Series of Publications of I.M.O.

Islamic Medicine
Organization
(I.M.O.)

Kuwait Foundation for
Advancement of Sciences
(K.F.A.S.)

Bulletin of Islamic Medicine
Vol. 2

Proceeding of
The Second International Conference on

Islamic Medicine

No. III

Contribution of Moslem Scholars to Anatomy and Surgery and The Influence of the Islamic Heritage on the Other Civilizations

Supervised by
H.E. Dr. Abdul Rahman Abdullah Al-Awadi
The Minister of Public Health and
President of Islamic Medicine Organization

Edited by
Dr. Ahmed Ragai El-Gindy
Hakeem Mohammad Zahoorul Hasan

Jumada Al-Thani 1402/March-April 1982
State of Kuwait

Series of Publications of I.M.O.

Islamic Medicine
Organization
(I.M.O.)

Kuwait Foundation for
Advancement of Sciences
(K.F.A.S.)

Bulletin of Islamic Medicine
Vol. 2

Proceeding of
The Second International Conference on

Islamic Medicine

No. III

Contribution of Moslem Scholars to Anatomy and Surgery and The Influence of the Islamic Heritage on the Other Civilizations

Supervised by
H.E. Dr. Abdul Rahman Abdullah Al-Awadi
The Minister of Public Health and
President of Islamic Medicine Organization

Edited by
Dr. Ahmed Ragai El-Gindy
Hakeem Mohammad Zahoorul Hasan

Jumada Al-Thani 1402/March-April 1982
State of Kuwait

PART THREE

CONTRIBUTIONS OF MOSLEM SCHOLARS TO ANATOMY AND SURGERY

Part Three: *Contributions of Moslem Scholars to Anatomy and Surgery.*

CHAPTER ONE

(Papers Presented)

1. REPORT ON THE FIRST SESSION.
   Editors.
2. OPENING REMARKS.
   Dr. Abdullah Al-Ghoneim.
3. THE MEANING OF ANATOMY IN THE ARABIC LANGUAGE AND MEDICAL TERMINOLOGY.
4. TRACING ISLAMIC INFLUENCES IN AN ILLUSTRATED ANATOMICAL MANUAL.
   Prof. Ynez Viole O'Neill.
5. IBN SINA'S VIEWPOINT OF HUMAN ANATOMY. (A BRIEF PRECIS AND COMMENT).
   Dr. Jurnalisuddin.
6. THE ANATOMY OF THE EYE: IBN AL-HAITHAM AND GALENIC TRADITION.
   Dr. Mrs G.A. Russell.
7. PAEDIATRIC SURGERY IN ARABIC AND MUSLIM LITERATURE.
   Dr. Mahmoud Al-Haj Kasim.
8. THE TREATMENT OF WAR WOUNDS BY ISLAMIC SURGEONS.
   Dr. Francisco Guerra.
9. GENERAL DISCUSSION.

REPORT ON THE FIRST SESSION

This session was held on "CONTRIBUTIONS OF MUSLIM SCHOLARS TO ANATOMY AND SURGERY", from 08.30 a.m. to 11.30. a.m. Dr. Abdullah Al-Ghoneim, Prof. Eric Forbes and Prof. Saeed Abdul Fattah Ashour were the Chairman, Co-Chairman and moderator respectively. The session started with the opening remarks of the Chairman and then six papers were presented. Among these, one paper was presented by Dr. Marwan Al-Sabeh on 'Contribution of Cazweeny in Human Anatomy and Physiognomy', which is not accepted by the critics to be included in this proceedings. So, it is not printed. In the end the general discussion was allowed.

Prof. Ynes Viole O'Neill could not come to present his paper, but as per selection and status, the paper is included in the concerned chapter.

Editors.

OPENING REMARKS OF THE CHAIRMAN

Dr. Abdullah Al-Ghuneim

It gives me great pleasure to start the Second day of the Second International Conference on Islamic Medicine. This session is mainly concerned with influence of the Moslem Scholars on the development of Anatomy and Surgery. We have six speakers. One of them, i.e. Dr. Ynes Viole O'Niell apologized to attend the Conference due to his ill health. I want to mention that this subject did not have the attention of most of the scholars and so priority is given by the Organizing Committee to discuss it. The Committee has received many papers in this aspect, but some of them are approved and others are rejected. So, I shall start the session and introduce our speakers one by one.

ANATOMY AS TACKLED BY LANGUAGE AND MEDICINE☆

Dr. Mohammed Salhiyah

KUWAIT

ABSTRACT

Few researchers tried to probe the relation between linguistic books dealing with medical diction and those other books dealing with the same subject from a purely medical point of view. The Arabic language is almost unique in that a lot of linguistic works in Arabic were also of great use to medical students. This paper focuses on the following points:

- A contrastive study between linguistic books, especially those entitled, "The Creation of Man", and their contemporary medical works. The conclusion was that the linguists' knowledge about anatomy was quite advanced. Moreover, they knew about the anatomy of certain internal organs of the body long before doctors did.
- The paper makes reference to the efforts made by doctors who got interested in anatomy. These references, albeit traditional, serve to reveal more how these doctors tried to fill in the gaps in acquiring their anatomical information.
- On the other hand, the paper points out the distinguished contributions of certain physicians to the field of anatomy, especially Ibn al-Nafees's dissertation on the uses of the human organs, and that of the scholar, Ahmed Abdul Moneim al-Damanhouri, entitled, "Al Qoul Al Sareeh Fi Elm Al-Tasreeh" (A Clear word on Anatomy). The best and most important of these dissertations is the one kept in the American Medical Library under No. 76A. It is an outstanding work with an excellent anatomical study of the internal organs of the human body. It contains whole chapters on the anatomy of the skeleton, the nerve system and even the muscles.

CONCLUSIONS:

- A student of the history of anatomy will have to make frequent references to linguistic books in his study.
- The unpublished Islamic medical heritage contains a lot of indications to the extent of Muslim Arabs' achievement in this field.

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

Editors.

TRACING ISLAMIC INFLUENCES IN AN ILLUSTRATED ANATOMICAL MANUAL

Dr. Ynes Violé O'Neill,

U.S.A.

Over seventy-five years have passed since Karl Sudhoff, then professor of the history of medicine in the University of Leipzig, published the text and illustration of a medieval anatomical treatise he discovered in two Bavarian monastic manuscripts. Since then, considerable scholarly attention has been directed toward interpreting the drawings, weighing the treatise's significance and pondering its origins[1].

The last subject is both important and vexing. Since the treatise is the earliest illustrated anatomical manual known in the Latin West, determining its source would yield essential data about the origins of anatomical illustration whose continuous tradition played a significant role in the development of the anatomical sciences in Western Europe. After studying the treatise and its drawings for over fifteen years, I have recently focused my research on the problem of its origins. I now believe that the treatise derived from an Eastern, probably an Islamic model. The purpose of this paper, therefore, is to review my findings in the hopes that Moslem scholars will aid in the important task of solving this enigma whose elucidation would cast light on the influence of Islamic physicians in the development of Western anatomical studies.

Several years ago, in a paper read at the Annual Meeting of the American Association for the History of Medicine, and subsequently published in the *Bulletin of the History of Medicine* [2], I demonstrated that the medieval anatomical treatise Sudhoff believed to consist of only the five drawings and texts he found in two Bavarian manuscripts, and which he titled the *Fünfbilderserie,* consisted initially of a connected group of graphics depicting not five, but nine sets of human organs. The critical evidence for this demonstration was the nine part nexus still integrally preserved in a late twelfth or early thirteenth century manuscript presently part of a codex in the Gonville & Caius College Library, Cambridge.

Nine pages of drawings appear in that manuscript. They are arranged in precisely the order announced in a preface found in the Bavarian copies and published by Sudhoff. The traits of these drawings indicate that the Cambridge copy represents the treatise as it was originally conceived and designed by the author. The text of that preface reveals its author's intention of giving an account of human anatomy according to the descriptions of Galen, including accounts first of the arteries, second of the veins, third of the position of the bones, fourth of the nerves, fifth of the muscles, sixth of the male genitalia, seventh of the stomach, the liver and the belly, eighth of the womb, and ninth of the brain and the eyes[3]

Though the drawings in the Gonville & Caius manuscript present those systems in precisely that determined sequence, the sketches in the only other manuscript known to contain all nine sets of drawings are disordered. Thus, the illustrations in the renowned medical codex, *Ashmolean 399* of the Bod-

leian Library, Oxford are dispersed in no particular order throughout several texts. Most of the graphics in the Cambridge and the Oxford codices, excepting only the sketch of the brain and the eyes, appear also in a fifteenth century medical compendium presently at the Wellcome Institute, London. In the Wellcome exemplar, however, drawings not originally part of the series are interspersed among the genuine ones[4].

The single innovation in the Ashmolean series is the sketch of the heart emerging from sheathlike lungs. This cardiopulmonary depiction is the sole design lacking a congruent sketch in the Cambridge series. Other organs depicted on the same page, the five lobed liver overlapping the stomach, embellished with an emerald gall bladder, the diagramatic sketch of the windpipe running into the lungs, the isolated verdant gall bladder and the tan colored spleen, all correspond to figures drawn on the seventh page of the Gonville and Caius series[5].

By comparing the two manuscripts containing the illustrations of the nine part series, therefore, we have discovered that the normal order is disrupted in the Oxford series,and all captions on the figures with the exception of the inscriptions on the matrix sketch have been eliminated. If this obliteration can be interpreted as scribal innocence or ignorance, how may the unique depiction of the heart enclosed in spathose lungs be explained? The comparison of the two exemplars, while confirming the thesis that the treatise comprised nine illustrated sections has both uncovered new questions, and provided new clues concerning the treatise's origins and transmission into Europe.

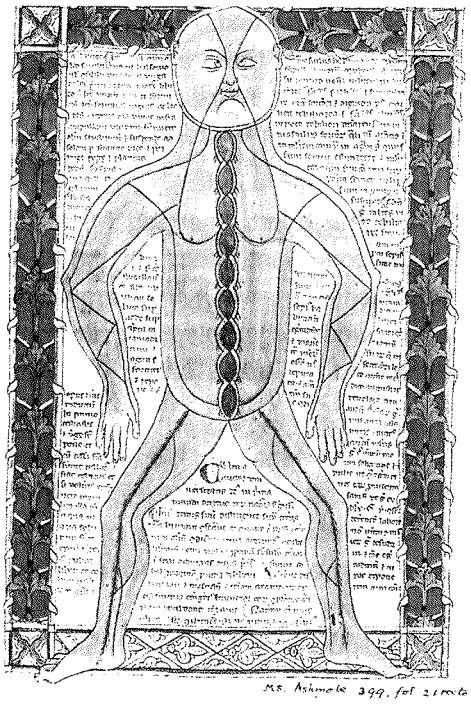
To further explore these indications, let us consider another specimen. Sudhoff believed he had discovered the earliest example of the treatise in a twelfth century copy written at the Benedictine monastery of Prüfening. This manuscript is now preserved among the treasures of the Bavarian State Library at Munich. Consisting of some 230 handwritten pages, *Codex 13002* is a huge folio work most of whose pages are devoted to glossaries and exegesses[6]. The first eight pages of the codex, on which the anatomical manual that Sudhoff studied are written, differ in form and content from its subsequent contents.

Many clerks were employed in writing this quarto, a fact indicating that its component parts were highly regarded by the abbot who commissioned it, and the monastery for and in which it was produced. These observations assume importance when we realize that much of the graphic material contained in it was considered innovative in 1165 when it was written. Illustrative of these conclusions, as well as of the general style of the quarto is the microcosmos figure, originally designed to serve as its title page.

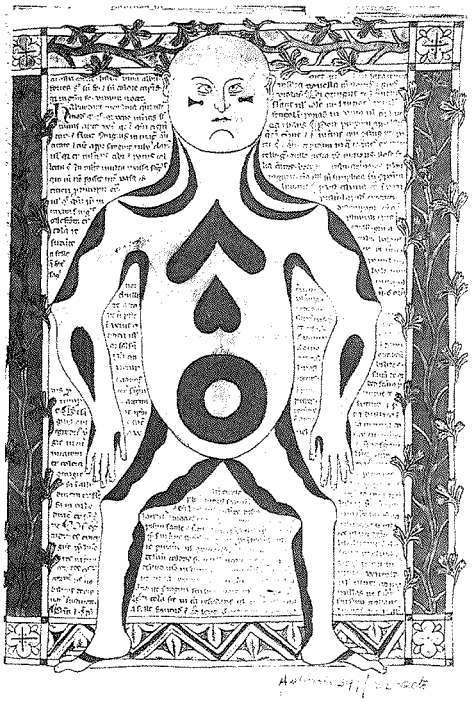
The figure is drawn in high romanesque style. Its captions stem from the *Elucidarium,* a work composed by Honorius of Autun in the third decade of the twelfth century. Drawn by a brother monk of the artist who copied the text and drew the illustrations of the five picture series, the microcosmos figure, when compared with the drawings of the anatomical treatise, leads us to two significant determinations[7].

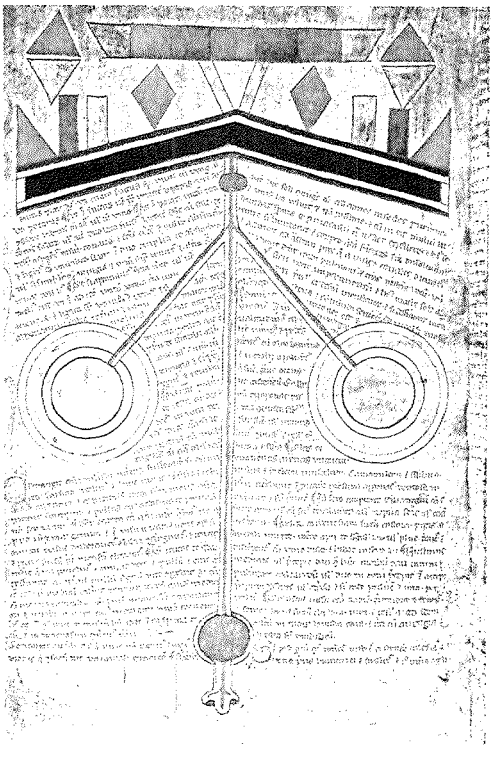
The First is that the scribes of the Prüfening scriptorium were well able to depict the human body more naturalistically than the five picture series would indicate. The reason the scribe of the anatomical treatise chose not to do so was probably that he hesitated to deviate from the models he found in the text he was copying.

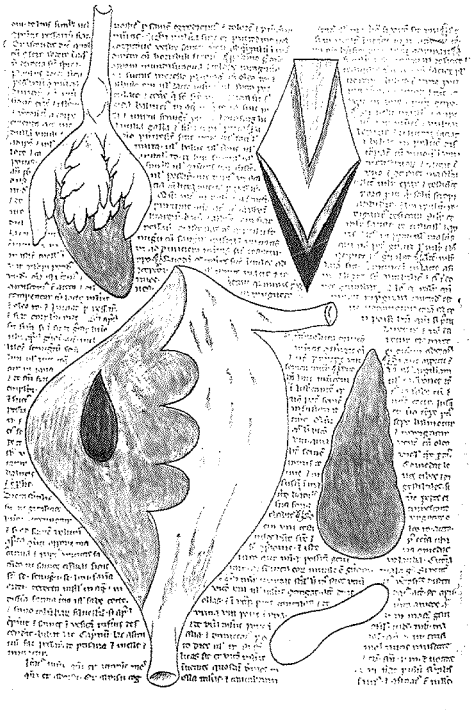
The second conclusion is that though the bodies of the figures in the five picture series may well have been copied from a stylized prototype, the heads were changed so as to correspond to the Prüfening style. The heads of the figures in the anatomical section of the quarto resemble the head of the microcosmos and of other human figures despicted in this, as well as other portions of the tome. Confirmation of this finding is found in the drawing of the arterial figure where the text is written over and intrudes on the right cheek of the "artery-man".[6] This defect seems to be the result of the scribes



MS. Ashmole 399, fol 21 recto







Ashmole 399/23 verso

inability to fit the desired Prüfening head into the portion of the drawing allotted for the rounder, less detailed shape he had envisaged when he copied the text.

While preserving the squatting posture of the figures, the Prüfening scribe altered the style of their heads. Why did he modify only that feature? I would argue that he made this alteration in order to disguise the treatise's origins, that what the scribe or his abbot were seeking to conceal was that the text and its drawings derived from a Moslem source.

This thesis is partially substantiated by drawings in certain Islamic manuscripts preserved at the India Office in London, the Bodleian Library at Oxford, and the Bibliotheque Nationale in Paris [8] . In each of these collections, Sudhoff and Seidel found examples of figures bearing a definite resemblance to the European illustrations he had previously published. These figures are not rare in the Islamic world, and several copies are to be found even in the United States. An example is the splendid Mansur treatise in the Trent Collection at Duke University, where the captions are written in both Persian and Arabic, and to the familiar five full anterior views, a sixth, that of a gravid woman, is added[9].

Figures depicting systems of the body posed in squatting attitudes can also be found in Chinese medical writings, as a skeleton and an acupuneture figure appended to a manual for coroners originally composed in the thirteenth century demonstrate [10]. Versions of the squatting figures are also to be found in Tibetan medical writings, though these are believed to derive from Chinese influences [11] . As the Eastern figures demonstrate, the problem Sudhoff believed to be a local or Central European one, can be shown to be multicultural or even of global proportions.

Throughout his prolonged study of the treatise, Sudhoff maintained that what he termed the five picture series was devoid of Arabic influences. Not having found Arabic words in the texts he edited, he contended that the treatise originated in Alexandria, that its prototype was a short anatomical text book composed in Greek during the third century B.C., and that the text and its illustrations must have been transmitted from antiquity via Byzantium to the Bavarian monastery of Prüfening, where he believed the earliest Latin exemplar was written[12].

The argument supporting the Alexandrian origin of the treatise is impaired by the fact that Galen, the only authority mentioned in the text, lived five centuries after the hegemony of Alexandria. Sudhoff's thesis is also damaged by the fact that the prototypal text he imagined has never come to light. Its absence, and the lack of independent documentation attesting to its existence casts doubt on the hypothesis that such a document was ever written.

Discovery of the Gonville and Caius copy of the treatise strikes other telling blows at Sudhoff's theories. Though be believed the Prüfening version to be the earliest example existent in the Latin West, we now know that the Cambridge copy either antedates that bowdlerised version, or is itself a copy of the treatise closer to the original one. Having proved that the original treatise contained nine sections, and having found a copy with nine sections in precisely the order specified by the author, one must conclude that the complete version more closely approximates the prototype than does any abbreviated version.

In the Cambridge nine picture series, moreover, the figures are captioned. Important evidence refuting one of Sudhoff's premises is found in them, since they contain literal Latin translations of Arabic expressions. The strange semi-circular objects on the chest of the "muscle-man," for example, are titled "*amindula,*" a literal translation of the Arabic word *lauzatan,* or almond. This term was used by Arabic physicians to designate the tonsil [13]. The downward slide of these lymphoid masses does little to discount their utility in identifying Arabic influences where Sudhoff maintained none existed.

The treatise's texts also contain enigmas which might indicate Arabic concepts misunderstood or imperfectly interpreted by the Latin scribes. An example is in the opening passages of the arterial sec-

tion where the arteries, or pulsating veins, are described as proceeding from one large vessel whose source is a black grain *(nigrum granum)* in the heart, and as forming a plexus in the head called an *anaphusa*[14].

Establishing the author's meaning in this passage has confounded medical historians for decades. Since the single authority invoked in the treatise is Galen, however, we seem justified in looking for clues to explain the account's bizarre features in the Galenic corpus. Galen's most extensive account of arterial inception is in his *On the Concordance of Hippocrates and Plato,* where he undertook to demonstrate that the nerves originated in the brain, the arteries in the heart, and the veins in the liver.

In this text, Galen traced the arteries to a single vessel arising from a fixed point in the heart and compared the fundamental artery to the trunk of a tree. Furthermore, he explained that the arboreal structure bifurcated, the larger branch passing to the spine and the smaller ascending to the head, where it formed a rete-like plexus. Finally he noted that as the liver was the origin of the veins, the arteries derived from the heart because the seed of the arterial tree was sown there[15].

In this Galenic text, then, a grain-like object is placed in the heart, if only by analogy, the cardiac region is designated as the source of a vessel from which all the arteries ramify, and the arterial network in the brain is described. The similarity between these ideas and those expressed in the illustrated anatomical manual is unmistakable, but a difficulty arises in tracing a route by which the author of the medieval treatise could have learned of these ideas since no copy of a medieval Latin version is known, and Renaissance scholars are generally accorded the honor of having discovered the Greek text of this Galenic treatise and of first rendering it into Latin[16].

But the work was well known from earliest times among Islamic scholars. Hunain ibn Ishaq tells us he translated the *Concordance* from Greek to Syriac, and that previously Ayyub of Edessa had also prepared a Syriac version. Subsequently, very likely in the second half of the ninth century, Hubaish rendered the work from Syriac to Arabic, thus making it available to Arabic practitioners[17].

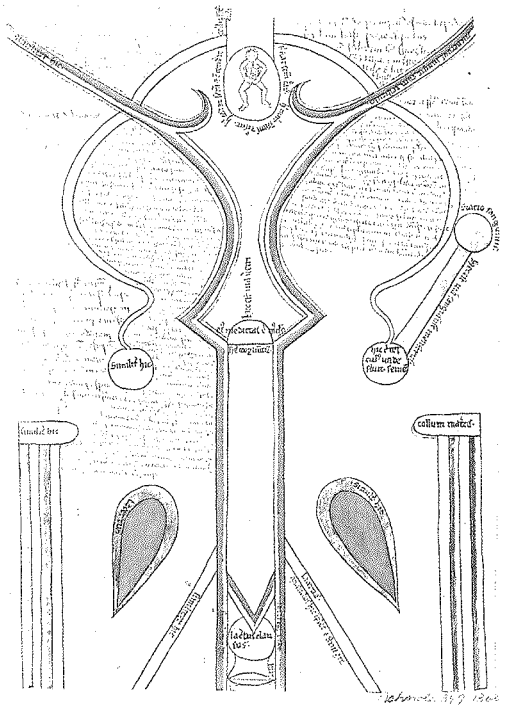
Latin editors suggested the illustrious Ibn Sina used the *Concordance* as a source for the chapter on cardiac anatomy in his *Canon* [18]. Ali ibn Ridwan's knowledge of the *Concordance* is even easier to document for in his commentary on Galen's *Ars parva,* the Cairo physician described the heart as the root of the arterial tree, compared the large artery to a tree-trunk, and noted that all of the arteries of the body stemmed from it[19].

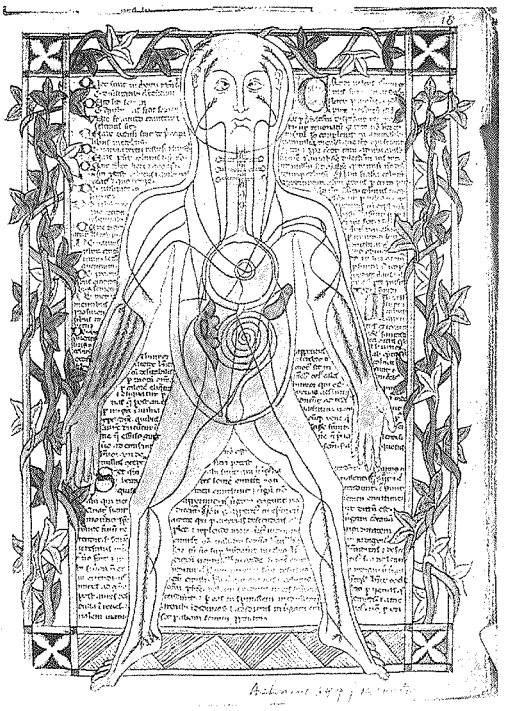
The idea of a grain in the heart from which all the arteries radiated, then, seems to have been an acceptable concept in the Moslem world. Since similar ideas do not seem to have reached Europe by the first half of the twelfth century when the illustrated treatise must have been circulating, the black grain in the heart of the "artery-man" tends to support the idea that its origins were Islamic.

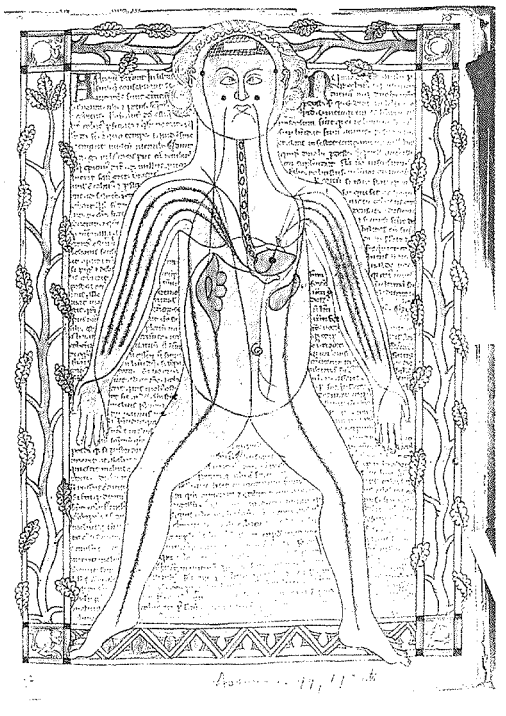
Far easier than supposing an Alexandrian origin for the treatise is postulating a Moslem one, and the problem of transmission is facilitated if certain pertinent historical facts are recalled. England occupied a position of considerable importance in the reception and diffusion of Arabic science during the twelfth century. Beginning with Adelard of Bath, English scholars frequented the Spanish schools during this period and became extremely active in the study and translation of Arabic scientific works[20].

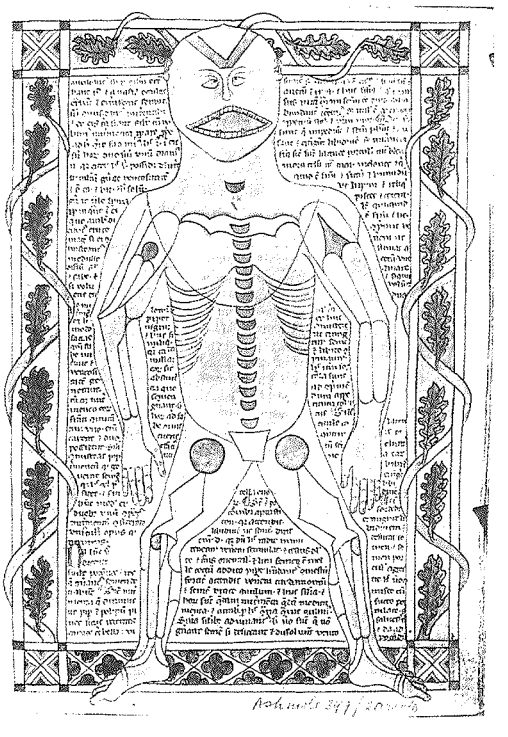
Following the Conquest, and the introduction of Norman customs into England, monastic, and especially Benedictine interest in the study and practice of medicine flourished. Monks, such as Baldwin, Abbot of St. Edmonds, Bury, who was retained by the Conqueror as his personal physician, and Faricius, Abbot of Abington, who attended Queen Matilda at the birth of her first child in 1101, attest to the development of monastic medicine during precisely the same period when Arabic scientific writings were reaching England from Spain[21].

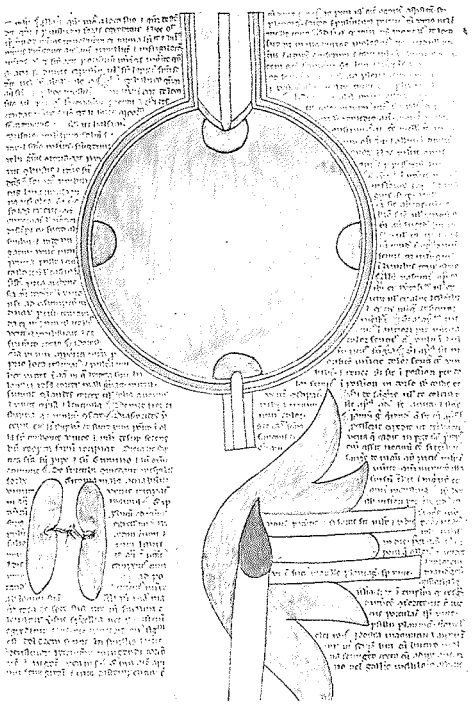
The most complete and graphically intact Latin copy of the treatise known, the Gonville and Caius

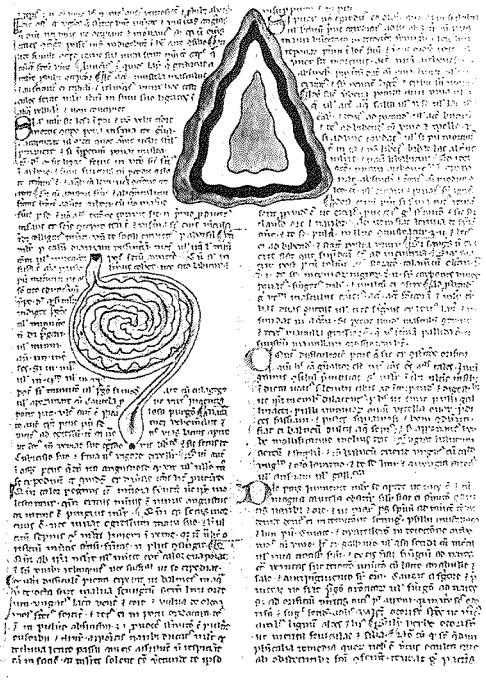


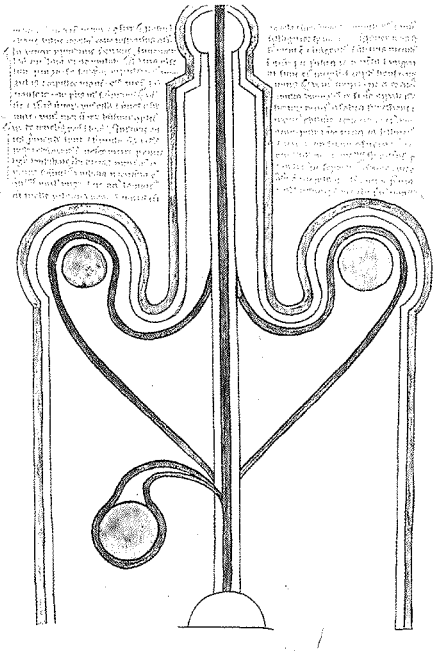












version, is presently and may always have been in England. The simplest hypothesis concerning its archetype's entry into Europe is to suppose that an illustrated Arabic anatomical manual found its way from Spain into an English Benedictine monastery.

Either before or after its arrival, the manual was rendered, word by word, into Latin, and its illustrations sedulously copied. Subsequently, it, or one of its facsimiles, was lent to the Benedectine monastery of Prüfening where during the second of the twelfth century, the Hirsau reforms, and a series of energetic abbots sponsored the development of an active scriptorium and the acquisition of a distinguished library.

Contemporary events may explain the two major alterations we have noticed in the Prüfening copy. The Hirsau reform movement, like the Cluniac on which it was patterned, demanded a return to the prescriptions of canon law regarding celibacy of the clergy, and chastity was particularly stressed. Given this orientation, a zealous abbot may have ordered the four final sections of the treatise expurgated as unsuitable for cloistered eyes. Religious, political, or economic animosities may have also motivated the alterations of the heads in the Prufening series[22]

In short, this is a more elegant conceptual scheme than Sudhoff's in that it is better able to bring order to a list of prescribed observations. Its additional significance is that it indicates the importance of a channel for the penetration of anatomical concepts into Europe that generally has been ignored. But it is still only a thesis.

If we are ever to truly understand the message hidden in this curious document, we must assemble every shred of evidence existant concerning it. The preliminary groundwork has been laid. The next stage is the preparation of a definitive edition of all known copies of the treatise's text and its illustrations. To date funding has not been made available to complete this vital segment of the project. When it is, the work of determining the sources and significance of the nine picture series can proceed. We look forward, with the aid of Moslem scholars, to reaching this goal, and to forging another link between the heritage of Islamic medicine, and the inception of anatomy as the fundamental Western biomedical science

REFERENCES

1. KARL SUDHOFF "*Studien zur Geschichte der Medizin, I*" Barth, Leipzig 1907, pp. 51-59
2. Y.V. O'NEILL "*Bulletin of the History of Medicine*" 51, 538-549 (1977)
3. CAMBRIDGE, "*Gonville and Caius College,* MS. 190/223", f. 2r-6r.
4. BOYD HILL Jr. "*Sudhoffs Archiv.*" 43, 13-19 (1959).
5. Oxford, Bodleian Library, "*Ashmole MS. 399*", f. 13v-24r.
6. Munich, "*Cod. lat. Monacensis 13002*", f. 2v.
7. ALBERT BOECKLER "*Die Regensburg - Prufeninger Buchmalerei des XII und XIII Jahrhunderts*" A. Reusch, Munich 1924, pp. 20-29.
8. E. SEIDEL and K. SUDHOFF "*Archiv für Geschichte der Medizin*" 3, 165-187 (1910).
9. Duke University Medical Center Library, Trent Collection, "*Mansur Manuscript*", f. 1r-44v.
10. PIERRE HUARD and MING WONG "*La Médecine Choinoise*" Presses Universitaires de France, Paris, 1964, pp. 54-55.
11. PIERRE HUARD "*La Médecine Tibetainne*" Latéma, Paris, 1968, pl. 3-5.
12. KARL SUDHOFF "*Studien zur Geschichte der Medizin, IV*[e]" Barth, Leipzig 1908, pp. 28-29
13. GERHARD BAADER "*Sudhoffs Archiv*" 57, 281 (1973).
14. Y.V. O'NEILL "*Bulletin of the History of Medicine*' ' 43, 236-237 (1969).
15. I. MUELLER, ed. "*Claudii Galeni De Placitis Hippocratis et Platonis*" Barth, Leipzig 1874, pp. 532-533

16. RICHARD J. DURLING "*J. Warburg and Courtauld Institutes*" 24, 236 (1961)
17. G. BERGSTRÄSSER "*Abhandl. f. Kunde des Morganlands*" 17, 21-22 (1925)
18. IBN SINA "*Canon medicinae*" Junta, Venice 1608, pp. 670-671.
19. ALI IBN RIDWAN "*Commentarius in artem parvam-Articella*" H. Lichtenstein, Cologne 1483, f. 158v.
20. C.H. HASKINS "*Studies in the History of Mediaeval Science*" Harvard University Press, New York 1924, pp. 113-129.
21. LOWRIE J. DALY "*Benedictine Monasticism*" Sheel and Ward, New York, 1965, pp. 306-308
22. Y.V. O'NEILL "*XXV International Congress for the History of Medicine-Acts*" 3, 1038-1040 (1976)

IBN SINA'S VIEWPOINT OF HUMAN ANATOMY
(A brief precis and Comment)

Dr. Jurnalis Uddin

INDONESIA

INTRODUCTION

Mettler said distinctly, that the only contribution of the Arabs to Anatomy is the finding of Abd-al-Latif al Baghdadi (1162-1231) that the mandible is not a twopiece bone as explained by Galen but a one--piece bone (Mettler, 1947). The limited contribution of the Arabs to Anatomy was said to be due to the fact that Islamic Law did not permit the dissection of the human body, although its strict prohibition has been debated by some of the jurists over the ages (Nasr, 1976).

Another obstacle to be considered is the hot and dry climate in the Arab countries which could have rendered the study of anatomy next to impossible (Mettler, 1947).

But despite all shortcomings, medicine has flourished extensively in the Arab countries during the medieval ages. The underdeveloped western countries had to study modern Arabic in any field of science. Ibn Sina's Canon of Medicine was the eternal evidence of the grandeur of the Islamic Medicine. It was used as a compulsory textbook in European universities up till the 17th century (Uddin 1981).

Book I of the Canon of Medicine deals mostly with anatomy and physiology. It describes and scrutinizes almost all aspects by which patho-physiological approach could be developed to explain any clinical phenomenon. The knowledge of anatomy was quite impressive which clearly contradicts directly the opinion of Mettler. Some questions could be raised to challenge the thesis:

☆ What is Ibn Sina's viewpoint on human anatomy?

☆ Is there any original finding or concept invented by Ibn Sina which contradicted the previous opinion or which proved to be confirmed up till the modern era?

IBN SINA'S VIEWPOINT ON HUMAN ANATOMY

Thesis I of Book I of the Canon put forward the very fundamental concept of Ibn Sina on health or sickness (Gruner, 1970). Without having good understanding of this concept, we shall never grasp Ibn Sina's viewpoint on human anatomy. He said that there shall be 4 kinds of "*cause*" of health or sickness:

A *The material cause:*

It falls into 4 subjects:

1) The human subject, is a state of health or disease

2) The immediate subject is the members and the breath.

3) The more remote subject is the humours

4) The most remote subject is the (imponderable) elements.

The humours and the elements are composites and they are liable to vary. But although they are subject to a variation and change, they show a certain constant unity, to which they converge, namely a unity of constitution or of the form. The constitution is in relation to the change, whereas the form is related to the composition.

B *The efficient cause*

It is a change or maintainability of the states of the human body, namely:

1) Extrinsic: the air and affiliated agents: localities, countries, habitable regions and the like comestibles, potables and the like.

2) Intrinsic:

- ☆ movement and its opposite-repose of body and mind;
- ☆ sleep and its opposite-the waking state;
- ☆ evacuation of secretions and excretions and its opposite retention thereof.
- ☆ the changes at the different periods of life
- ☆ occupations
- ☆ habits and customs
- ☆ descent (race, nationality)

C *The Formal cause*

It falls into 3 subjects:

1) the constitutions
2) the composition
3) the faculties

D *The final cause:* (the actions or functions);

A knowledge of this, presupposes a knowledge of the faculties and the breath (which are the subject of the faculties)

After introducing the causes of health or sickness, we are now aware that the causes have a close relationship with the understanding of elements, members, humours, faculties, breath etc.. Although Ibn Sina confined the science of anatomy to the members and the sense organs, it is almost impossible to have a comprehensive understanding of Ibn Sina's viewpoints on anatomy, without knowing the other terminologies. For that purpose let us summarize the whole thing as explained in Book I of the Canon (Gruner, 1970).

The elements are simple bodies. They are the primary components of the human being throughout all its parts, as well as of all other bodies in their varied and diverse forms. The number of elements are four: two are light e.g. *fire* and *air,* the other two are heavy e.g. *earth* and *water.*

Light elements equivalent to: weak, male (because conferring or inceptive), positive, active, heaven.

Heavy elements equivalent to: strong, female (because recipient), negative, passive, earth.

The temperaments are those qualities which result from the mutual interaction and interpassion of the four primary qualities residing within the (imponderable) elements. The temperaments can be classified into two modes:

- ☆ equable or balanced, where the contrary qualities are present to exactly equal degrees of potency; neither of them being in excess nor deficiency. It has a quality which is exactly the mean between two extremes.

☆ inequable or unbalanced, where the qualities are not an exquisitively exact mean between the contraries, but tends a little more to one than to the other (to hot more than to cold, to moist more than to dry or contrariwise).

In reality, strictly equable or strictly inequable never exists in human beings. The term equable or inequable does not refer to weight, but to an inequity of distribution. It is this distribution which should be considered properly, whether to the body as a whole or only to some individual member.

The temperament will change considerably relating to age, sex, place of residence and occupation:

- ☆ the temperament of the first period of life or adolescence period (up to 30 years) is heat, but mois-

ture is in excess.

☆ the temperament of the prime of life or the period of beauty (up to 35 or 40 years) is getting drier. It is due to the fact that the innate heat of the body begins to fail because the ambient air dries up the moisture of the body.

☆ the temperament of the elderly life or the period of decline (up to about 60 years) is cold.

☆ the temperament of the decrepit age or period of senility (to the end of life) is colder and drier than that of the decline period.

☆ the female is of colder temperament (that is why the female is smaller than the male) and moister.

☆ the temperament is moister in the peoples inhabiting northerly countries, colder in those living in southerly countries.

☆ the temperament is moister in those who follow a maritime occupation, others are contrary.

The humour or body fluid is the fluid that moists the body and into which our ailment is transformed.

Healthy or good humour is that which has the capacity for becoming transformer into actual body substance either by itself or in combination with something else or that which replaces the loss which the body substance (continually) undergoes.

Unhealthy or bad humour is contrary in capacity to the healthy or good humour and it is proper to expel from the body. In some exceptional condition it could be converted into good humour.

The humours should be classified into two:

☆ The primary fluids:
  ☆☆ the sanguineus humour
  ☆☆ the serious humour
  ☆☆ the atribilious humour (black-bile)

☆ The secondary fluids:
  ☆☆ non excrementitious
  ☆☆ excrementitious

The origin of the body fluids:

The body fluids are derived from food take in to the digestive tract, and by so doing it shall go to several stages of digestion.

1 *Preliminary digestion:*

Location: in the mouth
Mode of action: by the act of mastication and under the influence of saliva, whose action in virtue of the innate heat within, is digestive.

2 *First stage digestion*

Location: in the stomach
Mode of action: by the influence of two heats:
☆ the heat of the stomach,
☆ the heat of the enveloping members, namely:
  — on the right : liver
  — on the left : spleen
  — in front : omentum
  — above : heart

The end product is called: CHYLE.

3 *Second stage digestion:*
Location: in the intestine and in the liver.
Mode of action:
The chyle is drawn into the intestine and from there on to the mesenteric vessels and then to the Portal vein, finally enter the liver. In the liver, the chyle travels along finer vessels until it comes to the capillaries and from here on it goes into the superior caval vein which emerges on the convexity of the liver and finally enters the heart. From the heart, the chyle is distributed to the whole body. The passage in the finer vessels in the liver will never take place, if the chyle never admixed with water consumed in excess of the strict requirement of the body.

The products and by-products of digestion up to the liver are as follows:

☆ in healthy digestion:
— the blood itself
— by-products: · foam (bilious humour)
· a sort of precipitate (atrabilious humour)

☆ in unhealthy digestion:
— by-products:

* an oxidation product , where digestion is carried too far
** attenuated portion (morbid billious humor)
** dense portion (morbid atrabilious humour)
* a product when digestion is not carried too far:
** serious humour

The blood produced by the liver as long as it stays in the liver is more attenuated, because the wateriness is in excess. When the blood leaves the liver, the excess of water is removed for it is taken to the renal vessels and so provides the kidneys with the quantity and quality of the blood best suited for their nutrition:

* the fat or the blood nourishes the kidneys

* the superfluous wateriness and a certain degree of sanguineus material passes down to the bladder and so away from the body

* the good blood ascends into the superior caval vein and its subsequent smaller and smaller veins and finally into the hair like channels where the blood "sweats out" through their orifices and then bathes the tissues.

4 *Third Stage digestion:*
Location: in the blood vessels.

5 *Fourth stage digestion*
Location: in the various members

The faculty is a property whereby the phenomenon of life is manifested. The faculty originates the function. Function actualized potentiality. The faculty is a potential power, it is not a force. The faculty is static while power is the faculty in a state of activity. Power is dynamic. The soul is the tout ensemble of faculties. The life is the tout ensemble of functions. Hypofunction corresponds to the weakness of faculties. Hyperfunction corresponds to the plethora of faculties.

There are three kinds of faculties:

☆ the natural or vegetative faculty (taby'yat) which resides in the LIVER.

☆ the vital faculty (hayyawaniat) which resides in the HEART.

☆ the animal faculty (nafsaniat) which resides in the BRAIN.

The breath arises from the left side of the heart, for it serves not only as a storehouse but also as a seat of manufacture of the breath. The breath was produced out of the finer particles of the humour, while the tissue (the visible body) was produced out of the coarses and terrence particles of the humour. The breath is a divine emanation from the potentiality to actuality proceeding without intermission or stint until the form is completed and perfected.

The function of the breath is to enable the faculty of the soul to be conveyed into the corresponding members, whereby:

* the breath was to be the rallying point for the faculties of the soul
* the breath was to be an emanation into the various members and tissues of the body.

The breath from the heart passes thence into the principal centre of the body, lingering in them long enough to enable them to impart to its respective temperamental properties. It shall linger in the cerebrum where it receives a temperament by which it is capable of receiving the faculty of sensation and movement. It shall linger in the liver where it receives the faculty of nutrition and growth (the vegetative faculties). It shall linger in the generative organs where it acquires a temperament to receive the faculty of generation. Although the breath is immaterial, it needs a material basis or substance which has two folds: an equeous vapor and a fulginous vapor. It is also furnished by taking partly consisting of oxygen, for the function of oxygen in the body are the same as those attributed to the breath which it carries.

The members:

The members of the body are derived primarily from the commingling of the humours, just as the humours are derived from the aliments and the aliments are derived from the elements.

There are two kinds of members: *simple members and compound members.*

1. The simple members or the elementary tissues:

The simple members are those whose structure is homogenous throughout, so that their names describe them in all parts.

1.1 The bone:

Its nature : hard

Its function : to form the foundation of the body as a whole;
to provide the purchase needed for its movement:

1.2 *The cartilage:*

Its nature : softer than the bone, it can be bent but harder than all the other members

Its function : — as a cushion between the bone and the soft members, so as to prevent it from compression, injury, fall, etc...
— gives attachment to muscles

1.3 *The nerve:*

Its nature : soft, white, pliant, difficult to tear.

Its origin : brain and spinal cord

Its function : to subserve sensation and movement of the limbs

1.4 *The tendon:*

Its nature : resembles nerves in appearance

Its function : being attached to movable members, the tendon subserves the muscle in contracting and relaxing and by so doing moves the limbs.

1.5 *The ligament:*

Its nature : resembles nerve in appearance

There are two kinds:

1.5.1. *True ligaments:* those which simply join the two ends of the bone together

1.5.2. *False ligaments:* do not have the feeling of ligament and are not painful when moved or rubbed.

— They form the end of the muscles.

1.6 *The arteries:*

nature : hollow, elongated fibrous and of ligamentous consistence. They can expand and contract, which distinguishes them from the vein.

origin : the heart

function : to bring "breath" to all parts of the body

1.7 *The veins:*

nature : resemble the arteries but cannot pulsate.

origin : the liver

function : to carry blood away from all parts of the body.

1.8 *The membranes*

function:

* to form external covering for other structure
* to preserve the form and outline of these structures
* to support other members
* to bind other members with nerve and ligaments
* to impart sensation to members *which are themselves insensitive,* e.g. lung, liver, spleen and kidney (A distension or inflammation of these organs could be felt by us only, because of the enclosing membrane being stretched)

1.9 *The flesh*

It includes : muscle, fasciae, tendon, ligaments, connective tissues and so forth all together.

Its function : to fill up the spaces left within the members, thus imparting firmess and solidity.

2 *The compound members:*

They are for which one and the same word is not a correct description of all the parts; a part of the hand is not "hand", a part of face is not "face". These members are called "instrumental" because they are the instruments whereby the passions and actions of the mind are achieved.

The member and faculty connection:

Every member has its own faculty (vegetative faculty) which subserves its own nutrition.

Regarding the kind of connection, the members may be classified as follows:

* *Receiving and also giving a faculty:*

Example: brain and liver:
It receives the power of life, natural heat and breath from the HEART.
It gives a faculty to other organs

* *Giving and not receiving a faculty:*

There is a great disagreement between the philosophers and the physicians. According to the philosophers:

The HEART gives faculties of nutrition, life, apprehension and movement to several other members.

The HEART does not receive any faculty.

According to the physicians: Any member must have giving and receiving quality:

Those faculties are distributed to other members:

** the faculty of nutrition in the liver

** the faculty of vital power in the heart

** the mental faculty in the brain.

* *Receiving and not giving a faculty:*

Example: the flesh receives the power of sensation and life, but has no power of imparting another faculty in return.

Neither giving nor receiving:

There is also a disagreement between philosophers and physicians:

According to the philosophers:
The bone, the flesh and the like could not continue to live unless these powers were residing in them, and therefore, they do not need to receive the power provided by the aliments conveyed to them is adequate.

According to the physicians:

The powers in those members are not residing in them, but are formed in the liver and in the heart.

Regarding this discrepancy, Ibn Sina put forward his opinion. He classified the members into 3 kinds:

a) *The Principal or vital members:*

These are the members in which the primary faculties of the body arise, e.g.: the faculties necessary

either to the life of the individual or to the life of the race.

a.1 *The heart:* is the source or starting point of the VITAL POWER or INNATE HEAT.

a.2 *The brain:* is the seat of the MENTAL FACULTIES, SENSATION and MOVEMENT.

a.3 *The liver:* is the seat of the NUTRITIVE or VEGETATIVE FACULTIES

a.4 *The generative organs:* some of which are ESSENTIAL, and some are *AUXILIARY.*

- the essential function is that of forming generating elements
- the auxiliary functions are those of giving the masculine and feminine form and temperament.

b) *The auxiliary members:*

They are of two kinds:

b.1. *The preparative member:*
They come into operation before the principal members can come into play. These are the ADNEXA.

b.2. *The purely or absolutely members:*
They come into operation after the principal members have functioned.

