

الحضرة الاميرة العسماط

Islamic Culture and the Medical Arts

National Institutes of Health • National Library of Medicine

الطب علم يتعرف منه أحوال بدن الانسان
من جهة ما يصح ويزول عن الصحة
ليحفظ الصحة حاصلة و يستردّها زائلة

Medicine is a science from which one learns the states of the human body
with respect to what is healthy and what is not,
in order to preserve good health when it exists and restore it when it is lacking.

Ibn Sīnā, the opening of the *Qānūn fī al-tibb*



Islamic Culture and the Medical Arts

A Brochure to Accompany an Exhibition
In Celebration of the 900th Anniversary
of the Oldest Arabic Medical Manuscript
In the Collections of the National Library of Medicine

By Emilie Savage-Smith

University of Oxford

National Library of Medicine • Bethesda, Maryland

1994



Preface

On the 30th of November 1094 AD (or to be more precise, the 19th of the month Dhū al-Qa`dah in the year 487 of the Muslim era), a scribe in Baghdad completed a copy of an Arabic treatise by one of the most important medieval physicians and clinicians — Abū Bakr Muḥammad ibn Zakarīya' al-Rāzī, who worked in Baghdad in the previous century and was later known to Europe as Rhazes. This manuscript is the oldest volume in the National Library of Medicine (NLM) and the third oldest Arabic manuscript on any medical topic known to be preserved today.

The present exhibition is both a celebration of the 900th anniversary of this important manuscript and an opportunity to highlight the nature and achievements of the medical profession in Islamic culture from the 9th to the 19th century.

The core of the exhibition is a selection of 39 volumes from the Islamic manuscript holdings at NLM. The bulk of the Islamic medical manuscripts at NLM — that is to say, 129 of the volumes — were acquired in 1941 from Abraham S. Yahuda, a Biblical scholar and orientalist who had come to the U.S. as a refugee. Most of his large collection of Islamic manuscripts were acquired by Princeton University, but the Army Medical Library purchased the medical items by means of a bequest from William F. Edgar, a physician who in 1849 had taken a wagon-train over the Oregon Trail and settled in California. In the 50 years since the main group of manuscripts was purchased, an additional 22 manuscripts have been acquired from various sources. As a result, NLM now has 105 Arabic, 33 Persian, and 13 Turkish manuscripts, bring the total to 151 volumes. Many of these volumes,

however, contain a number of treatises, so that the collection actually comprises 351 individual medical treatises. A detailed catalog of the Arabic and Persian manuscripts is now available in an on-line computerized format.

The exhibition was supplemented with some printed books and Latin manuscripts from NLM, as well as artifacts on loan from the Walters Art Gallery in Baltimore and the Smithsonian Institution in Washington, D.C. Items were also borrowed from the private collections of Dr. Ahmad Younis and Mohamed Zakariya. Photographs of manuscripts from the Bodleian Library in Oxford and the Clendening Library at the University of Kansas Medical Center, Kansas City, were also displayed. The kind cooperation of these institutions is gratefully acknowledged.

In preparing the exhibition and the accompanying brochure, we have had the generous and enthusiastic assistance of many people. The calligrapher Mohamed Zakariya designed the poster announcing the exhibition, reproduced here on the cover. His inspiration for the design was the frontispages that are a distinctive feature of Bulaq printings of Arabic texts. In 1821 the Egyptian government established a printing press in Bulaq, a suburb of Cairo, and for the rest of the 19th century it was the most important Arabic press, responsible for modern printings of many classical Arabic medical texts. A video on Islamic calligraphy, with Mohamed Zakariya demonstrating some techniques, was available for viewing at the exhibition. To Dr. Ahmad Younis, now of Bethesda, Maryland, we owe a debt of gratitude for his tireless efforts on behalf of the project.

Without the generous support of the U.S.-Arab Chamber of Commerce, the

League of Arab States, and the Arab-American Physicians of the Washington Area, the present exhibition and brochure would not have been possible.

