir Agha ms. no 503, at the above library, also contains all the treatises of *al-Tasrif,* with parts or pages missing; inscribed in elegant, clear large Naskh, date 1115/1703 by copyist al-Faqih ᶜUbays (or Isa), in 736 fols., 33 lines p.p. [11]

5. Hasan Husni ms. no. 1361, of Ayyub, Egypt, in two volumes incorporating 29 treatises, only the last on surgery is missing. The first volume contains treatises one to fourteen, in 488 fols., 29lines p.p., and 24 × 36cm. in size, inscribed in elegant Taᶜliq, by copyist Muhammad al-Qaysari, dated 1093/1682; with detailed index of table of contents, similar to many other mss. In the introduction, the writer praises the healing arts as being the foremost after theology, and the knowledge of the Quran by recognizing that it is only second to that of medicine (ᶜilm al-fiqh li'l-adyan wa ᶜilm al-tibb li'l-abdan). Indeed the copyist, and possibly the author himself, gives priority only to the religious matters and its traditional exercising and faith as being the duty of all believers, ordered by Allah. Next to that, attention must be paid to the healing arts as second in order, and which are useful both for this life and the hereafter.

In *al-Tasrif,* the author reiterated that his work is intended to teach, exclusively, those who are interested in sanitary fields among his pupils, whom he addressed as his children. He confessed, with medieval modesty, that his book is most useful and all-embracing as its title denotes, *al-Tasrif.* It is sufficient for all occasions. Unlike others before it, handy to the practicing physician and available to consult at all times and in all matters.

The second volume contains treatises 15-29, in 455 fols., 29 lines p.p., 24 × 36cm. in size and by the same copyist as vol. one and most probably copied shortly thereafter. [12]

6. Rabat ms. no 134, housed at the Royal Library of Morocco, incorporating the total of *al-Tasrif's* entire book in six volumes. The previous owner was the Library of Bab al-ᶜAmmurah from where it was brought. The title pages, as well as the table of contents listings in each volume are executed in multi--colored decorative designs and calligraphy in elegant, vowelized Maghribi inscriptions and ornamentations in black, blue, red and green inks, in 19 lines p.p., $17^{1}/_{4} \times 22^{1}/_{2}$ cm. in size, copied by ᶜAbd al-Qadir b. Muhammad b. Idris al-ᶜAmmuri (or al-ᶜAmmurwi) al-Buwaijhawi known as Ibn al-Muqaddam, under the order of Sultan Mawlana al-Husayn al-Mansuri of Morocco, on the first of Muharram 1307 /1889.

7. Rabat ms. no.673, housed at the above Library, containing two parts of the subdivisions of *al--Tasrif.* It is in poor condition of preservation, with some pages missing. It is interesting that treatise 28th, like that of ᶜAli Emiri-Arabi mentioned above, contains the two figures of the tablet molds and the strainers. Of course it also displays the surgical instruments of the treatise on surgery.

8. Rabat ms. no. 6779, also housed in the Royal Library of Morocco above. It begins with the third part of *al-Tasrif,* according to the general subdivisions containing treatises 20-29. Treatise 28, fols., 176-200, incorporates the usual three sections fully, in 232 fols., 33 lines p.p., and the script in small, Maghribi-Andalusian.

9. Rabat ms. no. 6780, at the above library, containing treatises 16 to the end of *al-Tasrif.* It is in poor condition of preservation in about 344 fols. The 28th treatise incorporates the illustrative drawings as the above, as well as in the 30th treatise on surgical instruments. The copyist was ᶜAbd Allah b. Muhammad, dated 25 Jumada II, 1125/1713.

10. Rabat ms. no. 8364, housed as above. It has a modern binding in leather, with the list of table of contents well executed for treatises 3-30, but some pages are missing. The text is inscribed in elegant Maghribi, with titles in decorative techni-colors with calligraphy, and the text in black ink as most of the

other copies. In the first page there is a reporting of earthquake on Saturday 22 Rajab, 1033 A.H. during the reign of Sultan Mawlana Zaydan. Other events give uncritical reporting. The copy dated 20 Shaᶜban 1014/1605, in the city of Marrakish, (Morocco). [13]

11. Veliyuddin ms. no. 2491, housed at the Süley-maniey Üm.Küt. of Istanbul, containing treatises 28-30, inscribed in legible Taᶜliq, in 231 fols., 21 lines p.p. and 19 × 23¼ cm. in size. It was completed about 663/1265 in Aleppo, Syria, by the Judge Nizam al-Din, dedicated to his cousin the Governor Shams al-Din Muhammad. It is reported to have been copied from the autographed copy, but there is no way of telling about this matter. A later owner, Judge IᶜLa al-Din b. ᶜIzz al-Din b. Hudayri paid 300 silver pounds for it in 844/1440, a high price at the time, indicating its value and the appreciation given to it. Another owner was the physician ᶜIsa b. Nasir al-Din al-Husni (or possibly al-Homsi of Homs) al-Kamili in Syria. There was indication in the inscription that the thirty treatises of the book was executed in six volumes as was the case in the Rabat ms. no. 134 mentioned earlier. This copy was owned in 1175 /1762 by certain al-Shaykh Wali al-Din b. Mustafa b. al-Hajj Husayn Agha and in turn given as a gift (endowment = Awqaf or waqf al-Islam) and eventually ended at the Süleymanie Library above. [14]