Classification of the members according to the action:

Galen classified the members into:

* those which effect an action (e.g. heart)
* those which assist an action (e.g. lung)
* those which achieve both (e.g. liver)

Ibn Sina disagreed with Galen. According to Ibn Sina, there is no such a distinctive action. Action could be assisted when one member is prepared for receiving the action of the other member, thereby completing the process either of giving life to the individual or of propagating the race, example:

* the liver carries out the first digestion so far as to prepare for the third and fourth digestion. The more perfectly the liver functions with regard to the second digestion, the more likely is the blood so made to be adequate for nourishing the tissue.

  In this respect, the liver effects an action and in so far as the liver assists in accomplishing a further action, so it is preparative for that action.

Classification of the members according to their origin:

* Some members take their origin from the SEMEN, e.g. members composed of parts, except the flesh and the fat.
* some members come from the BLOOD, e.g. the flesh and the fat.
* other members come from both the male and female SPERM.

Relations between the female menstrual blood and the embryo:

During pregnancy, the menstrual blood becomes nutriment for the embryo in 3 ways:

* One portion is changed into the likeness of the substance of the sperm and the members derived therefore. This is the *growth nutriment portion.*
* One portion is capable of being aggregated into the material which fills up the interstices in the principal members and becomes flesh and fat. The flesh of the infant is derived from the gross blood, congealed by heat and dryness. The fat of the infant is derived from the aquosity and unaquosity of the blood which cold has congealed and heat dispersed.

* One portion is effete material and not utilizable for either of the two proceeding purposes. It remains in the same situation until the time of birth and is then expelled with the infant.

Repair of damaged members:

★ *Members derived from the sperm:*

Restoration can only occur, if the individual is spare in habit and has not passed the age of juvenility, for example the bones, the small veins, medium sized veins and arteries. If disseverance occurs in such members as bone and nerves, they will not grow again.

★ *Members derived from the blood:*

If the sperm is not very long in the member (e.g. the teeth at the age of juvenility) reconstruction could be expected. But if the blood has undergone a change of temperament, the reconstruction would not take place.

The membranes which cover the internal organs

These arise either from the *pleura* or the *peritoneum.* Organs in the thorax which are covered by the pleura, are the lung, the diaphragm, the veins and the arteries. Organs in the abdomen covered by the peritoneum are the abdominal viscera and also lining the muscles of the abdominal wall.

Texture of members:

There are 3 kinds of textures:

* fleshy texture;
* fibrous texture;
* devoid of fibrous texture (e.g. liver)

Fibrous texture goes with the power of movement, either voluntary (voluntary muscles) or involuntary (uterus and veins). Compound movement (like deglution) depend on the direction of the fibres:

- longitudinal fibres: produce in-drawing movement
- oblique fibres: expel or force onward
- transverse fibres: produce gripping or holding movement.

Members can have one or two coats, but still they have 3 kinds of fibres:

- one coat member e.g.: veins and bladder.
- two coat member e.g.: the intestine.

Members which have two coats have the cross fibres externally and the other on the inner side. The longitudinal fibres tend toward the inner surface. The purpose of this arrangement is that in-drawing and expulsion should not occur simultaneously, whereas there is no objection to the act of in-drawing and holding and gripping occuring together-except in the case of the intestines, where much retention is disadvantageous, whereas in-drawing and expulsion are all-important.

Hollow (tubular) members which contain substances different from their walls have sometimes, one coat; sometimes two coats. The presence of those two coats serve the following purpose:

* to provide the necessary strength to the walls, so that there is no risk of the proper power of movement failing at any time. Example: arteries.

* to ensure that the contents shall not dissipate or escape.

The arteries contain blood, and along with the blood goes the breath. Once the wall of the arteries fail to ensure its function, the blood would drain out, the death would be liable to occur.

* where there is a demand for vigorous suction and expulsion, such as the stomach and intestine.

* where each coat of a member subserves its own action or each action requires its own particular temperament. In the case of the stomach, there is a need for a power of sensation (which can only exist in a tissue containing nerves) and also a power to execute the movement of digestion (for which a fleshy tissue is needed). Hence each need is supplied by its own coat:
  - The nerve containing tissue for the power of sensation. The operation of sensation requires actual contact with the nervous tissues, as is true in the case of the sense of touch.
  - the fleshy coat for the power of executing the movement entailed in the work of digestion. The movement necessary to enable digestion, do not require contact of the material to be digested with the fleshy walls.

DISCUSSION

1. The concept of elements by which the human body was said to be composed of light elements (fire and air) and heavy elements (earth and water) is obviously obscured. No such classification exist in the modern anatomy or physiology.
2. The concept of temperament is almost impossible to explain. He classified members of the body into various degrees of heat, cold, moisture and dryness,. No fields of study have been developed pertaining to this specific area either in modern anatomy or physiology. He never explained what is the exact physiological change in any given member, so that some one could conclude that one member shall be cold or moist or hot or dry. But the idea of balance or imbalance in the physiological or pathophysiological activities is quite reasonable and very modern in its kind. The influence of age, sex, occupation and habitat to the balance or imbalance of organ activities are broadly spoken and substantial researches have been conducted such as hormonal or enzyme imbalance, imbalance of growth, etc..
3. The concept of humours is obviously an existing effort to understand the role and mechanism of body fluids. It was said that there are two kinds of humours:

   * the primary fluids e.g.: the sanguineus , serous, bilious and atrabilious humours;

   * the secondary fluids e.g. the excrementious and the non-excrementious fluids.

   It was also said that the body fluids are derived from food taken into the digestive tract and by so doing it shall go to several stages of digestion. There are three things which impressed us most. *The first thing* is his concept of blood manufacturing. He said it is the liver which produces blood, and then from the liver, the blood shall flow into the heart through the superior caval vein, and from thereon it shall be distributed to all members of the body. In this case, he actually followed the opinion of Galen (Guthrie, 1947).

   As has been approved, this thesis is completely wrong. According to the modern concept, the blood is formed in the haemopoietic organs, such as the bone marrow which produces: red blood cells, granulocytes and platelets; while the spleen and the lymph nodes produce lymphocytes and monocytes.

   The second thing is contrary to the first thesis. He surprisingly acknowledged that all digested food is drawn from the intestine to the mesenteric vessels and from thereon to the portal vein, and then enter the liver. After engaged to a certain process in the liver, it goes into the superior caval vein which emerges on the convexity of the liver and finally enters the heart to be distributed to all members of the body. This is what the modern anatomist called the portocaval anastomosis or the collateral portal circulation (Hollinshead, 1966). He also confirmed the most fundamental process of digestion that all digested food from the intestine has to drain into the liver whereby it shall have special treatment before distribution to all parts of the body.

The third thing is the confirmation of the most fundamental process of metabolism which occurs in the liver. All the digested food from the intestine has to drain into the portal vein and then into the liver. Although he put forward some vague concept of metabolism such as: the blood in the liver is more attenuated because of the excess of wateriness; when the blood leaves the liver, the excess of water shall be removed into the renal vessels etc., we should beware of his idea on the role of the liver in the food metabolism. The special treatment in the liver could be regarded as the metabolism process which is approved by modern anatomist and physiologist.

4. The concept of faculty is also difficult to understand. The statement that the liver is the seat of the natural faculty, the heart is the seat of the vital faculty and the brain is the seat of the animal faculty are unknown to modern anatomy.

5. It goes also to the concept of the breath. If we consider his statement that the breath is produced in the left side of the heart, it shall remind us spontaneously that the breath might be similar to oxygen. But he said that the breath is *immaterial,* although a perfect breath needs material basis or substance and oxygen was said to be taking part actively to form the breath. What is accepted by most anatomists, is that the soul alone is immaterial, but the seat of the soul is unknown.

6. What is called anatomy by Ibn Sina is clearly devoid of a very fundamental aspect e.g. lack of information on descriptive anatomy. He never classified organs into systems such as: digestive system, urinary system, respiratory system, central nervous system etc. He never described topography of organs and it goes also with detailed morphology of any existing organs.

But it could be easily understood, if we are aware of the prohibition to carry out dissection of human body and the unfriendly climate which made it impossible to do so.

Apart from that deficiency, the Canon is rich with functional and clinical anatomy. As we understand, these two approaches are very important either for educational or research purposes.

To any simple members or elementary tissues, after explaining the nature of the member, it always follows by the probable function of the respective organs.

The function of the bone, for instance is to form the foundation of the body and provide movement needed. The function of the nerve is to subserve sensation and movement of the limbs. Regarding the tendon, it was said, it subserves the muscles in contracting and relaxing and by so doing moves the limbs.

He classified ligaments into two: the true ligament, which simply joins the two ends of the bone and the false ligament which does not have the feeling of ligament and is not painful when moved or rubbed and it forms the end of the muscle. What is called as false ligament is not known in modern anatomy.

The description of artery is almost correct, but the vein was said to be arising from the liver. It is not true. According to modern anatomy, artery is all blood vessels which arise from the heart, while the vein is all blood vessels which enter the heart. But Ibn Sina described correctly the function of the vein, namely to carry blood away from all parts of the body.

Another impressive quotation is the function of the membranes, a.o.:

- to form external covering for other structure
- to preserve the form and outline of these structures
- to support other members
- to bind other members with nerve and ligaments
- to impart sensation to members which are themselves insensitive e.g.: lung, liver, spleen and kidney. A distension or inflammatory condition of these organs could be felt by us only because of its

enclosing membrane being stretched.

All statements are correct, especially the last function (Ranson & Clark, 1953). We wonder on what basis Ibn Sina took such a perfect conclusion, without experience of dissecting human body.

The connection between the member and the faculty is hard to explain, for faculty itself is beyond our comprehension. What is worth to be noted here is that Ibn Sina disagreed with Galen, as he disagreed with him on many other important views. Ibn Sina did not merely disagree with Galen's idea, but he formulated his own view on the respective matters.

It goes also with the classification of the members according to the action. Galen classified the members into:

* those which effect an action (e.g. heart)
* those which assist an action (e.g. lung)
* those which achieve both (e.g. liver)

Ibn Sina disagrees with Galen, as he said that there was no such a distinctive action. According to Ibn Sina action could be assisted, when one member is prepared to receive the action of the other member, thereby completing the whole process of action. He put forward the liver as an example which carries out the first digestion to prepare the third and fourth digestion. The more perfectly the liver functions in regard to the second digestion, the more likely is the blood to be adequate for nourishing the tissue. This bright idea is confirmed by the modern physiologist and biochemist.

But Ibn Sina's classification of members according to their origin is completely unsound. He said that the flesh and the fat are derived from the blood, while other members are derived from the male and female sperm. The truth is all members are derived from the conceptus or zygote which is the result of the fertilized ovum by spermatozoon.

Ibn Sina's concept on texture of members provided us with a comprehensive understanding of the action of tubular members. He said that the compound movement such as deglution depend on the direction of the fibres of the digestive tract:

* the longitudinal fibres produce in-drawing movement
* the oblique fibre expel or force onward
* the transverse fibre produce gripping or holding movement.

His explanation of the three different fibres invited us to have two comments:

* that his conclusion on the function of the different fibres are proved to be fully correct
* that he was fully aware of the existence of three different fibres and this must be the proof that he used to perform dissection, may be on animal or possibly on human being.

We now know, that not all tubular members have three kind of fibres, some members have two fibres such as: the intestine or the ureter; another member has three fibres such as: the stomach, the bladder or the uterus. He also identified that the longitudinal fibres tend toward the inner surface, the purpose of this arrangement is that in-drawing and expulsion should not occur simultaneously, whereas there is no objection to the act of in-drawing and holding and gripping occuring together, except in the case of the intestines, where much retention is disadvantageous, whereas in-drawing and expulsion are all important. Such kind of action now is known as the peristaltic movement, another proof of the far-advanced outlook of Ibn Sina.

CONCLUSION

1. The concept of Ibn Sina on element, temperament, humours, faculty and breath are almost beyond our comprehension, so far as the scientific approach is concerned. But we have to be aware that

those which cannot be proved by empirical experimentation at the moment, that is to say scientific way, could not be regarded as totally nonsense and irrational. It shall be far better to regard it as an enigmatic challenge to modern thinkers to conduct elaborate research work and find out appropriate answers to that enchanted enigma. Sometimes he followed Galen, that the liver is the seat of blood manufacture, which is completely wrong, but in other cases he contradicted him and formulated his own concepts, such as the case of the connection of members and the faculty, classification of members according to action etc..

2. Contrary to the opinion of Mettler, Ibn Sina exactly did a lot of contribution in the field of anatomy, especially in the functional and clinical approaches.

   He declared that all the viscera are insensitive and the pain sensation could be felt only through the stretching of the membranes which are enclosed to a distended or inflammatory organ. He mentioned a special process which goes in the liver to all digested food coming from the intestine. And by so doing he stated the existence of the portocaval anastomosis or the collateral portal circulation.

   On tubular members he stated the existence of longitudinal, oblique and transversal fibres along with its respective function, which is totally correct, and finally he came to a conclusion of what we call now the peristaltic movement in the digestive tract.

REFERENCES

1. GRUNER, O.C.: "*A Treatise of the Canon of Medicine of Avicenna*", Augustus. M. Kelley, New York, 1970.
2. GUTHRIE, D: "*A History of Medicine*", Thomas Nelson and Sons Limited, London 1947.
3. HOLLINSHEAD, H.H.: "*Anatomy for surgeon*", Vol. II Harper & Row, New York - Evaston - London and John Weatherhill, Inc., Tokyo, 1966.
4. METTLER, C.C.: "*Mettler, F.A.*": History of Medicine, The Blackiston Company, Philadelphia - Toronto, 1947.
5. NASR. S.H.: "*Islamic Science*". An Illustrated Study, Word of Islam Festival Publishing Company Ltd., 1976.
6. RANSON, S.W.: *CLARK, S.L* : "The anatomy of the nervous system", W.B. Company, Philadelphia - London, 1953.
7. UDDIN J.: "*Contribution of Ibn Sina to Medicine*", Proceedings, Symposium on History and Philosophy, University of Malaya, Kuala Lumpur, 1981.

THE ANATOMY OF THE EYE: IBN AL-HAYTHAM AND THE GALENIC TRADITION. ☆

Dr. G.A. Russell

U.K.

ABSTRACT

Although ophthalmology was one of the most important areas in Islamic medicine, rigorously pursued from the ninth century onwards, the most original and significant contribution to the anatomy of the eye came, not from physicians and eye-surgeons but from the work of a mathematician — physicist — astronomer, Ibn al-Haytham (al-Hazen in Latin; 965-1040 A.D.).

It is well-known that in relating the physics of light to the anatomy of the eye, his pioneering work created the science of physiological optics. The importance of his anatomy of the eye has not, however, been clearly shown because of the interpretation (a) that it is traditional, "well within the mainstream of mediaeval Galenism", and (b) that it is determined by his optics, and not by anatomical considerations. In other words, he simply adapted the traditional anatomy to suit the requirements of his 'theory of vision'.

In his Kitāb al-Menāzir (كتاب المناظر) Fātih MS 3212 , Ibn al-Haytham has two separate chapters (v, هيئة البصر) and vii, (منافع آلات البصر) dealing specifically with what could be termed as 'descriptive' and 'functional' anatomy of the eye. On the basis of close textual analysis and its detailed comparison with Galen *(De usu partium; on the Doctrines of Hippoc. & Plato)* together with such representatives of the Galenic tradition in Arabic as Hunayn b. Ishaq *(The Ten Treatises on the Eye)* and Ali b. Isa *(The Memorandum Book of a Tenth Century Oculist),* it will be shown that Ibn al-Haytham's description is not only accurate within the limitations of gross anatomy based on animal dissection, but also, contrary to the established views, significantly different from the humoral and teleogical traditional account.

Ibn al-Haytham's anatomy, in fact, represents the first effort to quantitatively define the biconvexity and the forward position of the 'lens' as well as the optical axis in strictly anatomical terms; i.e. with reference to the proportional relationship of the structure of the eye. What emerges is the eye, considered in terms of the segments of two globes, one large and one small, intersecting eccentrically.

Moreover, he investigates the functional significance of the parts of the eye (the constancy of their relationship, their position, distance, transparency, and opacity) as an optical system to allow the passage of light and colour for image- formation according to the principle of corresponding points.

Thus Ibn al-Haytham's approach constitutes a decisive departure from tradition to form the basis of a more correct understanding of both the descriptive and the functional anatomy of the eye.

☆ This paper was presented in the Conference with the help of slides, but the speaker did not supply us her full text, inspite of our continuous request, so we are forced to print only the abstract of the paper.

Editors.

PAEDIATRIC SURGERY IN ARABIC AND MUSLIM LITERATURE

Dr. Mahmood Al-Haj Kassim Muhammad

IRAQ

INTRODUCTION

Paediatric surgery is seen by the Muslims and Arabs as a vital subject and to my knowledge no one has yet written on the history of paediatric surgery as a separate entity and this prompted me to write this paper. In the past, diseases and operations on adults and children were discussed together. For example, removal of foreign bodies, tumours of the palate, nasal polyps, tracheostomy, tooth extraction, eye diseases, treatment of fractures and dislocations, were all discussed without specifying the age of the patient.

As regards paediatric surgery, we shall divide our talk into three topics: surgery of congenital anomalies, general surgery and urology and thirdly, surgery of the head and neck and vertebra.

SURGERY OF CONGENITAL ANOMALIES

Rare cases were mentioned by Orayb Ben Saad al-Kurtobi in his book "Khalq al-Janeen", (The Creation of the embryo). He mentions twins attached to each other by their abdomens and faces, and a boy with two heads, though there is no record of any attempt at surgical correction. Other congenital anomalies, with their management are listed below:

1. *Hare Lip:* Al Razi was the first to distinguish plastic surgery as a branch of general surgery. In the sixth section of his book "al-Hawi", he discusses how to repair this anomaly in a manner similar to that used now-a-days. Al-Zahrawy also wrote on this subject, noted its predominance in boys and discussed a repair technique using the sharp end of a catheterizing instrument.
2. *Division of the tongue* was noted by al-Zahrawi in his book "al-Tasreef", due to a band under the tongue, due to either a congenital anomaly or following healing of a wound. Treatment was by transverse division of the band, after lifting the tongue, taking care not to cut too deep for fear of cutting the artery. A dressing was put under the tongue to prevent adhesions, and any bleeding should be catheterized.[2]
3. *Imperforate ears (External auditory meatal obstruction)*: Al-Zahrawi mentions new born with their external meatus unopened, sometimes the obstruction extending deeper than the meatus. If it was superficial it could be opened.[3] This problem, and its treatment was also mentioned by Ben al-Kaff in his book "al-Omda".
4. *Anomalies of the fingers:* Regarding accessory fingers al-Zahrawi classified them into two types, the first only made of soft tissues, which can be divided at the base near the joint and the second containing bone where, when the soft tissue is divided the bone is exposed and cut.

   As for polydactyle and syndactyle they are either congenital or following a wound or burn. The fusion was divided and a dressing kept between the divided fingers to avoid re-union.[4]
5. *Imperforate anus:* In section nine of "Ketab al-Tasreef", al-Zahrawi discusses this anomaly. If it was only a membranous covering it should be opened by the midwife's finger or a knife, taking care to avoid injuring the muscle. A dressing should be placed at the opening, to avoid closure, and it was even suggested inserting a lead rod, to be removed for the baby to pass a motion.
6. *Anomalies of the External urinary system:* Some children are born either without an external meatus opening, or an abnormal one. It was suggested that an opening should be made if there was none, and a small lead rod inserted to avoid closure. Hypospadias was described as an opening, not at

the tip of the penis, where the penis had to be lifted up to pass urine. It was also said that it will interfere with the jet of sperm and prevent it reaching his wife's cervix, especially if the opening was very low down on the perineum.[6]

7. *Hermaphrodites:* Avicenna[7] defined these people as having neither male nor female sex organs, or both with one set more developed than the other. Treatment was by excising the underdeveloped organs.

GENERAL SURGERY AND UROLOGY

1. *Circumcision:* This was discussed by al-Zahrawi in "al-Tasreef" in some detail. He described a technique using scissors, bandage and thread. The boy should be standing while the scissors were hidden from view either under your feet or in your sleeve. The prepuce was first cleaned and the external urethral meatus identified. The prepuce was pulled up and ligated with a thread and small bandages put around and below the thread, and the prepuce divided between them. After cleaning the meatal opening with wet cloth, ashes of dried courgette were sprinkled on.

2. *Hydrocele:* Al-Zahrawi said this was caused by accumulation of dampness under the layer covering the testis. It may be encysted, and look like another testis, now-a-days called spermatocele or epididymal cyst. This accumulation of fluid could be yellow, red, black or milky. He also differentiated clinically between a hydrocele, spermatocele or epididymal cyst by stating that if the testis could not be felt because of the fluid around it, then it was a hydrocele, but if you could feel the testis and another separate swelling, like a second testis then it was a spermatocele or epididymal cyst. This description still holds good today. He also suggested confirming the diagnosis by aspirating and looking at the colour of the fluid.[9]

3. *Stones in children :* This was widely discussed regarding the causes and the higher incidence in males. Also mentioned were different methods of differentiating the site of the stones. Ibn al-Jazar attributed vesical stones to other diseases causing precipitation of material in the bladder, the neck of the bladder being too small to let the precipitate through. This could lead to difficulty in passing urine, pain, itching and erection. They also suggested four reasons why stones are not frequent in females. Firstly, the neck of the bladder is short, secondly, it has a wide outlet, thirdly, it is straight and fourthly, girls drink less water than boys.[11] His theory of accumulation of precipitate around a nucleus was also noted by al-Razi, Urayb and Avicenna.

   Avicenna also noted the predominance of stones in the northern areas, especially in boys.[12]

   Al-Razi also discussed patients who are unable to urinate when they feel the urge to do so. He said this would lead to distension of the bladder and retention of urine. He also went into detail on removal of stones and the complications.[13] He suggested bathing the child daily in hot water, giving diuretics and stone solvents.[14] He also suggested using opiate derivatives to ease the pain, soaking gauze with opiate and placing it rectally, similar to our present day suppositories.

   In his book, al-Zahrawi differentiated between renal and vesical stones[15] and said it was easy to treat boys up to age fourteen. He described removal of vesical stone through a perineal incision of the urethra, now-a-days known as perineal urethrostomy, noting that care should be taken not to make too long an incision, as this would cause incontinence. If the stone is large, it was suggested to break it into smaller pieces with a certain instrument. This is the first time litholapaxy was described.[16]

   As regards retention of urine, al-Zahrawi described how to catheterize the bladder using a silver instrument[17] known as "al-Zraqa" which could also be used for the drainage of blood and pus. He also devised a special rectal enaema for children.

4. *Hernia:* Al-Zahrawi described the hernia as being due to a defect in the peritoneum extending from the testis to the abdomen, leading to passage of the bowel into the scrotum. Or, it could be due to an extension of the peritoneum into the scrotum. It was said to follow lifting of a heavy object or to screaming and increased in size gradually. It may be accompanied by pain due to the presence of the bowel under the skin. The omentum could also descend with the bowel. It may cause the patient severe pain and give him the feeling of a gurgling sensation - this is now called incarceration. It could also become obstructed and thus lead to the death of the patient.[19]

   He discussed the operation of removing the hernial sac, or as he called it, the peritoneal extension. He gives a good description of how to dissect the sac from the testis, reduce the contents of the sac and tie a double ligature round the neck of the sac after excision. If infection occured, he advised opening the scrotum to release the pus and blood.[20] He also mentions the direct inguinal hernia, which is very rare in children and where the hernia does not descend into the scrotum.[21] He said this was easily reducible unless it had been present for a long time. He also discussed how to reduce it and repair the weak area, without excising the sac. This is the first recorded surgery of hernial repair.[22]

5. *Umbilical hernia:* Al-Razi said this was due to children crying, severe coughing or trauma,[23] and the treatment was to cauterize the area round the hernia after reducing it,[24] this being said to create fibrosis and thus avoid herniation. Al-Razi gave an interesting description of repairing a large umbilical hernia in "al Hawi".[25] He asked the patient to lie down and drew a circle round the hernia with ink. He then lifted the skin in the centre using a fish hook and then passed threads with a needle through the hernia. If the thread passed through the bowel, the bowel should be pushed down. If, through the omentum, then it should be cut after ligating its blood supply. More threads should be passed in the shape of a cross and ligated, causing necrosis, followed by healing in a concave shape, like an umbilicus.[25] Al-Zahrawi said umbilical hernia was due to rupture of the peritoneum, leading to protrusion of the omentum or bowel, or it followed bleeding from a blood vessel resulting in haemangeoma.[26] He also discussed its repair.

6. *Warts:* Al-Zahrawi gave a good description *of* warts, seen mainly on boys hands. He suggested tying them with silk thread or hair until it fell off, cutting it off, or cauterizing it.

7. *Tetanus:* Al-Razi mentioned cases of tetanus occuring in small boys with penetrating wounds, where spasms followed afterwards. He advised increasing the size of the wound to ensure proper drainage.

SURGERY OF THE HEAD AND NECK AND VERTEBRA

1. *Accumulation of water in the head:* Al-Zahrawi differentiated this into two types. One where the fluid collected between the skin and the skull, now-a-days known as meningocele. Two, where the fluid accumulated under the bone, where the skull suture lines would be open, now known as hydrocephalus. He only found this disease in boys and said they died very quickly.[29] He also discussed how to tap the fluid.

   Ben al-Kaff said there were three types: one where the fluid lay between the skin and the periosteum, two where it lay between the periosteum and the skull and third where it was between the skull and the meninges. He advised treatment of the first type only.

2. *Removal of fish bones and other foreign bodies:* Al-Baladi advised letting the boy swallow a large lump of food after swallowing some warm oily material in the hope this would push the bone down. If this is not successful he used a lead instrument similar to a knife, of his own design, to push the bone down.

3. *Fracture of the skull:* Ali Ben al-Abbas al-Majosy in his book "Kamel al-Senaa al-Tibiya", described

fractures, compound (hard) fractures where the bone protrudes to the outside and linear or hairlike fractures. Others added that tiny hair-like fractures may not be felt but could be dangerous and Ali Ben al-Abbas stressed that not only was the type of fractures important, but also in which manner it was caused and the neurological complications following. Avicenna stated that fractures of the skull did not heal in the same way as fractures of other bones, but that the bone stayed in separate pieces, attached together by fibrous tissue. He did not agree with Galen as to the treatment of depressed and comminuted fractures and in the use of surgical instruments.[31]

Al-Zahrawi talked about depressed fissure and pond fractures. The latter being due to a fall where the bone is dented like denting a soft metal, and is usually seen in boys.[32] Al-Zahrawi said that in fractures of the skull, where it reached the dura and the bone was comminuted, it should be treated by shaving the skull and removing the bone. He also described how to stop the bleeding using a dressing soaked in oil, and how to make a hole in the bone with a special instrument similar to the present day trephine. Abdul Latif al-Baghdadi said that the Arabs not only transferred their knowledge, but practised it and he saw patients who did well after removal of large pieces of bone from the fractured skull.[33]

4. *Cervical lymphadenitis:* It was discussed by al-Razi as mainly occuring in boys. He said they were directly connected to the surrounding tissue and invade it. He differentiated between firm and fluctuant nodes by clinical examination.[35] Al-Zahrawi talked of draining lymph nodes in the neck, possibly tuberculous for the most part. He said they could also be found in the axilla, were multiple and increasing in number. Some feel stationary and these were usually malignant and did not respond to treatment.[36] He used to remove the enlarged lymph nodes if they were attached to a blood vessel by ligating them and letting them fall off. If there was pus he only drained it.[37]
5. *Tuberculosis of the vertebral column:* Al-Razi and al-Hawi described cases of scoliosis accompanied by cough or asthma before puberty and said they would die, as whoever had scoliosis without trauma had a deep, thick abscess which could cause respiratory and cardiac embarassment, resulting in death from respiratory difficulty. It may also kill at the time of liquefaction of the abscess.[38] It is thus clear that he was aware of cold abscess leading to scoliosis.[39] Al-Zahrawi treated this with cantery, applying it to the lump.

SUMMARY

Paediatric surgery has an important role in childhood and has long been discussed by Arabs and Muslims, though not as a separate entity and it was this which inspired my research for this paper. Obviously some operations are shared by child and adult alike but the following are items of paediatric surgery.

Surgery of congenital anomalies:

1. *Hare lip:* Al-Razi was the first to mention this as a plastic surgical problem.
2. *Tie tongue:* Al-Zahrawi gave an account of its causes and surgical treatment.
3. *Imperforate ear:* Al-Zahrawi discussed this in his book "al-Tasreef".
4. *Deformities of the fingers:* Accessory fingers and syndactyle were discussed by al-Zahrawi.
5. *Imperforate anus* was mentioned by al-Zahrawi.
6. *Obstruction of the urinary outlet in childhood:* neonatal problems of this sort were atresia or stenosis, discussed by al-Zahrawi.
7. *Hermaphrodites* were discussed by Avicenna.

General Surgery and Urology:

In this section the following were mentioned:

1. *Circumcision:* Most of the physicians discussed this subject but al-Zahrawi had his own method the so-called scissor, thread and bandage circumcision.
2. *Hydrocele:* Al-Zahrawi differentiates clinically between the hydrocele and other scrotal anomalies.
3. *Stones in childhood:* Arab physicians discuss this as regards the causes, the predominance in males, differentiation from other diseases and surgical management.
4. *Inguinal hernia* was discussed by al-Jadri, al-Zahrawi and al-Razi.
5. *Umbilical hernia:* its causes and management as discussed by al-Razi.
6. *Warts* - their treatment.
7. *Tetanus* following injuries was discussed by al-Razi.

Surgery of the head and neck and vertebra:

1. *Accumulation of fluid in boys' heads* - the various types, with differentiation between meningocele and hydrocephalus.
2. *The removal of fish bones* and other foreign bodies from the throat.
3. *Fractures of the skull* were classified by Ali Ben al-Abbas and al-Zahrawi differentiated between linear (hair-like) fractures, penetrating fractures and pond fractures. Al-Baghdadi witnessed some of their surgery.
4. *Lymph nodes:* Al-Razi talked about cervical lymph nodes and mentioned their relation to the surrounding structures. Al-Zahrawi discussed their removal and drainage of abscesses.
5. *Tuberculosis of the vertebra:* Al-Razi was sure that a tuberculous lesion of the spine in children was fatal, and said that the scoliosis with no obvious external cause was due to a deep, cold abscess. This was fatal even if it burst through to the outside.

ACKNOWLEDGEMENT

I wish to thank Dr. Asal Yousif Izzidien, Assistant Professor Medical School for Translating the manuscripts and Mr. M.S. Khan for typing the manuscript.

REFERENCES

1. AL-ZAHRAWI /ABUL KASIM, "*al-Tasreef lemen ajaza an al-Taleef*", p. 61
2. Ibid, p. 279
3. Ibid, p. 201
4. Ibid, p. 593
5. Ibid, p. 501
6. Ibid, p. 389
7. AVICENNA (IBN SINA) "*al-Qanoon*", Vol. 2., p. 549
8. AL-ZAHRAWI "*al-Tasreef*", p. 399
9. Ibid, p. 485
10. HUSSAIN, DR. MOHAMMAD KAMEL, "*al-Majaz fe Tareekh al Tib wa al Sydalla in Arab*" p. 125 (Summary of Medicine & Pharmacy).

11. AL-QYRAWANJ, BEN AL JEZAR " seyaset al-Sebyan (*Children management*) page 130-131.
12. IBN SINA - "*al Qanoon*" Vol. 2, p. 509
13. HUSSAIN, DR. MUHAMMAD KAMEL, DR AL AGABI: "*al-Razi (al-Razi Medicine) analysis*", p. 96
14. DR. MUHMOOD AL-HAJ KASSIM AL-RAZI/Thesis, "*Disease of childhood*" p. 18
15. AL-ZAHRAWI: "*Ketab al Tasreef*", p. 411
16. HUSSAIN, DR KAMAL: "*al Mojaz*", pl 123-124
17. AL ZAHRAWI: "*al Tasreef*", p. 403
18. Ibid, p. 403
19. Ibid, p. 441
20.
21.
22.
23. DR. M. AL HAJ KASSIM: AL-RAZI/ "*Thesis*".
24. Ibid.
25. AL-HAWI, Vol. 10, p. 334-335
26. AL ZAHRAWI, "*al Tasreef*", p. 377
27. Ibid, p. 517
28. HUSSAIN, DR. MUHAMMAD KAMEL, "*Tib Al-Razi*", p. 41
29. AL-ZAHRAWI/ "*al Tasreef*", p. 171
30. AL BALADI, AHMAD BEN MOHAMMAD BEN YAHYA: "*Tadbeer al-Hubala, wa al atfal wa al Sobya*", analysis Dr. Mahmood Al Haj Kassim, p. 287
31. DR. ABDUL KADER ABDUL JABAR, READ AT KUWAIT ISLAMIC CONGRESS, 1981, "*Surgery of the skull and brain in Arab*".
32. AL ZAHRAWI / "*al Tasreef*", *p. 699*
33. Ibid.
34. AL RAZI, "*al Hawi*", p. 123
35. DR. MOHAMMAD KAMEL, "*Tib al-Razi*", p. 394
36. AL ZAHRAWI, "*al Tasreef*", p. 233
37. DR MOHAMMAD KAMEL, "*a Mojaz*", p. 116
38. AL RAZI, "*al Hawi*", Vol. 11, p. 87-88
39. DR. MOHAMMAD KAMEL, "*Tib al Razi*", p. 391
40. AL ZAHRAWI, "*al Tasreef*", p. 129

THE TREATMENT OF WAR WOUNDS BY ISLAMIC SURGEONS

Dr. Francisco Guerra

SPAIN

INTRODUCTION

Military surgery was dominated by War Wounds resulting from arrows, spears and swords up to the Renaissance, although fire arms were used in battle already in 1344 by the Islamic forces besieged at Algeciras, near Gibraltar, deploying cannons with iron balls, against the Christian army of Alfonso XI of Spain (1311-1350). During the period of Islamic expansion, from the 7th to the 15th century, wounds were therefore incised in most cases, while after the 16th century, contuse wounds resulting from the use of individual fire arms were more frequent.

Around the 9th century, the traditional Islamic medical practice called "*Tibb al-Nabi*" was enriched by the scholarly work of Hunayn ibn Ishaq (808-875 a.c) and his co-workers of Baghdad, under the auspices of the Caliphs al-Mamun and al-Mutawakkil. To his own *al-Masa il fi l-tibb* Hunayn added several translations into Arabic, from the Syrian and the Greek, of medical treatises by Hippocrates, Galen and other classical authors. Hippocrates (460-377 b.c.) in his book *On Wounds* maintained that ulcers and wounds should not be washed, but with wine, never with oils, and that simple incised wounds healed by first intention without suppuration. On the contrary, contuse wounds, where the tissues are cut and smashed, should corrupt and produce pus before repair and perfect healing can take place. This doctrine was upheld, discussed and extended by Galen (130-200 a.c.) and it was accepted after him for fifteen centuries until the discovery of microbes by Pasteur (1822-1895 a.c.) and the introduction of antiseptics by Lister (1827-1912 a.c.).

Arabic medical writers were influenced in their surgical practice by Galen's texts, but the personal experience in wound treatment of Rhazes, Ali Abbas, Avicenna, Abulcasis and Averroes offered certain variances, though it maintains the basic doctrine on the healing power of laudable pus, which deserves further study and discussion in the light of current medical tenets.

WOUND TREATMENT IN CLASSICAL ARABIC TEXTS

The first master to become acquainted with Galen's doctrines was Rhazes (ca.854-925), a contemporary of Hunayn ibn Ishaq and pupil of al-Tabari in Baghdad, who made clear an independence of criteria in his *Doubts on Galen.* However, despite his broad knowledge of ancient surgical writers, Rhazes did not cover the practical aspects of wound's treatment in the *al-Hawi fi-1-Tibb* (continens), and approached this subject on theoretical and general principles, very much like Galen, discussing the essence, causes, symptoms, accidents and prognosis of ulcers and wounds.

It has not been appreciated by surgical writers that Ali ibn al-Abbas (ca.925-982) a student of Musa ibn Sayyar and physician to the Emir Adud al Dawla, followed in surgery the best Hippocratic tradition in his main work *Kamil al-Sinaat al-Tibbiya,* also known as *Kitab al-Malaki (Liber Regius).* In incised wounds Ali Abbas recommended immediate suture, after cleansing the wound, applying dessicant powders and cold water if required. In contused, compound deep wounds Ali-Abbas stimulated the production of pus, like Hippocrates and Galen, although he used dessicants, ointments and poultices to control excessive suppuration. He was furthermore careful about the general condition of the wounded, his diet, intestinal evacuations, and in certain congestive and feverished patients did not hesitate to use phlebotomies.

Abulcasis (ca.1013) born at Medina al-Zahara, was physician to Abderraman III and al-Hakam, the Cordoba Caliphs. In his medical encyclopedia al-Tasrif *liman agiza an al-taalif,* devoted the second part

to surgery accepting the usual two types of wounds. In the simple or incised wounds, Abulcasis recommended cleansing the surfaces of foreign bodies to approach their borders and to keep them in place by bandages, not with sutures; he applied styptic wine or oil of roses to the borders if edema appeared during the process of repair. Abulcasis distinguished another type of wound, altered by the air, a surgical expression then used to indicate contamination, and in that condition he applied ointments aimed at the stimulation of the flow of pus. In a third type of wound, those with great loss of substance, Abulcasis used sutures with great care and without excessive tension, to approach the opposite surfaces of the wounds and to keep the borders joined. His success in the prompt healing of wounds was due to the use of dessicant powders made of incense, a vegetable resin still known as dragon's blood, and lime. He also paid attention to the general condition of the patient, to his diet and his way of life.

Avicenna (980-1037) dealt twice with wounds in the *Kitab al Qanun fi-al-Tibb (Canon).* In discussing the wounds in soft tissues, he aimed first at to stop bleeding, to preserve the union of the borders and to avoid suppuration by the use of proper drugs: at the same time he placed the wounded under adequate diet and quiet. Before the suture of the wound Avicenna was careful about removing foreign bodies and dirt which he insisted interfere with normal healing.

Averroes (1126-1198 a.c.) has seldom been mentioned on surgical matters, though he also discussed in the *Kitab al-Kulliyat al-Tibb (Colliget),* the theoretical basis of wound treatment following very closely the doctrines of Galen. He recommended the use of dessicant powders after the suture of the borders of a wound.

DISCUSSION

The medical writers of the Islamic tradition, followed as a whole the ideas of Hippocrates and Galen in the treatment of War wounds.

In the incised wounds, they proceeded in the following stages: —

1. Removal of foreign bodies
2. Approaching the borders
3. Maintaining the borders joined by bandages or sutures
4. Avoiding the accidents which could interfere with the natural process of repair
5. Correcting and treating any complication in the wound's healing.

The handling of the contuse wounds was more difficult, as the doctrine held by Hippocrates and Galen was that contuse wounds must suppurate and dispose of blood and smashed parts before nature repairs the substance injured and heals the wound firmly.

Islamic surgeons followed all these ideas and closed immediately the borders in incised wounds, while they favoured controlled suppuration in contused wounds, approaching the borders with care only when there was great loss of substance, by means of sutures. The use of dessicant powders over the borders enhanced prompt repair, while avoiding wet cures increased the chance of normal process of healing.

The need of pus, *laudable pus,* for perfect healing in contuse wounds, proposed by Hippocrates and Galen, and supported by Arabic surgeons, was discredited after fifteen centuries by the advent of antiseptics in 1867, when Lister began to apply carbolic acid to war wounds, followed by other less caustic chemical substances, aiming to stop suppuration. However, after the introduction of antibiotics in our days, it has been shown that antiseptic substances interfere indeed with the normal repair of wounds because they destroy without discrimination pathogenic bacteria and normal cells, and therefore block the formation of new tissues and scars. Furthermore, it was found quite early that antiseptic substances damage normal tissues while being unable to penetrate into the areas where bacteria and contaminating

agents survive.

The role of pus in the healing of War wounds was discovered during the Spanish Civil War (1936--1939) though the intimate mechanism of action remained unknown, when d'Harcourt (1935) and Trueta (1938) developed the "Closed Method" of treatment of War wounds and open fractures. Their technique was based on the ancient tenet of Hippocrates and Galen about *laudable pus:* The wound, within 6 hours, was cleaned and dead tissues removed surgically, the surfaces were washed with soap and water, and after covering the wound with gauze, the affected limb, including the open surfaces of the wound, was covered and immobilized with bandage of plaster. After a brief inflammatory reaction, the "closed wound" began to produce abundant pus, but after a period of around 30 days or less, the removal of the plaster discovered that the wound had healed perfectly, with little scar and the fracture had consolidated firmly. The "closed method" was adopted by the Allied Forces during the World War II and by the American Army during the Korean and Vietnam Wars. The doctrine of pus production for natural healing, as followed by Islamic surgeons has been proved to be sound, and could be explained by the action of lysosomes in pus cells.

Only quite recently De Duve (1966) has shown that lysosomes in pus cells play a dominant role in the process of defence against infection and in the formation of connective tissue, which are the basic processes involved in wound healing.

SUMMARY

Islamic surgical writers, including Rhazes, Ali Abbas, Abulcasis, Avicenna and Averroes, accepted and perfected the ideas of Hippocrates and Galen in respect to the treatment of wounds. Simple incised wounds were closed immediately after cleansing, but compound or contuse wounds were stimulated to produce pus for sound healing. The advent of antiseptics discredited for almost a century the role of laudable pus, which the introduction of the "closed method" of War wounds and open fractures and a better knowledge of tissue repair has rehabilitated. The ancient idea of suppuration in wounds, as supported by Islamic surgical writers has been proved correct.

REFERENCES

1. ABULCASIS — "*De Chirurgia Arabica et Latina*". Oxford, Typographeo Claredoniano, 1778. Fol. xxix, 642 p.
2. ALI ABBAS — "*Liber Totius Medicine necessaria contigens*". Lyon, Jacobi Myt, 1523. 4°419f.
3. AVERROES — "*Colliget libri vii*". Venetia, Hdes. M.A. Junta, 1553. Fol. 187 f.
4. AVICENNA — "*Liber Canonis*". Venetia, P. de Paganinis 1507. 4° 4h.573f.
5. De DUVE, C. and WATTIAUX R. — "*Functions of Lysosomes*". Annual Review of Physiology, 28:435-492, 1966.
6. D'HARCOURT J., FOLCH, A. and ORIOL, A. — "*The closed plaster method of treatment. An Account of its use during the Spanish War*". British Med.J., 1:652-654, 1940.
7. GALEN — "*Opera omnia Latina in Septem classes Jigesta*". Venetia, Hdi. LA.A.Junta, 1565. Fol.8 vols.
8. GUERRA F. — "*Las Heridas de Guerra*". Santander, Universidad de Santander, 1981. 4° xvi, 237, p 1h.
9. HIPPOCRATES — "*Opera omnia. Anutio Foesio auct.*" Francofurti, Andreae Wecheli heredis, 1595. Fol. 8 parts.
10. LISTER J. — "*On a new method of treating compound fractures, abscesses, etc., with observations on the conditions of suppuration.*" Lancet 1: 357-359, 1807
11. RHAZES — "*Continentem Rasis viri profecto in medicinali discipline inter Arabus auctores doctrina.*" Venetiis, O.scotto, 1542, Fol.8h 300f.
12. TRUETA J. — "*Treatment of War wounds and fractures with special reference to the closed method as used in the war in Spain*". London, Hamish Hamilton, 1959, 8° xvi, 391.p.

GENERAL DISCUSSION

Dr. Ahmed Mukhtar Mansoor

With regard to what Dr. Salehia mentioned, that anatomy is synonymous with manual labour. It is not a manual job. The Arabs have taken up the word 'manual labour' and converted on anatomy from the Greek language as 'Churgery', its translation is 'manual labour' and it is not synonymous with anatomy. And the second point which was mentioned by the lecturer was, that Arabs disrespected anatomy. This is not true. We have many Arab geniuses and many Arab genius doctors in anatomy and surgery, and this will be touched upon in the papers, which will be delivered in the afternoon. He also said that, el-Zahrawi had qualified manual labour as mean and menial. This is not true because I refer and I come back to the preamble, which was mentioned by the lecturer and I was doubtful about the fact. And the text in the preamble is as follows: He said that the author of this book, when I completed writing of the book, which is part and parcel of the art of medicine and I have achieved explicitness in it, I wanted to complete this article, which is a manual labour, because manual work in our country is a curse and feared and its science is not taught, it is almost untaught in our country. Only quite a few remains of it in the books of our predecessors and it has been disfigured and distorted and it has become unknown and un-understandable and reason for the lack of the good manual Artist is due to the fact, that the art of medicine is a lengthy way to go. He, who indulges in it must be wide-read in the science of anatomy and until he knows the advantages of the various limbs and their formation and their characteristics and knows the qualities of the bones and membranes and the ligaments and to know the pulses and for this, Hippocrates said, that, the doctors are many but true ones are few who really love manual work. Perhabs the lecturer had inferred that situation that prevailed in Europe during the middle ages regarding the disrespect of surgery. It was prevalent as well in Arab World and this is not true.

Dr. Abdul Munim Abdul Aal

I thank Dr. Francisco Guerra for his valuable lecture and have a question to put to him about the kinds of ointments used by the Arabs and I believe that the Arabs used to adopt cauterization for the treatment of wounds. I would like to explore his views about this point.

Dr. Eric Forbes

I would like to comment on the two lectures. One of them was of Dr. Jurnalisuddin and the other of Dr. G.A. Russel. I believe that Dr. Jurnalisuddin suggested or said that there is no complete explanation of the 'Four Element Theory' and 'Hippocratic humours'. As far as I learned from this conventional sources which I have read, the origins seem to stand from a combination between the naturalistic explanations of the Ionean philosophers, Ionea West Coast of Asia Minor, and the Pythegorean traditions of Greek thought as presented by Empedocles. Empedocles apparantly did some experiments to show that instead of mis-seeing one of the four elements, air was a reality; that it was an element with a substance and so you have separately appearing in different philosophies, the four basic elements. Then Aristotle gave a rational explanation of this in his 'Dicailo' when he tried to make a distinction between earth and water, the heavy elements, and air and fire being the light elements going upwards, and this was of course, also linked to the idea of Doctrine, Hypothesis of Hippocratic qualities. Then this was integrated through Hippocrates in his use of water and places with the theory of the humours and gradually found its way into Cleric writings from whence it came to the Arabic writings. This is my understanding at any rate, of this tradition. So, basically on rational speculation based on observation but not based on experiment. Then the other factor which you mentioned was the disagreement that Avicenna had with Galen's physiological explanation of his teleological explanations and I think one has to make a distinction between the use by Avicenna of the mechanics of Galen's physiology and the rejections by Avicenna of the teleology that he found in Galen's explanation of the functions of the heart, the lungs and the liver and the similar kind of rejection of teleological explanation was also mentioned by Mrs.

Russel in relation to her theme. The thing that interested me particularly in Mrs. Russel's theme was the visual similarity between the explanation that was given of the eye and the epicycle system in astronomy, which of course, Ibn al-Haithem was very well familiar with, because you do have one circle, more or less on the circumference of another circle. Admittedly, the circle remains to change the shape which is meant to be a true circle, but as an astronomer myself, there was to be a suggestion of some kind of link between the astronomical knowledge of epicyclic astronomy and the mathematical or quantitative explanation that was given by Ibn al-Haithem of the eye and I wonder if his expression came from that end and the detail of his explanations was as you say thoroughly anchored in anatomical considerations. These are the two points I wanted to make.

Dr. Abdul Muttalib

I am not commenting but I am going to add something to the paper of Prof. Jurnalisuddin, about the anatomy described by Ibn Sina. The study of history of any subject helps us to look back and that helps us to look forward. The Islamic Medicine has suffered the setback due to shortage of postmortem and examination of the dead bodies. Though the Muslim scholars in medicine described this part of difficulties a great deal on anatomy. Still, even today we are lagging behing the Western medicine because of the restrictions on the examination of dead bodies. In my part of the world the dead bodies are more valuable than the living ones. I do not know exactly what Islam has got to say about the cutting of dead bodies for postmortem and formation of diagnosis and for studying the anatomy. But so far, I have gone through the small amount of Hadith and Holy Quran, I have never seen any where restriction which prevents to do job which is going to be useful to the humanity. So, I see the name of Dr. Ahmed Sharafuddin, who is an expert on Islamic Juris, and I understood that an Islamic Medical Center is going to be established in Kuwait including a hospital, a library, a laboratory and a mosque. And may I earnestly suggest, if Dr. Ahmed Sharafuddin and the other learned colleagues on the Islamic Juris prudence feel, that cutting of dead bodies is not a sin in the eye of Islam, then to add to this Islamic Medical Center a morgue as well, to study the body of a dead person to establish diagnosis and to find out what it may do to us and to anatomy.