And last, but by no means least, I must express my thanks to Anne Whitaker of the History of Medicine Division, who had the unenviable task of taking my ideas and instructions, prepared a great distance away, and transforming them into the exhibition and brochure that you now see. While she bears no responsibility for whatever errors or omissions I have made, her uncomplaining and highly professional work is responsible for the exhibition and brochure coming to fruition.

It is hoped that through this effort more people will come to realize the important role in the history of medicine that Islamic medicine has played and will become aware of the artifacts of that important medical tradition that now reside in the collections at NLM.

A Note Regarding Dates: The Muslim calendar is a lunar one of 354 days beginning from the day of the Emigration (*Hijrah*) of the Prophet Muḥammad from Mecca to Medina, which occurred on the 16th of July 622 of the Christian calendar. Consequently, Muslim dates do not correspond directly to those of the Christian era (AD) commonly used today in Europe and the U.S. In the following essay, when specific dates are given, the first will be that of the Christian calendar and the second that of the Muslim era, designated by H (for *Hijriyah* referring to the Emigration of the Prophet). For example, the date 787 (171 H) refers to 787 AD, which is roughly equivalent to 171 of the Muslim calendar. General references to a century rather than a specific year refer to centuries of the Christian era. For example 9th century refers to the years 800-899 AD (or 184-287 of the Muslim era). The designation AC will be used only when there is need to distinguish a date from an earlier BC date.



Medieval Islamic Medicine

*With us ther was a Doctour of Phisyk
In al this world ne was ther noon him lyk
To speke of phisik and surgerye, . . .
Wel knew he the olde Esculapius,
And Deiscorides, and eek Rufus,
Old Ypocras, Haly, and Galien,
Serapion, Razis, and Avicen*

So Geoffrey Chaucer wrote in his prologue to the *Canterbury Tales*, naming the great physicians of the past that his 14th-century audience could be expected to recognize. In the list are four Greek figures: Asclepius, the focus of a Greek healing cult; Hippocrates, or 'Ypocras' as Chaucer called him, a 5th to 4th-century BC physician whose name is associated with a fundamental collection of medical writings; Rufus of Ephesus in Asia Minor, a physician of the 1st century AD who composed over 60 Greek medical treatises; Dioscorides, whose treatise on medicinal substances written about 77 AD formed the basis of pharmaceuticals for centuries; and, of course, Galen of the 2nd century, arguably the most influential figure in the history of medicine. The writings of all but the first of these Greek figures were known in the Arabic-speaking world and provided the early foundations of the medical art in the Islamic world.

Chaucer then goes on to name physicians from the medieval Islamic world: Ibn Sarābiyun or Serapion as he was known to Europe, a Syriac physician of the 9th century; 'Razis' the great clinician of the early 10th century; and 'Avicen', or Avicenna as other Europeans called him, referring to Ibn Sina whose early 11th-century medical encyclopedia was as important in Europe as it was in the Middle East. Just as early Greek medical teaching

served as a common intellectual framework for professional medical practice in the Islamic Near East, so Arabic medical literature of the 9th to 12th centuries, through Latin translations, provided late medieval Europe with ideas and practices from which early modern medicine eventually arose.

The earlier Greek medical teachings were welcomed and valued by an emerging Islamic empire which needed to find ways of dealing with medical problems common to all peoples: disease, pain, injuries, and successful childbearing. This heritage of medical theory and practice, mingled with some Persian, Indian, and Arab elements, was assimilated and elaborated by a community of both Muslim and non-Muslim physicians speaking many languages — Arabic, Persian, Syriac, Hebrew, and Turkish, though Arabic became the *lingua franca* and Islam the dominant faith.

From Spain and North Africa through the central lands of Egypt, Syria and Iraq, to Iran and India in the East, and over a period of roughly twelve centuries (from the middle of the 8th to the present century), Islamic medicine has shown great variation and diversity. As cosmopolitan Islamic culture developed, shared traditions spanned vast areas and crossed many centuries. Yet wound round the common threads were innumerable other factors and local conditions that produced considerable diversity. Communications over such a vast area during the course of several centuries were, as would be expected, neither uniform nor very swift, and the dispersion of ideas and texts from one region to another was uneven. The institutions and policies responsible for dispensing medical care were subject to political and social fluctuations. The general health of the Islamic community was influenced by many factors: the dietary and fasting laws and the general

rules for hygiene and burial of the different religious communities of Muslims, Jews, Christians, Zoroastrians, and others; the climatic conditions of the desert, marsh, mountain and littoral communities; the different living conditions of nomadic, rural, and urban populations; local economic factors and agricultural successes or failures; population migration as well as travel undertaken for commerce, for attendance at courts, or as a pilgrimage; the injuries and diseases attendant upon army camps and battles; and the incidence of plague and other epidemics as well as the occur-