Liber Servitoris:

At the fall of al-Zahra, the glorious capital of the Umayyads in 404/1013, a bright star fell in Moorish Spain by the death of al-Zahrawi, one of its most illustrious literary medical genius. At that time, troubles and turmoils in and around the capital was spreading. The vigorous intellectual life was curtailed or interrupted briefly but soon continued. The author and his outstanding book, however, were somewhat overlooked and gradually almost neglected. As far as the surgical part, for example, it took almost 270 years to bring about another great leader in surgery like al-Zahrawi, in the life and works of Abu'l-Faraj b.alQuff, and his surgical compendium al-ᶜUmdah. [15]

No sooner has his influence declined in his native country, then he was re-discovered in Western Europe. It came first through the translation of the surgical treatise by Gerard of Cremona. Other treatises followed. The impact continued up to the European Renaissance and beyond. Many treatises and quotations were published and circulated widely. The surgical treatise of *al-Tasrif,* for example, was first published in incunabula at Venice, 1471. Other printings followed in 1497, 1499 and in the 16th century about 20 more editions appeared in many European printing centers. The Petro Argilata copy of 1531, was frequently quoted and cited in this paper. [16] In 1778, Johannes Channing published, in two volumes, the surgical text in Arabic and in Latin, Oxford, England. [17] A much better rendering was the one compiled from individual articles, and eventually published in Paris, 1861 in one volume by the praiseworthy historian of medicine and surgery Lucien Leclerc. He is often recognized widely by his two-volumes history of Arabic Medicine, 1876. [18] Interestingly, an edition, the first in Arabic independently, was printed in lithograph at Lucknow (India), under the auspices of the College of Medicine, the only one known as such teaching the so-called Yunani medicine (according to the Greek-Arabic tradition and system), in 1329/1908. [19] Then recently an edition with translation, annotation and glossary appeared in 1972/1973, under the auspices of the Wellcome Institute of the History of Medicine of London, England and the Near Eastern Center of the University of California, USA. yet having misnomer and connotation in the title of "Albucasis, on Surgery and Instruments."[20]

There were, furthermore, several translations and editions of other parts of *al-Tasrif.* Indeed no single edition or translation was done in any language as yet. However, in using and calling the part for the whole, it happened in the West that al-Zahrawi's twenty-eighth treatise was designated for the entire book instead by naming it *Liber Servitoris.* The whole title was given to the 28th treatise, possibly in view of its originality and importance. In late 13th century, *L. Servitoris* was translated by Simeon Januensis and Abraamo Judaeo, and soon became widely circulated in European medical circles. It was

printed in Venice, 1471 by Nicola Jansen Gallicum, in a composite volume together with the *Antidotarium* of the physician John b. Masawayh (Mesue the Elder), *Antidotarium* Nicolai and others. Other versions followed. [21]

Still other parts or fragments of al-Zahrawi's work appeared, non-theless, time will not allow to elaborate any further on it at this time. Suffice it to say that the activities carried on were most significant, and as such the author's reputation became highly regarded in medical circles throughout Europe. His editions in Latin alone, spoke loudly and commendably of the high caliber he attained and the influence he received in the history of medicine, surgery, therapy and pharmacy. As a result his name ranked among the greatest in his field, in conveying and transmitting Arabic contribution to the West, influencing medicine up to the Renaissance.

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Liber e tricesima pticula libri Acaragi: que a posuit Albucasis, Venetiis, 1500, and 1531; Basileoe 1541.

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11. *A Pharmaceutical view of al-Zahrawi,* 1963, pp. 137-138; for *Liber Servitoris XXVIII Bulchasi Benaberazerin* translatus a simoe Ianuesi (Genoa), interprete Abraa Judeo Tortuosiesi.. *Prepatoe mediac simpliu* per Nicolau Ieso: Venetii, in 1471, 1495, 1541, 1581, 1602 and 1623 (incunabula beautifully illustrated and printed).

12. IBRAHIM SHABBUH, *Fihris al-Makhtutat al-Musawwarah,* Cairo,. vol.3, part 2, 1959, pp. 48-51; and quotations can be attributed to *Sahih* Muslim, or al-*Jamiᶜ al-Sahih by* al-Bukhari.

13. Visited Rabat in Morocco, and Cordoba-al-Zahra in Spain in 1964 and 1972 (June-July), where ruins and manuscripts studied.

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