Dr. Yousuf Killani,

There are some similar comments or some overlapping comments. I think we have come today to listen to the Arab achievements in anatomy and in my view that the first lecturer talked about this subject and the third lecture was of Dr. Russel, I should congratulate her because she has very simply and explictly explained to us the concept of the anatomy of the eye eccording to Ibn al-Haithem and she explicitly explained to us the concept of the anatomy of the eye according to Ibn al-Haithem and she determined that Ibn al-Haithem had anticipated his pupils, his contemporaries even uptill 1803, because his anatomical description was identical with the modern explanation without going into the details of the anatomical and physiological objectives. As we see in the book of Grey (Gray) of 1903, with this approach, I would like to make reference to the lecture given by my brother Mohd. Salehia. I indeed looked forward to have a picture of eye, given to us by Ibn al-Haithem and explain it to us, how the linguist had anticipated the scientists and the doctors in the medical glossary. All the synonyms and all the terminology which he mentioned such as regarding the qualifications of eye and the physiological functions of the eye and not under anatomy. And here I refer to the subject of Dr. Jurnalisuddin. His lecture was a simple review of the concept of four humours by Avicenna. It is a physiological theory and reference by any man to physiology and its connection with the parts of body does not mean at all that the paper is an anatomical paper.

Dr. Rushdi Rashed

I think there is some misunderstanding when they say that Dr. Salehia tried to show the proper place of anatomy and I give you an example of the history of mathematics. Dr. Salehia has raised a very important point which has been overlooked by many of the speakers when they speak about the history. It is the role of the linguist as a scientific encyclopedia that time, when he goes back to refer to the linguist. You will be able to see how well conversant good people have knowledge of science and I would add, that reference to the linguists is very important to know that there is accurate sense of the concept of the time. As an example, when we take up the word, I will be very quick and pick up the word قرأ واستقرأ that is, to read and to introduce the reading. If you use it in that sense, it used to be, it will be mistaken but if you do refer to the good linguistic book, who will know the sense and that had been the translation of a Greek word and for this I insist that we take up the general form of the lecture of Dr. Salehia. I understand nothing about anatomy, but in its general form. I think these two points are very important and that is I wanted to say. There are errors, you have to know, but as regards the history of science, and this is a meeting dedicated to the history of science and I think this is very important. Now I refer to the lecture given by Dr. Russel. I am sorry, my brother Mr Sabra is absent otherwise the debate would have been more fitting and interesting. Dr. Russel criticised what have been said by Mr. Sabra and others. This is something which can be legitimate and good, but unfortunately, her lecture is very valuable but not convincing. I am not convinced for the following reasons and I think there is an explicit answer by Dr. Eric Forbes when he referred to astronomy once more to show and to explain his explicit understanding of the lecture of Dr. Russel. Why? Because there are so many questions which are being put. What is the mission of Ibn al-Haithem? I will not accept that of Ibn al-Haithem, but there is a basic point in the lecture of 'The Work of Ibn al-Haithem'. He said that there is a physical revolution, which has taken place and thus there is a visual revolution which must be explained. This is the question, this is the topic, but Ibn al-Haithem did not know very well the anatomy of the eye. There are other physical questions whose answers you should know. Does he know the reflection of the vision? The answer to this question, I would say 'No'. If we say, with regards to this limited time, if we talk about the cornea of the pupil, how can we explain its reflection on the ball, then the inverse reflection, until the time of Ibn al-Haithem and all his problem was that the picture could not be reversed. So that the picture came to the eye as it was and thus only visual problems were not resolved. And the word anatomy was never mentioned in the book of Ibn al-Haithem and Ibn Haithem did not make any other medical work. I assure you there is no quantitative analysis of the work of Ibn al-Haithem, done so far, but let us not undermine the rate of Ibn Haithem. Ibn al-Haithem has bound things, but it is the general problem in the history of the Arab science. In order to be convincing you must be objective and to be objective we have to take very meticulously to the text. I congratulate Dr. Russel on her very valuable lecture, but I do not believe that this modern interpretation of the eye in the book of The work of Ibn al-Haithem would answer the question raised in the book of 'Al-Manazer' (المناظر).

Dr. Abdullah Al-Ghoneem (Chairman)

In fact, I agree with what Dr. Rushdi Rashed has said regarding the importance of what we have heard in the lecture of Dr. Salehia. That is the link between the language and the terminology, in view of setting or laying down terminologies for anatomy. I also like to point out one of the gaps, perhaps that Dr. Salehia has felt. He mentioned a poem and these verses come from the poem by Ibn Abras and he interpreted one of the words in an incorrect manner. Actually, the word here was Shaaeb (شعيب) which is 'small valley' and the image was trying to compare the eye with a 'small valley' and what I am trying to drive here is the importance of the precision in use of terms or words.

Dr. Fouad Hefnawi

I have a comment regarding the anxiety expressed by one of the observers regarding the dissection of the dead bodies. In fact, Kloot Bey in the school of Abu Zaabeel (أبو زعبل) started dissecting one of the cadivars 150 years ago and he was in fact criticised by one of the students. The result was that the Sheikh of al-Azhar, Hasan Bin Mohd. al-Attar went there and delivered a speech within the school of medicine, regarding the importance of advancing sciences and the view of religion, with regard to the promotion of medical studies. Ever since that day, dissection activities started on the courses without the religious authorities being against it. This happened 150 years ago and it confirms that Islam is not against the advancement of sciences. Of course, I will be gratified to hear some of the following men, within the framework of the speeches, Ahmed Abdul Moneem Al-Menhezi and other personalities, all of whom studied and worked in the University of Azhar.

Dr. Unaizy Mohammed,

I have a simple observation, a simple comment to make regarding the dissection of corpses. The fellow physician here said that the corpses in Islam were dissected and this was not prohibited. The Holy Prophet (ﷺ) says that if we break the bones of dead body, it is as if we are breaking his bones when he was alive. The Muslim has certain respects when he is dead, which is equivalent to his own respects when he is alive and if the person involved says that he accepts to be dissected or to accept that one of his organs be grafted, then it is not objectionable. So, we find that the main argument has to be found in the Holy Quran and in the Traditions of the Prophet (ﷺ) and Islam is not based on what any person can say. If there is an explicit text of all Hadiths, then there is no problem and as I have mentioned that the corpses of dead Muslims are not to be dissected except if they specify otherwise before.

Dr. Abdullah Al-Ghoneem

Now Dr. Mohammed Salehia is the last speaker on my list answering the questions and commenting also.

Dr. Mohd. Salehia

First of all, I would like to thank Dr. Abdullah for his clarification regarding the mistake made in verses, but it was a typing mistake. The speaker is explaining the precise meaning of the verse and I thank him for this correction. Regarding Mr. Ahmed Mukhtar, I thank him for his observation and I think he only insisted on one part of what I said, without regarding the rest of what I said. I did not say that al--Zahrawi mentioned that surgery is a base job. I said that on page 7, in the Paris Manuscript, in the 7th. diagram, he said that the craft or the art of medicine came in our time is base. So, he omitted to mention that I said, 'in our times' and nothing I have to say to Dr. Ahmed Mukhtar. Zaharawi has been writing by the mid of the 4th. century, and we do not know when he died precisely. He was writing before that date, he said that, to the exception of what has been the surgery done to the daughter (Sakeena) of al-Hussein, and she went to Drophes and she told him 'I can not tolerate surgery' and that is why he did it after she slept, I do not think there is a real history of surgery before that date. I am claiming that Arab physicians have carried out dissection and when I said why did they believe that the brain will be guiding principle of the whole body and it is based on the principle of the 4 elements and that is why they believe that the brain is guiding the body and since this is the case then I should tackle disease through the brain. Now physicians carried out dissection once again. Dr. Yousuf is here among us; Dr. Yousuf also said or it seems to me that he did not follow us properly. What I said was that the physicians believe the linguists. I have found a gap in this report. The linguists spoke about the creation of man, the physicians spoke about the dissection and if we draw up a graph, we will find out that the linguists went before the physicians. That was Ibn al-Qurtub, for example, who started writing in 206 and

Rhazes in 312 A.H. There is a whole century separating both men. What I did was, a time study and I found out that linguists came before the physicians. Where did we get this information from Galen or from where? That is why I am saying that we have to go back to the language books. Another comment addressed to Dr. Marwan Al-Sabeh*. We have the book of al-Cazweeny عجائب المخلوقات for example, which has been published five times and he has also (أخبار البلاد وأخبار العباد), and a first book which is the history of al-Cazweeny. Dr. Marwan had read out what was written and what was included in (عجائب المخلوقات وغرائب الموجودات). I would have accepted, if Dr. Marwan al-Sabeh had presented a new manuscript a new, un-known manuscript, but this book has been published and re-published five times and it only costs 750 fills. So, what I want and what I wish was that he would tell us about the true achievements of al-Cazweeny in the field of dissection and draw a comparison between him and other Arab and European physicians and all their contributions to this field.

Dr. G.A. Russel,

In my interpretation, the eye has been regarded as an abstract eye. I had not been attacking the distinguished scholars such as Sabra, Lindberg, or Nazif. I am simply putting a perspective on an interpretation, which has been simply from physical optic point of view, without the required balancing of the anatomy. My interpretation tries to bring into light the empty shell of the eye, which has been prepared and in Ibn Haithem's text, he spends 2 chapters and he gives an extremely coherent, systematic, though very repetitive description of his practice and there is no question that he had familiarized himself with the anatomy of the eye. In what way? We do not know. We have no direct access to the sources he used or consulted, but the text is there and a correct point I have made on the 2 slides which I have shown, has been based on his description. Secondly, I think, it is quite clear that his anatomy is not the starting point of his viewing of the eye as an image forming organ. His optics, his description of reflection, which enables the objects to be visible, his principles of reflections have to be considered. It is quite true, we have no evidence of the fact that he knew the reflective indices of this layers of the eye. But we can have a rough estimate, because, for example, his interpretation of image, correction in the eye, that is on the basis of his perpendicular rays the image which is formed in the eye, what have been inverted and his interpretation of the correction of the image is on the basis of reflection, he concieved of the .... mistakenly as having a thicker optical density than the lens. Therefore the rays, instead of being cross going through the center of the eye and giving an inverted image back, reflected away from the normal and did not interfere. So, that one principle, we have about the fact that he knew the reflective indices and we can, perhaps make a hypothesis about the fact that he knew the lens had a thicker consistency than the .... He describes the lense as Galees, (غليظ) as having a thicker consistency, but these are points which should be considered. I have not made an absolute interpretation of his view of the eye at all. I have simply pointed the fact, that perhaps as Prof. Forbes has suggested interestingly, his formulization of the anatomical structures of the eye was through the eyes of a geometre and an astronomer. That is my point and also it is true that in his description of the axis, he does view the eye corniary and saggetely and the nymph of the concentric eye, which has been regarded as being the original and m edieval onion eye, has been due to this supreme position of 2 places of reference, which have been texted seperate by Ibn al-Haithem. I have also worked out the optical implications of the eye, but it is not the subject of anatomy at the moment, , therefore I did not go into it because of shortage of the time. Therefore I would like to discuss these points with Prof. Sabra and Rushdi Rashid, in greater detail, because I am sure we could communicate and perhaps interpret the aspects which require further study and discussion. I could make one more point, if I am allowed. Another point is the fact, that, for example, he clearly viewed that the aperture of the eye was not the pupil, unlike Leonard

* The paper of Dr. Marwan Al-Sabeh was sent to referees once again & they rejected the paper. So it is not included in our proceeding. Editors

De Vinci, who in his interpretation of the image formation in the eye, had problems, because of the fact that he did not take into account the anatomical fact that the eye is not a big hole but an aperture.

Dr. Francisco Guerra,

Nothing stimulates more in a meeting than to have people, who disagree with you. So, I congratulate the energy of my friends and I am ready for the part. First, ointments are used by Islamic writers. They said a great deal of this, but I pointed out the only substances which are against the natural healing of the war wounds. However, as we all know that Islamic writers expanded considerably the Materia Medica. This is one of the subjects. Now, I have people with me in Madrid and the contributions of Islamic culture to the development of Materia Medica is probably one of the most important ones. There is, in fact several books published in Spanish, in the 16th century, dealing with the ointments and preparations used by Islamic writers and there is a book by the title of 'The Servant of Abul Casis', 'The Servedur de Abul Casis', that is a book, a whole book devoted to the description of the substances. Please, keep in mind, that Islam always used drugs externally. It never used mineral substances internally. This is something that very few people know. The Islamic writers never recommended mineral substances by oral source. About Dr. Halawa's question the study, when you know history of medicine, when you know your field, (medicine) well, you find that, when you discover something, there was something else before you. When you discover something, you always discover that there was somebody before you who had already had an idea of what you have discovered and this is the case of the treatment of war wounds by the close method. The close method of treatment was first used during the Rebellion of the Spanish Minors in Astudias in 1974. Then, 2 basic things of military surgery were learnt. First, when a soldier falls, if you wait more than six hours you lose him. The soldier will enter in shock and the wound will never be well treated. So, if you are a military surgeon, the first thing you have to do, is that you treat the soldier as soon as he falls. The soldier will be saved. Then, in that Rebellion of the Astudian Minors, that war later turned into Spanish Civil War, it was learned that when you treat the soldier immediately, you will recover the soldier. If you take longer, you lose the soldier. This is one, but before then others had used the close method for the treatment of Osteomylitis. I have a book published here, about 300 pages, on the history of war wounds and you will find the details there.

Now, Dr. Forbes has mentioned about the four humours and it is not as simple as that. We know perfectly well about the Indus Valley, that HK. Mohd. Said knows very well, that is the whole archeological basis of early medicine is changing. So the Treedosha, the dosha and tridhatu, the basis of Indus Valley humoural physiology has changed completely. You find it in every book and that, Hippocratic philosophers were the ones who discovered the humours. That is not correct any more, because China had the same idea at the same time. In the Indus Valley civilizations, you find it in Mohinjodaro and Taxella and every where, that they had the same idea. Now, I want to say something to Dr. Salehia that the theologists have always complicated the life of the medical historians. So, if you read Cigerres' book, you will discover that in the 19th century, medical history was killed by the theologists. So, as medical doctors, we were left out of place, because the theologists complicated our lives so much that we were unable to fight them.

Dr. Jurnalisuddin

I would like to comment on what Doctor Fadaly said, that Ibn Sina approached in a different way than Galen. I think this is the advancement of science, because we know Galen lived 200 years B.C. and Ibn Sina lived in the 10th century. A.D. So, I think Ibn Sina thought that the explanation of Galen was not sufficient to some particular matters. So, he did contribute something on that particular matter. And regarding the dissection of human body, the dead human body, I think now, in the 20th century , almost all of the Olama (علماء) agree that it is allowed to carry out dissection of the dead human body.

But, what I intend to say is, during Ibn Sina's era, that means in the 10th century, they had very limited Atlas or manual of human anatomy, which was published at that time, but I think, we are not contradicting Islamic Law about dissecting the dead human body at the present time, only at that time.

Part Three: *Contributions of Moslem Scholars to Anatomy and Surgery.*

CHAPTER TWO

(Some Selected Papers — Not Presented)

1. CONTRIBUTIONS OF ISLAMIC MEDICINE TO ANATOMICAL SCIENCES.
   Prof. M.A. Karim.
2. GYNAECOLOGICAL SURGERY IN ISLAMIC AGES.
   Dr. Kamal Samarai.
3. ANATOMY OF LIVER, SPLEEN AND ABDOMEN, THEIR DISEASES AND TREATMENT IN THE KITAB AL-TAYSIR BY IBN ZUHR (AVENZOAR).
   Dr. Carmen Pena Munoz, et al.
4. THE SURGICAL HERITAGE OF EGYPT DURING THE EARLY ISLAMIC PERIOD. 'ARCHEOLOGICAL STUDIES - ADDITIONS'.
   Dr. Henri Amin Awad.
5. CONTRIBUTION OF MUSLIM SCIENTISTS TOWARDS SURGERY.
   Dr. Shobhana Mathur.
6. STATUS OF ANATOMY AND SURGERY IN DIFFERENT CIVILIZATIONS AND THE CONTRIBUTION OF ARABS IN THIS FIELD.
   Mr. Rasheeduddin Ahmed.
7. CONTRIBUTION OF SOME MUSLIMS TOWARDS SURGERY.
   Hk. Abu Bakr Khan.

CONTRIBUTIONS OF ISLAMIC MEDICINE TO ANATOMICAL SCIENCES

Prof. M.A. Karim

MALAYSIA

It is rather unfortunate that our knowledge of Islamic medicine, based on a second-hand information through English authors is so sketchy and oblique that it is almost impossible to evaluate the contributions of these scholars to the present day medical sciences. The bias of these authors appears to arise, perhaps, from an apparent assumption that Islamic Medicine is a part of the Islamic religion. In fact, Islamic medicine refers to a medical system which was introduced to the world and mainly into the Arab countries at the turn of 8th century, A.D. and was practised through the middle ages, the impact of which is seen up to modern times. All the scholars of that time were neither necessarily muslims, nor Arabs. Eminent physicians like Rhazes, Avicenna and Haly Abbas were Persians, Hunayn ibn Ishaq, a translator par excellence was a Christian, and Maimonides, another eminent doctor was a Jew. They all lived and thrived within the sphere of the dynamic Islamic society of those days. In the words of Manfred Ullmann (1978) "when we talk of Islamic medicine, we are thinking of Islam as a cultural force, we are looking at a culture which has absorbed many different currents within itself and integrated and developed them". There is nothing new or strange and it needs no apology to call such a system of medicine, Islamic medicine. In fact, with the rise and fall of every civilization and culture, there has been a rise and fall of their medical systems, like Greek medicine, Roman medicine, Chinese medicine and Hindu medicine. Some of these have survived and contributed a great deal to the modern medicine, although it may not be appreciated, much less acknowledged .

To place the Islamic medicine in its proper perspective, it is imperative to look into some aspects of its emergence and survival. First, the era of pre-Islamic medicine in which it emerged and secondly, the modern era of Western medicine in which it is being revived.

1. THE ERA OF PRE-ISLAMIC MEDICINE

It is a well-established fact that pre-Islamic medicine was mainly folk medicine strongly based on superstitions and magical elements. Islamic teaching, however, transformed this folk medicine into a highly sophisticated system of scientific medicine from which magic and superstitions were totally banned. Until the advent of Islam, the art of healing revolved round the kings and the rich. Islamic traditions radically changed this situation and for the first time, presented this science as an instrument of human service to rich and poor alike. Again, it is said that there is nothing new and original in the writings of Islamic philosophers and thinkers of this period as they derived much of their knowledge from the earlier Greek writings. In this connection, it must be appreciated that no knowledge can develop in isolation. It is always either a continuation of, or a reaction to and consequently a result of some previous knowledge and wisdom. As such, under the aegis of Islamic culture and tradition, scholars and philosophers developed, reorganized and expounded medical knowledge and philosophy of Greeks on a brilliantly rational and analytical basis.

2. THE ERA OF MODERN WESTERN MEDICINE

In recent times, medical science has made tremendous progress. This spectacular advancement, by and large, has been through the assiduous endeavours of the Western scientists. Nevertheless, it must not be forgotten that all this progress of the medical science we see today did not develop in a vacuum. It rather, developed on the edifice of the human wisdom and knowledge achieved by the scholars and scientists of the Islamic medicine. But indeed, the real achievement of the West lies in disowning, disconnecting and in distorting the contributions of the Islamic physician and philosophers, so much so, that

today it has become difficult to think anything contrary to the western thoughts. In spite of this situation, these days more and more medical scientists of the West are turning towards herbal cure, acupuncture and to even the concept of humours and temperaments, and of psychic and soma.

CONTRIBUTIONS TO ANATOMICAL SCIENCES

Looking back on the sketchy history of the Islamic medicine, one comes across two main categories of contribution of its scholars to anatomical sciences; one, through translations and the other, through their original work.

At this point in time, the Greek philosophy of humours had taken deep roots, Galen's knowledge of human anatomy based on his observations of a few dissection of animals was beyond any doubt and discussion, and above all, dissection of the human cadavers was not permitted as it was considered unclean and sinful. Although Arab poetry in the pre-Islamic era occasionally depicted heart, lungs, liver, spleen and kidneys as important parts of the human anatomy, but they had very little, rather peculiar ideas as to their shapes and functions. They thought anger was located in the liver, courage and passion in the heart, fear in the lungs laughter in the spleen and greed was lodged in the kidneys. In short, the anatomical knowledge of the pre-Islamic Arabs was more poetic than factual and scientific.

The contributions of Islamic medicine during the medieval ages to the study of anatomical sciences could be classified into two phases:

A.THE PHASE OF TRANSLATIONS (7th to 9th cent. A.D)

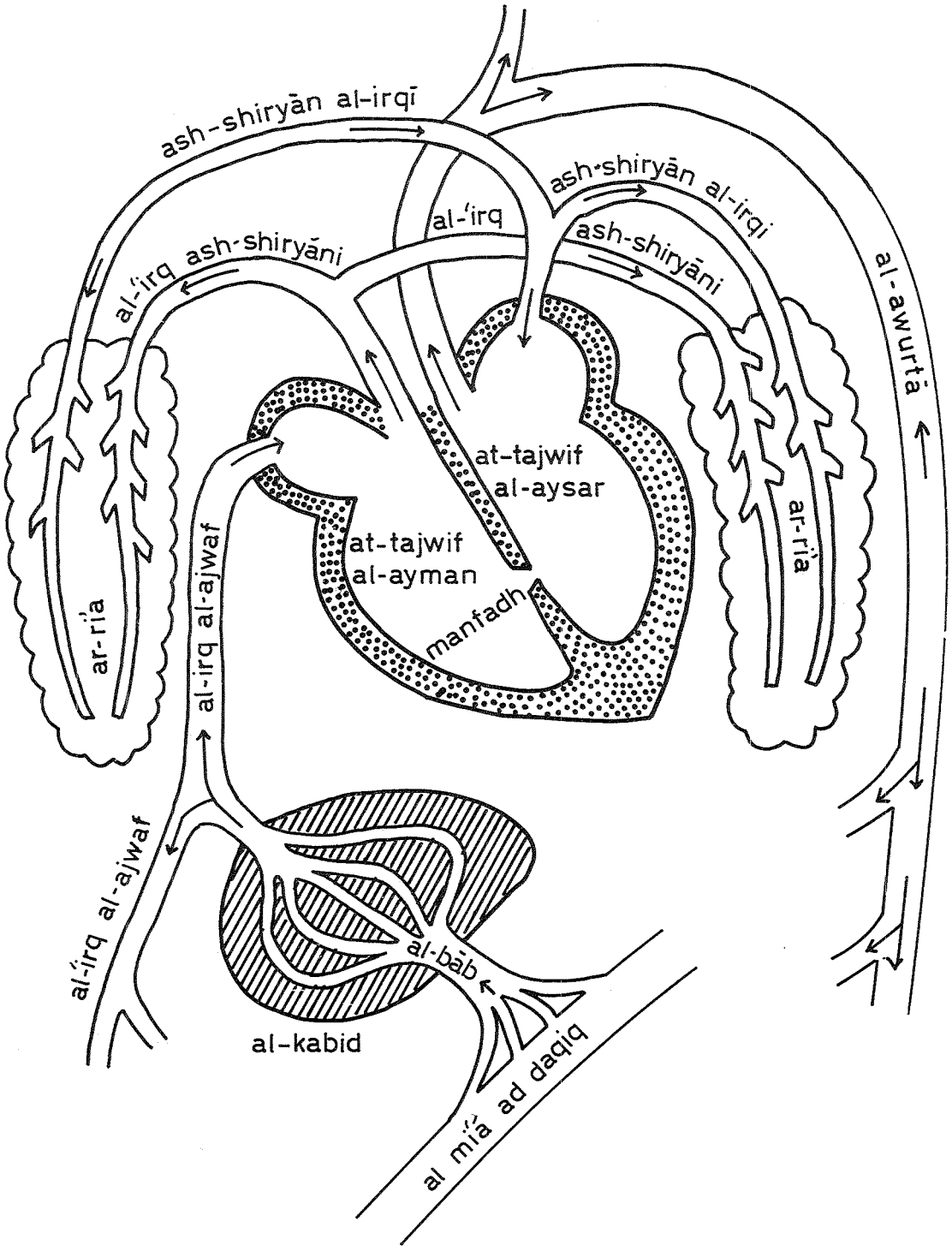
Before the year 800 A.D., translations were few and far between. Jurjis ibn-Bakhtishu who lived during the reign of Caliph al-Mansoor (754-774) and his son Jibril ibn-Bakhtishu translated a number of classical Greek works into Arabic and Persian. Translators, however, became very active under the Caliph al-Mamun (813-833) and by the turn of the 9th century, many hundreds of Greek work were translated into Arabic, Syriac and Persian. Al-Mamun established a sort of an academy. Bayt ul-Hikma to help and organize these translations. At this time, while Job of Edessa translated exclusively into Syriac, Yahya al-Bitriq translated a variety of Greek works including Anatomy into Arabic language. Hunayn ibn-Ishaq (803-873) was perhaps, the greatest translator of that century. In this endeavour, he was supported by his son Ishaq and nephew Hubaysh al-As'am. By the second half of the 9th century, almost all Galen's work had been translated into Arabic and Hunayn alone had contributed in the translation of no less than 129 of Galen's work. One of his famous book, Kitab al-Aghdhiya is the translation of Galen's "De alimentorum facultatibus". At this stage, the number of translations was so prolific that it gives an impression of a complete and total transplantation of Greek medicine into Islamic medicine. From the anatomical point of view, the teachings of Galen on digestion, blood circulation, his theories on pneuma and humours had its impact on the Islamic medicine. Galen's chief anatomical work entitled "Peri anatomikon egkheireseon" consisted originally of fifteen books. While all these fifteen volumes have been preserved in Arabic , only Vols . I-VII and a part of the IXth are available in the original Greek language. Galen's three other anatomical treatises, namely:

1) Peri tes ton homiomeron somaton diaphoras
2) De venarum arteriarumque dissectione
3) De nervorum dissectione

were also translated into Arabic by Hunayn and his associates.

B. THE PHASE OF ORIGINAL THINKING (10th to 12th century A.D.)

At the end of the 9th century, Islamic medicine came under the influence from four sides: the Greeks, the Syrians, the Persians and the Indians. These cross currents of knowledge were completely but not indiscriminately absorbed and integrated into the Arab medicine which then offered in the words



BLOOD CIRCULATION
ACCORDING TO al-Majusi

of Ullmann "a very colourful and varied picture of the Islamic medicine". Further, during this period intellectual giants like Avicenna (Abu Ali al-Hussain bin Abdullah ibn-Sina, 980-1037), Rhazes (Abu Baker Muhammed ibn-Zakaryya al-Razi, 860-932), al-Tabari (Ali ibn Sahl Rabban al-Tabari, 850-921) and Haly Abbas al-Majusi (Ali ibn-al-Abbas al-Majusi, 880-940) contributed a great deal to medical science in particular. Their writings in the field of Anatomy, Physiology, Pathology, Internal medicine and Ophthalmology have remained a compulsory manual of the medical curricula in the West up to the 17th century A.D. Some of their findings have not been contradicted up to this date.

I would now like to present a few glimpses from some of the major contributions of Islamic scholars to anatomical sciences. I would like to apologise for being patchy and a little disjointed in my commentary on their valuable works.

1) I begin my discourse with al-Qanoon which immortalized Ibn Sina in the field of medicine. Ibn Sina displayed his originality in Anatomy and classified the organs and functions of the human body. The most significant morphology described by him in these books, is on the structure and function of the eyes. He mentions about the six muscles of the eyeball which facilitate the movements of the eyeball. He believes that there is a separate muscle attached to the optic nerve which steadies the optic nerve and helps in focussing the vision. In this book, he also writes about the two optic nerves crossing each other 'like a crucifex', where he thinks the visual images from both eyes superimpose each other, a concept of binocular vision.

2) Classically, the body fluids are considered to exist in two main compartments, intracellular. Ibn Sina, however, classified body fluids into two basic categories, Primary (رطوبات اولی) and secondary (رطوبات ثانية). Primary fluids include basic four humours, blood, phlegm, bile and melenum. Secondary fluids include interstitial fluid, depot fluid, metabolic and structural fluids. He describes interstitial fluid as the fluid imprisoned in the spaces between the capillaries and that "which offers drink to the tissues". It is surprising that the same concept is being described today with the use of a modern terminology of "pinocytosis" which also means. 'drinking by the cell'. He regards the intra cellular fluid in the form of 'dew drops' as the 'depot fluid' which provides nutrition to the tissues. According to him, metabolic fluid is the fluid derived from the food and structural fluid is an integral constituent of the various structures and organs from its origin. These descriptions reflect a highly analytical and scientific trend developed by the Islamic scholars without the help of the present day modern tools.

3) Another scholar, al-Majusi in his book Kitab al-Malaki has described about elements, humours and temperaments. He mentions about three faculties, the natural, the animal and the psychical. Notwithstanding the terms used by him, his description and elaboration of these faculties are to a great extent modern. He believes life is maintained by the animal faculty which is located in the heart and reaches the organs and tissues through the arteries. He considers brain as the seat of psychical faculty which is concerned with:

a) Perception of the senses. (Sensory system according to the present understanding).

b) Voluntary movements. (Motor system according to the present understanding).

c) Faculties where brain works automatically. (Perhaps, represent the higher faculties of the brain).

4) Al-Majusi has displayed a remarkable knowledge of anatomy of the heart and circulation. He describes the heart as made up of flesh which is thick and firm and disposed in many layers. The heart has a right and a left ventricle. The right ventricle has two openings. The vena cava which brings blood from the liver enters through one of these openings which is guarded by three small membranes. After the blood has entered the heart these flaps lie over each other like a valve preventing the return of the blood into the vena cava. He refers to a 'venous artery' (al-Shiryan al-irqi) which transports the air from the lungs to the heart in the opposite direction. The two ventricles contract in unison, but the left one

does more strongly and sends blood to all parts of the body through one of the big arteries (al-irq al--abhar) attached to the left ventricle. This description of the heart and circulation is a gift of what al--Majusi wrote almost one thousand years back and broadly speaking, it does not differ much from the text of a modern book of Anatomy or Physiology.

5) In the 13th century A.D., Ibn Nafis (Alladdin Ali ibn-Abi-l-Hazm al-Qureshi) wrote Kitab al-Mujiz and for the first time described the circulation in the lungs, refuting a deep-rooted impression that there is a passage between the two ventricles. I believe, all these findings finally led to the discovery by William Harvey in 1628 that blood circulates in a circle.

6) Galen had described the human lower jaw as consisting of two bones joined in the middle. For many centuries Galen's teachings remained a gospel of truth and it was an Arab doctor, Abd al-Latif al-Baghdadi who for the first time pointed out this anatomical mistake of Galen because he could not observe any joint even in old bones.

7) Again, al-Majusi wrote in detail about the Anatomy of the Stomach and liver. Hippocrates had described five lobes of the liver and Galen had also mentioned about the five finger-like process of the liver. But al-Majusi described two and in some cases three lobes of the liver which appears to be nearer to truth. To sum up, the physicians and scholars of the Islamic medicine displayed a remarkable knowledge of the anatomical sciences. We have gained much from their writings on all aspects of medicine including anatomy and it is up to us to appreciate or to depreciate, to acknowledge or to abandon their immensely valuable contributions.

REFERENCES

1. ASLER, W., "*The Evolution of Modern Medicine (1st ed.)*", Barnes and Noble Inc., New York, 1954.
2. BROWNE, E. G., "*Arabian Medicine*", University Press Cambridge, 1962.
3. ELGOOD, C. L., "*A medical History of Persia and Eastern Caliphates*", Cambridge, 1921.
4. GOHLMANN, W. E., "*The Life of Ibn Sina*", New York 1974.
5. GRUNER, O. C., "*A Treatise on the Canon of Medicine of Avicenna*", Luzae & Co., London, 1930.
6. HILTI, P. K., "*History of the Arabs*", McMillan & Co., London, 1956.
7. IBN SINA, "*Al-Qanoon fi-Tibb*", Translated by M.H. Shah, Karachi, 1966
8. METTLER, C, "*History of Medicine*", The Blakiston Co., Toronto, 1947.
9. NADVI, A.D., "*Hukma-i-Islam*", Azamgarh, 1953.
10. ULLMAN, M, "*Islamic Surveys*", University Press Edinburgh, 1978.
11. ULLMAN, M., "*Medical History Journal*", IX, 1974.

GYNAECOLOGICAL SURGERY IN ISLAMIC AGES

Dr. Kamal Al-Samarai

IRAQ

Most of the available classical Arabic texts on surgery suggest that it was more theoretical than applied. This aspect is apparent to some extent in a number of works by Abu Bakr al-Razi, Ali bin Abbas al-Ahwazi, Abul Qassim al-Zahrawi, Ibn el-Koff al-Karki as well as in some works by Arab ophthalmologists. There are some other works on surgery by other Arab physicians most of which, however, have been lost. The few texts that have reached us do not clearly indicate that the author concerned had actually practiced the operations he described in his book. Apart from venesection and cauterization which figure prominently in the medical literature there is no record of major or complicated operations involving incision, excision and operating on contuse wounds except perhaps two or three. We know that some physicians including Ukasha al-Karki, Abu Nasr al-Masihi, and Abul Hakam Amr bin Ahmad al-Kirmani did perform surgical operations, but they did not report them, nor did archaeologists find the surgical instruments used by Arab surgeons, from which we could have deduced the level at which they operated. We are more poorly informed about gynaecological surgery as we have failed to find any classical text categorically establishing that it was practiced as much as it was written about.

Undoubtedly, things were further complicated by the fact that Muslim women, by virtue of their feminine shyness in addition to the legal and traditional constraints they submitted to, must have made it tremendously difficult for male gynaecologists to examine or treat them with the necessary thoroughness and accuracy required by their profession. This strictly conservative attitude was predominant even among the Spanish ladies who embraced Islam after becoming wives to the Arab Muslim conquerers. It is true that Prophet Muhammad (ﷺ) had advised men and women alike to consult a doctor in case of illness. But decent women, especially princesses and women of notable families, persisted in their caution and never allowed anyone to examine them except midwives. However, it would not be inconceivable if some of them had to yield to the hands of a male obstetrician or surgeon when matters became too serious to be handled by a midwife, but not without much resentment for having to be seen by a stranger.

There is no mention of female physicians in the Arabic classical works. Women seemed to have worked in the medical field only at the level of midwifery or perhaps a little higher. At this juncture, I would like to point out that gynaecology includes normal parturition, mogistocia, and surgical diseases to which women are exclusively susceptible. Classical Arabic medical literature abounds with all such cases.

In this paper I am going to present what I was able to ascertain about the traditional Arabic medical practice in the field of gynaecological and obstetrical surgery either directly or through midwives.

Owing to the close connection between Arabic and Greek medical systems and the abundance of information about gynaecological surgery in the Greek texts, we shall have to refer to these texts to find out points of relevance to the Arabic classical texts and commentaries. Anyhow, the books of Hippocrates, Surance, Ruphus, Galen, Atius, and Paulus of Agina which were translated into Syriac and Arabic during the third century A.H. (9th century A.D.) were the first texts that introduced Greek knowledge to the Arabs, and the last ones, too. These books remained accessible to Arab physicians for reference throughout the Islamic ages, though they later became integrated into Arabic medical literature. By referring to the original Greek works we can also determine how much Arab physicians adapted from them and how much they contributed of their own innovations and experience. Our job is greatly facilitated by the fact that most of the Arabic medical writers, or at least the leading ones, were honest enough to put on record the sources they had referred to in their writings. This attitude was characteristic of all Arabic classical works and is the right academic practice in writing nowadays.

In this study we also have to extend our investigation to the kind of gynaecological surgery practised by the pre-Islamic Arabs, as it constitutes an important source of Islamic surgical practices. Unfortunately, our traditional medical texts have failed to record any such Pre-Islamic activities, confining

their interest to Greek and Islamic medical systems. However, we can come across bits of information about pre-Islamic gynaecological surgery in Arabic literary works and dictionaries, hardly the kind of sources that would convince academic researchers. This traditional surgery was carried on during the earlier Islamic ages and much of it became part of the general medical practice for more than a century after Islam with very little development. Some of it is still practised until now.

Obviously, some pre-Islamic women must have practiced midwifery and handled some difficult cases of parturition. In all likelihood, a well known female obstetrician must have been one who had herself undergone the experiences of parturition, accouchement and motherhood. It became then a well established tradition that a midwife must be a mother in the first place as she would thus be in a position to know what to do in handling the parturient and her newborn.

Since early times, a midwife had enjoyed a certain high prestige among the surrounding families. She was also considered the higher mother of those into whose noses she had blown life while dragging them from the darkness of the womb to the light of this world. Naturally, this image was not the same in all nations. But the Arabs figured high among those who held midwifery in high esteem and respected those who practiced it.

When it was almost time for a pregnant bedouin, she was confined to a corner of the house called "mithbar" until she was in labour. At that moment, she would squat leaning forward and putting both hands and knees on the floor while the midwife sat behind her with hands ready to receive the delivered baby. Sometimes, a parturient would lie on her side and give birth in this posture. We needn't emphasise, of course, that these two postures were extremely hazardous both to the baby and to the mother.

There is evidence that some male bedouins practiced a measure of midwifery. It could be that they had their cue from those veterinary operations performed by shepherds on their sheep and camels, so that at times of emergency, when a midwife failed to do her job, such a shepherd would come foreward and apply the methods he had learned to the suffering parturient.

In the old Arabic dictionaries, the entry "sati سطى " was explained as that operation performed by a bedouin sheperd on his sheep and camels whereby an impacted dead foetus was extracted; "satw سطو " was the corresponding operation involving human parturients. We actually know nothing about the techniques or steps followed in performing such operations. The dead foetus must have been extracted through the vagina either manually or with the help of some instruments made of wood or metal. In most cases a midwife would perform such an operation. If she was unavailable, then a man with experience in this field would do it. Ibn Nazeer said, "There is nothing wrong with letting a man perform "satw" on a woman when a midwife is unavailable if her life is endangered by an impacted dead foetus in her uterus. In this case he may put his hand into her vagina and extract the dead foetus." This quotation shows clearly that midwifery was practiced by people of both sexes.

Instinctively, and through long experience, a bedouin obstetrician would know the symptoms of a dead foetus in a mother's uterus. This case was called "al-hash الحش" in the old Arabic dictionaries. If the foetus died and dried up it was called "hasheeshحشيش" and the mother would be said to have "ahshat", i.e. her foetus died and dried up in her uterus. It was also mentioned that such a "hasheesh" (dead foetus) would not get out of its own and had to be extracted. All these bits of information indicate that the bedouin midwife was capable of diagnosing cases of dead foetus and was then able to extract it. This kind of information is greatly important in gynaecolgy and is considered quite early for those times. Old Arabic dictionaries also mention that bedouins had practiced postmortem caesarean section to save the life of a baby. The entry for this operation is "khish'a خِشعة " and the woman operated upon is called "baqeer بقير ", an adjective derived from "baqar بقر " which means "ripped open" (The "Khish'a" is the baby of a "baqeer", the "baqeer" is a woman who dies with a live baby in her uterus which is then ripped open to get it out) In this respect, it is said that Kharija Ibn Sinaan and Bakeer Ibn Abdul Aziz, both pre-Islamic Arab bedouins, were born in this way. Postmortem caesarean section is still practiced at present, though very rarely.

History of the ancients tells us that the Babylonians practiced postmortem caesarean section during

the second millenium and that the doyen of Greek physicians, Escilibius, had been born to his father Apollo from his mother Coronus in this way. It was also said that Rustum Destan and Julius Caesar had also been brought to this world through a postmortem caesarean section. But such events are probably legendary and not real. In fact, both Escilibius and Rustum Destan have no existence outside the old history books. There is no record of this operation or of what is today known as the caesarean operation in the texts of the traditional Arabic medical system. The pre-Islamic age (200 years B.H.) coinsides with the later Byzantine period at the Northern tip of the Arabian Peninsula. At that time, the Byzantine medical system was the quintessence of the Greek medicine from the days of Hippocrates, who died in 348 B.C., to the days of Paulus of Agina who lived to see the early beginnings of Islam and mixed with the Muslims. Contact between the Byzantines and Arabs must have been confined to the joint borders of Arab and Byzantine territories. So, Greek medicine did not get as far as the innermost areas of the Arabian Peninsula. This means that pre-Islamic obstetrical and gynaecological medicine with all its simplicity and primitiveness was a purely Arabic tradition handed down from generation to generation with no trace of Greek medicine in which there is no record of postmortem caesarean sections or what is known today as the caesarean operation.

Circumcision is another operation practiced before and after Islam and performed on young boys and girls. In Islam, circumcision is not imperative but rather a customary procedure sanctioned by tradition. The best known circumciser of the times was Um Attiyyah al-Ansari who carried on her profession well into the early days of Islam. Concerning clitorotomy, the prophet (ﷺ) advised her against clitoriodectomy and told her she had better cut off only the tip as this would not deprive the girl from later marital pleasures. Um Attiyyah must have practiced midwifery besides circumcision and clitorotomy which were probably adopted by the Arabs from the Jews or Ancient Egyptians. Clitorotomy is still practiced today in Egypt and Sudan.

For a century and a half after Hijra, there were no reports about gynaecological surgery among Muslims. The type and scope of its practice must have been an extension of the pre-Islamic era with a little improvement resulting from Muslims' contact with the Romans in the urban areas in Northern Syria and Iraq, especially in Damascus. Islamic Jurisprudence reveals that the "khish'a" operation (post-mortem caesarean section) was maintained in Islam. Abu Haneefa was quoted as saying, "If someone could save the life of a baby from the womb of its mother at the moment of her death and did not do so he is considered a murderer and his crime is tantamount to killing all the people; but if he did so he had then saved a human life and it would be as if he had saved the lives of all human beings."

At the beginning of Islam, most of the physicians in Syria and Egypt were Romans who had learned medicine in the school of Alexanderia. Two of these were Ahron bin Ayin and Paulaus of Agina who mixed with the Muslims and taught them a lot about practicing medicine.

A Muslim woman might have been more compliant to those Roman doctors. Being followers of another religion, they would not know much about her identity and therefore her well-guarded feminine secrets would be better kept than if she was seen by an Arabic physician, if any. It could well be that Paulau was called for a mogistocia case which he handled skilfully saving the mother from sure death. He was a specialist in gynaecological and obstetrical surgery and was known among his colleagues as "Qabeli", an Arabic adjective derived from "Qabelah" which means "midwife". Other specialists in this field were Tyazouk (the Kufi), Masergawayh of Basra, and Maseeh Ibn al-Hakam al-Dimashqi. They all worked with a measure of freedom as they were not resented by their Muslim female clients. They derived their knowledge from Greek and Byzantine medical works before these were translated into Arabic in the first Abbasid era. They must have read these works in their original Greek language or in Syriac to which they were translated by Sergius. It is worth noting that when Tyazouk wrote on obstetrics he selected for his readers a number of directions that were most vital to perform and most essential for the safety of the parturient . About retention of the placenta and delay in its ejection out of the uterus he says, "Do not pull at the umbilical cord, but push it downward towards the thighs and use ptarmus." These directions are still valid today. We notice his emphatic warning against pulling at the umbilical cord for fear that it might overturn the uterus inside out leading to instant death.

This warning is the core of obstetrical technique in extracting the placenta. We shall see that

ptarmus is a very important procedure in this operation and has been advocated by all physicians since Tyazouk in the first century A.H. until the decline of Arabic medicine in the 10th century A.H.

There was no specific information about surgery until "Baytul Hikma" (The House of Wisdom) in Baghdad undertook the translation of the Byzantine medical works, one of which was "Kunnash al-Thurayya" (Fundamentals of the Pleiades) by Paulus of Agina, an encyclopaedic work on general and gynaecological surgery. The first Arabic book on surgery is "Fi Sina'atul Ilaj bil Hadeed" (On Treatment with Iron) by Ishaq Ibn Hunayn, a pilot study in the art of surgery much of which was presumably copied from Paulus of Agina's "Kunnash". Being a translation in Arabic, the "Kunnash" was the most widely circulated Byzantine work among the medical students and practitioners.

Unfortunately, Ibn Hunayn's book has not reached us. It could have cast some light on what was known at that time about surgical medicine. It must have contained some parts dealing with obstetrical and gynaecological surgery, or at least some of the surgical operations commonly performed at the time such as venesection and cupping.

It seems that all cases of parturition, whether normal or difficult were handled by midwives throughout the Islamic ages in the East and West. We do not have documented information about the instruments, drugs, etc. used in obstetrics during those ages. Some historians have revealed to us the strange practices of folk medicine at that time prescribing that pregnant women should wear some stones to avert miscarriage or that some dead animalcules should be tied onto the thighs of a parturient to make childbirth easy and quick. Application of these methods continued for some time by Arab physicians in addition to common people as they were believed to have unknown curative powers similar to those of the medicinal herbs.

According to the traditions of those Islamic ages, the parturient would sit on a chair specially designed for the occasion. We believe that those chairs were only used in rich houses. Perhaps each rich family had its own custom-made chair of which they boasted a lot. By and by, the childbirth chair began to drop out of use until it completely disappeared by the end of the 9th century A.H. when the parturient returned to the squatting posture of her ancestral grandmothers in the desert tent sites.

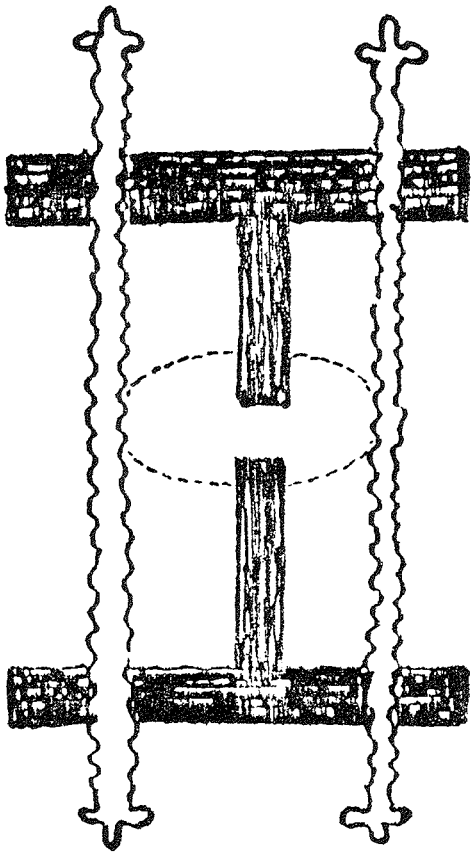
Presumably the first Arabic works on gynaecology were those of Al-Razi who died in 320 A.H. (932 A.D.) He is a medical genius of all times and a great critic of obsolete medical theories and practices. What is really remarkable about him is his concentration on gynaecological diseases to which he devoted the whole of the 9th book of his medical encyclopaedia "Al-Hawi fil Tibb" (The Continens) at a time when there was hardly enough medical writing to cover general medicine.

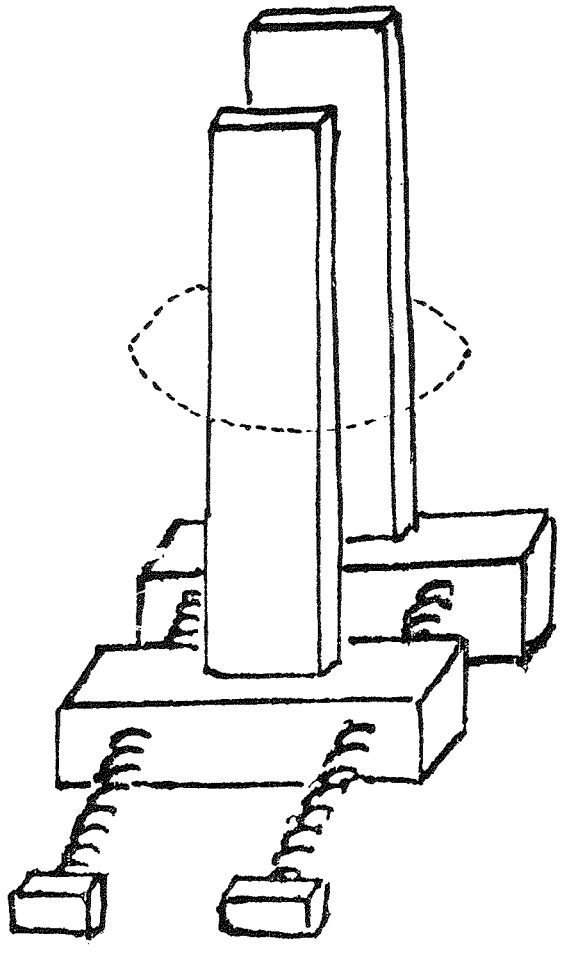
Al-Razi practiced obstetrics directly as well as indirectly through midwives. To our amazement, he used to make an incision in the front part of the uterine membrane to let out some of the amino water with a view to facilitating and precipitating childbirth. Atius of Amid mentions this vital point in his book but in such a superficial way that we can see clearly he was unaware of its important implications and methods of application. Repeated experiments have proved the validity of al-Razi's views in this respect, and the incision of uterine membrane has become the most modern technique in obstetrics adopted by the leading maternity hospitals after the '50s .