Woman, with attendant, reviving an elderly man. Ink drawing, highlighted with gilt and watercolors, signed by an artist Shaykh Muḥammad. One of several illustrations accompanying anonymous poetry following a Persian text on sexual hygiene. Undated. Possibly 18th century India, possibly Kashmir.



rence of endemic conditions such as trachoma and other eye diseases.

Medical care is, in addition, always multifaceted, with the needs of the society being served by various local traditional practices as well as the formal learned medicine. The sophisticated learned Islamic medical texts that are the focus of this exhibition represent only one facet of the actual medical care of the society. The medical practice of the society varied, not only according to time and place, but at the various strata comprising the society. The economic and social level of the patient determined to a large extent the type of care sought, and the expectations of the patients varied as did the approaches of the medical practitioners.

The medical care in the medieval Islamic lands involved a rich mixture of religions and cultures to be seen in both the physicians and the patients — a coexistence and blending of traditions probably unrivaled in contemporaneous societies. The medical profession in general transcended the barriers of religion, language, and country.

Greek Influences

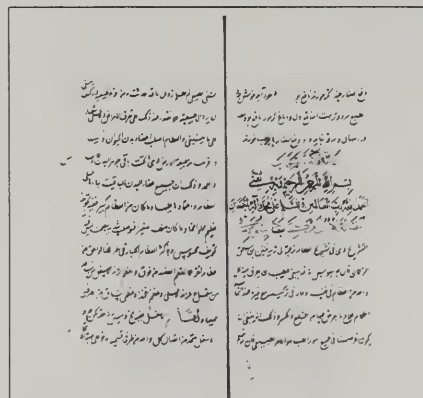
The medical theories inherited particularly from the Greek world supplied a thread of continuity to professional learned medical practice throughout the medieval Islamic lands. The caliphs al-Manṣūr, Ḥārūn al-Rashīd (of the *Thousand and One Nights* fame), and al-Ma'mūn are noted for their patronage of learning and medicine. When suffering from a stomach complaint, al-Manṣūr, who ruled from 734 to 775 (158-169 H) called a Christian Syriac-speaking physician Jurjīs ibn Jibrā'īl ibn Bakhtīshū' to Baghdad from Gondeshāpūr in southwest Iran. His son was also called to Baghdad in 787 (171

H), where he remained until his death in 801, serving as physician to the caliph Ḥārūn al-Rashīd. The third generation of this family, Jibrā'īl ibn Bakhtīshū', was physician to Ḥārūn al-Rashīd and to the two succeeding caliphs in Baghdad. For eight generations, well into the second half of the 11th century, twelve members of the Bakhtīshū' family were to serve the caliphs as physicians and advisors, to sponsor the translation of texts, and to compose their own original treatises. A remarkable, if not unique, record in the history of medicine.

Early in the 9th century, there was established in Baghdad a foundation called the House of Wisdom (*Bayt al-Ḥikmah*), which had its own library. Its purpose was to promote the translation of scientific texts. The most famous of the translators was Ḥunayn ibn Ishāq al-'Ibādī, a Syriac-speaking Christian orig-