Al-Razi also prescribes cutting up a bulky embryo in mogistocia cases, as well as cutting off the neck of a hydrocephalic embryo. These or similar operations may be the "satw" practiced by pre-Islamic bedouins. Killing in any form is usually repulsive to a Muslim or any other normal human-being. But in these cases, saving a mother's life adequately justifies these undesireable killings. So, al-Razi wrote about them as a normal course of action. Al-Razi emphatically advises against pulling hard at the umbilical cord which could damage the uterus. This point was mentioned earlier by Tyazouk as we said above. Now, whether al-Razi got the idea from him or from the several grievous incidents caused by erroneous extraction of the placenta by inexperienced midwives, the main issue here is the reason why al-Razi has chosen to qualify his warning with the word "hard" when he said, "Do not pull HARD at the umbilical cord." Would he permit the act of pulling if it was not hard?, and did he assume that the physicians reading his book would be well aware of that? Pulling at the umbilical cord to extract the placenta was strictly avoided up to the '50s. Then a new method for extracting it was later introduced in which pulling at the umbilical cord was included.

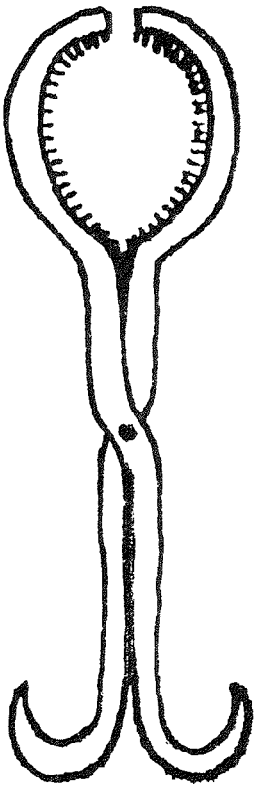
(Figure 1)

Al-Zahrawi's Speculum as sketched by Huntington





Al-Zahrawi's Speculum as envisaged by the writer



(Figure 2)

Al-Zahrawi's Cranioclast

The modern Cranioclast

Al-Razi's brilliant practices also included examining virgin patients by finger-probing the contents of the pelvis through the breech orifice. There is no record of this method in the available English translations of the Greek works. Al-Razi also refers to the placenta praevia, but in an indirect and vague manner. He did not elucidate the symptoms, signs, or dangers of this anomaly, and there is no mention at all of this pathologic case in the Greek books.

In spite of the Arab medical writers' established tradition of referring to the Greek sources which they consulted in their writings, they often failed to specify those particular points or items they had used. Al-Razi, for instance, said that he had relied heavily on Paulus of Agina in his presentation of the mogistocia causes. But in enumerating these causes he included certain items not mentioned by Paulus such as the small size of the embryo, omotocia, or the embryo's death. These particular three causes had not been mentioned by Atius of Amid who is the immediate source of Paulus's "Kunnash."

At first sight, it would seem that a premature baby is easier to deliver than a fully grown one as it would slip out smoothly through the partal passage. But this is not what really happens. Premature babies, dead foetuses, and small-size embryos in general are the most difficult to deliver.

Al-Razi also mentioned the process of turning the embryo in the uterus so that it comes out head first as this is the most suitable posture for a normal and easy parturition. Other postures would constitute a mogistocia case and may sometimes result in the death of the embryo with or without the death of the mother. He gives this excellent description of the pelvic abscess: "It is usually accompanied by high temperature, backalgia and uteralgia. If the abscess is at the front of the uterus, it is usually big and causes retention of urine, utero-gastric tumours, nausea, and loss of food palatalisation. There is also pain in the navel if the tumour is in the uterus. In a uterus bicornis, a tumour in one of the two cornises will cause inguinocrural pain at its side. Al-Razi does not discuss a surgical treatment for this case. But Ali Ibnul Abbas al-Ahwazi, who died in 369 A.H. (1005 A.D.), and al-Zahrawı prescribe opening the abscess after its maturation. Al-Razi also excels in discussing atresia and ways of treating it. He says, "It is either congenital or the result of treating an ulcer. If the atresia is in the vagina you will find that the vaginal aperture is covered by something very much like a muscle. But atretometria is not to be worried about until the girl reaches the menstruation age, for then there is the danger of retention of the menstrual blood leading to her death unless she is promptly treated as this blood will return to her body causing retention toxicosis." Then he adds, "If the atresia is in the woman's vaginal orifice she cannot have sexual intercourse, does not menstruate or conceive. Atretometria, however, does not obstruct sexual intercourse though it precludes pregnancy. Atresia may be total blocking the whole place, or partial with a little hole letting out menstrual blood. A woman with such partial atresia may conceive but will then surely die together with her embryo as there is no way out for it." I do not know of any better description either in the classics or in modern writings.

About cancer al-Razi says, "It is a callous tumour in the cervix uteri. It results in severe inguino-abdominal pain as well as pain in the pubis and vertebrarium and cannot stand a touch of the hand. If there is carcinelcosis, pus will be oozing out of it. It is behind all symptoms of thermal tumour diseases and is absolutely incurable." In my view, this is the most concise description of cancer todate. Al-Zahrawi goes so far as to warn against any surgical intervention for treating it.

Following al-Razi, there is the famous Ahwaz physician, Ali Ibnul Abbas, better known as al-Majusi. He is one of the celebrated surgeons who wrote on Arabic medicine. He has only one major medical work, "Kamilus Sina'aat Attibbiyyah" which is enough to place him at the highest rank of surgical medicine. It may rival Ibn Sina's "Qanun" if not excel it as it is more useful, more practical, and comes richer in surgical treatments both manually and through the use of surgical instruments. It is also clearer and more accurate in elucidating the steps to be followed in performing the various surgical operations.

In order to present surgery as a special field of qualitative importance in medicine, Al-Majusi made a point of discussing the internal diseases of each organ in the first part of the book, then its corresponding surgical diseases in the second part. For instance, in the first part he talks about the morphology of the uterus and each and every one of its diseases. But in the second part he deals with the manual or instrumental surgeries necessary to treat these diseases.

Contemporaneous with Ali Ibnul Abbas in Cordova was the Arabs' leading surgeon Abul Qassim Khalaf al-Zahrawi who died around 404 A.H. (1012 A.D.) and is considered in Europe one of the greatest physicians in the whole world.

Al-Zahrawi claimed to be descending from al-Anzar which could mean that his ancestors had originally lived in al-Medina al-Munawwarah in the Arabian peninsula and then accompanied the Islamic campaigns that conquered Andalusia or emigrated there at a later date. We do not know exactly what induced al-Zahrawi to specialise in surgery to the exclusion of other clinical fields at a time when medicine was still at its beginning and physicians were preoccupied by studying medicinal plants as interest in them surged after the arrival into Cordova of Diosocrides' book on materia medica. Since al-Zahrawi was reportedly a philanthropist who treated many patients free of charge, it could be that he was keen to promote surgery when he noticed that it was on the decline despite being in high demand.

Al-Zahrawi's permanent complaint was the unavailability of experienced midwives or of women doctors well trained in gynaecological and obstetrical surgery, which clearly indicates that he actually practiced the kinds of surgery he wrote about. His medical masterpiece is the encyclopaedic work "Attasreef Liman Ajaza An Attaaleef" (aid to the one unequal to the large treatises) which comprised thirty volumes the last one of which is devoted to general and gynaecological surgery. The book contains illustrations of the surgical instruments he used, most of which were of his own invention. A Latin translation by Gerard of Cremona (d. 1187 A.D.) appeared in the second half of the 12th century. At that time, the doyen of medicine in Europe was Guy Chulliac. He was so impressed by "Attasreef" that he placed its author on equal footing with Hippocrates and Galen. The translation of al-Zahrawi's book was printed for the first time together with that of Guy Chulliac in Venice in 1497 A.D.

Al-Zahrawi was a man of clear thinking and originality. He was keen to elucidate his ideas and illustrate them, too. His book "Attazreef" was the first reasonable, complete and well illustrated book on medicine which abounds with practical ideas and innovations. He dealt with paracyesis and the placenta praevia in a more detailed way than al-Razi. Obviously, the prognosis of these two cases require full knowledge of uterine anatomy and the changes undergone by the uterus during pregnancy and parturition.

A gynaecological and obstetrical surgeon must be fully acquainted with general surgery, its basic rules of anatomy, and its instruments used in excision, incision, suture, etc. Al-Zahrawi has contributed much in developing these instruments as well as in designing others specially used in gynaecological surgery. The scissors are considered key instruments in surgery. He is probably credited for inventing the ideal surgical scissors with the two blades joined in the middle. The classical scissors used by the Greeks were more like the shears used by the shepherds with the axis at the end near the two grips.

In obstetrics, al-Zahrawi designed an instrument to push the baby's limbs if it fell out of the uterus during delivery. He called it "al-Midfaa". There is no record of such or any similar instrument in the Greek books. Paulus of Agina and Surance of Aphsus used hooks with sharp-cutting ends. But the hooks used by al-Zahrawi were smooth and therefore safer to use in the dark partal passage. He also used a drill for handling a hydrocephalic embryo, whereas the Greek surgeons had used ordinary scalpels. With an artistic touch, al-Zahrawi has thus added a new instrument of special quality for this kind of operations. He also used an injector (zarraqah) and described its shape and usages in great detail together with several illustrations. We do not find a Greek word for this instrument and most probably no Greek physician had any idea about it.

The first instrument used for emptying the bladder was the one invented by the famous Alexandrian physician, Aristratus, who called it CATHETER. As described by Galen, it was S-shaped with a little bending at each end. It remained in use by Ptolemaic, Roman, and Byzantine physicians without any development or improvement until Zahrawi came and saw fit to improve it by making it almost straight. He called the new instrument "Qastarah" which is an Arabicisation of its Greek name. For Vaginal examination he used a speculum which he called "Lawlab" (spring) perhaps because of its screw-shaped axle on which it opened and closed. It is quite different from its counterpart designed by Surance (see figure 1). The pearl of Zahrawi's inventions in obstetrics is the cranioclast with its two jaws fitted with nails to have a firm grip on the embryo's head (see figure2). Undoubtedly, he used it to extract dead or

nearly dead embryos when he lost all hope of getting them out through the mother's pelvis. Extracting the embryo with this instrument would indisputably save the mother's life from sure death. Al-Zahrawi has thus scooped William Gumberlaine, an English national of French origin (d. 1596) who invented the forceps, by four and a half centuries.

"Attasreef" is the first Arabic illustrated medical book. Unfortunately, most of its illustrations were later distorted by the scribes who copied the manuscripts so that they looked quite different from the originals. This fact is most conspicuous in the drawings made by the two orientalists, Huntington and March, found in the California University edition of Attasreef.

Finally, we consider our study as an open invitation for more extensive research on the contributions of Arabic physicians to the field of gynaecological surgery hoping that more discoveries will be made in this field.

REFERENCES

1. SPINK & LEWIS, *Al Bucasis and Surgical Instruments",* California University Press, 1973.
2. CARRISON, *Introduction to the History of Medicine,* Saunders, 4th edition.
3. LUND, F., *Greek Medicine,* N.Y., 1936.
4. THE SEVEN BOOKS OF PAULUS OF AGINA (London, 1847).

ANATOMY OF LIVER, SPLEEN, AND ABDOMEN, THEIR DISEASES AND TREATMENT IN THE KITAB AL-TAYSIR BY IBN ZUHR (AVENZOAR)

Drs. Carmen Pena and Amador Diaz

SPAIN

BIOGRAPHY OF AVENZOAR

Abu Marwan ᶜAbd al-Malik b. Abi 1-ᶜala Zuhr b. Abi Marwan Abd. al-Malik b. Muhammad b. Marwan ibn Zuhr was born in Seville in 484 A.H. / 1091 A.D. or 487 A.H. / 1094 according to Ibn al--Abbar[1], in a family of physicians originating from Arabia as was a member of the family of Banu Zhur, that arrived to al-Andalus, and set up their residence firstly in Jativa, then in Denia, under the protection of their kings, from Mujahid, King of Denia, till the al-Mohad Emirs, to whom they served as physicians. Banu Zhur travelled all over North Africa, and occupied there prominent posts. Ibn Khallikan mentions several members of this family as ᶜulama, (Scholars); ru'asa (Chiefs) and hukama' (wise men)[2].

The most famous of this generation of physicians, both in the skill of Medicine and in writing medical works, were abul-ᶜala, Zuhr b.Abi Marwan ᶜAbd al-Malik b.Muhammad b.Marwan b.Zuhr, Known by his kunya Abu 1-ᶜAla, and especially his son ᶜAbd al-Malik b.Zuhr the author of the kitab al-Taysir.

Abu 1-ᶜAla studied medicine and stood out in its practice. Ibn Abi Usaybiᶜa[3], says that he was renowned by his dexterity and knowledge and his excellent cures which indicated his efficacy in the skill of medicine and its secrets, and he made prodigies in the treatment of patients.

Afterwards he went to Cordova where he studied literature and Hadith (Prophetic tradition), and studied also the works of Avicenna, inasmuch as wrote for his son ᶜAbd al-Malik ibn Zuhr a book entitled "Maqala fi1-raddᶜala Abi ᶜAli ibn Sina fi mawadiᶜ min kitabi-hi fi1-adwiya al-mufrada".

Abu 1-ᶜAla' worked firstly as a royal physician for king al-Muᶜ tamid b.ᶜAbbad in Seville, and afterwards in Agmat, the place of exile of al-Muᶜtamid, in order to treat his wife al-Rumaykiyya. Later he went back to al-Andalus, and worked at the service of Yusuf ibn Tashufin, who gave him the title of wazir (vizier, minister) and so he is known in the West under the name of al-Guazir Abulelizor, which is the phonetic corruption of al-wazir Abu 1-ᶜAla, ibn Zuhr. He died in Cordova in 1131 A.D. and was buried in the Victory Gate (Bab al-Fath) in Seville.

His son ᶜAbd al-Malik ibn Zuhr, became the most important physician of his family and is considered as one of the best Andalusian physicians.

Averroes, in the fifth book, chapter thirty-one, of his Kitab al-Kulliyyat, described him as the greatest physician after Galen.

ᶜAbd al-Malik learned the skill of Medicine from his father, and studied in the best schools of literature, fiqh (jurisprudence) and religion of his time. He worked as a physician at the service of the al-Moravidthen the al-Mohad Emirs.

During his life, he was exposed to the political changes, and he was in prison under the government of the al-Moravides. Afterwards , with the victory of the almohads, he served them as physician in their court, and wrote for Abu Muhammad ᶜAbd al-Mumin ibn ᶜAli a "Kitab al-Agdhiya wa-1-adwiya"[5].

Abou Marwan ᶜAbd al-Malik ibn Abi1-ᶜAla ibn Zuhr died in 557 A.H. / 1131 A.D. and was buried outside of the Victory Gate, next to his father's grave.

THE MEDICAL CONCEPT OF AVENZOAR

The medical and philosophical concept of Avenzoar, as it happens with other Arab physicians, comes from the Galen's theories, based on the theory of the four elements: fire, earth, air and water and their proper characteristics, i.e. heat, coldness, dryness and humidity. And according to this quaternary system, the human body is composed from four humors: Black bile, yellow bile, phlegm and blood and the state of health and the different diseases depend on the proportionality of these four humors.

SPIRIT OF OBSERVATION OF AVENZOAR

Ibn Abi Usaybi^{c}a mentions several stories that reveal the spirit of observation and examination of Avenzoar:

> "The Caliph ^{c}Abd al-Mumin needed to have a laxative drug, and he detested to drink the purgative drugs. Avenzoar acted by subtle means, he went to a grapevine of his garden, and irrigated it with water containing the purgative drugs, macerated or boiled. When the grapevine took the strength of the laxative drugs, and the grapes appear with these strengths, he ordered the Caliph to be on diet, and then brought him a grape and indicated him of eating it. The Caliph had a good opinion of Avenzoar. When he ate it, in his presence, he said to him: "Oh, Commander of the faithful, it is sufficient for you to have eaten ten grapes and you will go ten times to evacuate the bowels". The Caliph asked him the reason of this; he informed him of it. Then it happened as he said. ^{c}Abd al-Mumin became calm and was healed, and so Avenzoar's reputation and rank increased".[6]
>
> There is another episode that indicates the spirit of observation of Avenzoar:
>
> "^{c}Abd al-Malik ibn Zuhr was going to the palace of prince of Faithful in Seville, and on his way, at Abu l-Khayr bath, near Ibn Mu'amil's house, found an ill man who had a great tumor, his belly was swollen and his complexion became pale. This patient was always complaining of his state to the physician, and asking him to take care of his case. A day, when he asked him the same thing, Abu Marwan ibn Zuhr stopped, looked at him and found near his head an old jug from which he has been drinking water. Avenzoar told him: 'Break this jug, because it is the cause of your disease'. The man replied to him: 'No, by God, Sir, because I have not another jug save this one'. The physician ordered one of his servants to break the jug. He broke it, and a big frog appeared from it. Avenzoar said: 'You are saved from your disease. Look at what you have been drinking'. The man recovered his health".

WORKS OF AVENZOAR

Abu Marwan ibn Abi al-^{c}Ala ibn Zuhr wrote the following books:

- Kitab al-Taysir fi l-mudawa wa-l-tadbir.
- Kitab al-Iqtisad fi islah al-anfus wa-l-ajsad.
- Kitab al-Aghdiya wa-l-adwiya, that he wrote for Abu Muhammad ^{c}Abd al-Mu'min ibn ^{c}Ali.
- Kitab al-Sina
- Kitab al-Jami^{c} fi l-Ashriba wa-l-Ma^{c}ajin.
- Kitab Mukhtasar hilat al-bur' li-Jalinus.
- Risala fi tafdil al-^{c}asal ^{c}ala l-sukkar.
- Kitab al-Tadhkira fi l-dawa' al-mushil

And two books: Maqala fi ^{c}ilal al-kula and Risala fi l-baras.

KITAB AL-TAYSIR

Its complete title is Kitab al-Taysir fi l-mudawa wa-l-tadbir, and it is organized in the traditional

order, i.e. mentioning the diseases of the organs from head to feet.

We do not know exactly the date of its composition. Ibn al-Abbar says that he wrote it after he composed the Kitab al-Iqtisad and Colin says that it was, then, written between 1121 and 1162 A.D.

We know that this book was written at the request of the cadi Abu l-Walid ibn Rushd (Averroes), since this one says at the end of his Kitab al-Kulliyat:

> "Who thinks that this part of this book is incomplete, and wanted to examine after that the Kananish (notebooks), the best of these is the book entitled al-Taysir which has been written in our time by Abu Marwan Ibn Zuhr. I asked it from him and I have copied it (...)".[8]

The Kitab al-Taysir is one of the most important Arabic works on medicine, and it has had a great influence in Medicine of the following ages, and it was found always in the libraries of the Christian physicians.

There are several manuscript copies of this book: one in the Bibliotheque Nationale de Paris, MS or N° 2960, ff. 50r-189r. This copy was finished in Barcelona in 651 A.H./1165 A.D. There is another copy of the Bodleian Library of Oxford, MS Huntington N° 355, ff. 1-180v, but we do not know the place and date of the copy. The third manuscript copy is in the Biblioteca Medicea-Laurenziana of Florence (Italy), n° 215, ff. 1r-110v. And, finally there was another manuscript copy, lost at present, in al-Maktabe al-ᶜAbdaliya in Tunis, n° 2867/7. There are also many ancient translations into Hebrew and Latin.

TREATISE ON LIVER AND ITS DISEASES

Liver is one of the main organs, and Aristotle sees in it the origin of natural heat, the heat of heart. Physicians think that the heart in itself is a principal organ, which has great influence and effects. For that reason Hippocrates says: "If we live a good life it is because of the health of our liver. The liver is a source of the natural force with which digestion, maturation, attraction and repulsion are accomplished. Liver spread these forces and especially the transmissive force to all body, and with these forces the organs digest the food and transform it, after its attraction and retention. All these forces are in liver and come from it. When its mutative force is weakened, diseases occur in the body, according to this weakness, like dropsy. Its cure consists of returning the state of liver to its normal proportion or equilibrium. The weakness of liver, which occurs because it is an instrumental organ, origins obstruction and tumor, since tumor is a disease of the instrumental organs, and it is also a disease of the organs of similar parts. The cure of this consists of opening obstruction, if it is caused for it, and making to disappear the tumor, if it is the cause. If another sickness occurs in liver, like induration because of drinking cold water, against what is convenient or debilitation of strength because of an excess in eating food with vinegar, what is caused by drinking very cold water is not only cured with something which can warm the liver but adding altogether a strengthening force and a moderate astringency and flavour. Camomile and rose are drugs useful for this.

Know that the kinds of dropsy are composed like fevers. If the physician makes a good inspection and proceeds with care in the treatment of each kind of them, it will not be difficult for him, the treatment of which is composed of them always with the help of God.

COMPOUND DRUG FOR THAT

One ounce each of lac deprived of wood, flowers of camomile and rose, Chinese cinnamon, mastic, clove, and lavender; half an ounce of toasted linseed, agrimony, and scaly spleenwort. The drugs are separately pounded and sieved with a veil. Then, all of them are pounded, sieved and kneaded with a well-made syrup of common eryngo. About five dirhams of all this are taken every morning. Then the liver is annointed with fever-few chrysanthemum oil and lentisk grain oil, in similar parts. Food must be

fermented bread with pigeons, small birds or young partridges in white or green tafaya, God willing.

And if the weakness is caused by an excess in eating sour food or vinegar, you must treat it with the following prescription: half a pound of dry raisins deprived of their seeds, licorice wood; a quarter of a pound of common eryngo, and agrimony; one ounce of mastic; what is necessary of these drugs is separately crushed and it is macerated for one night in a quarter of boiled water; then, in the morning, it is put on a low fire until a half of the water is consumed; then, it is sieved, and about ten pounds of sugar and five pounds of honey are added to it; and it is cooked until becomes a thick syrup. The dose of it, every morning, is two ounces, with six ounces of lukewarm drinking water, and five dirhams of electuary of ᶜushari roses. The liver is anointed externally with lentisk grains oil, and camomile oil, in equal parts.

Tumor occurs in the liver substance, and what suppurates from it, I do not hope absolutely could be recovery, because it is a source of strengths, and because of its disease the strengths are disturbed and death overtakes him.

Obstruction occurs in it, and the treatment for liver obstruction consists of opening it with water in which agrimony, Venus' hair, scaly spleenwort or similar drugs are cooked. The juice of fennel has a good effect for this.

It happens in the cover of the liver that it is swollen as it occurs in the other organs. The patient feels an insufferable pain which he fancies to be located in his liver. The sensibility of this cover is great because all the nerves coming to it are subdivided into many branches, and its sensibility is very great. The wicked ᶜAli ibn Yusuf[9] often suffered of this pain. I treated him with oil I extracted from egg yolk and duck fat, and he was cured in that same day. After this pain he suffered from jaundice.

SPLEEN

The spleen is an organ that attracts the melancholic residues, nourishing itself with those of them that are thinnest. Several diseases affect it, as it happens in other organs. It is not one of the main organs, and no strength comes from it to the body, but it received the thick residues of the body, as kidneys receive the thin ones, and then it becomes very much swollen and hard.

Its treatment consists of the same drugs that I have mentioned for liver. Know that spleen can tolerate stronger drugs than the ones tolerated by the liver, and remember always that when you give any drug to drink which is useful for spleen, you must mix something sour with it, because this organ is only nourished with drugs containing some acidity, and it attracts them to it, by taking them, and accelerating the arrival of the useful sour drugs.

We know that when spleen hardens itself, and cannot receive the sediments of blood, these ones remain spread within the body, and the state of the liver becomes worse and after this induration it follows weakness of liver, and also dropsy of one or more than one of its kinds.

COMPOUND DRUG FOR SPLEEN'S INDURATION

One ounce each of camomile, bast of tamarisk's root, agrimony, lavender, mountain germander, Venus' hair, common ceterach, and wild ginger; half an ounce of dyer's madder, five dirhams each of common larch root, bast of fennel's root, six dirhams of mastic, one dirham of saffron, half the amount of licorice of all the before mentioned drugs. All that is necessary to crush is separately crushed, and macerated for one night in twenty-four pounds of very hot water. In the morning, it is macerated with the fingers, its broth is sieved, and put on a low fire, together with eight pounds of honey bereft of froth and two pounds of sugar. When it is about to grow thicker, two pounds of very sour grape vinegar are added to all the other drugs. When a thick syrup is formed, it is kept into a glass or glazed earthenware vessel.

Every morning, are taken from one ounce and half an ounce to two ounces, with three equal parts

of drinking water and two dirhams of honey-suckle electuary. If weakness appears in liver, the honey--suckle electuary is substituted for three dirhams of electuary of ᶜushari rose. Food must be the lightest possible meat. Chicks and young turtle-dove meat is enough. Occasionally, hen meat is not bad, until total cure occurs. Put also the following plaster over the spleen.

PLASTER FOR INDURATION OF SPLEEN

One part each of tamarisk root, camomile, narcissus and jasmine flowers. Add to this half the amount of all rest of barley flour and darnel flour. It is kneaded with water and vinegar in equal amounts. Apply this plaster over the spleen, and bind it with fresh vineleaves. It is convenient for the patient to have, before his meal, caper in vinegar with some salt, as caper so prepared is one of the useful drugs for spleen, especially if they are eaten on an empty stomach. Apply the plaster to him in this way, at night, and order him to annoint himself, by day, with lily oil, and rose oil, in equal amounts, and apply them together twice every day, and the plaster at night. Often it happens that the strength of the body repels it, because the spleen does not accept this sediment, and it remains spread within the body. Physicians say that sometimes it is repelled, and very black blood goes out along the anus, and consequently the hypertrophy decreases. I saw this with my own eyes. Or, sometimes, this sediment is pushed to the skin, which becomes black and blue; then the swelling of the spleen decreases. I saw this with my own eyes. I also saw many times jaundice that occurs when the bilious sediment is repelled, without feeling its issue along the anus, because of its thinness and its is carried by the laxity of belly or diarrhoea. And if it is pushed towards the skin, this is generally a dangerous thing; so hurry to the physician.

JAUNDICE is originated by a bilious humor which is suddenly impelled towards the skin and this one takes the colour of the peel of the cedrat, and likewise the white of the eyes becomes yellow. When you see this, observe if acute fever has occured before the ejection of this humor, or if fever has decrased, or if it continues, or if he ejected it without fever, or if there was fever after its ejection. If fever continues, and the ejection was after the apparition of fever, observe if this happens after the seventh day, or in the seventh day. If it is in the seventh day, approximately, hope for a good end, because it has been ejected after its maturity. If it is ejected immediately after the beginning of the fever, suspect that a hot tumor is in the liver or in its cover. In fact, when this happens in the liver, everything coming into it is transformed into this humor, and it does not go out onto the skin by means of crisis, but, spreading itself through the whole body. If you know that the liver or its cover have a tumor and are swollen, do not give the patient anything hot to eat, not sweet, or containing oil or fat, because if you do it, you will kill the patient. Give him immediately juice of watermelon, or crumbled bread in juice of watermelon without containing oil or spices, except dry coriander, and give him pulp. of watermelon or crumbled bread soup to eat, and the pulp is not bad, if it is cooked in water with a bit of salt. Then it is cooled in snow or in a well as it is useful for this.

TREATISE ON THE HERNIAE WHICH OCCUR IN HYPOCHONDRIUM

Hernia occurs in hyponchondrium either because of a contusion with a stick or a stone, on a full belly, or because of a great jump, especially when the belly is full. At times, it occurs because of an excess of violent cough, or because of raising a heavy load, or the like.

When this happens in hypochondrium even if the man is young, it does not stop increasing until it becomes very big, and some bowels come out, remaining hidden only by the skin of the belly. Rumbling noises and pain occur in the belly and the state of health of the patient becomes worse, because of the hernia of hypocondrium, especially if the patient is fatigue or tired by walking or riding and galloping a horse, or by hard works. When the hernia happens, it increases continually, because the man must move with sudden movements. As for he who can be calm and quiet, when he reduced his movements,

lies continually on his back, avoids crying, and tries not to cough or sneeze, then you must return the bowels to their place and bind his belly over an astringent and not too thick plaster, and if he remains so, it will be useful for him.

The substance of the hypochondrium is humid, and for that reason its cicatrization is difficult, because it moves a lot with the movements of the body. I saw a man, who was my friend, who suffered from hernia, and for this reason remained disabled for some time. I was then a young man. The man suffered from intense pains, and no doubt this was caused by eating a lot of apples or grapes. Acute pains overtook him, and they spread all over the body, and he could not move but with great difficulty. I was treating his pains, and denied him all food, except a little fermented bread and small birds in white tafaya, well-cooked until their meat was on the point of being overdone. The man remained lying on his back for a long time, about two months, praying only by means of gesticulations. Afterwards, pains disappeared when their cause disappeared, and he recovered completely from the hernia which he suffered and whose treatment was difficult for me, because of this behaviour during that time. When he remained quiet and kept calm, he recovered, according to the symptoms. In fact, lying on his back, his bowels returned to their place, and the place remained calm. His food was light, and his stomach was empty. He healed due to all these things, not because any one tried to treat.

TREATISE ON BELLY WOUNDS

Wounds can occur in the belly because of a piece of iron, or a sharp stick, that pierce through both the skin of the belly and the hypochondrium, and the caul comes out. When this happens, someone dexterous enough must return it to its place. If it is affected by earth, dirt or sawdust, it is necessary to wash it with tepid water and to return it to its place with care. If a part of it is rent and becomes black, the solution is to cutt off the part of it which is rent and corrupted and to return it to the belly and seam it with a silk thread. A skilful and responsible person must make it, as this is only learned by practice, not by science. Over the suture something is put that helps the cicaterization. At the same time, it is necessary because of the wound, to moderate food, as much as possible, in order to reduce the flux of humors. If the flux of blood is not excessive, a little blood-letting in the medial arm vein is not bad to him. This is a general means in all kind of wounds for reducing the flux of humors. It is possible that some portion of the bowels comes out. If bowels come out uninjured, without a great or a small injury, except their issue to the outside, you must hurry to return the bowels to their place with care in order to avoid inflammation. And if the bowels cannot be returned the same way they came out, because the bowels are swollen due to slowness of action, then you must pour tepid water in the surface of the fissure, so that it may be pleasant for the man, pouring it softly on the inflammated part until the swell disappears. After this has disappeared, you must reduce it softly. The rent of the skin and the peritoneum are seamed with a silk thread, with great care. Make the patient stay calm, not raise his voice, not move, and not stuff himself with food or drink. Nourish him with something in little quantity but very nutritive, like cock testicles in tafaya; two of them will be enough. Try the utmost to remove matter from the place of the wound. It is convenient to annoint around the wound with very flavoured rose oil, and the patient must have anything to eat until the rent cicatrizes, God willing. If bowels are affected by a wound with this piece of iron, and if it is in the small intestine, as it happens in most cases, I think that there is not any means to cure it. If rent occurs in the large intestine, the patient may live, because the rent is only in one of the tunics of the intestine, and the patient may be saved. If both tunics are rent, and especially if their rent is important, recovery is very difficult. However, at times, the patient can survive in this state. Physicians are of this opinion, having observed it in men and animals. I saw a man who evacuated the bowels through the wound he suffered, and he remained so for a long time, moving himself very much to get food. His life was long, but rather bad.

Here I finish with these organs, and I shall begin to treat on stomach, God willing.

TREATISE ON STOMACH DISEASES

Stomach is affected by consumption and weakness, so that its volume becomes thinner, like a rag, and it does not digest any food. I mentioned this disease, and presented it, because of people's neglect of it, and of what is against it. Beware of known drugs for strengthening the stomach which are astringent, dessicative and heating. The symptoms of this disease are that the patient cannot vomit what is in his stomach, the saliva does not flow from his mouth, his appetite is very weak and his digestion is far weaker, he evacuates dregs not digested or crushed, dregs are not very stinking, the colour of food is lost, the patient does not belch, and if he belches, does it scarcely, and he often hiccups. Dessicative food, cold or warm, damages him, his pulse is feeble, hard and invariable, with a tendency to become weaker. When you see these symptoms, you can be sure that this disease is certainly consumption and emaciation of the stomach substance. If you observe, in spite of all this, that the stomach looks, from outside, like a hollow when the patient is lying on his back, there is practically no doubt the patient suffers from this disease. However, if you have a sharp touch and you put your hand on the stomach, pressing it hard, with the patient not feeling any pain, and you percieve a pulsation under your hand, be sure that your caution is justified, and that the stomach suffers consumption, because this movement comes from the artery inside backbone. It is evident that you would not have perceived, were it not because of the stomach consumption. You must then annoint the stomach with sweet almond oil, together with some lentisk seed oil, and put two dirhams of lentisk seed oil for each ounce of sweet almond oil. Mix one tenth of tepid water with the whole of it. Shake it well, and annoint the stomach with it. Feed the patient with young hens in tafaya with almond oil and seasoned with a sarira of mastic. Put a rough rag anointed with pitch, previously softened with some almond oil, on the stomach. Put it on the stomach for a limited time, because if you leave it more than it is convenient, you will injure the patient. You must put the pitch on the stomach for half an hour, more or less. Then remove the rag together with its pitch from the stomach, and anoint it with almond oil in which you have put rose oil, mixing both of them well. See that the roses are recent, of that same year. Give him goat's milk to drink at the same time when it is milked, before it is affected by air, in a moderate quantity, from two to three ounces. Feed him with hen meat or cock testicles. Cock testicles are better than the meat. Feed him with this food several times on equal terms, and see that it is easily digestible. Keep him away from all dry foods either hot or cold. The hot ones are more strengthening because the heat, even when it is humid, dissolves a lot and accidentally dries. If it moistens by its proper nature, water evidently moistens by its natural humidity and also it dissolves a part of the organ substance because of the heat it has acquired. Things dissolving the substance of the organ are to be avoided in this disease. Endeavour, the, procure humidity and that the patient makes a good digestion, inasmuch as any food is assimilated, except after it has been digested. Remember also that the stomach is a main organ, due to the relation between its pit and the brain, because of the many nerves existing between both of them. Preserve, then, his strength, and there must be something softly astringent and flavoured in your drug. And if there is some bitterness in it, like bitterness of roses, that is one of the most useful thing. Chicken and hen meat and cock testicles ought to be very well-cooked. Bread ought to be fermented and proportionated, only with a bit of salt; and the flour it is made of ought to be from good wheat and to be grounded after having been moistened. Before kneading the dough it is put in a mortar and pounded for some time until it becomes like powder. It is kneaded as well as possible with tepid water. Oil used in his food ought to be sweet almond oil or sesame oil, and you must know that almond oil is preferable and that the oil of sesame in excess damages organs, because it is not astringent. If there is any bad property in it, halitosis results, but halitosis is only produced when diseases and bad symptoms are present. But, I do not see any objection to using this drug two or three times until halitosis disappears. Olive oil, if washed in water three times, is used in diseases like this one. Barley water well-made is also good, if it is had in a small quantity.

I think that anything remains to be mentioned on this disease, except one thing. The patient himself

prefers astringent and bitter drugs or foods. Moderate astringency and bitterness are useful for this organ, because it is the stomach.

Keep in mind, then, all these aspects in your treatment. Also, this disease and this organ require to avoid sour drugs. However, for making medicinal powers arrive at the the stomach layers, you must put, at times something a bit sour. Pears, if broiled, are good, because of its moisture, and have the property of making thirst disappear, and strengthening the stomach, due to its astringency and flavour, that make medicinal powers circulate and arrive at the organ with drugs containing some sourness.

REFERENCE

1. CF. IBN AL-ABBAR, "*Kitab al-takmila li-kitab al-sila*". Ed. F. Codera, Complementum libri Assilah, 2 vols. (Madrid 1887 - 1889) I,P.76
2. CF. IBN KHALLIKAN, "*Wafayat al-aᶜyan*", ed. F. Wustendeld. (Gottingen, 1835 - 1843).
3. CF. IBN ABI USAYBIᶜA, "*ᶜUyun al-anba fi-tabaqat al-attibba*". Sources d'informations sur les classes de medecine. XIIIᵉ Chapitre. Medecine de l'Occident Musulman. Publie, traduit et annote par Henri Jahier et Abdelkader Noureddine. (Alger, 1958) Vol.I, pp.88-89
4. CF. IBN AL-ABBAR, "*Kitab al-Takmila li-kitab al-sila*", I.pp.76-77
5. CF. IBN ABI USAYBIᶜ A, "*ᶜUyun al-anba*", pp.96-97
6. CF. IBN ABI USAYBIᶜ A. "*ᶜUyun al-anba*", pp.94-95
7. CF. IBN ABU USAYBIᶜ A. "*ᶜUyun al-Anba*", pp.94-95
8. CF. IBN ABU RUSHD, "*Kitab al-Kulliyat MS. OF Sacromonte (Granada)*", f.230; Ibn Abi Usaybiᶜa, ᶜUyun al--anba p.131.
9. ᶜALI IBN YUSUF "*was the son and successor of Yusuf Ibn Tashufin, who reigned from* 500 A.H ½ 1106 A.D. *to 537 A.H.* / A.D. CF. E - LEVI- PROVENCAL "*in Encyclopedie de l'Islam*", nouvelle edition, I. pp. 401-402 s.v.

THE SURGICAL HERITAGE OF EGYPT DURING THE EARLY ISLAMIC PERIOD

"ARCHEOLOGICAL STUDIES [1] — ADDITIONS[2]"

Dr. Henri Amin Awad

EGYPT

The Arab conquest of Egypt during the seventh century (641 A.D. - 21 A.H.), had led to a great advance in the art of healing i.e. medicine, surgery, pharmacy. The natives of the Nile valley aided the Arabs and welcomed the change of Masters. The spirit of innovation of the ancient Egyptians which had persisted despite the passing of time and despite its periods of decline and degeneration was taken by the Arabs and this led to significant contributions and development of better practice in medicine and surgery since the dawn of Islam.[3]

The Arab interest in the art of healing was mostly due to a religious incentive which finds its expression in tradition. One tradition makes science two fold, theology and ecology. Other tradition reported that God never permitted a disease in a place without creating there a way to combat and cure it, so they utilized, searched, and trusted treatment to the very end. The Arabs in the Arabian peninsula, since the rise of Islam have had a fair knowledge and good practice in surgery.[4]

This fact is confirmed by the following: —

1. Many surgical operations were mentioned in early Arabic poems.
2. The first hospital in Islam was in Arabia. It was that tent erected during the ditch Raid by the order of the Prophet (ﷺ). An eminent female " Rofida el-Aslamia " was the head of this hospital. She was clever in first aid, stopping of bleeding, removal of broken arrows and treatment of fractures.
3. Many eminent medical figures were in Arabia in early Islam "el-Hares Ibn Kilda" who was called the physician of the Arabs and his son "el-Nader".

It we take a deep look into the history of surgery through Archeological findings, we find that all evidence proved, that Egypt had donated a lot to universal surgery throughout the five thousand years, that spanned the period between the Pharos till the Mamluk period. The ancient Egyptian described various types of surgical instruments as scalpels, needles, probes, forceps, pincers, trocars, etc., together with many surgical operations... The Edwin Smith papyrus (1600 B.C.) is considered the earliest surgical papyrus and the Kahum (1900 B.C.) is the earliest gynaecological papyrus.[5]

After the ancient Egyptians, came the Greek and they took the torch of learning from the ancient Egyptians and kept its fire burning more brightly to give more light. In the aftermath came the Romans, then the Byzantines and there was a definite decline in the practice of medicine and surgery... in the seventh century many surgeons were in Alexandria university, one eminent figure was "Paul of Aegina (642 A.D.) who ranked very high among other surgeons of the Greco-Roman period. His influence was great on surgical development not only in Egypt but throughout the whole Islamic world in the Middle East, North Africa, and the Arabian Peninsula. His seven books Compendium was translated into Arabic by "Hunayn - Ibn-Ishak al-Abadi".

Many excavations were undertaken on the site of Fustat, the first Islamic capital of Egypt founded in years 21 A.H. - 642 A.D. by the celebrated leader "Amr Ibn el-As" in the times of the second Mohame-

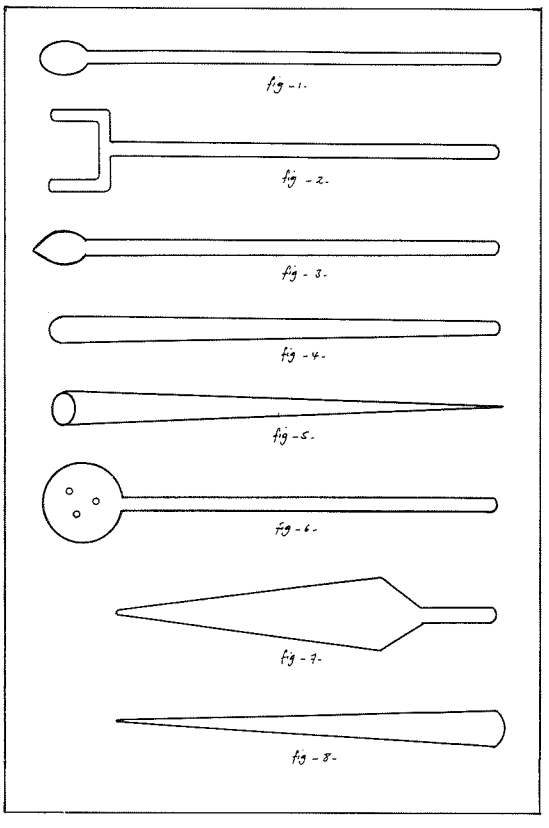


Plate 1

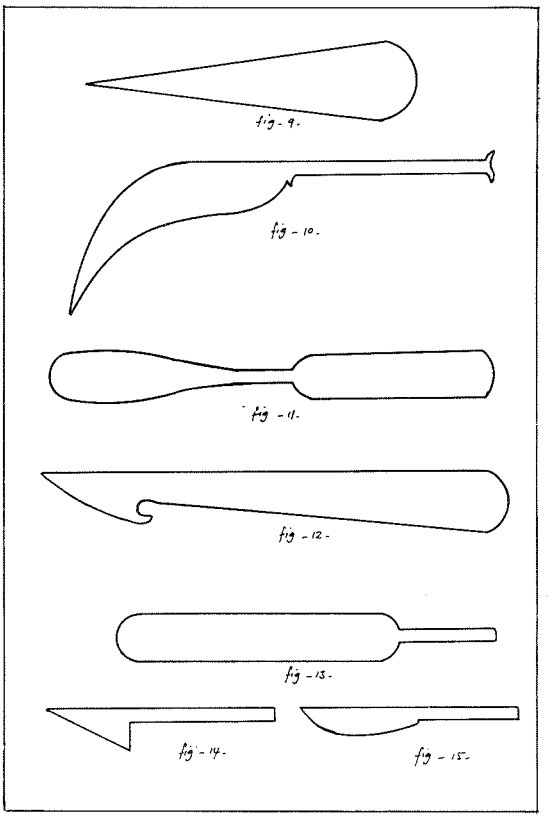


Plate 2

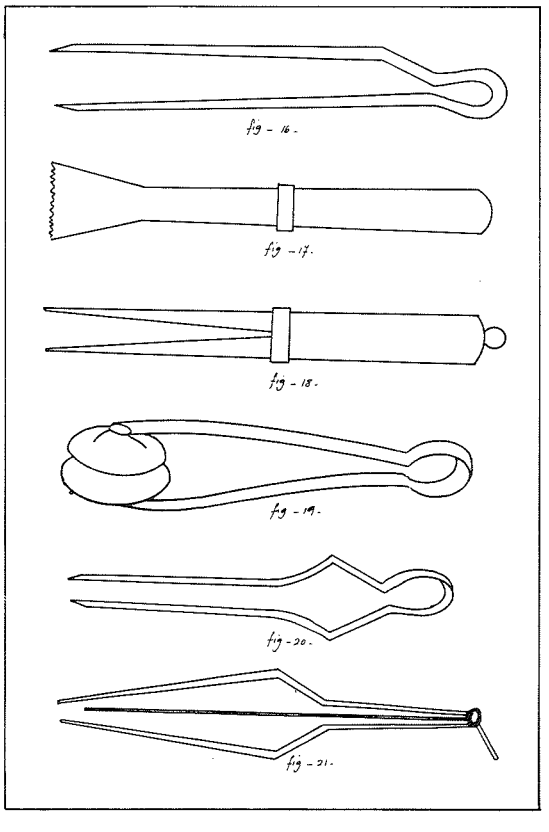


Plate 3

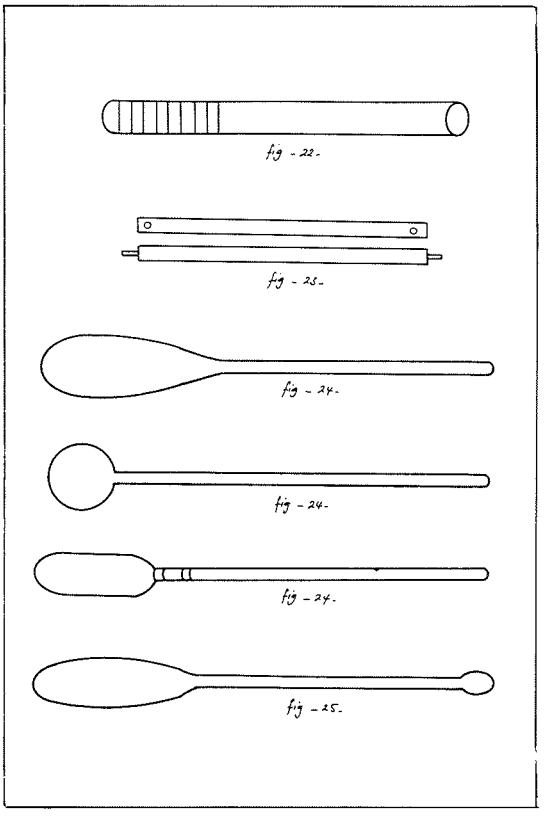


Plate 4

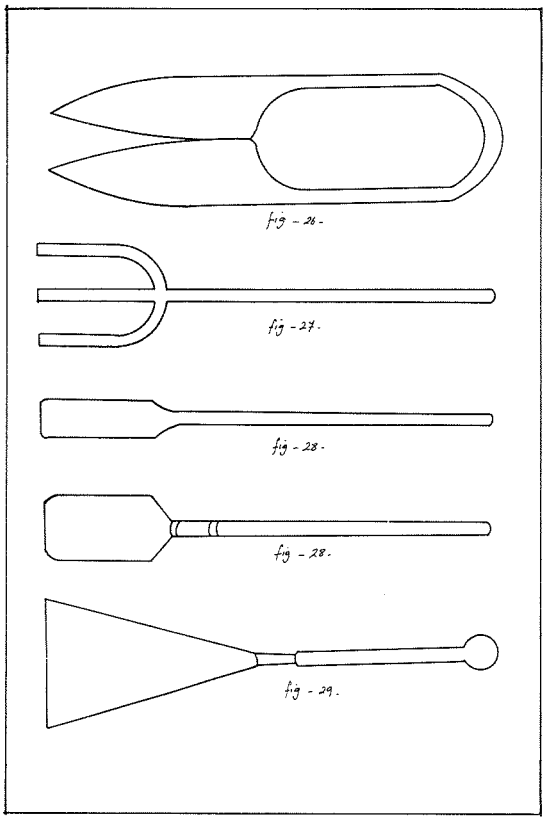


Plate 5

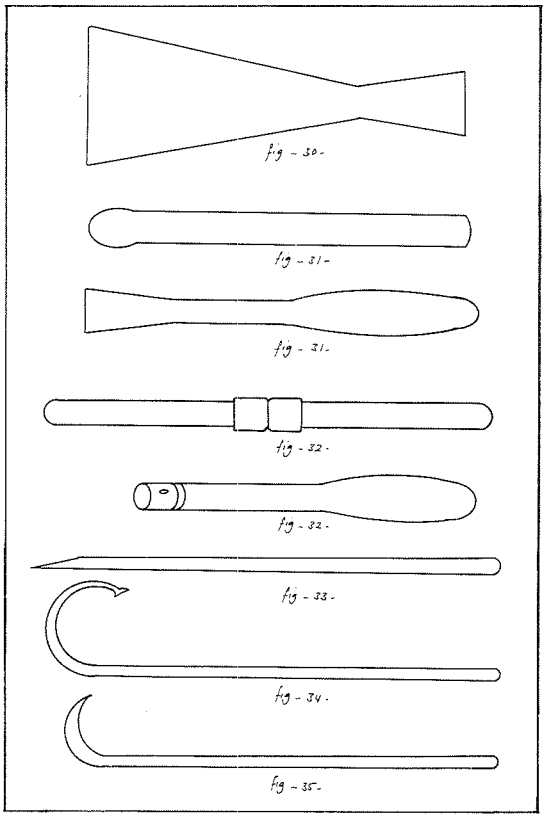


Plate 6

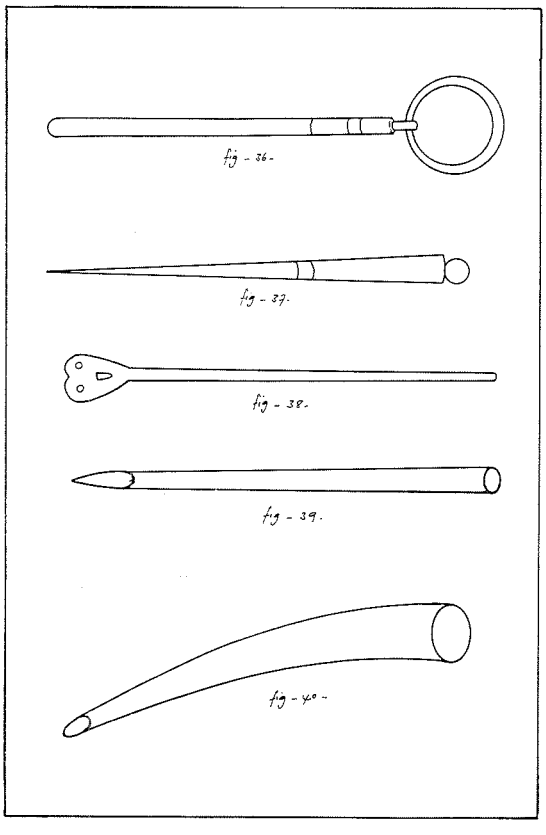


Plate 7

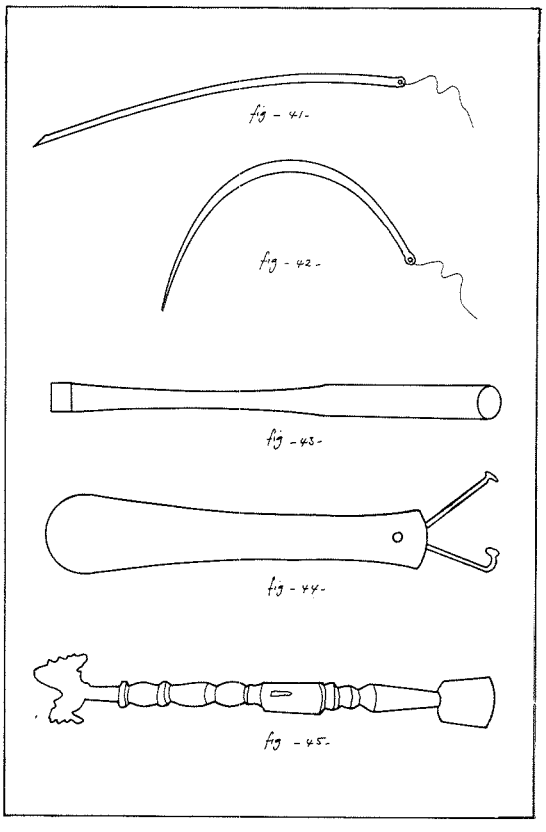


Plate8

dan caliph "Omar Ibn el-Khattab", the caliph ordered Amr to select a more central place for a new capital other than Alexandria.

Fustat began as a military garrison, then soon became one of the most important cities in the Islamic Empire. Amr built his mosque in the centre of the city which is considered the first mosque in Africa and the oldest university that radiated its lights over the whole empire.

Egypt saw its first hospital "el-Kanadil" in the seventh century and it was near Amr Ibn el--As mosque.

These excavations unearthed a large number of surgical tools which are considered the first and earliest known of their kind, according to the sites of these excavations. These excavated tools are attributed to the late Ommyad and Abbasid periods in Egypt. These instruments bear much resemblance to the ancient Egyptians' surgical tools and to those pictured on the walls of the "Kom-ombo" temple in upper Egypt and dating from the Ptolemic period "second century B.C.". The presence of these tools in the Egyptian soil proves the presence of a great progress in surgery during the early Muslim reign of Egypt. Among the excavated tools, there are various types of cauteries, surgical needles, trocars, hooks, pincers, forceps, scissors, tweezers, osteotomes, tongue depressors, ear cones. In this paper forty five pieces were studied and illustrated.

1. Olivery end cautery used for the treatment of paralyses, headache, and dislocation of hip.
2. Two pronged end cautery used for hip dislocation.
3. "Knobbed end" cautery used in ophtalmology.
4. Nail shaped cautery used in treatment of tumours of buttocks, lumbago... cautery is carried in three raws, every raw five points.
5. Hollow cautery, one end like a probe, the other end like a tube used in treatment of fistulae.
6. Circular cautery used in the treatment of stomach troubles.
7. Double edge fine scalpel used for incising the skin before ligation of arteries.
8. Extra fine scalpel for excision of tumours in the ear.
9. Scalpel, like a lancet for eye surgery.
10. Tonsilectomy scalpel, curved, one end sharp, the other blunt.
11. Short scalpel, double-edged, blunt-ended, used, for bladder operation.
12. Knife with hooked end for venesection.
13. Broad knife, double-edged, blunt-ended.
14. Triangular fine scalpel for eye surgery.
15. Fine scalpel, one-edged, sharp ended, for conjuctival incision.
16. Long forceps for removal of foreign bodies from the ear.
17. Forceps with toothed end for removal of warts, "Monkash".
18. Forceps with a guard used as a clamp for stoppage of bleeding, "Artery forceps".
19. Forceps with broad circular ends, for removing pieces of bones from fractures.
20. Tweezer with a probe "Mirwad".
21. Tweezer used for eye surgery.
22. Hollow tube for removal of skin tags and papilloma.

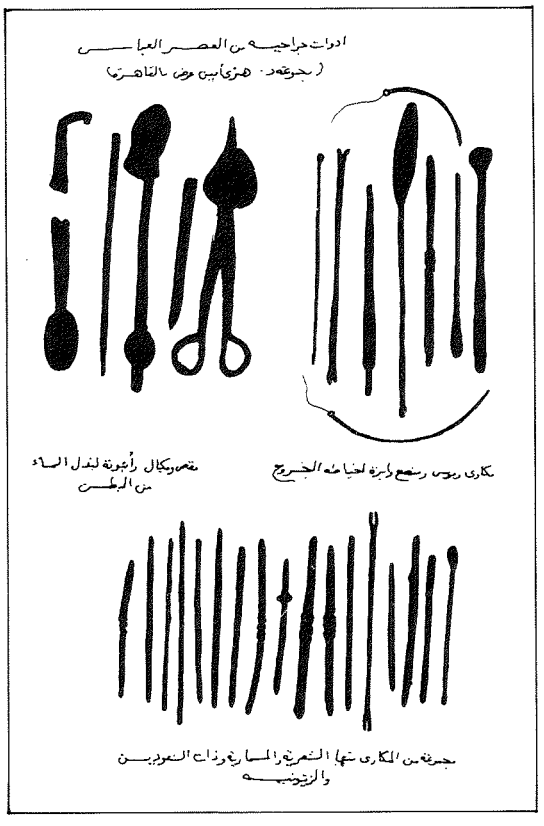


Plate 9

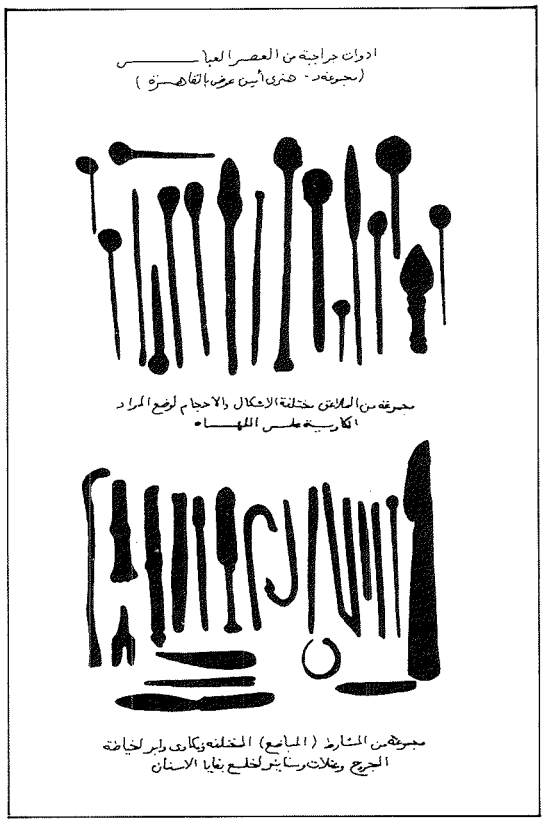


Plate 10

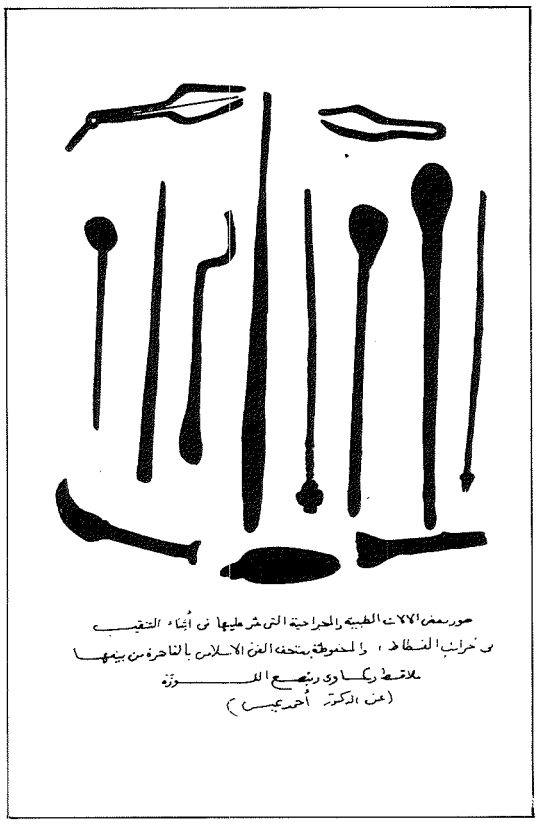


Plate 11

23. Two bars used to remove excess skin in case of ectropion.
24. Spoons of various sizes and calibres for application of chemicals on inflamed uvula and fistula.
25. Pincer called "Middas", a probe ending with a sharp spoon which is inserted in a tumour, then with rotation, the surgeon can collect pathological matter.
26. Scissors called clipper, "Mikrad".
27. Three pronged hook for pulling up and handling the tissue when operating on tumours and haemorroids.
28. Scrapers, "Mijrad", for scraping bones in fractures and in dental surgery and orthopedies.
29. Tongue depressor, used to keep the tongue down during tonsillectomy.
30. Piece of metal shaped like a spoon, one end narrow, the other broad used to protect soft tissues, during operations.
31. Lever used for removing roots of broken tooth.
32. Sound, used as a dilator for urethra and inspection of fistulae.
33. Explorer "Barid" used for inspection of fistuale, wounds, tumours.
34. Elevator "sinara" for removing broken tooth.
35. Hooks for removal of foreign bodies from throat.
36. Currette, sharp end and edges, for operations on lachrymal canal.
37. Drill "Mithgab" for bone surgery.
38. Fine currette for scraping eye lids in case of trachoma.
39. Cannula for Ascites.
40. Ear cone for removing worms, pus from the ear by suction.
41. Straight surgical needle.
42. Curved surgical needle.
43. Small chisel or osteotome.
44. Big osteotome.
45. Osteotome, its handle is decorated like a bird.

SUMMARY AND RESULTS

The fame of surgery which flourished in Egypt at the dawn of Islam spread rapidly over the Islamic world, in East as well as in the West. Two centuries later Abul Qasim al-Zahrawi (Abulcasis) wrote his profusely illustrated, Treatise "al-Tasrif" and described many of the surgical tools that bear much resemblance to excavated ones.[6] Then in the twelfth century , in Egypt , the Egyptian physician "Abu--Naser Ibn al-Ayn Zarbi" in his book al-Kafi described many similar instruments. One century later. Abu'l Farag Ibn al-Quff in his book "al-Umdah fi Sinat al-Jiraha", described many surgical procedures and instruments and is considered the largest manual in medicine and surgery . Finally,[7] the Turkish physician "Sharaf al-Din Ali" in his royal surgical book " al-Jiraha-al Kaniya" [8] described and illustrated many surgical instruments. In the second half of the twelfth century "al-Tasrif" was translated to Latin by Gerard of Cremona and its influence on Latin world was enormous.

REFERENCES

1. The excavated surgical tools examined and evaluated are in the collection of Dr. Henri Amin Awad, the Islamic Art Museum, the Coptic Museum Cairo.
2. A concise article in the magazine of the faculty of Archeology Cairo University 1976, pp. 19-23. Dr. H.A. Awad gave general data about these excavated surgical instruments, the journal International surgery, October 1977 No.10, Page 520-24, Sami H. Hamarneh and H.A. Awad, "Early surgical instruments excavated in old Cairo", a paper prepared for the 25th International congress for the history of medicine, Quebec, Canada, 1976.
3. SEE GEORGE SARTON, "*Introduction of the history of science*" vol. I Baltimore Md. Institute 1927, 583-89.
4. The "*Medicine of the Prophet*", IBN QUEIME EL-GOZIA, Cairo 1978.
5. DR. HASSAN KAMAL, Pharonic Medicine, Cairo, 1964.
6. SAMI HAMARNEH, "*Drawing and pharmacy in al-Zahrawi 10th century*", USNM Bulletin 228 paper, 22 Washington D.C. 1961, pp. 81-94.
7. S. HAMARNEH, "*The physician, therapist and surgeon Ibn al-Quff*", Cairo atlas press 1974, pp. 94-136.
8. Serefiddin Sabuncon by Suheyl Unver, Istanbul.

KEY TO PLATES:

1. Plates from I-VIII; The figures of the excavated and studied forty five surgical instruments.
2. Plates IX-X; Dr. Henri Amin Awad collection.
3. Plate XI; The Islamic Art Museum Collection.

CONTRIBUTION OF MUSLIM SCIENTISTS TOWARDS SURGERY

Dr. Shobhana Mathur and Prof. Dr. G. Sakait Rama Rao.

INDIA

The Arabs have played an important role in the history of medicine. They preserved the medical knowledge of the Greeks and added to them the results of the medical experience of various nations like Rome, Egypt, Persia, India and China, in addition to their own. They laid the foundation of the principles of various inductive methods and stressed upon their application to medical science e.g. cauterization and cupping.

The Islamic era which began in about middle of the seventh century, ends with the fourteenth century. The intellectuals during this period who practised medicines were:

1. Messue	777 -857 A.D.
2. Alkindus	873 A.D.
3. Rhazes	850 -930 A.D.
4. Haly Abbas	994 A.D.
5. Avicenna	980-1037 A.D.
6. Albucasis	1122 A.D.
7. Avenzoar	1113-1161 A.D.
8. Averroes	1166-1198 A.D.

and some other persons like Maimonides and one of the four masters of the school of Salerno.

Of all the Muslim rulers, the most distinguished for love of learning and general enlightment was Haroun-al-Rashid of Baghdad, who opened many medical schools and hospitals during his reign. His son al-Mamon founded the Academy of Baghdad. He made to translate writings of many philosophers and physicians of various countries into Arabic and gave equal weight of gold, to the persons who translated the books as encouragement.

The Muslim scientists who developed deep interest in surgery as part of medicine were very few. They were - Rhazes, Avicenna, Albucasis and Avenzoar and a few others.

Rhazes (Abu Baker Mohammed Ibn-Zakaria) was an Arabian Physician born in Ray near Tehran in 852 A.D. He was a follower of Gallen and Hippocrates. He was called al-Razi of Ray which was later latinized to Rhazes. He treated many cases of Sciatica by the method of blood letting.

He was an intelligent person and diagnosed many diseases by taking complete history of the patient.

Eg.1) Once a man came to him with blood in the vomit. He was given all sorts of medicine but was not responding. He asked the person first full history of the day what he ate and drank. The man gave history of drinking water from a stagnant pond. Rhazes gave him nauseous water-weed to eat as much as he could and he made the patient to eat more and more . The patient vomited after some time and there was a leech in the vomitus, which was responsible for the trouble.

Eg.2) One man came to him with a history of continuous bleeding from gums not responding to any treatment and his son with bleeding from rectum. He gave all types of treatment and then diagnosed it as different type of hemorrage. It was hemophilia, but he could not treat it (Medical History of Persia).

He was the man to use animal gut as a suturing material. Towards the end of his life he lost vision

perhaps due to cataract but refused to get operated by surgeons who were not aware of Anatomy of Eye.

The next great person to show some interest in surgery was Avicenna or (Ibn Sina) who was famous for mastering the whole Quran at the age of 10 years.

Rhazes and Avicenna were the ornaments of Eastern Caliphate, while the western Caliphate including the southern Spain was graced by Albucasis.

Avicenna was born in Bokhara and studied in the University of Baghdad. He wrote many books with illustrations. Out of which "Canon of Avicenna" is world famous. He described the methods of cauterization in different conditions and surgical procedure in renal stones, several eye diseases. He also mentioned Tracheostomy, amputations and many operations.

Albucasis is the most important person in the field of surgery. He was born in Moslem Spain in el-Zahra near Cordova in about the beginning of Eleventh century. His main interest was surgery. He wrote many volumes of surgery in which he mentioned in detail the methods of operation and illustrations of the instruments used. About Anatomy he said that no one should attempt the Art of Surgery without the perfect knowledge of anatomy. He divided the surgery into three parts in his book (al-Tasrif):

1. Cauterization and vascular surgery,
2. General surgery including ophthalmology and obstetrics,
3. Treatment of fracture and dislocation.

Avenzoar (1113-1161) was born in a Spanish family, and had specialised in surgery of Renal Calculus describing the steps of operation in detail in his book "Kitabut Taysir".

Averroes or Ebn-Ruschd (1166-1195) was a student of Avenzoar. Others were Haly-Abbas, Massue, etc. who also contributed some of their experiences to surgery.

CONTRIBUTION TOWARDS VARIOUS FIELDS OF SURGERY

1. **Instruments:** Albucasis has given his contribution by inventing and designing various surgical instruments. Avicenna has designed many types of cauteries, forceps, trefines and also various instruments for eye surgery, e.g. eye cautery.

2. **Absorbants:** They used cotton, kuff-e-darya (foam) as absorbants during surgery. Use of alcohol as antiseptic was first described by Rhazes.

3. **Cauterization:** Cauterization was practiced by most of the Arabian physicians. Rhazes has described different methods of cauterization. He mentioned the following methods for the control of bleeding:
   a) By cauterization.
   b) By firm pressure with finger.
   c) Ligature with silk twine or horsehair or fibre of ood plant.
   d) By division of the artery when it is not completely severed and then cauterize or ligate.
   e) By application of snow or ice cold water.
   f) By applying remedies that have properties of stopping hemorrhage.

4. **Blood letting:** It was practised by all the Arabian Physicians. It was done by four methods:
   a) By cupping i.e., by applying horns and creating vacuum.
   b) Venesection.
   c) Incising an artery.
   d) By applying leeches — when other methods are not applicable e.g., in old people, small children and severe skin infections.

These methods are used in the treatment of diseases such as Sciatica, Delerium, Convulsions and removal of foreign body.

SURGERY

Surgery was preferred only when medical treatment failed. Avicenna always preferred cautery to knife. The various surgical operations Arabians did were as follows:

i) E.N.T. surgery like tonsillectomy, tracheostomy, paracentesis of ear drum, repair of the ear lobule etc..

ii) In ophthalmology Arabs have special credit as they performed almost all eye operations. Avicenna was the first person to treat lacrimal fistula by probing. They knew that cataract was due to lens-opacity.

iii) In dental surgery they were perfect in tooth extraction and treating their complications. Avicenna and Albucasis designed many tooth extracting forceps. They used to treat loose teeth by gold and silver wire.

iv) They performed abdominal operations and drained peritonial cavity in cases of Ascites in sitting posture, using specialised drainage tubes which were later adopted by Fowler and Potin modifying as trocar and canula. The operation of renal lithiatomy was done mostly by Avicenna, Albucasis and Avenzoar. Operation of colostomy was first done by Avenzoar. Abdominal wounds were sutured in layers using animal gut, silk and horse hair.

v) In obstetrics Avicenna was the first person to practice instrumental deliveries. Albucasis described in his book the abnormal position of the mother during delivery which is known as "Walcher's position". He also mentioned about extraction of the placenta. He performed the operation of cranioplasty for the delivery of dead foetus which he had described fully in his book al-Tasreef and designed instruments for this operation.

vi) In orthopaedic they knew treatment of all the fractures e.g. of hand, upper arm, clavicle, vertebrae, ribs, femur and head of femur. Dislocations for shoulder, knee, elbow and wrist joints, were also treated by them.

vii) Arabians also knew about amputations and their indications. Avicenna described the and regulations for amputations. Albucasis used to amputate the entire limb when the cancer was at the terminal part of the extremity, but he never used to attempt amputations if it is associated with inflammation. Amputations were done with special saws under anaesthesia.

viii) Surgical treatment of goitre was attempted hesitatingly by Albucasis. The operation was revived by Pierre Joseph Desault at the end of the of the 18th century.

ix) Among other surgical operations they did, were hernias, hydrocele, imperforate anus, hypospadias, circumcision, imperforate hymen, swellings under the tongue and cancer breast etc...

x) They divided injuries into incised, lacerated arrow injuries and head injuires. Head injuries were treated after shaving.

a) Treatment for incised injuries they advised suturing and dressing with dusting powder (containing ood, dum-ulaqwain).

b) For lacerated wounds suturing and dressing with tight bandage (using water and honey, alum and olive oil).

c) For deep wounds they used to advise packing with bathi (gauze) for absorption .

They used to assess the prognosis of the patient ofter surgery by noting whether the patient is having the following signs and symptoms:

a) Dyspnoea (allergy)
b) Delirium and convulsions (Tetanus)
c) Rigidity of the extremities (Tetanus)
d) Fowl smell (secondary infection)

If none of these symptoms were found, the prognosis was presumed to be good.

Anaesthesia: Even in those days Arabs practised Anaesthesia by giving drugs obtained from various plants like, poppy juice, henbane, deadly night shade, hemp, mandragora (mandrake), alcohol and some of its combinations like hemlock (which Socrates took in order to sooth himself in his last hours). Mandragora mixed with a glass of wine was given to induce sleep for surgical operations.

They induced Analgesia by applying tight bandage (tornequet) to the limb meant for amputation.

They used special needles for suturing. A special guild was entrusted for making such needles. Persons working for that were supposed to take an oath before hand not to adulterate the metal. The best suturing needles were known as "al-Musawada" which has round eye sharpened three times before use and then polished.

They gave importance to the post-operative care of the patient. Avicenna was of the opinion that dry dressings of the post-operative wounds help in rapid healing of the wound. They also used camphor, alum, olive oil, ood, alcohol and rose water for dressing the wound. They advised good nourishing diet after operation which included mutton preparations, brain, eggs, fish, etc.. and wine for sedation. They observed that the healing of the wound was slow in weak and old people.

Arab surgeons used to take special care for treating ladies. Lady surgeons were rare hence Lady assistants were called while operating ladies. When Tabeebas (lady assistants) were not available, gents of high morality were called for to assist a surgeon during operation along with an adult lady midwife.

Apart from this treatment part, Arabs were highly God-fearing and always used to mention the name of Allah before giving any treatment and particularly before starting any surgical operation. They also used to pray to God for the welfare of patient. They stressed the importance of morality in a person who practised medicine.

STATUS OF ANATOMY AND SURGERY IN DIFFERENT CIVILIZATIONS AND THE CONTRIBUTION OF ARABS IN THIS FIELD

Mr. Rasheed Uddin Ahmed

INDIA

INTRODUCTION

The history of medicine goes back to antiquity so of the anatomy and surgery. The present day medical science as what we see today, like other sciences, is the outcome of mutual efforts of different civilizations through centuries. In the beginning, the concept of disease has always been magico - religious or priestly whether be an Egyptian, Mosopotamian (Babylo-Assyrian), Persian or Greek medicine of the west or the Chinese and Indian medicine (Ayurveda) of the east. But with the advancement of the time and knowledge these old concepts, on the basis of observation, experience and reasoning also changed, and different theories started emerging making the primitive sciences reasonably more scientific. Only these theories have lead to form different schools of medicine, which through ages, reached their peak in the time of Arabs (in the form of Arab medicine or Greco-Arab medicine), which later on was utilised by the Western world to give a new scientific outlook in the name of modern medical science or so called "Allopathic System of Medicine" of the West.

Surgery is that branch of medical science where the physician uses hand and the surgical instruments to cure the ailments. The records of the knowledge of this science are available in Egyptian, Babylonian, Assyrian, Persian, Greek, Roman, Chinese and Indian Civilizations. In the olden days this science of treatment was considered as an art but during 7th and 8th centuries A.D., this art achieved the status of a full fledged science.

The cure of wounds, setting up of the bones and articulations were known to the competent persons dealing with this science who were available in every period of the civilizations. The human skulls found in pre-historic age had holes which indicate that they were made for curing some sort of ailment. If it is true then it can easily be proved that there were people who instead of using incantations and magico--religious or priestly methods must have used surgery as means of treatment, which is now available to the present generation in the form of modern surgery.

To know exactly the biggest and the most important contributions of Arabs or the muslim scholars and physicians in the field of anatomy and surgery it is essential to discuss in short the status of this science possessed by different civilizations.

ANATOMY AND SURGERY IN DIFFERENT CIVILIZATIONS

EGYPTIAN MEDICINE

In the Egyptian Medicine the knowledge of heart occupied prominent position. Its beat was believed to be felt not only in the heart region alone but also by placing the fingers on the head, hands, legs and also in the pulse. Also in the human body there was a vessel system arising in the heart and connecting it with all the other parts of the body. The blood, however, was of great importance to the Egyptians. The preservation of the body was not done through physical embalming but also through religious rituals by which chief parts of the body were identified with the organs of sun god. This is how we have the list of organs in the ancient religious texts and also in the incantations. This may well be the origin of an arrangement of materials that was customary in the medical literature for thousand years. Papyrus Edwin Smith and many other books followed the same order. Thus many organs known had their names, and it was believed that they were well connected with one another either directly or indirectly through heart by a system of canals (as explained erlier).

As such there is no record of dissection in Egypt before the Hellenic period. Actually very little operation was performed and surgeons needed some experience in topographical anatomy. There was only limited knowledge of anatomy to those who had set the dislocated jaws or a dislocated humerus, obviously some empirical knowledge of bones and articulations.

MESOPOTAMIAN (BABYLO-ASSYRIAN) MEDICINE

The Babylonians did know that the heart was the seat of intellect, the liver of affectivity, the stomach of cunning, the uterus of compassion, ear and eye of attention. Surgery was performed at an early date in Mesopotamia since the Code of Hammurabi dealt with the surgeon's liability. The armies had surgeons who knew how to treat wounds. There is no doubt that the physician did not dissect the bodies. We know that surgery was practiced by Babylonians and that operations were performed even on the eye. The Code of Hammurabi also mentioned that the barber, who was considered to be the auxilliary of physician in that he also performed minor surgery, like the dental operations performed by them. The teeth were extracted in Assyria. In Bundhaism each part of the body was equalled to some part of the earth e.g. the back was the sky, the tissue like the soil, the bones like mountains, the veins like the river, the blood in the body like water in ocean, liver like the vegetation and the marrow of the body was like the liquid metal within the earth.

PERSIAN MEDICINE

The medical training given in the centers of Ray, Hamadan and Persepolis in Persia, included the study of theory of medicine and a practical apprentice-ship. In that three kinds of physicians were recognised — the healers with holiness, healers with law, and healers with knife. The surgeons (healers with knife) had to undergo a very severe trial before he was allowed to operate. The regulations required the young surgeon to perform his first known operation on Non - Zoraostrians. If he failed he was disqualified from any further practice.

GREEK MEDICINE

History of Greek Medicine is a story of roughly about a millennium that is from 500 BC to 500 A.D. The most important document on the evolution of Greek medical thought and professional practice in the early period are Homeric poems. In the post-Homeric literature, we find the magico-religious concept, as in other cases, because of the ancient influence left on Greek culture. In due course of time the Greek medicine was in a form of continuous change. Disease was no longer regarded as a super natural phenomena, as it was approached from a rational, naturalistic, and scientific view point, which is the most characteristic and striking factor in the evolutionary history of Greek medicine, and is for the first time of its kind in the overall development of medicine. Greek Medicine was greatly influenced by the philosophical ideas of the early Hellenic culture, which threw off the priestly and mystic dogmatism and established its base on observation and constant study of nature and man, in his relation to animal — a Biological study that brought essentially a new note into medicine.

The history of Greek Medicine is actually believed to be originated from the legendary god Aesculapius (also Asculapias) in the form of a cult. The Aesculapian cult is believed to be introduced in Athens about 429 B.C. Priestly medicine spread with great success throughout Greece about fifth century B.C., and continued to be in common practice upto 4th or 5th century of the Christian era, and about 500 A.D. the cult of Aesculapius of ten mingled with in strange combinations with the cult of Christian saints.

In the Homeric period the anatomical knowledge was primitive, but fairly exact as regards the bones, muscles and joints. The anatomical knowledge of Hippocratic school, as far as can be judged is based on experience with animals. The scanty knowledge in all the fields of anatomy, except the bones about which they had accurate information, as is shown by the marked development of the bone

surgery, proves that the examinations of the Cadaver was almost unknown. Nerves and tendons were confused with muscles, often also with blood vessels; ideas about the thoracic and abdominal organs were vague although these organs were named and some time briefly described. Arteries were thought to contain air because it was observed that they were empty after death. By the word "Veins" was meant those vessels which contain blood. Knowledge of heart, and the part that it played in the circulation was uncertain. Some Hippocratic books state that the veins carried blood to head. According to other Hippocratic writings the uterus is bicornate; in the right side males are conceived and in the left side females. The centre of thought and will was brain. The brain was regarded as the centre of sensation. Sight was thought to occur from the formation of image on the pupil; the bones of the ear carried the auditory sensation to the brain.

The actual dawn of the scientific medicine in Greek history is attributed to pre-Socratic school of philosophy. The Ionian School of Milletus was probably the most ancient one, founded by Thales of Milletus (639-544 B.C.). The other Schools of importance in Greece flourished in Cyrene, Rhodes, Cnidus and Cos. The reactive period of Greek medicine started with the name of Hippocrates (the father of medicine). Hippocrates was born in the small island of Cos in 460 or 458 B.C. The writing of Hippocrates (about 50-75 books are attributed to him) were later on collected in Alexandria into "Corpus Hippocraticum".

In the Greek Medicine Alcmaeon (500B.C.) a contemporary of Pythagoras, was the first to practice the anatomical dissection. Hippocrate, in his writings, explained briefly about the setting up of the broken bones and dislocated joints. One of the methods mentioned for dislocated shoulders is still practiced in the present day surgical science. He has also discussed in detail about the ailments of the backbone, and emphasised that the patients suffering with the paralysis of the lower portion of the body should not be treated as there is no cure to it, moreover, there was no wheel chair to carry them, which makes the life of the patient more miserable. His saying was followed for centuries after his death. Hippocrate has also classified the methods of treatment into three main divisions — one of them was surgery. The doctrine of the Hippocratic medicine survived in Greece, Rome and Egypt for many centuries. After his death, in the first century B.C. a Roman surgeon Aulus Cornelius Celsus wrote many books on surgery and emphasized that for the surgeon it is important to have the knowledge of anatomy in detail. Another Roman surgeon Rufes of Ephesus (second century B.C.) has explained elaborately how to stop the blood coming out of the wounds. Antyllus was another Roman surgeon (who is believed to have lived in second or third century B.C.) has mentioned about the disease — Aneurism (swelling of the blood veins) and its treatment. It is believed that Autyllus has very successfully removed the upper and the lower jaws and operated upon the joints. Among the Roman physicians Galen occupied a top most position. He was a Greek by birth but lived in Rome and for some time in Alexandria. Though he was not a surgeon but his name can be included here as he has emphasized extremely on the Pharmacological actions as it in modern surgery plays an important role. After Hippocrates, he was the only physician who had a tremendous impact on the medical sciences as a whole. He not only studied the animals thoroughly but wrote his observations on them in a very descriptive manner. After the decline of medicine in Rome and the texts of the earlier Greek workers were forsaken, luckily the Greek medicine found its votaries in Arabs.

ARAB MEDICINE (GRECO-ARAB OR UNANI MEDICINE)

The Unani Medicine as the name itself suggests owes much to the Greek Medicine (Unani means Greece) and is also called Arab Medicine because of the tremendous contribution of Arabs and other Muslim Scholars and Physicians to develop it into an elaborate medical science. Therefore, the name Greco-Arab Medicine is very correctly justified because of its Greek origin and its development by Arabs through centuries. Muslims still call it Unani (Ionian) System of Medicine or "Unani Tib" and Arab

Medicine by Europeans. It has its origin in the fourth or fifth centuries before Christian Era under the patronage of Hippocrate in Greece. It was greatly influenced by the scientific thoughts of Aristotle, Theophrastus, Dioscorides and Galen, who need no introduction.

The actual history of Arab Medicine started when the exiled Nestorians founded Schools of medicine in Persia (Iran) and translated Greek writings into Assyrian and then into Arabic through ancient cultural heritage of Egypt, Iraq, Persia, China and India. The translators were not only the muslim scholars and physicians but also Christians and others. One of the Schools, that of Junde Shapur on the banks of the river Euphrates served as the point of departure of medicine from Greek to Arabic and ultimately to Baghdad — the place of Abbasid Dynasty. The most important contribution to this system is attributed to Omayyad Caliphs (first half of the eighth century), whose empire extended from Spain to Samarqand, where most of the Greek work was translated into Arabic imbibing the best known in the medical knowledge of Egyptian, Misopotamian, Greek, Persian, Roman, Chinese and Indians. The climax of this activity reached in the 8th to 9th century A.D. and lasted until 12th century when it began to fall.

In my opinion the biggest and the most important contribution of the Arabs is that they not only added their own ideas on the basis of observation and research, but preserved all the medical knowledge prevalent in different civilization in their original and natural forms. Arabs made three fundamental contributions in medicine — medical chemistry in the form of Alchemy and Botany, the organisation of pharmacy and the foundation of hospitals. Arabs enriched the Greek medicine, and this Arabic form of Greek medicine was transmitted to Europe through Latin translations.

Amongst the distinguished scholars and translators of that period the names of Yuhanna bin Masawayh (778-857A.D.) Hunain bin Ishaq (809-873 A.D.) and Qusta bin Lauqa deserve mention. These scholars not only translated the Greek work but also paved the way for further writings, investigations and research in different fields of medicine. The important Arab Scholars who have contributed by writing the books, translating the Greek, Persian and Indian works into their own language along with the footnotes, commentaries and additions, on the basis of their own experience and research in the field of Arab medicine are Hajjaj bin Mutar, Ibn-ul-Batriq, Isa bin Yahya, Ahmed bin abi al-Ashat, Ibn Jaljal (Galgal), Abu Sehal Masihi, Abi Ibn Saadiq, Abul Hasan Qarshi, Ali bin Rizwan, Ibn Wafid, Raziuddin Abul Mansoor, Said bin Bushar bin Abdus, Jarji Zidan, Abdul Lateef Baghdadi, Abul Qasim Khalaf bin al-Abbas al-Zahrawi (also written as Abu-al-Qasim al-Zahrawi and known in Europe as (Albucasis'), Yahya Ibn Jazla "Muqhni", Abu Rehan al-Biruni, Ali bin Abbas, Haji Ziauddin Attar, Shaik Yusuf of Baghdad, and Ibn Rushd "Averroes" (died 1198A.D.) Rabban Tabari, Yaqub bin Ishaq al-Kindi (800-887 A.D.) Abu Bakr Mohammad bin Zakaria, Razi "Rhazes" (854-932 A.D.) or (850-925 A.D.) Shaikh Bu Ali Sina "Avicenna" (980-1037 A.D.), Abdullah Mohammad Abdullah bin Ahmad al-Maliki "Ibn Baiter" (1197-1248 A.D.), Ibn an-Nafees "Mulla Nafis" (1210-1288 A.D.), Shaikh Dawood Antaki (about 1008 A.H.), Abul Farj bin al-Qaf (630-685 A.H.) and Yusuf bin Omar "Saheb-ul-Yamen" (Died 694 A.H.)

Instead of going into the details of each of the above workers, I will confine here only to the scholars who have achieved the fame and glory not only in the Arab medicine but also in the European medicine by their remarkable discoveries and contributions, especially those who have contributed in the field of Anatomy and Surgery.

There is an abundance reference of the book 'Almaliki' of Ali-ibn-Abbas in the European literature. Zakaria Razi 'Rhazes' is credited to having written 250 works. Some of which are of pharmaceutical aspects. Rhazes amongst his contemporaries was known as Galen of his time. His most famous contribution is al-Hawi Kabir or 'Continens of Rhazes'. Garrison in his history of medicine classes Rhazes with Hippocrate in the influence upon medicine. He devoted his whole life to literary and clinical research. His book (al-Hawi) was translated into Latin in 1486 in Brocia and published in Venice in 1547. His book is luckily preserved in Escorial Library and some of its different parts are present in India

either with individuals or with private collections. Al-Razi was the first to describe and give a clear cut account on small pox and measles and differentiate between them in his reliable treatise, 'al--Hasaba-wa-al-Judri'. Al-Razi's medical encyclopaedia was used in Venice until the 16th century. There is very interesting account about Rhazes in it, for instance al-Razi chose a site for a new hospital in Baghdad by hanging up lumps of raw meat in various parts of the city to see where it rotted most slowly. Avicenna amongst the Unani physicians was known simply as Shaikh. He is the world renowned author of the book 'al-Qanoon' (Canon). In fact he was the father of Greco-Arab Medicine. During the Middle Ages the Canon of Avicenna was by far the most popular text book of medicine in Europe and was most frequently quoted by later writers. Actually Avicenna's works were considered authoritative and used by the Universities of Europe till as late as 1650. It is his likeness that adorns the diploma of Pharmaceutical Society of Great Britain. According to Osler Avicenna's Canon was a 'Medical Bible'. Avicenna's brilliance is shown in classifying and arranging all the medical knowledge of his time, and presenting it in a logical form. He was a physician as well as a philosopher, astronomer, mathematician and a poet. Ibne Sina (Avicenna) in the 10th century wrote 43 books on medicine. He emphasised the importance of diet and climate on health and wrote about the dangerous effects of emotional strain and of contaminated water being a carrier of diseases. He also recommended the use of alcohol as an anaesthetic. Al-Idrisi was born in Sveta and educated in Spain. The reference of his work is found in the famous book al-Aqaqir, (believed to be written by Ibn-Baitar) and is believed to be an authority of drugs of North Africa. Ibn al-Baitar was the Chief Botanist in the court of Egypt. Ibn Baitar in his monumental work, (al Jame-al-Mufredat) collected the work of Dioscorides, Galen, Rhazes, Avicenna and others on drugs of plant origin. Ibn al-Baitar is the greatest name in Arab Botany. Another book written by him on Materia-Medica is known as 'Kitab-ul-Mughni - fi-al-Adwiyyah - al-Muffreda' or 'Corpus of Simples' was translated by Le clerc in French and according to Castiglioni (the famous medical historian) this work is one of the most complete that we possess in the field of Botany and Materia-Medica. Arab physicians also excelled in treating diseases of the eye. Ali-Ibn-Isa wrote a treatise on Ophthalmology in which he discussed one hundred and thirty two diseases of the Eye. Hunain's 'Ten Treatises on the Eye' is the earliest systematic text book on Ophthalmology. In Pharmacology, al-Kindi, Abu rehan al-Biruni, Ibn Jazala, al-Ghafiqi, Ibne Jalal, Ibn Maimoon, Ibn-al-Baitar, Kohin-ul-Attar and Shaikh Dawood Antaki have contributed a lot.

Abu Farj-Ibn-al-Qaf (630-685 A.D.), the pupil of Hakim Ibn-i-Abi-Usaibiya (the famous author of Tabaqat-ui-Atibba and was given the title of Ameenud-Daula in the royal court of physician) is the author of several books on medicine besides a commentary on Canon (al-Qanoon) of Avicenna in six volumes. His book 'Kitab-ul-Umda - fi-al-Jirahat' contains 20 sections of which section 11 gives the description of 212 drugs dealing with surgical practices. This book is also commonly called 'al-Umda-fi-Sinnat - al--Jirahat', the last of the Arabic writings on surgery is by him. The first Arabic scholar to write comprehensively about surgery was al-Majusi (Ali-bin-Abbas - al-Majusi 10th century A.D.). A special section of his book. 'al-Kitab - al-Maliki' was devoted to Surgery. The greatest of the Arab surgeons was undoubtedly Abu-al-Qasim - al-Zahrawi (died in 1013 A.D.). His book al-Tasrif established his fame not only as the best surgeon produced by the Arabs but also as one of the best and most frequently quoted surgeon during the Middle Ages. This book was used as a text book until the beginning of 17th century. The most important part of the book is the last section dealing with Surgery. The surgical part of al--Tasrif was translated to Latin and was used as text book in the Universities of Europe. Another famous Surgeon of Spain Abul Mardan Abdul Malik-ibn-Zohr 'Avenzoar' (1130-1162 A.D.) was an Arab and is described to be the first who has operated upon the foetus. His book 'al-Satbar' has been translated into Latin. Avenzoar linked surgery, therapeutics and pharmacology into an inseparable whole. In the field of Anatomy, Abdul Latif Baghdadi and others deserve mention. The Arab physicians were advanced in mid-wifery and performed the operation of 'Cranioclasty' for the delivery of the dead foetus. Zahrawi's book al-Tasrif is full of such examples and he was the first to describe 'Walchar Positon' in obstetrics.

Arabs were the first to introduce the use of drawing the diagrams and illustrations in scientific and medical books. Al-Zahrawi was the first to give illustrations in his book on the subject. Although Muslim doctors performed surgery only as last resort, many surgical operations were well developed. For example Caesarian operations were done and even the operations on eye were performed. Anatomical details of the human and animal body were given by the Arab scholars as evident with the picture and diagrams displayed in the 'World of Islam Festival in London'.

CONTRIBUTION OF SOME MUSLIMS TOWARDS SURGERY

HK. A. B. Khan

INDIA

It is generally spoken that Muslims did not contribute to our knowledge of anatomy and surgery as the Muslims law prohibited dissection of the human body. Their knowledge was mainly derived from Greeks and animal dissections. However, on a more careful study of Arabic medical literature, we find that Muslims contributed a lot towards surgery. The present paper deals with the independent contribution by al-Razi, Ibn Sina and al-Zahrawi etc. towards surgery. The paper also includes the Islamic surgery in France during the first two decades of the present century A.D.

Al-Razi (841-926 A.D.) was the first to describe the use of the Seton, (a sort of thread which keeps the wound open), suturing of wounds by the use fo silk thread, catgut and the use of alcohol in surgery was also for the first time described by al-Razi. He carried out skilfully the operation of eye specially of cataract for which he became very much famous in his time. He knew well that cataract was due to the opacity of lense. Al-Razi and many other Arab Ophthalmologists used various kinds of lenses for defective visions. The commentator of al-Asbab has mentioned these lenses in the chapter on cataract [1].

Al-Razi performed the operation of Tracheotomy on Wazir Ahmad Ibn Ismail in the case of tracheal obstruction due to diphtheria. This was his excellent operation for which he became more famous in Khurasan [2].

Ibn Sina deserves the credit for introducing the treatment of lacrymal fistula by probing when he suggested the introduction of a medical probe into the channel. Dry dressing was also stressed by him in his Canon. He pointed out that healing was hastened by this method. He also deserves the credit for prescribing the complete and thorough removal of the tissues and all blood vessels of the affected part and its adjoining areas as the treatment of cancer *(Sartan).* According to him even then the cure was not certain [3].

The greatest of Muslim surgeons was undoubtedly *Abul - Qasim - Khalaf - ibn-al-Abbas* (1936--1013), known as al-Zahrawi. His book *al- Tasrif li-man Ajazanal-Talif* established his name not only as the best surgeon produced by the Arabs but also as one of the best and most frequently quoted surgeons during the middle ages. This book was the guide to the early European surgeons in the *Renaissance* and was used as a text book until the beginning of seventeenth century [4]. The most important part of the book is the last section dealing with surgery. It contained all the surgical knowledge upto that time and laid great stress on *cautery* and *vene-section.* He used the cautery extensively for opening of abscesses and for the removal of cancer in preference to incision as advised by Hippocrate. In describing the technique for opening of the liver abscess with cautery, al-Zahrawi speaks of the necessity of having adhesion between liver and the peritoneum , otherwise there will be danger of pus going to the general peritoneal cavity causing the death of the patient.

Al-Zahrawi was the first to treat surgery as a distinct science founded on the knowledge of Anatomy and separate from the other medical branches. He advised the ligature of vessels and should also be considered first to use hooks in the extraction of polyps. He was first to teach the methods of vaginal Lithotomy[5]. Spencer holds that Zahrawi was the first to write on the treatment of the deformities of mouth and dental arches and the first to describe the " Walcher Position of Child ".[6] He was the first to describe the haemorrhagic diathesis, having noted several cases in one family and treated them by cautery. He also invented many delicate surgical instruments and has reported 280 in his book. Zahrawi has given full description in his book about the operation of hydrocephalus, cataract, removal of vesicle

calculi from bladder, complete removal of breast carcinoma, thyroidectomy, transversal tracheotomy, operation on the cervical lymphnodes, elephantiasis, scrotal and anal surgery and orthopaedic surgery etc... besides above mentioned surgery. He added greatly from his wealth of experience. His personal observations he gives, are very important and clearly show that he was a skilful and experienced operator. His precise description about the symptoms and private technique show that he had repeatedly done the work and done it well[7]. Some of these Arab Muslims developed a method for the reduction of shoulder dislocation known even now as the Arabian method. In the use of anaesthesia in surgery they were the pioneers. They probably invented the anaesthesia sponge which was extensively used during the Middle Ages. They also deserve the credit of causing unconsciousness in certain cases for seven days before the major operation [8].

ISLAMIC SURGERY IN FRANCE

In 1912, Mr. Hilton Simpson , an English man visited the northern part of Africa which comes under France and known as *Aures*. This place is surrounded by hills and forests , so the people living there got no awareness about the progress and development of the rest of the world . His basic aim was to study the condition of the people living there . Mr. Hilton has given a detailed description about his visits in his book, *Arab Medicine and Surgery* This book was published in 1922 by the Oxford University Press, London.

In Aures he came to know about a group of Arab Muslims who were excellently and smoothly doing surgery specially the operation of craniotomy which is even now a major and difficult operation. Their surgical activities were legally prohibited by the Government of France. Anyhow, Mr. Hilton Simpson succeeded in contacting those surgeons and making them friends after assuring that he will not disclose their surgical activities to the government officials. He visited Aures four times, first in 1912, second in 1913, third in 1914 and the fourth in 1920. In the third visit he brought about fifty instruments and drugs used by those surgeons and in 1919 he presented these materials to the Royal Society of Medicine. To complete his notes, Mr.Hilton visited Aures the fourth time in 1920. This time he was able to know about hundred more surgical instruments and the drugs used in surgery [9]. He has reported in detail about Craniotomy, removal of bone from limbs with their substitution , fractures and management of collar bone ribs and jaw, hernia, dentistry, eye surgery, skin grafting, obstetric surgery and bullet wounds and its management etc.. but I am taking here only Craniotomy as example because it is not possible here to describe each and every one.

OPERATION ON SKULL (CRANIOTOMY)

Majority of the Aures surgeons completely removed a portion of the scalp usually with the help of cylindrical or slightly oblong cutting instrument resembling a gun maker "wad punch". It was used red hot in which cutting edge was placed at right angles to the hand, variants of this being small circular or diamond shaped specimen with the cutting edge in the same plane as the handle which had been designed by one successful operator.

When scalping with the knife or by means of the scalping-knife and saw combined , some surgeons used to tie a handkerchief tightly around the patient's head in order to check haemorrhage. Then a rectangular piece of skin was removed in four straight cuts , others made two incisions intersecting at right angles and then turning back the points of scalp which were retained by means of hooks or by a V-shaped spring inserted between the flaps. Some surgeons employed the knife cold, others red hot while some used an instrument specially made for the making of incisions by means of red hot wade.

When the scalp over the seat of the injury had been removed or turned back, many surgeons scraped away tissues adhering to the bone by applying a fan shaped scraper or of a combined saw and

scraping instruments. Some surgeons used to treat the surface of the bones with powdered bark of *Juniperus Phoenicea* upon which a little warm butter was poured, before commencing the work upon it.

The next step of the operation was the perforation of the skull by means of a drill. The purpose of this perforation was to let out any pus or blood which may be beneath the bone. The drill was merely used to produce a shallow hole in order to serve as a starting point for the saw. In some cases several holes were made with the drill e.g. where cracks in the bone radiated from a central punctured wound.

It was a collective opinion of those surgeons that drill should be applied to the good bone just clear of the damaged surface beyond the extrimities of the cracks.

After the work of drill was over the operation continued with the saw. Most of the surgeons completed sawing in one and a half hour. The damaged piece of the skull having been completely sawn round, was very carefully lifted out by means of elevators and retractors. Some left it in position for three days in order that nerves of the dead bone may withdraw on third day, others still left it from ten to fifteen days preventing the scalp from a tendency to close over it, meanwhile by applying a pad of cotton soaked in honey and butter. After the interval of ten or fifteen days, the fragment of the bone was found to have risen up so as to be easily removed. This whole process of the operation was generally completed in thirteen hours. These surgeons were of the opinion that this operation must be done within seven days of injury. Some surgeons immediately lift away the bone after sawing and recommended a dressing of the gum of *Aleppopine* melted with sheep butter upon which a few drops of honey was poured subsequently sprinkling a little of the finest wheat and barley flour upon the dressing. Then a pad of wool was applied which was retained in position by a rectangular leaden weight, slightly larger than the hole and fitted with a boss of its upper surface through which was passed a thread wherewith to raise it. The object of the weight was to check the tendency of the brain to rise up through the aperture formed in the skull by the operation.

The dressing was renewed daily for a fortnight. After seven days the duramater was seen to have become steady save for the pulsation permanently noticeable even when the scalp had closed over the aperture. Duramater appeared red in colour instead of white with red tissues in it as appeared when first revealed by the operation. After a fortnight of daily dressing it was replaced alternatively for a month or six weeks, at the end of which time the patient restored normal health. Few surgeons used the powdered leaves of *Ajugaiva* and *Tencrium polium* mixed together for sprinkling upon a dressing of butter while another employed a butter dressing upon which was sprinkled some powdered *saffron* and white *cone sugar* before *pitch of pine* was poured over it. None of the surgeons applied stitches to the scalp and none attempted to replace the bone removed, by any form of artificial plate. However, grandfather of one of these surgeons had replaced the bone by means of a cap plaited *Halfagrass* . Another surgeon used a piece of Camel's skin as his material. Here, I am reporting in brief about Haemostatics, and anaesthetics used by Aureus surgeon along with their method of sterilization of surgical instruments.

Haemostatics: These surgeons besides cautery and ligation of vessels to check the haemorrhage used to apply this drug combin ation. (1) Ashes of rag or paper, (2) A piece of wool dripped in olive oil, (3) powdered green leaves of *solanum nigrum,* (4) Fresh leaves or barks of the *walnut tree,* (5) dried goat's dung (6) Damp earth, (7) powdered *gallnut,* (8) sulphide of copper, (9) *Juniperus Phoenicea.*

Anaesthetics: Most of the Aures surgeons performed their operations without anaesthesia but the following drugs had been reported to be in the use of these surgeons. (1) *Hyocyamus albus,* (2) 3 grams of the powdered fresh seeds of wild opium swallowed in rose water was sufficient to produce unconsciousness in the patients for fifteen minutes, (3) white excrement of the lizard *uromastrix acanthinurus* was dried, powdered and applied to wounds, such as those caused by a bullet. This was also proved as an excellent local anaesthetic while some such operations as the removal of a foreign body was carried out.

Method of Sterilization: These surgeons generally made incisions by means of red-hot cutting instruments. This appeared to be done to check haemorrhage and not to secure surgical cleanliness.

Dressings for wounds: A number of dusting powders were prepared and used by the surgeons to cuts, e.g. dried and powdered leaves of *Globularia alypum,* dried and powdered leaves of *Tamarix gallica,* L.mixed in equal parts with *alum,* dried and powdered leaves of *Ajugaiva* L. mixed with a little *alum,* green leaves of *Marrubium supinum,* L, dried in the sun, powdered and mixed with a little *alum,* dried and powdered leaves of *Erodium Guttatum* and five parts of the dried and powdered leaves of *Erodium Malocoides* mixed with one part *alum* etc.. Besides these powders, some ointments were also used for suppurating wounds and sores, such as, (a) six parts of the drugs of *red-vinegar* boiled over a charcoal fire with six parts of *honey* and mixed with one part of *copper acetate,* (b) Honey heated till it simmers with equal parts of *red vinegar, copper acetate, Myrrh* and *aloes.*

These Aures surgeons were so expert in operating on skull that some of them could cut through the shell of an egg without damaging its inner membrane and so gentle were their methods of operation that the patient rarely fainted during the operation. Mr. Hilton Simpson has given detailed description about the kinds, shape and size etc.. of the knives, drills, saws, retractors, elevators and weight etc.. in his book along with illustrations.

REFERENCES

1. SIDDIQUI, n.z., "*Studies in Arabic and Persion Medical Literature*", 1959, pp. XIV-XXII.
2. USAYBIAH, "*Uyun al Anba'a fi tabaqat al-Atibba*" , vol. II, p.46
3. IBN SINA, "*Al-Qanoon*", vol. III, p.133.
4. KHAIRALLAH, A., "*Outline of Arabic Contributions to Medical Sciences*", 1946, p.136.
5. LECTERE I., "*Histoire de la medicine arabe*", vol. II, p.456.
6. SPENCER, H., "*Lancet 1912*" Vol. I., p.1568
7. KHAIRALLAH A., "*Outline of Arabic Contributions towards medical sciences*", 1946 pp.137-138.
8. Ibid, pp. 281-85
9. LATIF A. "*Qadeem Tarikh Tashreeh-wa-Ilmul Jarhat*" (an urdu manuscript) pp. 50-51
10. HILTON SIMPSON, M.W., "*Arab Medicine and Surgery*" 1922, pp. 30-38.

Part Three: *Contributions of Muslim Scholars - Miscellaneous.*

CHAPTER THREE

(Some Selected Papers — Not presented)

1. A PRESCRIPTION FOR HISTORICAL REVIVAL.
   Prof. Eric Forbes.
2. ISLAMIC MEDICINE AND THE THERAPEUTIC USE OF HEAT.
   Dr. Mostafa Ahmed Shehata.

A PRESCRIPTION FOR HISTORICAL REVIVAL

Prof. *Eric G. Forbes.*

U.K.

The advent and rapid growth of Islamic civilisation is one of the greatest spectacles in the cultural history of mankind. Within decades, a combination of military prowess and favourable historical circumstances resulted in the Muslim domination of almost all of the lands in which the intellectual achievements of previous civilisations had occurred — the notable exception, of course, being Byzantium. Through the adaptation and translation of the numerous literary sources to which they thus obtained access, Muslim scholars made most of this knowledge their own. Uninhibited by the faith in ancient authority which for many centuries blinded the vision of scholars in Western Christendom, and unrestricted by the barriers of language and custom that had also previously inhibited the spread of ideas in the mediterranean culture area, they have transmitted this rich heritage in many Arabic, Syriac, and Persian sources which are still available for study to this day.

If justice is to be done to the flowering of scholarship in centres such as Damascus and Baghdad during the first three centuries of the Hegira (7th-10th centuries A.D.), we must recognise the fact that not all branches of learning were included in the Hellenistic classification of the sciences, history itself being a notable omission[1]. Ziauddin Sardar's recent pioneering attempt to produce a classificatory scheme of knowledge from *within* the Islamic world view[2] suggests to me a concept of history stemming from the annalistic and dynastic tradition of the Byzantine-Greek chronicles, that entered Islam through Graeco-Syriac historians. At any rate, it is placed by Sardar in a different sub-category from Education and Learning (which includes science and medicine) and from Civilisation and Culture (which includes various forms of art), and is consequently much more restrictive in content than that to which I myself am accustomed. However, this may be a pragmatic rather than a cultural distinction. The classification of Islamic Technology as a sub-division of Contemporary Issues is presumably a reflection of the widespread impact of technological innovation on modern Islamic society, which this country has been quick to put to its material advantage; but *mediaeval* Islamic technology can scarcely be fitted into this category, and Sardar does not take account of it in his proposed scheme. In order to avoid the issue of what the scope of historical study ought to be, I shall address myself to its methodological aspects rather than view it in terms of its subject-matter. Thus most of my remarks are equally applicable to ancillary areas of study such as the history of science and technology, and to sub-disciplines such as the history of medicine.

History may be regarded as consisting of four distinct, though closely-related activities: namely, the systematic collation, critical examination, interpretation, and presentation of its primary sources[3] — however we decide to define these. I would wish to include in my definition material artifacts as well as handwritten and printed documents, because a great deal has recently been learned about pre-literate civilisations through anthropological and archaeological investigations.[4] Let me now comment briefly on each of those activities, insofar as their international aspects and relevance for the history of Islamic science and medicine are concerned.

1. Collation of Sources

There is, and will always continue to be, a constant need for international co-operation in identifying and collating bibliographic reference sources covering all realms of literature, whether it be in science, medicine, and technology, the social sciences, or any other field of human intellectual endeavour. For

the Islamic world, a valuable start was made in this direction around the turn of the century by Carl Brockelmann [5] and more recently through the labours of Fuat Sezgin, [6] but much still remains to be done.

The IUHPS / DHS, which I here represent, attempts to stimulate this kind of basic activity through three international standing commissions for Bibliography, Documentation, and Scientific Instruments, respectively. The lines of demarcation are blurred, since bibliographies cite both manuscript and printed sources and instruments can sometimes be better understood from handwritten descriptions which, more often than not, are in an archive far away from the instrument itself. And the third commission is being too restrictive in seeking to catalogue historic scientific instruments alone. We need to explore major industrial archives, and pay more attention to physical and chemical *apparatus,* archaeological objects, engineering relics, *specimens* in botany, zoology, geology, mineralogy, and *collections* of portraits, busts, medallions, plaques, etc. We need also to establish working links with other interested international bodies such as CODATA (= Committee on Data for Science and Technology), FID (= International Federation for Documentation), IAB (= ICSU Abstracting Board), IFLA (= International Federation of Library Associations and Institutions), and more specialised working groups affiliated to other scientific unions such as the IAU and IUGS. I hope that more Islamic countries will in future actively assist us in these aims, by identifying the precise nature, size, and where abouts of their archival and museum holdings.

We are fortunate to be living at a time when, through the application of microelectronics, it is already possible in principle to dial a number and obtain within seconds whatever bibliographic information we require. This may appear on a video-display unit in front of us, and be fed on to a printer which provides a typed record that we may consult elsewhere at our leisure. Such "on line" data bases are gradually coming into existence and the machines required are widely available at moderate costs. There is, in fact, an International Federation for Information Processing (IFIP) which is very much involved in such activity.

The limiting factor in this world-wide operation is, however, the number of young men and women who are employed in gathering the primary source materials from which those vast data-banks are built up. Not enough is as yet being done to provide the necessary literary and linguistic training, or to encourage exchange programmes that will give experience to those capable of carrying out this type of research. This is an area which, as far as its applications to historical research are concerned, deserves wider encouragement than that which it has so far received from inter-governmental agencies such as UNESCO.

In collaboration with the recently-elected President of the Documentation commission of my Union, I myself have been planning an international symposium on Documentation in the History of Science, Medicine, and Technology which will address itself to the problems I have mentioned as well as to others that I have not. This will be a relatively small gathering of up to 70 specialists, to be held in a residential college near Edinburgh on 13-16 September 1983. I hope that representatives from Arab-speaking countries and from the history of medicine discipline will wish to be present to express their particular interests and problems.

2. Critical Examination of Sources

This is the responsibility of the individual scholar, and is not something for which others can prescribe. Before historical facts can be ordered and classified, they require to be examined from some distinct point of view. There can be no history, nor even chronology, without prior theoretical conceptions,[7] and the reliability of textual evidence is often a matter of subjective judgement. The historian of medicine's particular viewpoint must take account of the fact that the subject-matter of medical history is a product of the social activity between physicians and their patients; that is, essentially prac-

tical in character and directed towards the definite goal of curing an illness or a disease. Since health conditions are as much a feature of a human society as its politics, economics, or religion, disease itself must be regarded as a cultural manifestation. It is not enough, therefore, for the medical historian merely to concern himself with the development of the theoretical knowledge and practical skills required by the physician in his treatment of a specific ailment.[8] Social, psychological, and spiritual factors are also important.[9]

Here, however, a distinction should be drawn between the historian of medicine and the social historian of medicine. The prime task of the social historian of medicine is to provide all information necessary for reforming present-day social evils,[10] using history as but one means to this end. Historians of medicine, on the other hand, are *not* social planners. Their primary concerns are with the proper understanding of past modes of thought, and with the origin and dissemination of medical concepts and discoveries. They ought to be able to explain, for example, why such a strong belief has always persisted in our health being governed by astral influences and the positions of the planets, rather than dismiss this as mere astrological superstition because it fails to conform to what is nowadays generally accepted by the majority of medical practitioners.[11] They should teach us the history of codes of medical ethics, the changing attitudes between doctors and patients, the trends and fashions of medical practice, the rise of social medicine, as well as the lives and works of individual physicians.[12]

3. Interpretation of the Sources

The main danger in interpreting the facts and ideas which constitute the body of our present knowledge, is that we will fail to recognise the influences of prejudices inherited from our personal social or religious environment or from the epoch in which we happen to live. It is of the utmost importance that we detect and eliminate these. A prime illustration of how a great intellect can be led into making a major error of judgement is the statement made over a century ago by England's renowned historian Lord Macaulay in his Minute on Education in India (1871), where he remarked that people should not be paid to learn Sanskrit or Arabic merely in order to study "false history, false astronomy, false medicine... in company with a false religion".[13] Although the beliefs and practices of many millions of people throughout the world whose cultural traditions do not conform to Christian ideals can clearly not be summarily dismissed in this autocratic manner, it is still difficult for Europeans to feel a sympathy towards those other modes of thought. More must be done to instruct not only physicians and medical students, but those who wield political power in Islamic, Hindu and for that matter Chinese and African science and medicine and agricultural techniques, so that they acquire a better appreciation of what forms of technical aid and what policies of medical care are of the most practical utility to developing or Third World countries.[14] History can here be of real value in preventing a great deal of public money from being wasted on impracticable schemes or unwanted medical services. And governments should be made to recognise that

> *There is a dead medical literature and there is a live one; the dead is not all ancient and the live is not all modern.*[15]

The educational, or pedagogic role of the history of medicine and science is very important. The IUPHS / DHS tries to cater for it through its international commission on the Teaching of the History of Science, of which the current President is Professor Hafez from Cairo, who is himself an entomologist. His commission has previously been gathering information on institutions where and how these subjects are taught. However, there is now a need to put all this information to some use, by defining the aspirations and needs of the various countries involved and actively seeking funding for worthwhile projects. The results of a circular sent out several years ago by our Documentation commission, which Professor Hafez has incorporated with his work, have already revealed a significantly large response from Islamic countries. The ICSU / CTS (= ICSU Committee for the Teaching of Science) is a progressive body

which would welcome greater participation from our discipline and from this area of the world, and I am in close contact with its officials on matters of mutual interest.

4. Presentation of Sources

The importance of the presentation of the final products of historical scholarship is often underestimated. Many historians wrongly suppose that their task is complete when they have succeeded in amassing, distilling, and interpreting their data. Too often are they content to allow professional communicators like television and radio broadcasters and freelance journalists to determine the manner of presentation so that, in the words of Marshall MacLuhan, the medium television, radio, newspapers, etc. becomes the message or (as he was later to pun) the massage. [16] In this process, however, the facts generally become distorted because the prejudices that the historians have tried so hard to eradicate are now deliberately re-introduced by the communicators in order to supply an element of controversy or popular interest. This can at times be positively dangerous, especially where the majority of the viewers or audience is fundamentally ignorant of the culture with which the report is concerned — as is the case in Europe regarding Africa, Asia, the Islamic world, Latin America, or the Far East. Authoritative translations of books and articles about all aspects of Islamic culture, into the major European languages, is one means of combating this unavoidable trend; others being audio-visual materials such as slides, tapes, films, video-cassettes, and the like. Here again there is ample scope for the application of microcomputers to educational programmes that will provide factually accurate information about events in Islamic history or Islamic contributions to the development of science and medicine, at whatever level of complexity the pupil or student requires. This is something which I would personally like to develop, but I have so far been unable to secure funding for a pilot project.

Let me end this address, which I hope has given some food for thought, with a few statements about the value of medical history extracted from an article by a former Edinburgh surgeon whom I knew, who tried hard some years ago, though with little success, to convince our university's medical faculty to incorporate this subject into its teaching curriculum. [17] Medical history, like general history, makes us feel heirs to a great tradition. It provides an essential basis to medicine by giving us ideals to follow, inspiration for our present work, and hope for the future. It widens our intellectual horizons by linking medicine with other branches of knowledge, thereby counteracting the current trend of ever-increasing specialisation and concern for purely technical matters at the expense of ethical and cultural ones. Moreover, it is perhaps the only means of re-uniting a profession so fragmented by many specialisations and reviving the holistic outlook of former times. Medical history must, sooner or later, be an integral aspect of medical training as it makes young doctors more clearly aware of their professional responsibilities to the tradition which they are inheriting and to the patients they will serve. I hope that this symposium will be a useful contribution towards that end.

REFERENCES

1. This point is elaborated by Franz Rosenthal, *A History of Muslim Historiography,* 2nd revised editon (London, 1968).
2. ZIAUDDIN SARDAR, *Islam: Outline of a Classification Scheme* (Munich, New York, Paris, 1979).
3. HEINRICH SCHIPPERGES "*Zur Problematik und Methodik der Medizingeschichte*", *Clio Medica* 2 (1967), 231-47 makes a similar categorisation for the case of medical history.
4. LEWIS MUMFORD, "*History: Neglected Clue to Technological Change*", *Technology and Culture 2* (1961), 231.
5. CARL BROCKELMANN, "*Geschichte der arabischen Litteratur*", 2 vols. (Weimar, 1898, 1902).
6. FUAT SEZGIN, "*Geschichte des arabischen Schrifttums*" (Leiden, 1967 onwards).
7. GEORGE ROSEN, "*A Theory of Medical Historiography*", *Bulletin of the History of Medicine 8* (1940), 655--65.

8. *Ibid.,* pp.659 ff.
9. See, for example, the articles by OWSEI TEMKIN, *ibid. 19* (1946), 9-47 and WALTER PAGEL, *ibid. 25* (1951), 207-25; also, FRIEDRICH WILHELM NIETZSCHE, "*Von Nutzen und Nachteil der Historie für das Leben. Unzeitgemässe Betrachtungen*". Zweites Stück (1873-74), *Werke 1* (Leipzig, 1903), p.279.
10. THOMAS McKEOWN, "*A Sociological* Approach *to the History of Medicine*", *Medical History 14* (1970), 342--51.
11. J.G. HUTCHINSON, "*Historical Method and the Social History of Medicine*", *ibid.17* (1973), 423-28.
12. CHESTER R.BURNS, "*Exploring New Possibilities in the Teaching of Medical History*", *Clio Medica 10* (1975), 143-152.
13. Quoted by F.N.L. POYNTER, "*Medicine and the Historian*", *loc.cit.,* note 7, 30 (1956), 430. The full text was first printed in W.N.Lees, *Indian Musalamns; with Macaulay's Minute* (London, 1871), and reprinted in W.F.B. Laurie, *Some distinguished Anglo-Indians. Second Series, including Macaulay's great Minute on Education in India* (London, 1888).
14. LESTER KING, "*Viewpoints in the Teaching of Medical History*", *loc.cit.,* note 12, p.130.
15. This is a quotation from Dr. OLIVER WENDELL HOLMES, taken from GEORGE E. GIFFORD, Jr. "*Medical History: Curio or Cure?*", *ibid.,* 304-8.
16. HERBERT MARSHALL MACLUHAN, *Understanding Media. The extensions of man* (London, 1964); and subsequently, with his wife Fiore (née Quentin), *The Medium is the Massage* (London, 1967).
17. DOUGLAS GUTHRIE, "*Whither Medical History?*", *loc.cit.* note 10, 1 (1957), 307-17.

ISLAMIC MEDICINE AND THE THERAPEUTIC USE OF HEAT

Dr. Mostafa Ahmed Shehata

EGYPT

INTRODUCTION

For hundreds of thousands of years, man lived in a primitive way, using stones as tools to struggle more effectively against the hostile forces of nature. these were the eoliths, stones that mark the dawn of human civilization[1].

One of Man's greatest discoveries was fire, which he was able to control. Peking man, about 500,000 years ago was the earliest unquestionable user of fire[2].

The original source of fire undoubtedly was lightening and such fortuitously ignited blazes remained the only source for aeons[2]. This was confirmed in al-Quran,

> *DOTH ANY OF YOU DESIRE TO HAVE A GARDEN OF PALM TREES AND VINES, THROUGH WHICH RIVERS FLOW, WHEREIN HE MAY HAVE ALL KINDS OF FRUITS AND THAT HE MAY ATTAIN TO OLD AGE, AND HAVE A WEAK OFFSPRING, THEN A VIOLENT FIERY WIND SHALL STRIKE IT, SO THAT IT SHALL BE BURNED, THUS GOD DECLARETH HIS SIGNS UNTO YOU, THAT YE MAY CONSIDER*
>
> (S2: V 266)

Paleolithic man, who lived on earth, at about 30,000 B.C., suffered from diseases, and he was all too familiar with the pains and disabilities caused by arthritis. He made conscious efforts to maintain his health and to prevent illness, using elementary measures as seeking shelter, keeping sufficiently warm and satisfying his appetite[1]. A strange way to obtain warmth was described in the Bible, the Old Testament[5], that was occasionally used in ancient times "King David aged as the days went by. He was covered heavily but he felt no warmth. His slaves suggested searching for a virgin for the king to stand by him to hug him and lie in his bosom to keep him warm. They searched for a pretty maiden in all of Israel until they found "Becheg of Schonum" and brought her to the king. The maiden was very beautiful and she became the king's hugger and servant, but the king did not recognise her"[5].

Strange enough that this lively vigorous body warmth of young people was publicly accepted in European society and had followers for its use, up to the seventeenth century[6].

Moslems, brought up by al-Quran standards and the Prophet's instructions cannot accept such methods of warming the body. They followed the reasonable examples metnioned in al-Quran on the behaviour of Moses

> *AND WHEN MOSES HAD FULFILLED THE TERM, AND WAS JOURNEYING WITH HIS FAMILY TOWARDS EGYPT, HE SAW FIRE ON THE SIDE OF MOUNT SINAI. AND HE SAID UNTO HIS FAMILY, TARRY YE HERE, FOR I SEE FIRE, PER ADVENTURE, I MAY BRING YOU THENCE SOME TIDINGS OF THE WAY OR AT LEAST A BRAND OUT OF THE FIRE, THAT YE MAY BE WARMED.*
>
> (S28: V29)

THE BEGINNING OF FIRE THERAPY

Fire-heat as a therapeutic agent was known since old times, when early man noticed some relief of his joint pains after sitting in front of fire. For heat to be available in his cave or primitive house, he used heated stones or jugs filled with hot water[6].

The use of heat for therapy was almost certainly known to the Egyptians as early as 3000 B.C, for

the treatment of tumours. In the Edwin Smith Papyrus instructions and drawings reveal the use of hot red iron bars in destruction of superficial tumours of the body [8] , and the control of severe wound bleeding by cautery. A relief of a collection of instruments which were used for surgical purposes is illustrated in (Fig.1), which contains many types of cautery instruments [10] . The papyrus reported two cases in which the verdict appears as part of the treatment "An ailment which I will treat with the fire-drill, thou shoudst burn for him over his breast" [1]

Haemorrhage presented an acute emergency in primitive medicine , as while some were helpless and let the patient bleed to death, others developed effective methods to control the bleeding. Thus the Indians packed the wound tightly with hot sand, with ealge's down or with scrapings from the inside of tanned hides. The melanesians applied a bandage of tapa cloth tightly to the bleeding part. Cautery was widely used for control of haemorrhage in many parts of the world.

In the ancient Greek medicine also cautery had its place. Hippocrates, the great Greek physician (460-370B.C.) mentioned the use of heat for opening suprapubic abscesses. Celsus (53 B.C.-7 A.D.) described the control of haemorrhage by cautery [9] .

In the pre-Islamic period, the Arabs had acquited their knowledge of medicine by their own experience and through contact with the neighbouring nations as Persia, India and Greece. They were experts in local therapeutic measures as blood-letting, cupping and cautery. They used to heat their surgical instruments before use, to make them sharp and more effective. This was — unintentionally — an effective sterilising procedure. The story mentioned in their ancient history of the tribal chief — Sakhr — , the brother of Khansaa, the famous lady poet, when he was deeply wounded in the side, a reddish mass appeared through the wound. He was advised for its cutting and cauterization, but after that he soon died [11,12] .

During the sixth century, Mohammed (ﷺ) Apostle of God, came and medicine of the Prophet (ﷺ) appeared, in which many hygienic and sanitary instructions were advised, to care after the general public health. Cautery received the attention of the Prophet (ﷺ), and many sayings are narrated advising its use.

> *"Moslem and Abou Dawoud narrated that when Saad Ibn Moaz struck in the heel by an arrow, he was cauterised by the Prophet (ﷺ). When the heel swelled he was cauterised again. It was also narrated by al-Khotaby that the Prophet (ﷺ) cauterised Asaad Ibn Zouarah to stop bleeding from his wound as he feared his death from bleeding."*

The importance of cautery is evident in the Prophet (ﷺ) saying,

> *"Cure lies in three, a mouthful of honey, scarification by cupping expert and cautery by fire". Abou Obeid narrated that a man recommended for cauterization was brought to the Prophet (ﷺ) who said, "cauterize him and foment him with warm stones".*[13].

In the early Islamic period, cautery took its place as the last local therapeutic measure for cure of

some diseases. It was usually practiced by cupping experts, called hand working experts, who perform blood letting, cupping and amputations [14] .

CAUTERY IN ISLAMIC MEDICINE

The rapidly developing Islamic civilization pushed medicine rapidly forward. Cautery received the attention of the eminent Islamic physicians, who defined its use for certain diseases and described the ways and techniques of its performance.It was not restricted to the use of heat, from the heated metals or boiling oil, but also extended to the use of chemicals for cautery. Avicenna described the use of a mixture of oil with other medical stuffs for chemical cautery [14,15], Rhazes used a corrosive substance "Phaltafion" — for cautery of the gums and teeth[14,15] (Fig 2) and Fig.(3).

Abulcasis (936-1013) in Andalusia revived surgery and rescued it from the hands of cupping experts, carried cautery onwards to perfection and specified a good part of his textbook 'El-Tassrif' for description of cautery techniques and instruments. The thirtieth treatise in his book is divided into three parts, the first concerned with cautery in many diseases from the top of the head to the end of the feet (Fig.4). He was the first to describe the cautery instruments and their use in the different conditions. They were of his own invention, classification and illustration [14] . They were of the following types:

1. Olivary cautery instrument
2. Cutting cautery instrument
3. Crescentic cautery instrument
4. Nail-like cautery instrument
5. Bilforked cautery instrument
6. Triforked cautery instrument
7. Circular cautery instrument
8. Probe-like cautery instrument

He used to cauterise the head in cases of headache,migraine and amnesia, besides cases of toothache and throat pains. Cauterisation of the scalp, neck or the back in cases of epilepsy, neurasthenia and melancholia.

Cases of recurrent shoulder dislocation, were deeply cauterized by the biforked instrument, to induce fibrosis and prevent futher dislocation. The same was done for cases of stomach, liver and spleen troubles, as well as for anal fistulae and sciatica.

For cancer especially early cases, Abulcasis used a new technique of his own suggestion. He left the ancient method of cauterizing the centre of the tumour and used a circular cautery instrument to encircle the whole tumour with a sufficient safety margin.

Regarding bleeding vessels, he described in chapter 56 of his treatise, the different methods for control of bleeding, as ligation of vessels, haemostatic compresses, bandages and fire cautery [14]

For cautery of oral lesions as lip fissures, oroantral fistulae, hypertrophied gums, caried teeth and palate disorders, he used a special cautery instrument of his invention, formed of a fine probe encircled by a covering tube except the tip, to protect the healthy tissues from cauterization. This was an original new method, that persisted for use, in the same way, up till now [15] (Fig.5).

This advanced performance of cautery by Abulcasis got the great admiration of his successors and the great attention of surgeons in other parts of the world. Bettmann (1962) [18] confesses in his textbook of history of medicine that Abulcasis rescued surgery by reviving the glory of the white-red cautery. He used to teach his students how to treat over 50 diseases by cautery. Wounds were seared, cancers removed and abscessed sores reopened by the famous branding iron [18] .

Two hundred years later, during the epoque of Salah el-Din, a famous moslem physician "Abou

El-Farag Ibn el-Koff (630-685 Heigra), continued the progress in medicine. He studied the old Greek textbooks and those of Avicenna, Rhazes and Abulcasis. He wrote his own textbook of surgery called "El-Omdah in the Making of Surgery", in 20 treatises. Cautery attracted his attention and was much practiced by him according to Abulcasis' instructions. He said that cautery instruments could be made of gold or silver but it was preferable to make them of iron, according to Abulcasis suggestion. He added some more details on the techniques and indications of cautery [19,20].

ISLAMIC CAUTERY IN EUROPE

The different specialities of medicine were all carried to Europe by the different channels of contact. Surgery by all its techniques and instruments including those of cautery, were copied by the European physicians.

In Bologna, William of Saliceto (1210-1277) took the merit of re-introducing to surgery the use of the knife that had been almost entirely abolished. He was also one of the first to bring medicine and surgery closer together [6].

The introduction of the new surgery into France was brought about by the Italian physician Guido Lanfranchi (died in 1315) who read "El Tasrif" the textbook of Abulcasis, and was much impressed by his skill and experience [14]. He wrote his own textbook "The Chirurgia Magna" in 1296, that soon became one of the recognised texts of Paris. Using the cautery rather than the knife, he was cautious with such operations as trephining, removal of cataracts, lithotomy and treatment of hernia [6].

Henri of Mondeville (1260-1320) another Italian physician, a pupil of William of Saliceto moved also to Paris. He wrote his surgery book, relying chiefly on Avicenna. He used ligation of vessels instead of cautery and reserved cautery for limited indications.

In Germany, Fabricius Hildanus (1560-1624) is considered the father of German surgery. He adhered to cautery and practised his surgical work in Bern [6].

Unfortunately, in all other parts of Europe, surgery deteriorated and its perfection lagged behind and was nearly left to the hands of unskilled barbers, who used to perform blood-letting, cupping, skin scarification and fire cautery in a non scientific aggressive way. This degree of deterioration was so evident in France, that the Council of Tours in 1163, had resolved that surgery should be abandoned by schools and by all descent physicians [18]. In the seventeenth century the school of medicine in Montpelier cancelled surgical studies and stopped all surgical practice [21].

During that time, the surgeons were labelled field barbers and the barber's apron kept them out of the ranks of legitimate medicine. It was only at the end of that century, that the court in France, recognised the surgeons at the college of Saint Come [18].

Medical deterioration was also manifest in the United States around that period. It led to the loss of their first president — George Washington — after 24 hours of the onset of his disease, due to the ignorance of his treating doctors of his diagnosis and proper treatment. He got severe throat infection on 14th December 1799 with stridor. The treating physicians performed him blood letting for four successive times which was not indicated or required. His health rapidly deteriorated and he died on the second day from suffocation as no one was able to give a tracheostomy operation [25].

During the seventeenth century, central Europe was torn by 30 years of warfare and as usual, the army surgeons gained knowledge and experience and they also attempted more daring operations which gave them more self-assurance. Cancer was usually treated by corrosives, a primitive useless method, by all conservative surgeons in Europe. Although Lanfranc in France, follower of Abulcasis, called for radical extirpation for cancer, this was neglected during the following centuries. Purmann in the seventeenth century returned to Lanfranc's idea and suggested that once a cancer growth had been removed,

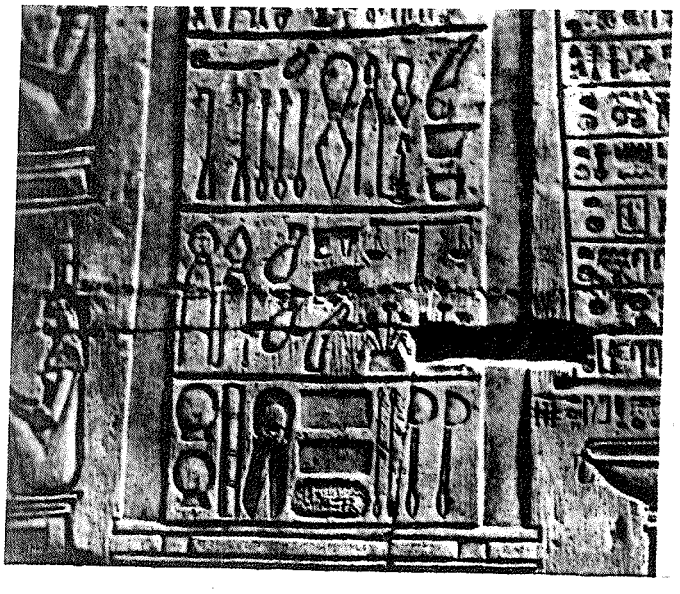
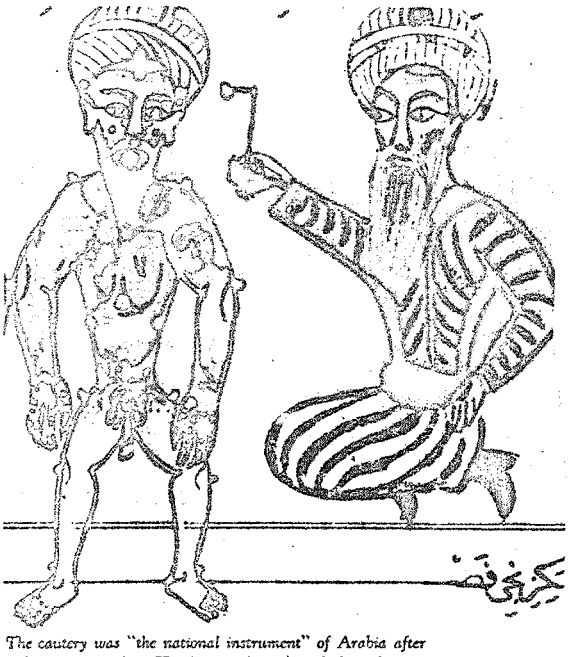


Fig. 1
Old Egyptian Surgical Instruments, Many Cautery Instruments are seen in the first and second raw.



The cautery was "the national instrument" of Arabia after Albucasis revived it. The doctor, above, brands lepers' sores.

Fig. 2
Moslem Physician Cauterising a Leper Patient.

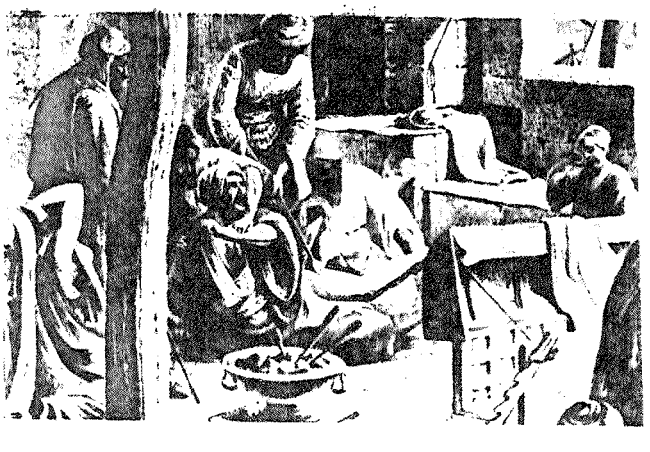


Fig. 3
Patient and Cautery Instruments under Preparation.

the wound should be thoroughly cauterized. This searing process helped to keep edges sterile, it severed lymphatic vessels without undue bleeding and prevented cancer cells from re-entering the circulatory system [18] (Fig.6).

Conservative dentistry, or the methods used to arrest caries in individual teeth, started in the very early times. Celsus, the Greek physician, used wax, resin and gold foil to fill teeth cavities. In the middle ages cautery was used by Moslem physicians to prevent futher decay [10] . These Arabic techniques were revived by Fabricius ab Aquapendente in Italy (1533-1619) who used a drill followed by cautery and finally filling the cleaned cavity by gold leaf [10] .

ELECTRO-CAUTERY

Static electricity had been studied since the beginning of the seventeenth century by Luigi Galvani (1737-1798) in Bologna, while investigating the susceptibility of the nerves to irritation. It was called Galvanism, and people thought of an animal electricity, capable of giving cure to diseases. This view was disapproved by Alessandro Volta (1745-1827) of Pavia, devisor of the voltaic pile in 1800 [10] .

Following the development of the voltaic pile and Leyden jar in the early 1800 , electricity became a potential new form of energy for heating the cauterizing instrument and thus the earliest electrocautery was developed. Colvell (1922) and Blech (1938) attribute the first use of this for surgical means to Becquerel [9] .

The first attempt at destruction of small tumours was tried in 1907, by sparking from a high frequency current generator, this was named fulguration by Pozzi [9] and electro - dessication or coagulation by Doyen in 1909 [9] . Electrodissection, or cutting by means of an electric current, was first described by Czerny in 1910 [9] .

Whilst the electrocautery still remains, it was proved to be a comparatively localised form of heating, with very little penetration of the tissues. The credit for realizing the therapeutic use of electric current permeation must go to Nagelschmidt in 1909, who introduced the name diathermy, now so widely used in medicine [9] . The word diathermy is from the Greek, meaning through heating, as it signifies a method of producing heat throughout the tissues. In this form of heat therapy, the patient himself forms a part of an electrical circuit. The electric current passes from the generator, via an active electrode through the living tissues, back by another electrode, to the earthed pole of the generator. The produced heat can have three diathermy functions, coagulation, fulguration and cutting. The intensity and extent of any of these functions depends on the intensity of the current, the type of current used and the electrical properties of the tissues and the relative sizes of the two electrodes [9] .

The subsequent development of the diathermy machines however, owes much more to the manufacturer's ideas than to the experience of surgeons. Hence bipolar diathermy where the two electrodes are situated in a pair of forceps and microdiathermy, using very fine electrodes under the operating microscope are recent modifications [9] . This enabled surgeons to coagulate minute blood vessels which previously were difficult or even impossible to ligate, such as those encountered in neurosurgery [9] .

Laser is the newest therapeutic thermal means introduced into medicine. It can be produced by certain apparatus using carbon dioxide, argon or yttrium aluminium garnet, with the emmission of a beam of laser rays, that has a highly localised thermal reaction. This produced laser beam has the advantage of a precise tissue destruction and excellent hemostasis and no damage of the underlying tissues. Hence it is now widely used in many surgical procedures that need great skill and efficiency [24] .

MECHANISM AND FUNCTIONS OF ELECTROCAUTERY & DIATHERMY

Electrocautery differs from diathermy in technique and functions. In cautery, a current is passed through an element with high resistance, which subsequently becomes hot in just the same way as the

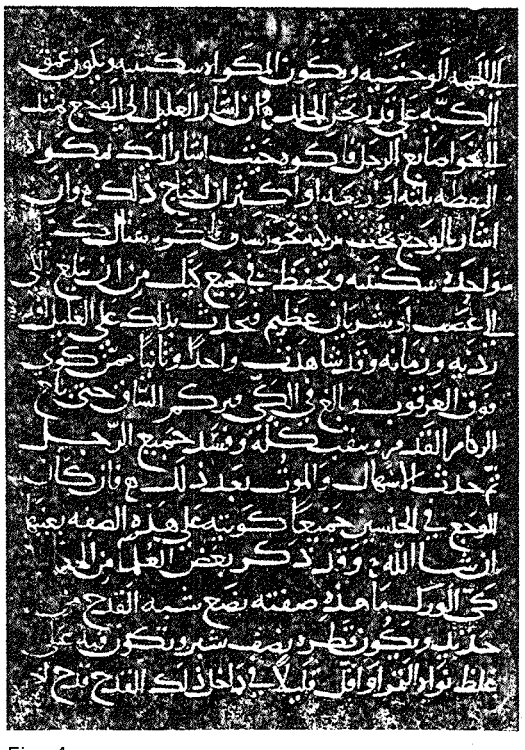


Fig. 4
A Full Page of "El Tassrif" the Texbook of Abulcasis, Showing instructions about Thermal Cautery.

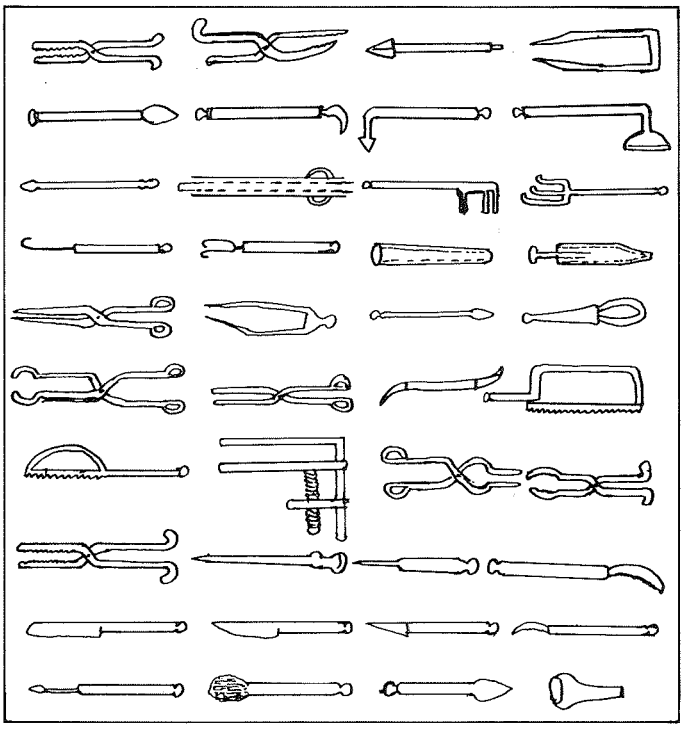


Fig. 5
Surgical Instruments of Moslem Surgeons

Fig. 6
Four steps in extirpation of cancerous breast.
The last step is fire cautery.

element heated on fire. This hot element is then used to burn the tissues, exactly the same function as the previous thermal cautery.

In diathermy, on the other hand, the electric current heats the tissues between the two electrodes, which merely transmits the current and do not become hot themselves [9].

All methods of cautery, whether by fire or electricity are similar in their mechanism and functions. The affected tissues undergo dehydration, coagulation and carbonization, this allow shrinkage of certain growths or destruction of selected pathological tissues in a bloodless fashion. They are, one of the most versatile aids to surgical technique, as they reduce unnecessary mechanical manipulation and allow the use of minimal conservative surgical operations and preservation of the local organ functions [22].

Definitely all these functions were aimed at all the times by the use of cautery, when it has started many thousands of years ago.

SUMMARY AND CONCLUSIONS

The Islamic medicine is characterised by being based on personal experience and observation, away from charlatanism and legends. Hence it persisted up till now and formed the basis of many recent medical studies.

Taking one therapeutic technique as cautery, to show the participation of the moslem physicians and their additions to its uses and indications is a useful way to record the efforts and work of the pioneers in this technique. Credit can go to them of being the actual inventors of fire therapy

Cautery, when done, produces dehydration, coagulation and carbonization of the affected tissues. These pathological changes are all the same whether cautery is done by fire, electricity or laser rays, as the active underlying agent is the produced heat.

Cautery's main aim has always been and still is to give the patient a better state of health by a conservative way of therapy, which when used by surgeons reduces unnecessary mechanical manipulations and improves surgical control. In spite of the great progress in medicine and technology achieved in the twentieth century, with the advent of new devices and apparatus for cautery, by the different energy producing agents, the aim of cautery, technique, effects and results are nearly the same as before, since it was introduced into medicine many thousands of years ago.

Credit should go to the moslem physicians who presented the classical methods and instruments for fire cautery, that persisted after them, even after the discovery of the new energy sources for heat cauterization.

REFERENCES

1. SIGERIST H.E., "*A History of Medicine*" Vol.1., University Press, New York 1951, pp.105, 113, 206, 208.
2. Encyclopaedia Britannica, "*Fire*", Vol. 4, 15th ed. Helen Hemingway Benton Publisher, England, 1978, P.148.
3. SALE G., "*The Quran*" English translation, Frederick Warne and Co., London, 1891, Chapter 2P 33 and Chapter 28, P.319.
4. AL-QURAN, "*Sorat the Cow*", verse 266
5. The Bible, Old Testament, the first chapter of Kings, verses 1 to 4, the United Holy Book Society, Beirut, Lebanon, P.318
6. CASTIGLIONI A., "*A History of Medicine*" 2nd ed. Alfred Knopf, New York 1958, PP284, 336, 476, 898.
7. AL-QURAN, Sorat Stories, Verse 29
8. BREASTED J.H., "*The Edwin Smith Surgical Papyrus*", Chicago University Press, 1930
9. NITCHELL J.P. and LUMB G.N., "*A Handbook of surgical diathermy*", Bristol, John Wright and Sons Ltd., 1966, pp. 1, 5, 6

10. SINGER C and UNDERWOOD A., "*A Short History of Medicine*", 2nd edition, Oxford, London 1962, p.8
11. EL-MAHI T., "*An Introduction to the History of Arabic Medicine*". 1st ed., Misr LTD. El-Khartoum, Sudan, 1959, p.35
12. AL-ASSFAHANY A, "*Kitab el'Aghani*" et Takaddom Press, Chapter 13, p.130
13. IBN ABI-BAKR S., "*The Prophet Medicine*" Essa el-Baby el-Halaby Press, Cairo, 3rd ed., 1980, pp.58, 61
14. The Arab League "*The Concise History of Arabic Medicine and Pharmacy*", 19078, pp.97, 206.
15. IBN SINA, "*Al Qanoon in Medicine*", Second Part, Alia Press, Cairo, 1294 Hegra, p.183
16. EL-RHAZES A. , "*El-Hawi in Medicine*", Third part, 1st ed. Heider Abad, El-Dekn, India, 1955, p.147
17. EL-ZAHRAWI A., "*El Tassrif*", el-Kanou, el-Nami Press, 1908
18. BETTMANN O.L., "*A Pictorial History of Medicine*", Charles C. Thomas Publisher, 3rd Printing, U.S.A., 1962, p.60, 174.
19. HAMARNAH S K "*Techniques and Useful Hand Work in the Book of Surgery of Ibn el-Koff*"., First International Islamic Medical Congress, el-Kuwait, 1980, pp.130-142.
20. IBN EL-KOFF A.E., "*El Omdah Book of Surgery*", Heider Abad, el-Deken, India, 1356, volume 2. pp. 265-271
21. The Arab League, "*Arab Surgery*" by Dr. EL-KHARADLY, under publication.
22. KIRCHNER F.R. and TOLEDO D.S. "*Microcauterization in Otolaryngology*" Arch. Otolaryn. Vol.99, 1974, p.198
23. FROOTKO N.J. and ROGERS J.H., "*The Treatment of Juvenile multiple laryngeal papillomatosis by Suction Diathermy, Journal Laryng. and Otol.*" 1979, Vol.93, pp. 373-381.
24. PAPARELLA M.M. and SHUMRICH D.A., "*Otolaryngology*" 2nd edition, Saunders Company Philadelphia, USA, pp.2296, 2426.
25. HEINS H.E.S., "*Did George Washington die of Quinsy*", Arch. Otolaryng., Vol.102, N9, 1976, p.519
26. SEDKEY BEY M. "*Un Banquet de Medecins au Temps de L'Emir Nasr El-Dawlia Ibn Marwan*" le-Caire, Imprimerie Misr, 1928, p.32

PART FOUR

THE INFLUENCE OF THE ISLAMIC HERITAGE ON THE OTHER CIVILIZATIONS

Part Four: *The Influence of the Islamic Heritage on the Other Civilizations.*

CHAPTER ONE

(Papers Presented)

1. REPORT ON THE THIRD SESSION.
   Editors.

2. ISLAM IN CONNECTION WITH MEDICINE AND BIOLOGY.
   DR. Amal Alami.
3. ISLAMIC MEDICINE IN AFRICA. NEW PERSPECTIVES AND CHALLENGES.
   Dr. Omar Hassan Kasule.
4. THE MUSLIM CONTRIBUTION TO ANTOMICAL LITERATURE IN THE INDO-PAKISTAN SUB--CONTINENT DURING THE LAST HALF MILLENIUM.
   H.E. Hk. Mohammed Said.
5. SURVEY OF EUROPEAN RESEARCH ON ISLAMIC CULTURE, INCLUDING MEDICINE, WITH A SPECIAL REGARD TO MEDICAL ILLUSTRATION.
   Prof. M. Putscher.
6. ISLAMIC MEDICINE AND ITS ASPECT IN THE MAGHREB.
   Dr. Abdul Aziz Ben Abdullah.

REPORT ON THE THIRD SESSION

This session was held in two parts.

The first part of the session was conducted in the evening hours by Dr. Adnan Al-Aqueel, Director of Kuwait Foundation for Advancement of Sciences. At this session four papers were presented on "THE INFLUENCE OF THE ISLAMIC HERITAGE ON THE OTHER CIVILIZATIONS", among which one paper was read by Dr. Amal Alami. As this paper belongs to the topic of "The Importance of Spiritual and Religious Aspects in Therapy", it is published there-under.

Prof. Abdul Aziz Ben Abdellah could not attend the Conference, but as per policy, his paper is included in the concerned chapter.

The second part of the session was held for discussion on the total recommendations of the different committees of the conference. This session, which started after Maghreb Prayers, was conducted by H.E. Dr. Abdul Rahman Al-Awadi as chairman with H.E. Hakeem Mohammed Said and Prof. Mehdi Ben Aboud as Co-Chairmen, accompanied by Dr. Hassan Hathout and Mr. Fouad Tawfiq as members and Dr. Ahmed R. El-Gindy as the secretary . First of all, Dr. Hassan Hathout read the recommendations for final consideration in the general Assembly. Then some delegates expressed their views and suggested some additions which were accepted. The chairman gave his closing remarks. At the end, Majalla Award was given to Dr. Mohd. Tharwat Ghoneim for the presentation of the best paper on Applied Sciences as per the opinion of the expert committee consisting of Dr. Gunther Stille and Prof. Abdul Wahab Al-Borollosi.

The session ended at 9.30 p.m.

Editors

ISLAMIC MEDICINE IN AFRICA NEW PERSPECTIVES AND CHALLENGES

Dr. Omar Hasan Kasule

U.S.A.

INTRODUCTION

This paper presents the health problems in Africa and explores the possible contribution of the Islamic Medicine Movement to the improvement of health care delivery on the continent. Although emphasis is placed on Africa, the issues raised are common to many developing countries outside Africa and should be seen in that perspective.

While the paper asserts the great achievements of Islamic Medicine in the past and its signal contribution to the advancement of medical knowledge and practice, it does not look at Islamic Medicine from a historical perspective only. It proposes and argues for a new dimension of Islamic Medicine in its relevance to solving the health problems of the poor and least privileged people in the developing world like Africa which has 20 out of the 30 Least Developed Countries (LDC).

The paper shows that the health conditions of the poor of the world are desperate and asserts that participating in the effort to change these conditions for the better is a relevant, contemporary and future role for Islamic Medicine.

With the present corpus of medical and scientific knowledge most of the health problems can be solved. What is lacking is the will and compassion on the part of the global community to enable benefits of this knowledge to reach the needy.

Islam as a complete way of life can be the needed guiding and motivating force for improved health care. It is a challenge to the Islamic Medicine Movement to put this in practice.

POVERTY AND POOR HEALTH

The main determinant of health in Africa is not the climate or the geographical location but the poverty. The extreme poverty of the masses and all that this poverty is related to are highly detrimental to the health of the population. Bad health and poverty are inter-linked in a vicious circle in which poverty leads to inadequate diets, emotional and physical illness and inability to work. The following tables illustrate a generally low per capita Gross National Product for African countries as compared to some richer countries as well as the rather pessimistic growth rates.

TABLE I: SHOWING PER CAPITA GROSS NATIONAL (GNP) IN US $

COUNTRY	GNP	COUNTRY	GNP
Ethiopia	110	U.S.S.R.	3,020
Somalia	110	U.K.	4,420
Chad	130	Saudi Arabia	6,040
Tanzania	190	U.S.A.	8,520
Sudan	290	Kuwait	12,270
Nigeria	420		
Senegal	430		
South Africa	1340		

SOURCE: World Bank, World Development Bank, 1979

TABLE II

SHOWING GROWTH RATES OF GROSS DOMESTIC PRODUCT (G.D.P.) FOR SOME AFRICAN COUNTRIES

COUNTRY	GDP GROWTH RATE 1960-70	GDP GROWTH RATE 1970-80	PROJECTED RATE FOR 1980-90
MIDDLE INCOME OIL IMPORTERS (Kenya, Ghana, Zambia, Ivory, Coast)	1.7 %	0.4 %	0 to 0.3%
LOW INCOME OIL IMPORTERS (Chad, Ethiopia, Tanzania, Zaire, Sudan)	1.7 %	0.4 %	−1% to 1%

SOURCE: World Bank, World Develoopment Report (Aug. 1981)

TABLE III

SHOWING MEASURES OF HEALTH STATUS BY LEVEL OF GNP IN SELECTED COUNTRIES

COUNTRY	GNP (US $)	CBR (1977)	CDR (1977)	e^0 (1977)	IMR (1975)
Ethiopia	110	49	25	39	—
Somalia	110	48	20	43	—
Mali	110	49	21	43	—
Chad	130	45	21	43	—
Burundi	130	47	20	45	138
Tanzania	190	48	16	51	—
Sudan	290	45	19	46	132
Nigeria	420	50	18	48	163
Senegal	430	49	22	42	158
S.Africa	1340	39	10	60	—
U.S.S.R.	3020	18	9	70	—
U.K.	4420	12	11	73	16
S.Arabia	6040	49	18	48	—
U.S.A.	8520	15	9	73	16
Kuwait	12270	45	5	69	—

GNP	=	Gross National Product in U.S. Dollars
CBR	=	Crude Birth Rate Per 1000 Population.
CDR	=	Crude Death Rate Per 1000 Population.
e^0	=	Life Expectance at Birth.
IMR	=	Infant Mortality Rate per 1000 of 0-1 year olds.

SOURCE: World Bank, HEALTH SECTOR BANK 1980

Besides high infant mortality rates, maternal morbidity is high (10 per 1000 live birth in Senegal and in Ghana it is 60-80 times the rate in Western Europe in North America). Endemic diseases dehabitate many people. 800,000 people in the seven countries of the Volta Basin in West Africa are blind or partially blind from ONCHOCERCIASIS. 50 - 70% of the people in the rich agricultural Gezira region of the Sudan are infested with bilharzia.

The African population has proportionately more children than the developed countries - 18% under the age of five years and 44% under the age of fifteen years. Out of the 100 African children born 30-40 do not reach the 5th year of life. They die mostly of potentially preventable diseases. The pattern shown in the following table is characteristic over most of Africa.

TABLE IV

SHOWING MAJOR CAUSES OF DEATH AMONG CHILDREN IN A WEST AFRICAN VILLAGE.

CAUSE OF DEATH	% OF ALL DEATHS
Diarrhoeal diseases	12
Pneumonia	12
Malnutrition and Marasmus	12
Malaria	8
Pertussis	8
Measles	8
TB	5

SOURCE: D.C. Morley, Mother and Child (London, 1959).

Childhood malnutrition is common. Out of 61 million children in Africa in the age-group 1-5 years, 6.6 million have severe malnutrition and 16.3 million have moderate malnutrition (E.M. de Maeyer in NUTRITION IN PREVENTIVE MEDICINE). 50% of children in the Sudan are malnourished. In Tanzania 4% of children under 5 years have severe malnutrition and 20% have moderate malnutrition (Johnson et al: Village Food and Nutritional Planning in Tanzania *Food and Nutri Bull.* Vol. 3, No. 4, Oct. 1981).

Due to the poverty and infrastructural insufficiency at all levels the health care coverage is limited. In Gambia and Sierra Leone 20% and 30% respectively of the population have access to modern health facilities. In the Senegal 20% of the rural population utilises the existing health facilities. In Sudan (1975) each 100,000 people were served by 1.1 hospitals. There is a wide gap between needs and resources.

TABLE V

SHOWING PER CAPITA PUBLIC EXPENDITURE ON HEALTH IN SELECTED COUNTRIES (US $), 1976

Ethiopia	1	South Africa	5
Somalia	3	U.S.S.R.	90
Mali	2	U.K.	204
Chad	1	Saudi Arabia	117
Burundi	1	U.S.A.	259
Tanzania	3*	Kuwait	244**
Sudan	2	Sweden	550
Nigeria	3		
Senegal	4*		

* Figures for 1975
** Figures for 1977

SOURCE: Sivard Ruth: WORLD MILITARY AND SOCIAL EXPENDITURE, 1979.

The average figures for health expenditure do not show the big discrepancy between the rural and urban areas. Over 90% of the population live in rural areas but urban areas are better served, for example, 95% of the physicians in Senegal practise in urban areas. 83% of them in the capital Dakar. In Sudan 75% of all the hospital beds are in urban areas. In Kenya, the urban area (NAIROBI) there is one doctor for every 672 people whereas in the rural areas where most people live there is one doctor for every 20000 people.

The following table shows comparative statistics on factors influencing health:

TABLE VI

SHOWING SOME OF THE FACTORS INFLUENCING HEALTH IN SELECTED COUNTRIES

	POPULARION PER PHYSICIAN (1)	DAILY PER CAPITA CALORIE INTAKE AS PERCENTAGE OF REQUIREMENT (2)	ADULT LITERACY RATE (3)	TOTAL FERTILITY RATE (4)
Ethiopia	84,850	82	10	6.7
Somalia	15,560	79	50	6.1
Mali	23,460	75	10	6.7
Chad	41,160	75	15	5.9
Burundi	45,430	99	10	6.3
Tanzania	18,490	86	66	6.5
Sudan	9,760	88	20	6.6
Nigeria	14,810	88	25(5)	6.9
Senegal	16,450	97	10	6.5
S.Africa	1,970	118	—	5.1
U.S.S.R.	300	138	99	2.4
U.K.	670	133	—	1.7
S.Arabia	2,220	102	—	7.2
U.S.A.	600	133	99	1.8
Sweden	580	114	99	1.7
Kuwait	850	1	60	7.1

(1) For period 1974-76
(2) Estimates for 1974
(3) For years 1974, 1975
(4) For year 1977.

Total Fertility rate represents the average number of births per woman over her lifetime.

(5) For 1960

SOURCE: World Bank, WORLD DEVELOPMENT REPORT, 1978, 1979

Inspite of the financial and other constraints to improvement of health in Africa, there is a rapid population increase. The rate of population increase is about 3% per annum for many of these countries.

Refugees pose a special health problem. It is estimated that Africa with 5 million refugees has half of all refugees in the world. According to a recent report over US $ 1 billion is required to meet emergency and other needs of the refugees. $108m is required for education, $98m for health and $89, for agriculture.

THE MAJOR PROBLEMS OF HEALTH CARE DELIVERY

1. Health facilities are few, far apart and inaccessible to the majority due to difficulty of transport.

2. The majority of the people are poor and cannot pay for the services. Even if the services are free the cost of transport and time away from work are prohibitive.
3. Curative medicine has been emphasized more than preventive medicine and primary health care.
4. Training of health personnel not geared to the local conditions.
5. Inadequate community participation.
6. Inadequate planning. Detailed multi-disciplinary planning is needed within the context and realities of overall socio-economic development.
7. Lack of technology appropriate to the local conditions and resources. Overall there is lack of well studied workable health care delivery systems. There is incomplete applied knowledge of the disease dynamics and the factors influencing health.

WHAT IS OUR REACTION?

Describing and analysing a desperate health situation has no use (except the narrowly academic) unless it inspires and guides practical efforts at improvement. Expressions of sympathy and pity for the unfortunate are not enough and are not action. Practical measures are needed. As Muslim professionals dedicated to a humane and Islamic perspective of Medicine, we are called upon to undertake a moral obligation and an Islamic duty. We should turn these problems into opportunities and challenges of demonstrating by action our ideals of medicine.

There are basically three possible ways of reacting to the situation:

a) Passive attitude with nominal sympathy and pity,

b) Intensification and improvement of health care delivery,

c) Reacting to the whole situation of interlinked problems of disease, poverty and ignorance in the realization that health cannot be looked at in isolation.

The first alternative is untenable in view of the Islamic teachings about the universal brotherhood of all men and the need for mutual support. We are passing through a phase of Islamic re-awakening and assertiveness which has to cover all fields of endeavour because Islam does not dichotomise life but looks at it as one whole. It is, therefore, our duty to identify the Islamic role in the alleviation of human misery.

Although our main area of concentration will be the second alternative, field experience has shown that often good health results are obtained quickly if enough attention is given to the third alternative. In the long run, medical and non-medical efforts aim at reducing sufferings and deprivation and in this health is not a separate problem but goes along with the other problems of underdevelopment. Experience in Sri Lanka and the Kerala State of India has shown that the most effective way of lowering mortality in developing countries is to assure minimum equitable health, nutrition and education services for all the people.

Our concern for social justice and human rights should motivate us to promote a new approach to the basic human needs of the poor by calling for and working towards a more equitable distribution of the world resources. Social justice as a philosophical concept has no meaning unless it is reflected operationally. Islam teaches us that all men regardless of colour and nationality are members of the same human family:

> *OH YOU PEOPE, WE CREATED YOU FROM MAN AND WOMAN AND MADE YOU INTO NATIONALITIES AND TRIBES THAT YOU MAY KNOW ONE ANOTHER...* (Quran)
>
> *" All of You are from adam "* (Hadith Shariff)

In a Hadith the Prophet Mohammad (ﷺ) articulated this brotherhood in practical terms of mutual help and support:

> *"He is not one of us who sleeps on a full stomach while his neighbour is hungry"*

For the poor in Africa, the most important human rights are rights to health, suitable housing, education, nutrition and a better quality of life for their children and mothers.

As mentioned elsewhere, it is not resources that are lacking in the world but the will to help and the compassion for the poor. The Islamic Medicine Movement is challenged to lobby for changed attitudes.

As the Muslim World we do not lack resources; what we lack is the will and capability to use the resources optimally. We must learn managing the old and new resources as well as using the oil revenues to improve the health and quality of life for the poor. We are challenged to translate the Islamic teachings about basic human rights and social justice into tangible results. It is the aim of this paper to highlight potential areas of involvement where this "translation" may be effected. In fulfilling this, we shall have to learn working as members of multi-disciplinary teams and not be locked each in his professional cell. We shall have to bring our influence, power and persuasion to bear upon decision-makers to divert resources to improve the welfare of the poor. We shall have to call upon the conscience of people and their governments to rise to the occasion and help.

Much rethinking and radical redefining of our attitudes, re-ordering our priorities and clarification of our purposes will be necessary. We must be clear at least in our minds what the future direction of Islamic Medicine will be.

MUCH CAN BE ACHIEVED

With the present medical and scientific knowledge and with relatively simple, low-cost appropriate measures, much improvement in health can be achieved. The leading causes of morbidity and mortality (diarrhoeal disease, respiratory infection, measles, malaria, anaemia, tetanus, malnutrition, etc.) are potentially preventable.

A project in Imesi, Nigeria covering a community of 200,000 and consisting of establishment of clinics for children under 5 years of age undertaking mostly preventive work produced good results as shown in the table below:

TABLE VIII

SHOWING INFANT & CHILD MORTALITY IN THE VILLAGE OF IMESI BEFORE 1957 AND IN 1962-5

	STILL BIRTHS PER 1000 BIRTHS	NEONATAL DEATHS (< 28 DAYS PER 1000 LIVE BIRTHS	INFANT (< 1 YR) MORTALITY PER 1000 LIVE BIRTHS	DEATHS PER 1000 CHILDREN IN 1-4 YR. AGE GROUP
Before 1957 (preproject period)	41	78	295	69
1962-1965	36.4	21.9	72	28.1

SOURCE: D.C. Morley, "Practical Approach to the Problems of children in the Tropics", SIXTY CONFERENCE OF THE INDUSTRIAL COUNCIL FOR TROPICAL HEALTH (BOSTON, 1966).

Prenatal Mortality Rates of 60-80 per 1000 livebirths in Africa are high compared to developed countries like Japan (14.1) and Sweden (19.9). Studies in Ethiopia and other parts of Africa have shown that good prenatal care can reduce this morbidity and mortality fourfold.

The Director of the Central Hospital in the Mozambican Capital of Maputo expressed a firm belief that 80% of the medical problems in the country could be eliminated by preventive medicine and health education (JNL OF HLTH POLITICS AND LAW, VOL. 6, NO. 3).

Several other projects and studies have shown that low-cost primary health care at low cost can achieve much in terms of health improvement.

ILSAMIC MEDICAL & RELIEF FOUNDATION (ISMEREF) FOR AFRICA

To practice the Islamic ideals of compassion for the poor and provide practical help to ameliorate their health, I suggest establishment of an Islamic Medical and Relief Foundation for Africa to undertake programs and projects in health care delivery and also do applied research on the optimal health care delivery, disease dynamics and prevention, the related social, economic and cultural factors.

The Foundation should have the capabilities to solve practical problems and participate in the advancement of knowledge securely and steadily in the largest sense. Its staff and collaborators shall work as searchers for the truth, teachers and consultants. The Foundation should become a storehouse of applied knowledge at the disposal of all performance in the field of health care. The Foundation should encourage and inspire researchers to work on the frontiers of knowledge finding the best ways of equitable health care delivery and formulating programs for resolution of priority problems.

ORGANIZATION AND FUNDING OF ISMEREF

There should be a Council of Trustees consisting of leading Muslim personalities in Medicine and related fields who meet twice or thrice a year to review the activities of the Foundation and set policies. There, in addition, should be several Advisory Commities on such subjects like ethics, Islamic SHARIAH, Planning, Programs and Projects, Research etc.. An Executive Director with a skeleton headquarters staff will run the day-to-day affairs of the Foundation and coordinate its activities.

ACTIVITIES OF THE ISMEREF

The activities of the ISMEREF are basically of 3 types:

a) General Activities.

b) Programs and Projects.

c) Education and Research

a) General Activities

1) Mobilising governments, institutions and individuals in the Muslim world to support health care delivery in Africa.

2) Gathering and dissemination of information.

3) Work on resolving the moral and ethical issues related to health care delivery & medical practice in Africa in the light of Islamic teachings.

4) Generally promote an inter-disciplinary approach to health issues through collaborative research, inter-disciplinary technical meetings and conference.

b) Health Programs and Projects

1) Undertake designated health and hunger projects either directly or in collaboration with local institutions.

2) Prepare contingency plans for crises intervention programs in cases of drought, famine, refugees, natural disasters like floods, earthquakes, etc..

3) Undertake health care delivery to special groups like the nomadic populations and populations in

remote inaccessible regions.

c) Research

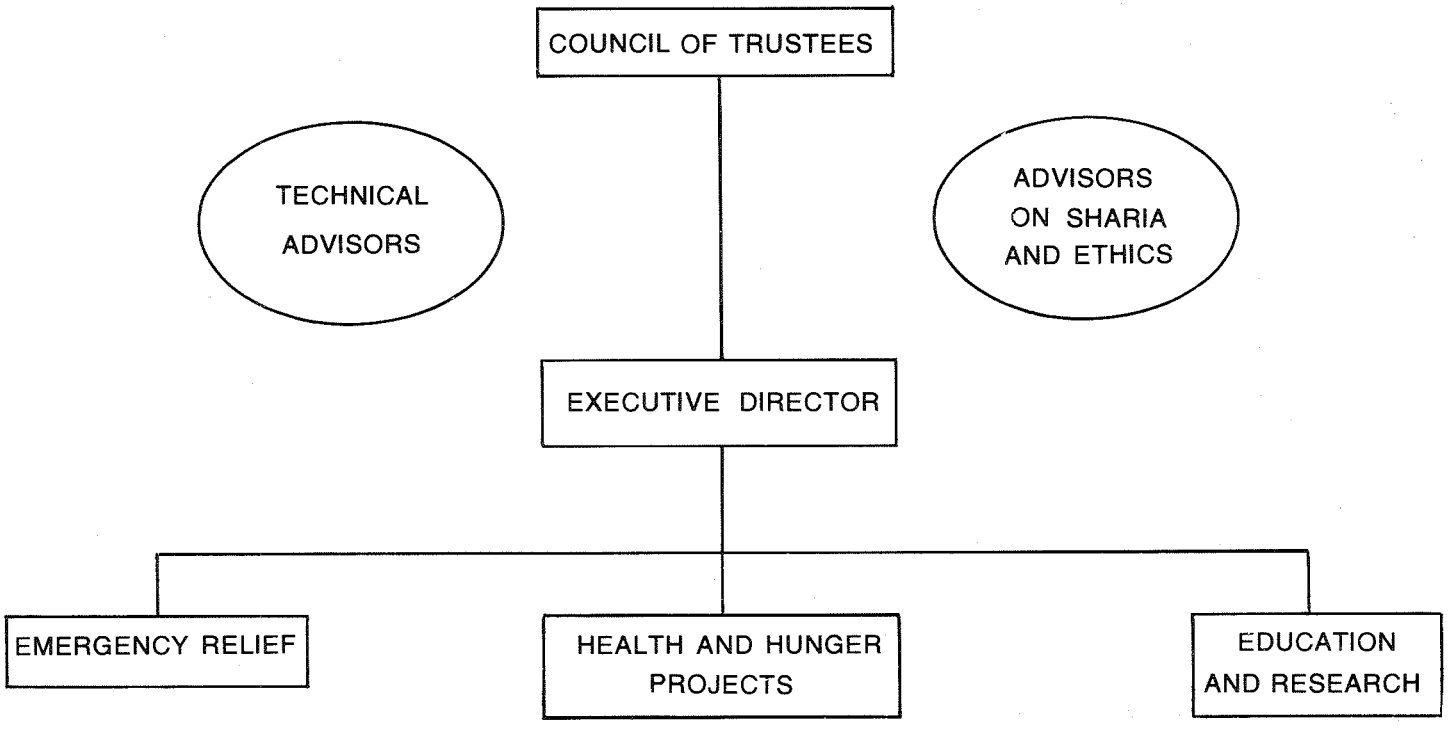
1) Research on the historical achievements of Muslims in the field of Medicine and their possible application today. Herbs have to be analyzed and tested by modern methods. We must be careful not to repeat some work that has been done before.

2) Specific research on medical aspects of the SHARIA. There is at the moment a gaping need for leadership in religious knowledge and religious experience in matters pertaining to health. The ISMEREF through its research efforts will provide the needed knowledge base and train the needed leadership.

3) Initiate, encourage and support targeted applied research in preventive and community medicine, control of endemic and epidemic disease, family health and welfare, for social problems like addiction to drugs and alcohol found in Africa. These problems have medical and health implications.

4) Research on optimal health care delivery system.

The following chart shows the proposed organizational structure of ISMEREF:



Muslim Governments, Muslim Organizations and individuals will contribute to the budget of the Foundation. Some awards may be tied to particular projects or given to the Foundation to use as it pleases.

FUTURE OF THE ISLAMIC MEDICINE MOVEMENT

We live in an age of fragmentation and separation between science and faith, between faith and practice. I envisage Islamic Medicine as the strong effective integrating force that will enable us harmonise our professional pursuits, our faith in God and our efforts to solve man's problems. The very concept of Islamic Medicine is a rejection of the paths of separation. Islam looks at man and society as one whole embracing material and spiritual aspects of harmony.

As we start the forward march we are walking on the so-called "boundary" between medicine and religion which should not exist under a truly Islamic environment because Islam is a complete way of life enbracing all aspects of human endeavour. As we refine our concepts of Islamic Medicine this "boundary" will gradually fade away at least in our minds.

Our effort should be to rejuvenate the moral values that the early physicians of Islam applied in their practice of medicine. They were able to combine their scientific genius with their profound and sincere belief in God and were often theological consultants in the mosques. They were comfortable both in the mosque and the clinic. It is this synthesis and harmony that we should aspire to restore to medicine.

History should not be mere recital of facts because this type of history is not useful. To serve its purposes it must teach and guide. Lessons of history should not be stored in libraries but should be used to solve present problems and inspire future developments. The labours of the present and past generations should be efficiently directed to solve man's pressing health problems at the moment. Thus Islamic Medicine has to address itself to the current health problems of humanity. More important it has to assert what is so often neglected by many that good health and good living must include enjoyment of certain moral ethics.

Through our concern for the welfare of the afflicted we shall build more bridges of understanding in the universal human brotherhood and break down fences of prejudice and hatred.

20th Century medicine has made many scientific discoveries and technological progress but is very inept in its application to those most in need. It is not the basic knowledge that is lacking not even the resources if we think globally . What is lacking is the willpower to help and to be compassionate. There is primarily lack of a cadre of leaders with enough compassion and sensitivity to problems of others and strong ethical principles. We need a quality of leadership in medicine that will enable us face the fundamental moral challenges involved in medical practice and health care delivery. It should be the aim of this Movement to instil these values and principles into medicine.

The contemporary Islamic Medicine Movement is a call for moral and fundamental revolution in medicine. It is the values, ethics and principles that are being called into question and not necessarily the finite practical details which have to differ according to circumstances of time and place. This call is necessary and timely in this age of technological giants but moral dwarfs.

The Prophet Mohammad (ﷺ) taught that seeking knowledge is a duty for every Muslim. We should, therefore, set ourselves the task of expanding the frontiers of medical knowledge especially the operational knowledge of widening its coverage to reach all the needy. Our scholars and researchers should be powerful shapers of a better and healthier world for all.

While we set ourselves standards of excellence in creative scholarship, research and opening up new pathways of knowledge, we have to realise that mere expansion of the body of knowledge will not suffice if we do not also develop the breadth of vision and compassion to use that knowledge in launching an enthusiastic attack of man's leading health problems all over the world.

THE MUSLIM CONTRIBUTION TO ANATOMICAL LITERATURE IN THE INDO-PAKISTAN SUB-CONTINENT DURING THE LAST HALF MILLENIUM

Hk. Mohd. Said and Dr. Kamal Mohd. Habib

PAKISTAN

INTRODUCTION

We cannot really assess the real contribution of Muslims to anatomy until and unless the different munuscripts scattered in Europe and West Asia are collected, compared, and indexed in the form of annotated bibliographies on different topics, e.g. human physiology, anatomy, aetiology of diseases, materiae medicae, and so on. [1] The contribution of ᶜAbdal-Latif al-Baghdadi to anatomy, and those of al-Majusi, Ibn al-Haytham (especially with respect to his theory of vision), Ibn Sina, Ibn al-Nafees Qarshi and al-Zahrawi in the field of anatomy and allied disciplines are now coming up for progressive review, and we have no doubt that at this Conference many papers will be read to highlight the contributions of Muslim physicians and scientists in this and allied fields. We are here concerned, however, with a subject that needs to be given some attention, viz., the contribution of Muslim physicians of the Indo--Pakistan sub-continent to anatomy.

It must however be emphasized here that this is just a preliminary survey and might as well be the first paper in English on the subject. In the bibliographic field *Hamdard Medicus,* Karachi, has already initiated work on the subject, having already published two bibliographies upon the work of Muslim medical scientists and scientists engaged in allied disciplines during the British period. It is hoped to extend this work further. [2] It is through such publications that the work of the practitioners of Islamic medicine will get better known.

From the circumflex accent adopted by the Orientalists about Muslims to culture, social sciences, philosophy, and medicine, it becomes clear that a good deal of responsibility devolves upon us to highlight this heritage. We find that even learned writers of the West are not prejudice-free. What they give with one hand, they are likely to take with the other. One notable exception is perhaps George Barton who provided a clearer picture of the contribution of the Muslims to science for the first time. [3] Since then much work upon Islamic medicine has followed, into the details of which we need not go here. [4] One notable historian of medicine, while describing the Muslim contribution to medicine, states at one place that, while the *Kitab al-Maliki* (Liber Regius) by al-Majusi, with respect to its anatomical portion, was taught at Salerno till the twelfth century, on another occasion she writes that ᶜAbdal-Latif al--Baghdadi's observation that all the human mandibles are of one piece, contrary to what Galen had said, viz. that this structure was composed of two bones, and a few other observations of like nature, constitute the sum total of the Islamic contribution to anatomy. [5] Basing their knowledge upon second-hand information or poor verification, such writers tend to make extremely superficial statements. It has now, for example, been definitely established that ᶜAla' al-Din ᶜAli bin-abi-al-Hazm Qarshi (1210-88), the author of commentaries on Galen and Ibn-Sina, advanced the theory of lesser or pulmonary circulation of blood in the course of his commentary on the *Canon,* in which it was deduced specifically from the impermeability of the septum. [6] In Europe the description of the lesser circulation was first printed by the Catalan Miguel Serveto in a theological work, *Christianismi Restitutio* (1553). [7] Starling has also credited Ibn al-Nafees with the concept of the pulmonary circulation of blood, [8] and Major has accorded him clear precedence over Serveto and the 16th century anatomist, Realdo Colombo, with regard to the theory of the lesser circulation of the blood. [9]

In fact, so much had anatomy and medicine become the integral parts of the Islamic ethos that even in the *Arabian Nights* in the story of Tudud, we find reference to the ossicles and the cranium in the form of questions-answers.[10] An extremely useful work on the history of anatomy — particularly with reference to the Islamic contribution — is that by Hakim Sayyid Kamal al-Din Hasan, prividing, as it does, a comparative survey and in pinpointing the areas in which the Muslim physicians recorded a definite advance.[11] Thus it was al-Razi who first distinguished the laryngeal nerve from the recurrent[12] and, although the theory of vision was elaborated by Ibn al-Haytham and Kamal al-Din al- Farisi later, it was this great physicians who first stated that vision was due to the expansion and contraction of the pupil of the eye. Ibn Sina's concept of the arteries acting as the suppliers of nutriment and air, with the lungs acting as the eliminators of smoky vapours, comes close to the modern concept of the blood carrying oxygen from and eliminating carbon dioxide and water-vapour through the lungs.[13] Liber Regius and the *Canon* by al-Majusi and Ibn Sina respectively have described the following structures and parts of the brain: the longitudinal and transverse fissures, central sulcus, false ventricle and true ventricle, interventricular foramen, cerebral aqueduct, septum pellucidum, commisure, choroid plexus, tela choroidea, cerebrospinal fluid, pituitary gland, optic thalamus, cerebral peduncle, etc. It ought to be noted here that while the sulcus, ventricles, the foramen, and tela choroidea had been earlier described by Galen, the description of the remaining structures is by Islamic physicians.[14]

ANATOMICAL LITERATURE IN THE SUB-CONTINENT

In the foregoing paragraphs we have made very succinct observations as regards the contribution of Islamic physicians to anatomy. Illustrations of the skeletal, nervous, venous, and arterial systems and schematic representations of the eye are available from medieval and late medieval Arabic and Persian MSS.[15] This fact, if any further proof were needed, would alone refute the charge that the Islamic physicians followed the Classical masters of Europe and that all they did was to act as mere transmitters of the knowledge bequeathed by Classical Antiquity.

It is most probable that Islamic medicine came to the sub-continent through the Ghaznawid and Ghurid conquests during the eleventh and twelfth centuries. Evidence for this is provided by the expanding materia medica of the Period with respect to Islamic medicine.

The first major work on therapeutics and materiae medicae to have appeared in the sub-continent was by Bahwah bin Khawas Khan, who in 918 A.H. wrote the *Maᶜdin al-Shifa' Sikandarshahi,* dedicated to the ruling sultan of Delhi, Sikandar Ludhi. It is a curious composite of the Ayurvedic (Hindu) system of medicine with the Islamic. The second part of the work is concerned with the anatomy of different organs and consists of nine chapters.[15]

After an interregnum of about half a century, work on medicine writing was taken up in right earnest, especially in view of the influx or artisans, poets, scientists, and physicians from Iran during the early Mughal period in particular. Mahmud bin Masᶜud Shirazi, a celebrated physician at the Mughal court, wrote a two-volume commentary upon the anatomical aspects of the *Canon.* This is the most detailed and comprehensive commentary of the *Canon.* It was completed on Monday, 26 Shᶜaban 973 A.H. There is a MS of the work in the library of the Dar al-ᶜUlum, Deoband.[16]

Another Iranian physician of the Mughal era, ᶜImad al-Din Mahmud Shirazi, wrote among other works a treatise on anatomy, entitled the *Risalah fi al-Tashrih.* Cyril Elgood, just before his death, had undertaken research work on this physician's treatise on syphilis.[17]

It was an era of ingenuity and expansion, insofar as Islamic medicine in the sub-continent is concerned. It was then that fermented medicaments *(Khamirahs)* were invented to make them more palatable and more facilely absorbable. Another remarkable piece of work in the same age was the composition of a verified description of anatomy in Persian. Called the *ᶜIlm al-Insan* (The Knowledge of

Man), an MS of the work is housed in the library of the Institute of History of Medicine and Medical Research, Tughlaqabad, New Delhi.

Ghiyath al-Din ᶜAli bin ᶜAli al-Hasani Isfahani, another Iranian physician at the Mughal court, wrote a detailed treatise, the *Danishnamah-i-Jahan* (The Book of Worldly Wisdom). It was completed on 21 Jamadi al-Thani 1217 A.H. The treatise *commences with a discussion of the eleents, heavens, lightning, clouds, and allied* ancient physical subjects. Human anatomy is covered in the last chapter which has thirty two sections. It describes the internal and external organs, muscles, nerves, bones, arteries, the spinal cord, the eye and its coatings, ducts and openings of the ear and the nose, the mouth, the tongue, the uvula and tonsils, the throat, oesphagus, thoracic cavity, trachea, plura pulmonalis, the heart, the stomach, greater and lesser omenta, peritoneum, the greater intestines *(amᶜal kabirah),* the gall--bladder, the splean, the kidney, the urinary tract, testicles, vesiculae seminales, the male genital organ, and the womb. The number of muslces has been given as 527. According to the standard works on anatomy by Islamic physicians, the number of muscles is 498, half on each side, and they are regarded composed of nerves, ligaments, flesh, and membranes. The total number of nerves, has been mentioned as 77, with the cranial nerves comprising 7 pairs and the spinal nerves 31 pairs. Regrettably enough, the book has not been so far printed, and an MS of the work exists in the Tibbiyah College, Delhi.[17]

In anatomy discoveries prior to the advent of the microscope were far rarer than in materiae medicae; and the Islamic materia medica by the 18th century could already boast about 10,000 medicinal plants. This is amply borne out by the *Muhit-i-Aᶜzam* by Hakim Aᶜzam Khan of Delhi. Anatomy was therefore outfaced by materiae medicae.

Among the celebrated medical works published during the eighteenth and nineteenth centuries from Calcutta under the patronage of the British East India Company one was the *Makhzan al-Adwiyah.* [18] This is primarily concerned with materia medica. The other medical work, brought out from Fort William was the *Anis al-Mushsharahin* (The Antomist's Friend). It was the Arabic translation of the text-book of anatomy by Robert Hooper, and the Arabic rendering was by John Tatler according to the syllabus prescribed for the Mahometan College, which was being run by the East India Company. This work is probably the first to have been printed in the sub-continent as a result of direct translation from English.

Hakim Sadiq Khan (1264 A.H.), a prominent member of the Sharifiyah family of Delhi, in 1237 A.H. wrote his *Tashrih-i-Aᶜda'-i Murakkabah* which gained considerable popularity in his time. He was, as he writes in the prolegomenon to the work struck with the idea of editing this work while explaining the certain parts of *Jami al-Sharhayn* by ᶜAli Husayn Gilani (written in Arabic) to his son. Comprising 192 pages, the book was printed in 1327 A.H. in Delhi.

A notable advance, both in the field of scholarship and the preservation of heritage in the field of anatomy, was achieved with the translation into Urdu of the first volume of the *Canon* in 1303 A.H. by Sayyid Ghulam Hasnayn who also translated the portion of the *Canon* concerned with materiae medicae. The fifth edition of the translation was published by the same press in 1931.

Of the different disciplines of knowledge as regards medicine, the discipline to have recorded the greatest impact upon Islamic medicine was anatomy (and by inference surgery). The impact of Zahrawi and the Spanish-Muslim physicians and surgeons in the sub-continent was slow in registering itself, as it was primarily the Persian factor which figured most. Further, Persian was the official language at the Mughal Court till the War of Independence of 1857.

After 1857, when the administration of the subcontinent was taken over by the British Crown, it was felt that the incorporation of scientific knowledge from the West was a desideratum. Movements were initiated in different fields to cope with changed circumstances; and this especially true of medicine and physical sciences. Practice of medicine was hitherto confined to families for the most part. A landmark

was made with the founding of the Madrasah-i-Tibbiyah in Delhi by Hakim ᶜAbd al-Majid Khan in 1882. The anatomical portion of the *Canon* was included in the curriculum, and the *Sharh Tashrih-i Aᶜda' Murakkabah* was made into a text-book. Hakim Ajmal Khan (d. 1928) provided further impetus to the movement for modernization by including the Urdu translation of the text-book of anatomy included in the syllabus of the Medical College at Agra by having had it divided into three parts. His remark in this connection was that he aimed at providing full explanations to the principles of anatomy in Islamic medicine, and that such problems as would not admit themselves of ready solution should be made the objects of research and investigation.[19]

It was with this in view that Hakim Ajmal Khan founded the Institute of Tibbi Research, the first of its kind in the world, for the conductance of research on drugs and investigations upon and isolation of active principles from them in the early twenties. One of the medicinal plants specifically investigated was *Rauwolfia serpentina* Benth, which was incorporated in certain Tibbi preparations in conjunction with other ingredients for arresting cardiac arrhythmas and fibrillations. It was here that Dr. Salimuzzaman Siddiqui, FRS, discovered ajmaline, on the constitution of which Sir Robert Robinson, the Nobel Laureate, did work.

At the same time Hakim Ajmal Khan stimulated work on anatomy. In 1919 Hakim Muhammad Kabir al-Din had the first edition of his *Tashrih-i Kabir* published in two volumes. Another expanded and illustrated edition was brought out in 1933. The work respresents a landmark in the sense that it reproduces microscopic and histological diagrams with Arabic captions, for in the preface the author says that he is confident that for every Western medical term he can give its Arabic counterpart and that, in his view, the Arabic language has the resilience and breadth to cope with such situations. At the end of each volume the author has provided a glossary of Arabic terms and their Western equivalents.

Five years after the appearance of the *Tashrih-i-Kabir* appeared the *Makhzan al-Jawahir,* [20] compiled by Hakim Ghulam Jilani, who practised both Islamic and allopathic medicine. It was meant to minister both as an encyclopedia and dictionary of Arabic medical terms. A novel approach of the work is that the author describes the Islamic medicine theories regarding organs and diseases, giving the viewpoints of Classical Islamic medicine writers and the theories current in allopathic medicine in his time. His explanations to which he appends, wherever possible, notes from allopathic viewpoint regarding the functions of different organs, e.g. the heart, the spleen, the kidneys, etc. and ailments like dropsy, migraine, epilepsy, and so on, and the aetiology of certain diseases. In this sense, the work makes a sizeable contribution.

The first book on anatomy to be translated into Urdu from Arabic was *al-Tawdih fi Usul al-Tashrih,* whereas the anatomical treatise by Mansur bin Muhammad which was in Persian, had been translated earlier.

In the wake of the reformation movement initiated by Hakim Ajmal Khan, works on human anatomy began to gain in output. The Nami press, Kanpur in India, brought out the *Tashrihat-i Qutbiyah* which summarized the anatomical information contained in the Classics of Islamic medicine and carried illustrations of organs and body-structures. This work was followed by the *Tashrihat-i Shamsiyah, Tashrih al-Ajsam,* and the *Haqayaq-i Tashrih* by Hakim Ahmed al-Din of Lahore. Mention must be made here of the two volume *Tashrih-i Saghir* by Hakim Muhammad Shams al-Haq Khan and the *Tashrih-i Habib* written by Hakim Malik ᶜAta Allah Habib.

Among the two major anatomists of Islamic medicine before 1947 were Hakim Sayyid ᶜAbd al--Razzaq of Delhi and Hakim Nadhir al-Din Ahmed. Unfortunately the *Tawdih al-Bayanat fi Tashrih al--Shiryanat,* expounding the concept of Islamic medicine towards the arterial circulation, could not be published in the form of a book. Its instalments are, however, fortunately preserved in the files of the journal, *Tibiyyah,* which was brought out under his editorship. Another treatise on anatomy by him is the

Taᶜlim-i Qabilah, the first part of which, published in 1909, pertains to the description of female organs. Of the five parts which is contemplated for publication, only the first and the fourth could be published in 1909. Hakim Nadhi-al-Din Ahmad, who taught anatomy at the Tibiyyah College, Delhi, in 1940 published his *Tashrih-i ᶜAmali* (A Handbook of Practical Dissection), and its importance is underscored by the fact that it is the first guide on practical dissection to have been published in Urdu.

In Pakistan Dr. Siddiq Hussain Toor of Lahore, some fifteen years ago had the *Tasrif* of Al-Zahrawi privately printed with its Urdu translation and Illustrations of the surgical instruments used by that great surgeon. To the late Col. M.H. Shah goes the credit of explaining, in *The General Principles of Avicenna's Canon of Medicine,* Ibn Sina's anatomical observations in modern medical terminology. In a booklet, *An Evaluation of Ibn Sina's Concept of Temperament and Constitution for Food & Drug Research,* he brings the perspective of an objective scientist to view the overall contribution of that giant. Thus, while describing Ibn Sina's anatomical descriptions, he observes:

> Ibn Sina copies Galen, but makes several improvements. He describe the organs as simple or compound; simple organs are the tissues composed of homogeneous particles. These (like cells) carry the same name as the whole organ. Compound organs are the parts, structured from simple tissues. These act as the instruments of functional expression. It is through the parts that the various movements and activities of the 'self — *nafs* — are carried out.[22]

Regarding the relationship between the humours and the organs, he makes the observation:

> Organs are developed from the heavier portions of humours and vary in size, shape, position, and relationships. Each organ has its own characteristic structure and temperament, according to its functions. Heart is thus hot and cold, liver dry and moist, bone cold and dry, brain cold and moist.[23]

About the accuracy of Ibn-Sina's anatomical observations, Shah states that this great Islamic physician has committed fewer errors than Galen. Among the notable advances made to our knowledge through the *Canon* are the author's concept of the unidirectional flow of the blood, with movements to and from the heart, and the presence of anatomoses between the minute branches of arteries and veins which even Harvey failed to recognize.[24] His major error is to have regarded the origin of the pulmonary artery from the left heart and the presence of a hole in the septum ("as if he had dissected only a congenital malformed heart").[25] This error was subsequently rectified by Ibn al-Nafees, three hundred years before Harvey.[26]

We thus see that both in Urdu and English work has been done, and is being undertaken, on human anatomy in the sub-continent and the history of anatomy by Hakim Sayyid Zill al-Rahman itself represents a pioneering work which needs to be elaborated from time to time. It is, however, the aim of this paper to underscore the point that we, in the sub-continent, are not letting this all-important field lie in default.

REFERENCES

1. PROF. SALAH AL-DIN MUNAJJID, in the Muᶜjam "*al-Makhtutat al-Matbuᶜah*" (Beirut, 1962), p.4, gives an estimate of about 3,000,000 MSS on Islamic history and culture, medicine, and science in different libraries all over the world. A good sign is the salvaging of some of the most precious MSS from mouldering in the archives for purposes of research.
2. MUHAMMAD ATAUR RAHIM, "*Contribution of Muslim Medical Scientists during the British Period in India: A Bibliographic Study*", Hamdard Medicus, XXIII, 1-2, pp. 75-105; "*Idem, Contributions of the Muslim Botanists, Agriculturists, and Foresters during the British Period in India*", Ibid., XXIV, PP. 135-66.
3. "*Introduction to the History of Science*" (Baltimore, 1927-48), 5 vols.
4. A notable advance, especially with regard to Kuwait is the translation of Manfred Ullmann's "*Die Medizin im*

Islam" (Leiden-Cologne, 1970) by Dr. Yusuf al-Kilani with a foreword by H.E. Dr. Abdel Rahman Abdullah al-Awadi, Minister of Health, Kuwait, as "*al-Tibb al-Islam*" (Kuwait, 1981).

5. CECILLIA C. METTLER, (ed, Fred A. Mettler), "*History of Medicine*" (philadelphia 1947).
6. G. SARTON, *op.cit.,* 11-2, pp.1099-1101.
7. A.R. HALL, "*The Scientific Revolution (1500-1800)*", (Boston, 1960), p. 140.
8. "*Principles of Human Physiology*", (8th ed., 1940), p. 174.
9. RALPH H. MAJOR, "*History of Medicine*" III., 1954, vol. 1. p.247.
10. "*Alf Laylah*" (Bombay ed., 1298 A.H.), pp. 234-64.
11. The Achievements of Ancient and Medieval Physicians in Anatomy (Urdu), (Department of Publications and Public Relations, Aligarh Muslim University, n.d.), 65 pp.
12. C.G. CUMSTON, "*An Introduction to the History of Medicine*" (New York, 1926), p.200.
13. M.H. SHAH, "*The General Principles of Avicenna's Canon of Medicine*". (Karachi, 1966), p. 49
14. Arterial system from MS 2296; arterial system of a pregnant woman, Persian MS No.2296, India Office Library, London; arterial system of a pregnant woman, Persian MS No. 1576, Bodleian Library, Oxford; Skeletal system from Persian MS No.2296; muscular system in *Ibid.;* schomatic representation of the eye, Arabic MS No.3008, Bibliotheque National, Paris (1714 A.D.), from a Persian MS (1690 A.D.), and from MS No.924 Istanbul (1560A.D.).
15. The book was published in 1294 A.H. by Nawal Kishore Press, Lucknow.
16. SAYYID ZILL AL-RAHMAN, "*A History of Anatomy*" (Urdu) (Delhi, 1967), p.291.
17. "*Idem, Ibid.*", p.292.
18. Reprinted by Nawal Kishore Press, Lucknow, 1900 A.D. with the gloss reproducing & prior work, the "*Tuhfat al-Mu'minin.*
19. HAKIM RASHID AHMAD KHAN, "*Hayat-i Ajmal*", p.87
20. First edition, Lahore, 1924.
21. Published by the Pakistan Academy of Sciences (Islamabad, 1976).
22. *Idem, Ibid.,* p.15
23. *Idem, Ibid.,* p.16
24. CF. (DR.) KHURSHID HUSSAIN, "*The History of the Development of our knowledge regarding the Circulatory System*", p.79
25. M.H. SHAH, "*Ibid*." p.16.
26. KHURSHID HUSSAIN, *p.cit.,* p.53.

SURVEY OF EUROPEAN RESEARCH ON ISLAMIC CULTURE, INCLUDING MEDICINE, WITH A SPECIAL REGARD TO MEDICAL ILLUSTRATION

Prof. M. Putscher

W. GERMANY

A "survey" has to give a picture from a distant point of view: from Europe to the Near EAST. So, when I decided to change my subject slightly and to treat the results of European research on "Islamic culture, including medicine" I had to overlook the whole geographical area and a much longer time. Those very old cultures which you meet then have something in common which is to be felt intensely by scientists who like to travel: the "mediterranean" - that is: all things mediterranean, a way of life, a history. Only the two youngest of these cultures - the Arabian (with the Islamic religion) and the European (with the Christian faith) - are to be treated.

They were studied since the 19th century by European scholars, not only by orientalists but also by scholars of history of art and archeology, who brought to light all the knowledge which will allow us nowadays to understand the manuscripts and books much better than even in times nearer to the origins but just too far away to understand exactly the ideas of Egyptian, Persian, Russian, Spanish or Turkish authors, even if written in Arabic.

The mentioned European research was done with high concern, may be because the scholars felt they went back to the very origins, to the roots of both cultures: the oriental one and the occidental one. So in the 20th century Europe may give back to the now Islamic countries the past which is their own past as well, in an historical view - just like the Arabian authors who, in former times, have given to us the cosmos of Greek philosophy linked to Arabian practice and speculation, humanity and experience of life, a way of living and of solicitude for the poor, the weak and the ill.

A survey regarding the different influences and their alternating effects looks like a very long biography of a living creature, called the mediterranean world. For Europe and the Near East, Orient and Occident have been closely connected since the beginning of history or even since earlier times. Looking over the regions we find cultures with an affinity to pictures and- not too much later-cultures concentrated on texts.

When the first paintings in the caves of southern France and Northern Spain were discovered (datable 'Magdalenien', 16.000 - 12.000 BC) it was surprising to find them so very realistic and near to nature. Later paintings, however, found in the Sahara (about 5.000 BC) are of a more abstract character. But at the beginning of the 3rd millenium the writing is invented: a pictographical script is developed in Egypt a long side a very rich painting.

In Mesopotamia instead the script has signs for syllables. Equally we find syllable-writing in Crete in the 2nd millenium, before - with the last millenium Bc - the Phonicean, Persian and Greek cultures are entering the scene with new impulses, using a new notation, and a new and very rich pictorial and figural art.

I do not intend to report wellknown facts - but the succession of the four great empires in this part of the world should be mentioned: the Persian first, then the Greek (with Alexander) conquered the people from the Black Sea to India, followed by the Roman Empire, holding the Western region from North Africa and Spain, France and England, to Asia Minor, and finally the Arabian conquest with a new language, bearing a new religion.

The fights for power circle round the Mediterranean Sea, but beginning with the 3rd century AD the character of these combats is slightly changed into the more spiritual exposition of religious difference.

The separation of the Roman Empire in East and West Rome confirms the old and mere philosophical discrimination between the Greek and the Roman culture, before the new religion of Mohammed confirms the destruction from North and South: it is the Islamic world which now will take in and preserve the rich heritage of scientific thought and medical experience, while the Christian religion will not tolerate the pagan wisdom: it fights against its own tradition and hesitates for centuries to acknowledge its benefits.

During the European middle ages (from 12th to 15th century) Islamic medicine was one of the main sources of medical theory and practice. These sources were studied in their Latin as well as in their Arabic language by European scholars of the 19th and 20th century. I have listed a bibliography of only a few main works of European research, and I want to emphasize some of their results.

One of the astounding fruits of these studies shows the interdisciplinary entanglement of Islamic medicine with fields of research, in philosophy and, for example, in history of art. While a clear separation from philosophy is taking place in the European medicine of the 19th and the first half of the 20th century, the return to interdisciplinary studies can be observed only now, in our days. Consequently the European interest in the evolution of Arabic medicine in the present time has a topical background. So let me now refer to some topics in special:

1. Recent studies on the general impact of Arabic art on European art have made it quite clear that this does not commence with the 16th century only, but that this influence on architecture, calligraphy, arts and crafts as well as on ornamentation is to be felt during the 12th century already.

Many interesting studies have been made on the *Arabic hospitals* and their influence on the medieval as well as on later institutions of health care all over Europe. The architecture of the hospital buildings, too, aroused the interest of historians of art, but I cannot, in this place describe them in detail.

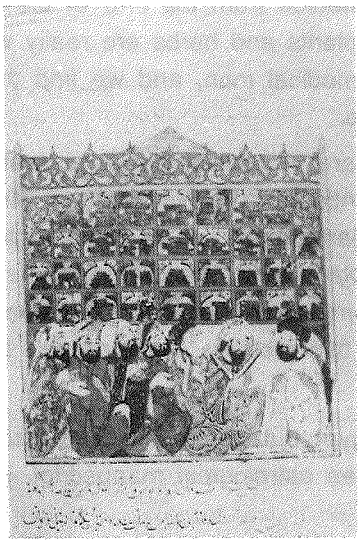
2. *On manuscripts* a lot of studies are to be found, and it is here, too, that the very manifold interlacings are to be seen even more clearly. For more than a hundred years it is a wellknown fact, that the roots of Islamic medicine reach back to Greek Antiquity. The connection, however, to later Roman Antiquity and Byzantine medicine was distinctly recognized only in the last decades. More recently the importance of Arabic texts, for their part, as a link between Antiquity and the European medicine, not only for medieval times but also for the renaissance era, is shown in a bright light.

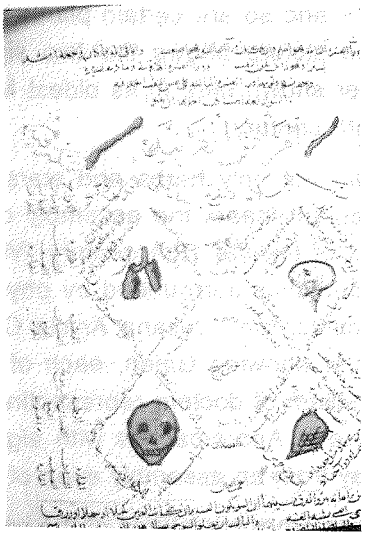
   The unity of language permits to melt down rather different intentions as well as the spiritual deliveries of ancient cultures into a new form. The Greek north-east and the Latin north-west have left their impression on the languages of the European tribes, but how far deeper reaches the stamp of the religious language on the old and new Islamic nations!

   The classical period beginning nearly with Mohammed (ﷺ) Himself shows its continuity for almost eight centuries and it is probably the conquest of Constantinople (1453), which is as significant for the Arabian world as it is for the Occident: The concentration towards the East has begun with the loss of the Spanish territory.

   But since the 12th century Spain (Toledo) is the main bridge for the return of knowledge from Antiquity to Europe, often in its Arabian transformation and enriched with some centuries of experience. Another bridge leads from North-Africa (Kairouan) to Italy (Salerno). Science and medicine are of outstanding importance in this transfer.

3. Turning now to the further development we find a certain change of the character not only in European medical treatises, but also in the Islamic ones, which may be interpreted as a certain reflux now from Europe. Beginning with the 13th century the manuscripts are more and more decorated with pictures. This development is to be demonstrated with some slides.





1. *Illustrations from the Greek-Byzantine Tradition*

First slide (Arabian translation of *Dioscurides* Materia medica from the *end of the 10 th century,* Paris, Bible. Nat., Ms. Ms. Arab. 4947, fol. 66): Pictures of plants and herbs are really very useful, not only for the pharmacists and apothecaies, but also for the medical man, and we find them in medical texts all over the world, wherever there are medical illustrations.

So it is no wonder that two books of Greek origin are in special favour in Arabian medical libraries: *Dioscurides* Materia medica and *Galen's* book on Antidotes (Arabic: Kitab al-Diryaq - the name having accepted the enigmatic word "Theriak" in the new language). Let us have a closer look now at the composition of this fine page. The composition of the plant itself, the harmony of nature is used to give a design of a very sensible harmony. You see how masterly the slight variation of symmetry is composed with the fine lines of written text between the two pictures, so that you may find art and nature in full accordance.

Second slide shows another example: plants from Egypt but painted in *Iraq four centuries later* (Washington, Freer Art Gallery). The picture is taken from an astrological manuscript, so you may recognise the very old tradition from Mesopotamia.

Third Slide: now bringing in the zodiac, and with it not merely a personal horoscope of somebody (as we can find it sometimes in Europe even today), but first the seasons and the mark or "seal" of the herbs used for special diseases, because every sign of the zodiac is thought to be linked to one organ of the human body - and so are certain plants, animals and even minerals which were thought to strengthen its vigour. The picture shows the two signs of late autumn and winter sol-stice: Sagittarius and Capricorn - the latter shown here in its oldest Mesopotamian shape: the goat-fish (Washington, Freer Art Gallery, Ira, Late 14th century).

Fourth slide: But not only herbs and stars are shown - here you see another very Greek type of illustration in its Arabian shape: the assembly of philosophers or The Seven Wise Men. This page of an *Arabian Dioscurides of the the 13th century* (Vienna, Austrian Nat. Library Cod A.F. 10) shows the often cited botanist Andromachus surrounded by physicians - as we find them earlier in the famous Byzantine Dioscurides manuscripts: the "Juliana Anicia Codex". This manuscript has two pages, one with Cheiron the centaur, the other showing Galen, each of them likewise surrounded by six physicians, so that you may imagine a consilium of doctors representing all the wisdom of health and benefit in the world. In the Arabian version there is Andromachos with eight physicians, so the picture is very regular and it seems to be not so far away from an assembly even of angels or wholesome spirits.

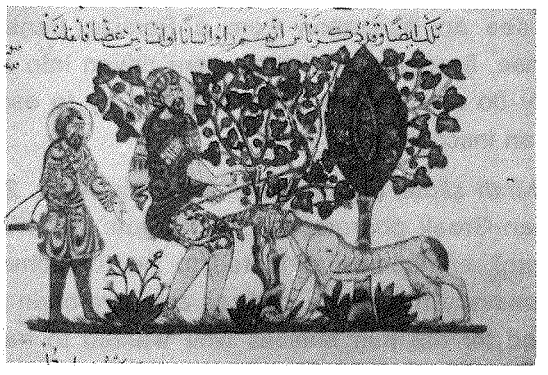
But let us see two other miniatures of the same codex:

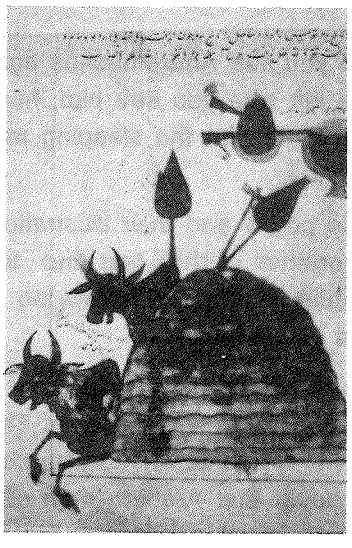
Fifth slide: Beginning with this 13th century the manuscripts become richer, the illustrations often show short scenes: a man bitten by snakes (the physician and his famulus approaching in haste), or

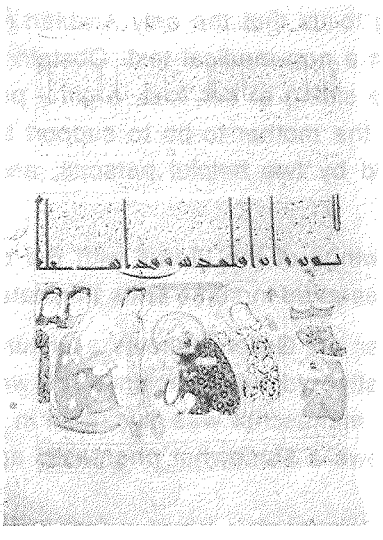
Sixth slide: the famulus catching a snake to prepare the antidote. The doctor sitting on his horse supervises the action.

This picture shows us something we have found all over the Arabian tradition: Most illustrations are not really necessary - except perhaps the drawings of the herbs. There you see what is well known: the pupil is learning how to do his work as a physician, as a surgeon, or as a pharmacist from his master - for instance: how to catch a snake, because snakes are an important ingredient to prepare the Theriak the antidote, which will prevent all poisoning.

Seventh slide: (New York, Metropol. Mus. School of Baghdad 1224): But it is really nice to have these pictures, and we as the descendants of the old doctors and historians of medicine - will recognise, that there are situations to fear in former times and still today: a man bitten by a dog infected with rabies. The time of Louis Pasteur will come more than 700 years later, and even today rabies is still







highly dangerous.

Eighth slide:(Istanbul, Topkapi Mus., 15th century) Methods of disinfection are old, however. Here you see an illustration from a Persian translation of *Dioscurides.* Cows are to be disinfected with incense. It seems as if they were driven into a very small shelter looking like a beehive. The cows evidently do not like the fumigation and try to escape. On top, in a little extra drawing you see the censer with an inscription.

Ninth slide: (Paris, Bible. Nat., Ms Arab. 2964) shows the title page of the other famous text from Roman-Greek pharmaceutical tradition: *Galen's book of antidotes,* often called "On Theriak" (Kitab al--Diryaq), sometimes attributed to Andromachus. The very precious manuscript of *about 1200 AD* may demonstrate that these codices are very often not only made for the use of physicians, but for the nobility and for the rich families who wanted to have exactly this book with its prescriptions to prepare the antidote against poisoning - i.e. probably murder. The title page looks like a Byzantine picture of the Mother of God. In fact it might be in this context the allegory of wisdom ("Sapientia") surrounded by helpful and charitable geniuses.

Tenth slide: coming from the same manuscript on which you see Andromachus again, in the middle of the scene, healing his brother bitten by a snake. On the left side you see him, hurt and weak, with three waitresses at his bed (the white sheet seen from above). Maybe the sleeping man with the same red gown at the right is the patient after that course of treatment.

2. Let me give you a short demonstration of original Islamic books and their illustrations - if ever illustrated. I think it is of interest to recognise the growing importance of the text and furthermore to find out which pictorial tradition is not handed down from antiquity or only very late so or scarcely: We find no early illustrations in surgery, orthopedy, anatomy and obstetrics.

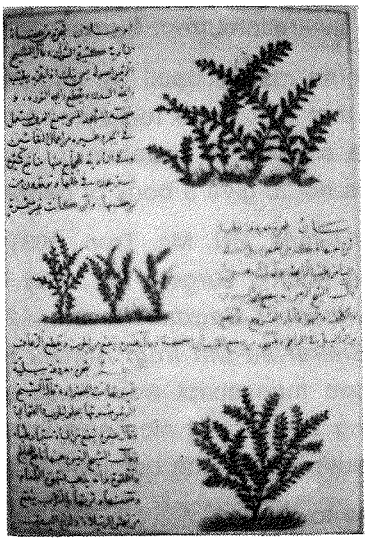
Eleventh slide: (Paris, Bible. Nat., Arab. 5847) A famous illustrated manuscript from the Maquama of *al-Hariri* (1054-1121) shows a library and the people in it, involved in a discussion. There is no reason to believe that they are physicians: Al-Hariri was a poet who wrote down very thoroughly his observations on daily life of his contemporaries, and there is no doubt that Arabian men of his time liked to read and to discuss as they did before and later: They were usually learned people who wanted to understand nature as well as the humanities. More than a century after al-Hariri's time, *1237*, when this text was illustrated by the *painter Jahja... al-Wasidi,* nothing had changed in behaviour.

Twelfth slide: It seems astonishing to us that the only Arabian *representation of a childbirth* is from this same book of al-Hariri, that is from a non-medical text. Obstetrics were but an affair of women. You see the wife labouring and the midwife sitting at her feet, a girl - perhaps the midwife's assistant - has put her shoulder under the left arm of the mother-to-be to support the delivery. In the upper part of the picture you see the husband, consoled by two helpful persons, and finally you see twice two persons coming with gifts or something to eat.

In the Greek tradition we find drawings of the uterus with the child in its different positions - but it seems as if this knowledge was only preserved in some texts translated from Greek authors.

Thirteenth slide: (Washington, Freer Art Gallery) shows a picture in a book by *al-Jazari.* The Latin title is "*Automata*", it shows some mostly hydraulic machines, as we find them al-ready in ancient Egyptian and Mesopotamian tradition. This manuscript was illustrated in *1315 AD by Farruk Ibn al-Latif.* It is not a medical book, only this page shows a somewhat phantastic apparatus: how to measure the quantity of blood when bloodletting.

With this subject we have but entered the field of medical art and craft, which is surgery. The name one should mention is *Albucasis* (Abul'l Qasim), who lived in Cordoba (Spain) in the 10th century. I could show you the first illustrated manuscript, with the famous pictures of the orthopaedic operation, as



we find them delivered from antiquity - but the Codex S. 2641 of the Austrian Nat. Library in Vienna is a Latin translation with illustrations from European tradition.

In the later, Arabian manuscripts, we find the drawings of surgical instruments but they are stylized in so fine a manner that it appears to us in harmony with the Arabian script on each page - it seems to be difficult to make a scalpel, for instance, or a probe or even a surgical saw after these drawings, and surely: the intention is not to give a book of patterns with the text.

Fourteenth slide: (Paris, BN, Ms. Truc. 693): Spain in the West and Persia in the East are perhaps not so very strong in putting surgery far away from the medical business. Thus the book called "*The imperial Surgery*", *written in Bagdad, in the 12th century* and in Persian language, was translated at about *1300 AD by Sharaf ad-Din from Amaria* into Turkish language, and - after the conquest of Constantinople - a painted manuscript was made and given to Sultan Mehmed II *in the year 1465.* This manuscript is showing us a lot of nice and very lively drawn scenes of medical manipulations, as you may see here: the cauterisation, the burning of the probably chronically infected wounds of a leper.

Let me now come to an end.

To reflect the older times, also means to speak of modern times. In the half millenium which passed since the so called medieval centuries, medicine has changed - and in a way has not changed at all. There has always been the patient who needs a learned physician, who needs nursing and help in his psychic distress. In this point the Islamic medicine has a very long experience and it is not really surprising that nowadays the old wisdom is discussed and studied by European doctors too. It is medicine delivered in texts - and in practical instruction. And so Medicine, the so called "small surgery" and above all the therapy including Materia medica and Psychiatry is the very field of traditional medicine in all oriental cultures.

But there is another tradition which depends partly on learning with the aid of pictures - but now, that photography had been invented and the illustrations needed show the details to be learned, it is no more necessary to repeat the European development.

The Islamic medicine had refused to study anatomy, and the so-called "great surgery", as a consequence, could not enter Islamic hospitals, before the new impulse from Europe reached the orient. Today, many colleagues of your country have studied in Europe and in the United states. They learned the more active medicine, with deep and often dangerous operations; they learned modern physiology, micro-biology and the technical science in the laboratories. But now it will be of vital interest, to find out what is really needed, to the benefit of the ill.

Nowadays even many European colleagues study the therapeutic techniques of other cultures, including those of primitive tribes and of Indian Medicine, including those from the Far East. Today, however, we find Islamic medicine all over the African continent as well as in India and in Indonesia. As a matter of fact Islamic medicine is much easier to understand and to handle for Europeans than any other medical system in the world, which is due to the common tradition. It therefore seems to be obvious - from our point of view - that the Islamic medicine will again come in as a mediator between the modern, merely diagnostic techniques and the old medical wisdom in therapy.

REFERENCES

Having a look at bibliography is to see signs and symbols of the results of research. In order to give a synopsis on both the general research on the cultural relations between Orient and Occident, as pointed out by scholars of history of art and archeology, as well as on the results of this research in detail, I first of all checked the very voluminous work of:

K.A.C. CRESSWELL, Bibliography of the architecture, arts and crafts of Islam till 1960. Cairo, 1961. With comprehensive supplement 1060-1972, Cairo, 1973.

The sources of research in the field of history of medicine were published by the Wellcome Institute in London:

RY EBIED, Bibliography of medieval Arabic and Jewish medicine and allied sciences. London 1971 (Wellcome Institute Occasional Publications 5.2).

There are two more and newer bibliographies to be cited:

H. ZOTTER, Bibliographie faksimilierter Handschriften. Graz 1976.

DIANA GRIMWOOK-JONES et al, Arabic Islamic Bibliography. Hasoccks, 1977.

Out of these bibliographies I have chosen about one hundred quotations referring to the following sections:

I. General relations between Orient and Occident in the Middle Ages.
   1) in the field of architecture, arts and crafts (excluding hospitals)
   2) hospitals

II. Medicine in Islam:
   1) studies on medical subjects in Islam.
   2) on manuscripts

III. Some famous illustrated manuscripts in chronological order.

I GENERAL RELATIONS BETWEEN ORIENT AND OCCIDENT IN THE MIDDLE AGES

1) *In the field of architecture, arts and crafts (excluding hospitals)*

ANTON CASASECA, FRANCISCO: Las influencias hispano-arabes en el arte occidental de los siglos 11 y 12. Bull/boletin de Seminario de Estudios de Arte, Valladolid 8-9, 1935, 221-257 25 Tafn.

CHEGNE, ANWAR G. Muslim in Spain, its history and culture. Minneapolis 1974.

DANIEL, NORMAN: The Arab and medieval Europe. London, 1975.

ELGOOD, CYRIL: A medieval history of Persia and the Eastern Caliphate from the earliest times until 1932. Cambridge 1951.

GOTTSCHALK, HANS L. Die Rezeption der antiken Wissenschaften durch den Islam. Anzieger Osterr. Akad. d. Wiss. Phil. Hist. Kl. 102, 1965 (7) 111-138; Graz, Wien, Koln 1965

KUHNEL, E. Oriente y Occidente en el arte medieval. Archivo Espanol de Arte. 15. 1942, 92-96. Bespr. Torres Balbas, al-Andalus 9. 234-235.

NASR, SEYYID HOSSEIN: Islamic Sciences, an illustrated study. World Islamic Festival, London 1976. Westerham 1976.

ROSENTHAL, FRANZ. Das Fortleben der Antike im Islam. Zurich und Stuttgart 1965. Bibliothek des Morgenlandes Artemis.

SABRA, ABDELHAMID I. Philosophie und Naturwissenschaften. Der Islamische Beitrag zur Entwicklung der Wissenschaften. Welt des Islam, hg. Bernard Lewis. Braunschweig 1976, 181-200.

SCHACHT, JOSEPH Uber den Hellenismus in Baghdad und Cairo im II. Jahrhundert. Zeitschr. d. Dt. Morgenland. Ges. 90. 1936, 526-545.

SUTER, H Die Araber als Vermittler der Wissens-chaften in deren Ubergang vom Orient in den Occident. Aarau 1896.

VERNET, JUAN: La ciencia en el Islam y Occidente. Settimane di Studio 2. 537-576. Centro Italiono di studi sull'Alto Medievo. L'Occidente et l'Islam nell' Alto Medievo. 1-2 Spoleto 1964. Spoleto 1965.

WEITZMANN K. The Greek sources of Islamic scientific illustration. Archaeologica Orientalia. (hg. G.C. Miles) in memoriam Ernst Herzfeld. New York 1952, 244-266. Reviews: D.S. Rice, Ars Orientalia I. 200 M. Th. and Ch. P, Revue Archeol. 1958, 246.

WUSTENFELD, F: Die Ubersetzungen arabischer Werke ins Lateinische seit dem I. Jahrhundert. Gottingen 1876.

2. *Hospitals*

BAY, ELLEN: Islamische Krankenhauser im Mittelalter unter besonderer Beruckischtigung der Psychiatrie. Diss. Med. Dusseldorf 1967.

BRANDENBURG D: Die alten islamischen Krankenhauser in Cairo. Forsch. Prax. Fortbildung 18. 1967, 524-530.

GURKEN, KAZIM ISMAIL: Les Hopitaux des Turesselb Joukides. Soc. fr. d'hist. des Hopitaux Bull. 26. 1971, 33-54

HAMARNEH, SAMI KHALAF: Development of Hospitals in Islam. Journ. Hist. Med. 17, 1962 (3) 366--384.

HEUSINGER, CARL FRIEDRICH: Ein Beitrag zur altesten Geschichte der Krankenhauser im Occidente. Janus, Zs. f. Geschichte und Literatur der Medicin. Neue Ausg., Leipzig 1. 1931, 661-774.

ISSA, BEY AHMED: Histoire des Bimaristans (Hopitaux) a l'epoque islamique. Le Caire 1928. In: Comptes rendu du Congres International de medecine et Hygiene Tropique. Le Caire 1929, 81-209.

JETTER, DIETER: Grundzuge der Hospital geschichte. Darmstadt 1973, 21-24 und 102-107.

LEVEY M. Medieval Muslim Hospitals, administration and procedures. J. Alb. Einstein Med. Cent. Philadelphia. 10. 1962, 120-127.

PHILIPSBORN, ALEXANDRE: Les premiers hopitaux au Moyen Age (Orient et Occident). La Nouvelle Clio. Bruxelles-Mainz 6. (1-2) 1954, 137-163, bes 143 ff.

QUADFLIEG, RALPH. Filaretes Ospedale Maggiore in Mailand. Zur Rezeption islamischen Hospital wesens in der italieniscnen pruhrenaissance. Phil. Diss. Koln 1981. Veroff. d. Abt. Architektur des Kunsthist. Inst. d. Univ. Koln. 20. hg. Gunther Binding.

TERZIOGLU, ARSLAN: MLittellterliche islamische Krankenhauser unter Berucksichtigung der Frage nach den altesten psychiatrischen Anstalten. Diss. TU Berlin 1968.

TERZIOGLU, ARSLAN: Das Nureddin-Krankenhaus in Damaskus (gegr. 1194) aus der Epoche der Seldschuken und seine Bedeutung fur die Medizin-und Krankenhausgeschichte. Historia Hospitalium 11. 1976, 59-75.

WUSTENFELD, F. Maorizis Beschreibung der Hospitaler in el Kahira. Janus, Zeitschrift fur Geschichte u. Literatur der Medizin. Leipzig Neue Ausg. 1. 1931 (1) 28-29

II MEDICINE IN ISLAM

1) *Studies on medical subjects in Islam*

ADAMEK, GERHARD: Das Kleinkind in Glaube und Sitte der Araber im Mittelalter. Diss. Bonn 1968.

ALI ZAKI: La Psychotherapie dans la medecine arabe. Bull. Soc. Fr. Hist. Med. 30, 1936, 268-272

BLANCO JUSTE F.J.: La botanica arabe aplicada a la medicina. Actas 10. Cong. Internat. Hist. Med., Madrid 1, 1935, 29-66

BRANDENBURG, DIETRICH: Medizin und Magie, Heilkunde und Geheimlehre des Islamischen Zeital-

ters. Berlin 1975 Medizingeschichtliche Miniaturen 1.

BURGEL, JOHANN CHRISTOPH. Die wissenschaftliche Medizin im Kraftefeld der Islam. Kultur. Bustan 8. 1967, 9-19

BURGHAM, EDWARD: Die GroBmoguln und ihre Arzte. Ciba Zeitschr. 6. Basel 1938, 2165-2194

CAMPBELL, D: Arabian medicine and its influence on the middle ages. 1-2, London 1926.

FAUST, EL FRIEDE: Arabien 1680. Olfert Dappers Arabienbuch und seine Quellen, gepruft an Nachrichten uber Kaffee, Sesam und Traumen. Koln 1977 (Kolner med. hist. Beitrage, ed. M. Putscher vol. 5)

GATJE, HELM UT: Ein Blick in die muslimsche Medizin des Mittelalters. Med. Welt 32. 1962, 1671-1674.

GERMAIN, ALEXANDRE: La medecine arabe et la medecine grecque a Montpellier. Etude Hist. Montpellier 1879.

GURLT, Ernst Julius: Geschichte der Chirurgie und ihrer Ausubung. L Berlin 1898, 620-649, Taf. 4-5

HAMARNEH, SAMI KHALAF: Some aspects of material practice and institutions in medieval islam. Episteme 7. 1973, 15-31

HAU, FRIEDRUN R. Die Bildung des Arztes im islamischen Mittelalter 1. Clio Medica 13. 1978 (2) 95--123, (3/4) 175-200, 14. 1979 (1), 7-34

MENETRIER, M.P. La medecine arebe, son role dans l'histoire et son influence sur la medecine francaise. Bull. Soc. fr. hist. med. 25. 1931, 181-207

Meyerhof:

BEN-HORIN, W: The works of Max Meyerhof, Bibliography, Jerusalem 1944. See: Bull. Hist. Med. 19. 1946, 375-432.

SCHACHT, I.: MAX MEYERHOF, Bibliography. Osiris 9. 1950, 7-32

MEYERHOF, MAX: al-Marchid fi'l-Kohl, ou le Guide oculistigue Barcelona 1933.

MEYERHOFF, MAX, Ibn al-Nafis und seine Theorie des lungenkrieslaufs. Quellen und Studien zur Gesch. d. Nat. wiss. und Medizin. 4. 1935, 37-88

MEYERHOF, MAX, The Background and origin of Arabian Pharmacology. Ciba Symposia 6. 5-6 1944, 1847-1856

MEYERHOF MAX, Pharmacology during the golden age of arabian medicine. Ciba Symposia 6. 5-6. 1944, 1857-1867.

MEYERHOF MAX, Arabian Pharmacology in North Africa Sicily and the Iberian Peninsula. Ciba Symposia 6. 5-6 1944, 1868-1872.

MEYERHOF M., The sources of the history of arabian medicine. Ciba Symposia 6. 5-6 1944, 1873--1876.

MIR-HOSSEIN, NABAVI. Hygiene und Medizin in Quran Stuttgart 1967.

OMER RECEP, TIBB AL-NABI, Medizin bei Ibn as-Sunni und Abu Nu'aim unter besonderer Berucksichtigung der Kapitel uber den Kopfschmerz, Die Augenkran-kheiten. Diss. Marburg 1969.

RITTER, HELMUT UND RICHARD WALZER: Arabische Uber-setzungen griechischer Arzte in Stambuler Bibliotheken. Sber. d. Adad. f. Wiss. Phil. hist. kl. 26. 1934.

ROSENTHAL, F. "Life is short, the art is long". Arabic commentaries on the first Hippocratic aphorism. Bull. Hist. Med. 40, 1966, 226-245.

ROSENTHAL, FRANZ. The classical heritage in Islam. London 1975.

SAREMI, FARAMARZ. Das Kapitel uber die Behandlung von Vergiftungen aus dem persischen Tuhfat al-muminin vom Jahre 1669. Med. Diss. Koln. 1972.

SCHAFFLER, HEINZ HERBERT: Zur mitelalterlichen Embryologie. Sudhoffs Archiv 57. 298 ff.

SCHIPPERGES, HEINRICH, Die fruhen Ubersetzer der arabischen Medizin in chronologischer Sicht. Sudhoffs Archiv 39. 1955, 53-93.

SCHIPPERGES, HEINRICH, Die Assimillierung der arabischen Medizin durch das lateinische Mittelalter. Wiesbaden 1964 (Sudhoffs Archiv Beiheft 3).

SCHIPPERGES, HEINRICH, Arabische Medizin im Lateinischen Mittelalter. Heldelberg und Berlin, Sber. d. Heidelberger Akad. d. Wiss. Math. Nat. Wiss. Kl. 2. 1976.

SCHLEIFER, J. Zu zwei arabischen Medizinbucher. Islam 24. 1937, 75-89.

SCHMUCKER, WERNER, Die pflanzliche und mineralische Materia Medica im Firdaus al-Hikmades. Ali ibn Sahl Rabba al-Tabari. Diss. Bonn 1969.

SCHRUTZ, Die Medizin der Araber. see: Handbuch der Gesch. d. Med. edited by: Neuburger-Pagel, I. Jena 1902, 589-610

SEIDEL, ERNST: Medizinisches aus den Heidelberger "Papyrischott-Reinhardt" II. Islam 1. 1910, 238--263.

SEZGIN, FUAT Geschichte des arabischen Schrifttums. 3: Medizin, Pharmazie, Zoologie bis 1038/1039. Leiden 1970.

SPIES, OTTO und HORT MULLER-BUTOW, Anatomie und Chirurgie des Schadels, insbes. der Hals--Nasen-und Ohrenkrankheiten nach Ibn al-Quff. Berlin 1971 Ars. medica 3.

SPINK, M.S.U.G. BERNARD LEWIS, Abucasis. On surgery and instruments, arab. - engl. text edition. 30. Abhandlung des Tasrif uber d. chirurgie London 1973. Review Emilie Savage-Smith. History of Science. 14. 1976. 245-264.

STEINSCHNEIDER:

BERLINER, A: Die Schriften des M. Steinschneider Berlin 1886.

GARRISON, F.H.: Bibliographie M. Steinschneider Sudnofts Archiv 2b. 1932, 249-278

STEINSCHNEIDER, M., Die griechischen Arzte in arabischen Ubersetzungen. Virchows Archiv 124, 1981.

SUHEYL UNVER, A. zur Geschichte der Medizin und der Hygiene in der Turkei. Ciba Zeitschr. 2 1934 (15) 515-522.

SUHEYL UNVER, A., Turk. General History of Medicine. Pictures and documents. Istanbul 1943.

TASCHKANDI, SCHAH EKRAM, Ubersetzung und Bearbeitung des Kitab al-Taswig at-tibbi des Sadid ibn al-Hasan (11.hn.) Phil. Diss. Bonn 1968.

TURK TIB TARIHI ARKIVI, zusammen mit Castiglioni. Sur l'histoire de la medecine turcque. Istanbul und Padua 1935. I. 30.

ULMANN, MANFRED. Die Medizin im Islam. Leiden 19/0. = Handbuch der Orientalistik. I erg. bd. 6.1

WHIPPLE, ALLEN O. Role of the Nestorians as a connecting link between Greek and Arabic medicine. Annals of Medical Hist. NS 8. 1936, 313-323.

WIBARY, J., The anatomy of the brain in the works of Galen and Ali al-Abbas, a comparative hist.-

-anatom. Study. Janus 19. 1914, 17-32, 84-104.

II. 2) On Manuscripts

AHLWARDT, W. Verzeichnis der arabischen Handschriften der Kgl. Bibliothek zu Berlin. 1-10 Berlin 1887-1899.

AL-HAWI, Una "Bella copia" di al-hawi, tradotto d'all arabo di Farag Moyse per Carlo I d'Angio, Ms. Vat. Lat. 2398-2399 contributo alla storia della miniatura dello scorcio del sec. 13 a Napoli. Miscellanea di studi in memorio di Anna Saitta Revignas. Florenz 1978 (=Biblioteca di bibliographia italiana 86).

BEAUJOUON, G. Manuscrits medicaux du Moyen-Age Conserves en Espagne. Melanges Casa Velazquez 8 1972, 161-221.

BLAUSTEINER, KURT, Zur Entwicklung der Bildform in der islamischen Miniaturenmalerie. Graphische Kunste NF 1. 1936, 41-56.

BLOCHET, E. Peintures de manuscrits arabes a types byzantins. Revue archeol. S. 4. 9. 1907, 193-223, see also seminarium Kondakovianum 4. 1931, 111-119

BONNET, E. Etudes sur les figures de plantes et d'animaux peints dans une version arabe. manuscript de la mati re medicale de dioscoride. Janus 14. 1904, 294-303.

BRANDENBURG, D, Das Werkzeug des Schriftkunstlers. ur medizinischen Handschriftenkunde des alten Islam. Med. Monatsschr. 25 1971 (10) 463-467.

BUCHTHAL, HUGO, The paintings of the Syrian Jacobits and the relation to byzantine and islamic arts. Syria 20. 1939. 136-150.

BUCHTHAL, HUGO, On byzantine influence in early islamic miniaturepainting. 6. Internat. Congr. d'Etudes byzantines. Algier 1939, Paris 1940. 229-230.

BUCHTHAL, HUGO, "Hellenistic" miniatures in early islamic manuscripts. Ars Islamica 7. 1940, 123--133.

DIETRICH, ALBERT. Medicinalia Arabica, Studie Uber arabische medizinische Handschriften turkischen und syrischen Bibliotheken, Gottingen 1966. Abhandlungen der Akademie der Wissenschaften Gottingen 66, Phil. Hist. Kl. 3, 1966.

F,D., Mohammedan Manuscripts. B. 1. Metropolitan Museum. 9. 1914, 159-166.

FARES, BISHR, Un herbier arabe illustre du 14eme siecle. Archaelogical Orientalia in Memoriam Ernst Herzfeld, New York, 1952, 84-88

Review: D.S. Rice Ars Orientalis I. 218

FARES, BISHR, Le livre de la Theriaque, manuscript fin 12eme siecle. Bibl. Nat. Paris, ca. 1199 Inst. fr. Archeologie orientale, Cairo 1953, Art Islamique 2. 1953

Review: I. STCHOUKINE, Syrie 31. 344-345.

R. MOUTERDE, Mel. Univ. St. Joseph 31. 446-447

ANAWATI, Mem. Inst. Dominicain d'etudes arabes 2. 302-3032, *E. Kuhnel,* Oriens 8 352-353

FARES BISHR, Le livre de la Theriaque, manuscript arabe. Bibl. Nat. Paris. Presse medicale 61. 1953, 938-940.

FULTON, A.S. Arabic medical manuscripts. British Museum Quarterly 11. 1937, 81-83

GRABAR, ANDRE. Elements sassanides et islamiques dans les enluminures des manuscrits espagnols du haut Moyen Age. Atti 2. Convegno Studio Arte Alto medioevo Pavia 1950, Turin 1952, 312-319

GRAPE-ALBERS, H, Spatantike Bilder aus der Welt des Arztes. Med. Bilderhandschriften der Spatantike und ihre mittelalterl. Uberlieferung. Wiesbaden 1977.

GRMEK, MIRKO DRAZEN

PIERRE HUARD

Le premier manuscrit chirurgical turc redige par Charaf al-din 1465, illustre de 140 miniatures, Paris 1960. Review. Y. A. Godard, Syria 38. 339-340

GRUBE, ERNST. J. Materia lien zum Dioskuridus Arabicus. Festschr. Ernst Kuhnel, Berlin 1959, 163-194

GUILMAIN, I, Some observations on mozarabic manuscript illimination. Scriptorm 30. 1976 (2) 183-191

HERRLINGER, R: Arabische Handschriften zur Pharmakologie. Arztl. Praxis 2. 1950 (48) 12

HOLTER, KURT, Die Galen-Handschrift und die Makamen des Hariri der Nat. Bibl. Wien. Jahrb. der kinsthistorischen Sammlungen Wien NF 11. 1937, 1-48 Taf. 1-6

HOLTER, KURT, Die islamischen Miniaturhandschriften vor 1350. Zentralblatt fur Bibliothekswesen 54. 1937, 1-34.

Review: *R. PARET,* Oriental. Lit Zeitung 41. 629-630.

RICHARD HELK, Artibus Asiae 7. 342

W. HE FEENING, Zeitschr. Dt. Morgenland. Ges. 93, 388-89

HOLTER, KURT, Mss. Bibliothek Nat. Wien, Manuscripts orientaux. Bull. soc. francaise de reproduction de manuscrits a peintures 20.1937, 85-150 mit Tafeln

ISKANDER, A.Z. A catalogue of Arabic manuscripts on medicine and science in the Wellcome Hist. Med. Library, London 1967. Cat. S. Mss. 2

KADAR, Z. Survival of Greek zoological illuminations in byzantine manusctipts. Budapest 1978. Review: A.V. Cernecov, Sov. Arheol. 24. 1980 (3) 325-330

LEROY, I., Les manuscrits coptes et coptes-arabes illustres. Paris 1974 Bibliotheque archeologique et historique 96. Inst. Beyrout.
Reviews: V. Poggi, Orient. christ. 42 1976 (2) 565-567

I. LA FONTAINE DOSOGNE, Scriptorium 32. 1978 (1) 116-119

M. KRAUSE, Byzantin. Zeitschr. 71 1978 (1) 120-123

LEVEY M., Medieval arabic book-making and its relation to early chemistry and pharmacology. Transactions American Philos Soc. NS. 52. 1962 (4) 1-79.

LUPO, M., Un erbario-ricettario del 15 secolo a Trento. Continuita della tradizione medievale nelle raffigurazioni miniate di argumento botanico.
in: *Vailati Schoenburg-Waldenburg* (editor). La miniatura italiana in eta rominica e gotica. Atti 1. Congresso Storia Miniatura italiana. Cortona 1978 Florenz 1979. (= Storia della miniatura, stude e documenti 5.259-267).

MAYER, C.F., The collection of arabic medical literature in the Army Library with a checklist of arabic manuscripts. Bull. Hist. Med. 11. 1942, 201-216 und Bull. Med. Libr. Assoc. 30. 1942, 96-104.

MEYERHOF, M, Etudes pharmacologie arabe tirees de macrits inedits. 3 Deux manuscripts illustres du livers des simples d'Ahmed al-Gaegiqui. Bull. Inst. 23. 1940/1941, 23-29

MOINFAR, MOHAMMAD DJAFAR, Catalogue des manuscrits orientaux Jahrb. Bern. Hist. Mus. 43. 1966.

OTTO-DOHRN, KATHARINA, Figurendarstellung im Islam. Archaol. Anzeiger 1950-1951 Berlin 1952, 323-357.

PLESSNER, M, The cataloguing of arabic manuscripts on medicine and the sciences. Archives internationales Hist. sciences Paris 9. 1956, 345-348

REITZENSTEIN, FERDINANC V., Liebe und Ehe im alten Orient. Stuttgart 1909.

RENAUD, H.P.J., Les manuscrits arabes de l'Escorial d'aprés les notes de Hartwig Derenbourg. II. 2.: Med. Paris 1941.

ROBLES, F.G. Les manuscrits arabes de Medecine de la Biblioteca nacional Madrid. Siglo Med. 35. 1888, 35-422.

SAITO, M., Brwagung zum of orientalischen Charakter mozarabischer Handschriften im. 10. und 11. Jahrhundert. Espana entre el Mediterraneo y el Atlantico 2. Actes 23. Congreso internacional de Historia del Arte. Granada 1973 2 Granada 1977, 183-186.

SCHROEDER, ERIC, Mrs. Rockefellers Miniatures of the Fogg (Museum).
Connoisseur 148. 1961, 70-75.

SONTHEIMER, Nachricht einer arabischen medizinischen Handschrift, vermutlich ibn Dsdezia. Janus 2, 1897.

SUHEYL UNIVER, A, Sur un manuscrit medical illustre du 15 siecle. Comptes rendus du 9. Congr. Internat. d'Histoire de la Medecine. Bukarest 1932.

SUHEYL UNIVER, A, The illustrations of the treatise of surgery of Sharaf al-Don Subunjuoghlu, written in Turkish language, Istanbul 1939.

THORNDIKE, LYNN, Latin manuscripts of works by Rasis at the Bibl. Nat. Paris. Bull. Hist. Med. 32. 1958, 54-67

TORRES BALBAS, L: Miniaturas medievales espanolas de influjo islamico. Al-Andalus 15. 1950, 191--202.

WALZER, R.R., Check-list of the arabic manuscripts in the Wellcome Hist. Med. Library. London (Typescript) 1960

WEBER, PAUL JOHANNES: Arabische Miniaturen, Genf 1979

WELLESZ, EMMY La question des influences byzantines sur la peinture musulmane. 6eme Cong. Internat. d'etudes byzantines. Algier 1939 Paris 1940, 228-229.

III SOME FAMOUS ILLUSTRATED MANUSCRIPTS IN CHRONOLOGICAL ORDER

A. List of some illustrated books with pictures from Arabian manuscripts. The books are cited by the names of the respective authors only.

ILZA VEITH in: Der nahe Osten, S 292 (fig. 264)- S. 295 (fig. 266) in: HSchadewaldt, Leon Binet, Charles Maillaut, Ilza Veith. Kunst und Medizin. Paris 1966 (French), Koln 1967 (German)

ROBERT HERRLINGER, Geschichte der Medizinischen Abbildung I. Munchen 1967.

ALBERT S. LYONS, Die Geschichte der medizin im Spiegel der Kunst. German ed. Koln 1980: Medizin im Islam, Arabische Medizin p. 294 (fig. 432) - p. 317 (fig. 472)

JEAN CHARLES SOURNIA: Die arabische Medizin p. 589 (fig. 571) - p. 629 (fig. 616) in: Sournia, Poulet, Martiny. in : Histoire de la Medecine, de la Pharmacie, de l'Art Dentaire et de l'Art Veterinaire. Paris 1978 Vol. 2. German etition: Geschichte der Medizin, der Pharmazie, der Zahnheilkunde und der Tierheilkunde. Salzburg 1980, vol 2.

B. The Manuscripts

1) *Paris, Bibl. Nat., Mas Arab 4947*
Dioscurides. Arab. Trans. by *BAHNAM IBN MOUSA IBN JUSUF.* About 1000 A.D. (fol. 66 = two plants. Lyons. 448)

2) *Paris, Bibl. Nat. Ms. Arab. 2964,* Kitab al-Diryak = Antidotarium = Galen's book on Theriak. About 1200 A.D. (fol. 37: Titlepage, Lyons 444. Three more illustrations: Sournia 586, 587, 596).

3) *Washington, Ireer Gallery of Art,* Dioscurides. Arab. copy by *ABDALLA IBN AL-FADL. School of Baghdad,* 1224 A.D., (Lyons 450, 451, 436, Veith 265).

3a) Probably of the same manuscript: New York, Metropol Mus. of Arts, Dioscurides, School of Baghdad, 1224 A.D. (Lyons 452).

4) Paris, Bibl. Nat. Ms. Arab. 5847, Maquamen of Hariri Neshki (1054-1121), Copy by *JAHJA IBN MAHMUD.. AL-WASIDI* 1237/38 A.D., (fol. 122: Childbirth. Lyons 459. Veith 264

Another illustration shows the famous disputation of two scholars in a library (Sournia 583)

5) Wien, Osterr. Nat. Bibl., Kodex A.D. 10, Dioscurides. 13th Cent., (3 illust. see: lyons 447, 453, 456)

6) London, Brit. Mus., Ms. Nr. 2784, Arabian "Bestiarium". 13th century. Compilation from Aristotle and 'Ubayd Allah B. Jahra'il B. Bakhtishu'. (fol. 60b: Locusts. Herrlinger pl. XIV).

7) Washington, Ireer Gallery of Art, "Automata" al- Jazari, Copy 1315 A.D. by *FARRUK IBN AL--LATIF* (Lyons 443)

8) Wien, Osterr. Nat. Bibl. Kodex S. 2641, This is the famous Latin transl. of Italian miniaturists. 14th century.

9) Washington, Freer Gallery of Art, Astrology = Ajaib al-Makblukat by al-Kazwini. Iraq, late 14th cent. (Lyons 440, 442, 449)

10) Paris, Bibl. Nat., Ms. Pers. 1555, Mansur Ibn-Ahmed Anatomical Manual, made for Zigga, el--Hakkwa I Sultan, 1396 A.D. The manuscript shows the Alexandrian "five-figure-series" a completed by two figures probably of Arabian origin, a pregnant woman and a woman and a man with the spots of bloodletting. Pregnant woman (= fol. 29) Sournia 581).

11) Paris, Bibl. Nat., Ms. Turc 693, Turkisk translation, about 1300 A.D. by *SHARAF AD-DIN IBN AL-HADJDJ ILIAS,* names "Sapundji oghlu" (son of the Soapboiler) from Amaria (Asia Minor). The original is of the 12th century. The famous illustrated manuscript was given to Sultan Mehmed II in the year 1465 A.D. (see publication, Grmek and Huard). *fol. 46^{v}*: Cauterization of Leprosy (Lyons 441) and some other illustrations fol. 110^{r} (Lyons 469), fol. 110^{v} (Lyons 467) and the operation of a cataract (Sournia 599).

12) Istanbul, Topkapi-Museum, A Persian Dioscurides of the 15th century (ill. see Lyons 446).

13) Paris. Bibl Nat., Ms. Arab. 2953, Abulcasis, surgery Ms. from Morocco, 16th century. The illustration shwo the tools of a surgeon in a strongly abstracted way (Lyons 465, Sournia 489 and 602)

14) Damaskus, Nat. Mus, Avicenna, Canon of Medicine, 16th Cent. with a sketch showing four organs: the lungs and the heart, the brain and the skull. (Sournia 591)

15) Istanbul, Yeni Cami Librari, Ms. 924, This is the manuscript with the famous sketch of the brain and the eyes, drawn by Jahja from Mosul, about 1560 A.D., first published by Karl Sudhoff, (Sudhoffs) Arch. Gesch. Med. 8 1915. 1-21 (fig. 5 on plate I), see Herrlinger fig. 52.

There are, it is true, more manuscripts in the 17th, the 18th and even the 19th century, some of them very fine and precious which might be mentioned here. It was now, however, my intention to make an even nearly complete list of illustrated medical manuscript although this would be a meritorious task of great usefulness.

ISLAMIC MEDICINE AND ITS ASPECTS IN THE MAGHREB ☆

Prof. A.A. Ben Abdella

MOROCCO.

ABSTRACT.

Islam has paid a special attention to Medicine as a branch of human knowledge which has practical application in our culture. As a matter of fact the slogan adopted by Islam is: (the preservation of one's health is prior to the preservation of one's religion). This explains why many of the greatest Muslim theologists studied and excelled at Medicine and Pharmacology.

Both the Holy Quran and the Prophet's ﷺ tradition made references to medical matters, and Islamic literature on Medicine is prolific: the Arab League's Institute of Manuscripts has compiled recently a thousand manuscripts on Medicine and Pharmacology.

The paper summarizes the historical developments in the Medical and Pharmacological research and practice in the Maghreb. One evidence of this development is the Medical School which was founded in Fez during the fourth Higri century. When Andalus was under the rule of the Sultan of Marrakech, a group of doctors formed a medical association to develop the teaching of and research on Medicine. Even before the fall of the Arabs in Spain many outstanding doctors came to Morocco, such as Abu-Ala ben Zuhr who became the private doctor of Yousif ben Tashfeen. Abu al-Ala wrote several books which were translated later into Latin. His son Abu Marwan as well, and his grand-son Abu Bakar followed suit.

On the other hand several Maghriban doctors immigrated to the Mashriq, such as Au bin Yaqdhan al-Sabti, Yousif bin Yahya al-Sabti, and Abu Jaafar bin Ali al-Qalil.

Also, the paper refers to the outstanding medical school, hospitals, scholars, and works that contributed to the development of medicine and pharmacology in the Maghreb.

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

Editors.

Part Four: *The Influence of Islamic Heritage on the Other Civilizations.*

CHAPTER TWO

(Selected paper — Not Presented)

1. ANDALUSIAN MEDICINE, THEORY AND PRACTICE.
   Dr. Abdullah Al-Omarani.

ANDALUSIAN MEDICINE: THEORY AND PRACTICE ☆

Dr. Abdallah Omrani

MOROCCO

ABSTRACT

The medicine, as a whole, is partly a fruit of revelation or inspiration and partly is a result of experience or practice. The Andalusian medicine is a mixture of the Copt chemistry, the remainders of the Greek and Roman culture.

After the conquest of Andalus, the physicians started to work in all the fields of science. They worked and wrote on the horoscope, the atmospheric influences and on alchemy. They suggested the best time for operations of phlebotomy and cupping and collection of medical herbs. They manufactured and sold, some medicaments and gold. They prepared liquids collyriums, syrups, ointments of a secret and a wonderful composition. They cured their patients by means of Necromancy.

When a new generation grew up, Andalusian medicine was liberated from every strange or ancestral influence. The physicians started to follow a new method of cure. For this purpose they used to examine and consider the patients', appetites, structures, characters, temperaments, and their ambients.

When the Umayyad Caliph Abd al-Rahman got the manuscript of Dioscurides "Materia Medica", he arranged for its good translation which proved and provided a good opportunity for Andalusian scientists to serve and enrich the fields of Botany, Pharmacology and Medicine. Some of them wrote very useful books about these subjects of study. The study of Botany as a science, the practice of Medicine as a profession, the application of scientific theories as an art, all that became a nationalized Andalusian works.

Later on, a pure Andalusian Islamic Medicine era started. The writings of Andalusian physicians dealt with Dietetics and Hygiene. They also wrote some treatises or books, handling of compound and uncompound medicaments, of healthy nutrition, nutritive elements, drinks, not by means of Empiric method but by virtue of Observation and Experience. There were some specialists for example Urayb ben Sa'id al-Katib in Obstetrics and Paediatrics and Abu Zakriyya Yahya b. Ishaq in venereal diseases.

Abul Qasim al-Zahrawi (d.1013) known to the Latins as Abulcasis, was in the Islamic Occident as the famous doctor Rhazes in the Orient. His greatest medical work "al-Tasrif" is composed of thirty sections, the last of which deals with Surgery. This book which contains illustrations of author's invented instruments, influenced other Arabic authors, and helped to lay the foundations of surgery in Europe.

Further, some celebrated physicians are worth to be mentioned in this paper e.g. Ibn Bayya (Avempace), Ibn Tufayl, Ibn Rushd (Averroes), Banu Zuhr (Avenzoar), Ibn Khatimah and al-Khatib.

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

Editors.