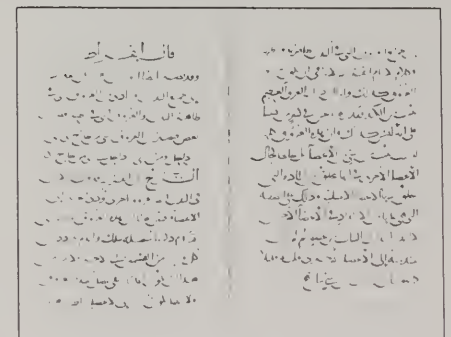
inally from southern Iraq who also knew Greek and Arabic. He was the author of many medical tracts and a physician to the caliph al-Mutawakkil (ruled 847-861/232-247 H), but he is most often remembered as a translator, an activity he began at the age of seventeen. He produced a truly prodigious amount of work before his death in about 873 (260 H), for he translated nearly all the Greek medical books known at that time, half of the Aristotelian writings as well as commentaries, various mathematical treatises, and even the *Septuagint*. Ten years before his death he stated that of Galen's works alone, he had made 95 Syriac and 34 Arabic versions. Accuracy and sensitivity were hallmarks of his translating style, and he was no doubt responsible, more than any other person, for the establishment of the classical Arabic scientific and medical vocabulary. Through these translations a continuity of ideas was maintained between Roman and Byzantine practices and Islamic medicine.

A number of Hippocratic treatises circulated in Arabic translations made at this time, as well as the writings of more



A very rare copy of Ḥunayn ibn Ishāq's Arabic translation of Galen's introductory treatise on the skeletal system, *On Bones for Beginners*, known in Latin as *De ossibus ad tirones*.

NLM MS P26, opening at fols. 62b-63a, the beginning of the treatise



A commentary on the Hippocratic treatise *On the Nature of Man* by Ibn al-Nafīs (d. 1288/687 H). The copy was completed on 1 November 1269 (4 Rabī' I 668 H) by his pupil who worked from Ibn al-Nafīs's autograph copy.

NLM MS A69, fols. 47b-48a. No other copy recorded.

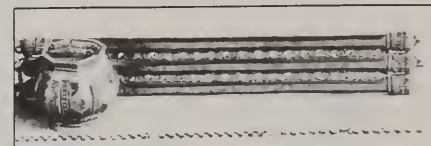


than a dozen other Greek physicians and some Syriac, Persian, and Indian medical writers. Knowledge of medicinal substances was based initially upon the illustrated treatise on materia medica written in Greek by Dioscorides in the 1st century. Several Arabic translations and revisions of his treatise were undertaken in 9th-century Baghdad and in 10th-century Spain and later.

No single figure was of greater influence upon medieval Islamic medicine than Galen. In his writings Galen displayed a firm belief in a spiritual Providence and in the foresight and design of the Creator as exemplified in the human form — ideas acceptable to Muslim physicians. The combination of philosophy and medicine, which is so evident in the writings of Galen, continued to be a part of medieval Islamic medical literature.

The Book as a Means of Communication and a Forum for Artistic Design

It was through the written word that formal medical knowledge was transmitted from one generation of physicians to another and from one region to another. The arts of the handwritten book — calligraphy, illumination, illustration and binding — were and are highly developed in Islamic culture. While European medieval handwritten books were prepared on vellum or parchment made from animal skin, in the Islamic world nearly all manuscripts were written on paper, which was in plentiful supply in the Middle East by the 9th century. Printing, on the other hand, came relatively recently to the Middle East (essentially not until the 19th century), so that the careful copying by hand of treatises continued to be a living and important tradition through the 19th century. Only by hiring a scribe



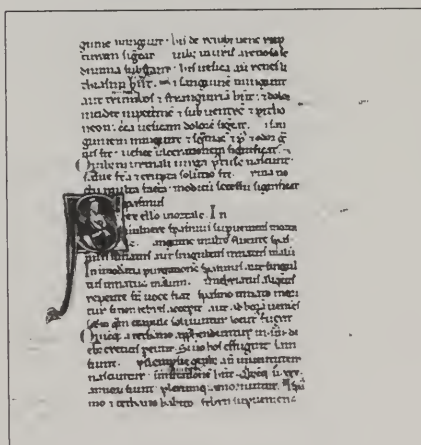
A portable pen and ink box of silver, engraved, gilded and nielloed. Three pen containers, each with a stopper-top held by a chain, are attached to the ink pot. Turkey, 18th-century.

Walters Art Gallery, Baltimore.
Inv. no. 57.627.

to prepare a copy by hand, or copying it himself, could a physician possess his own copy of a book.

The fluid Arabic alphabet, which reads from right to left, lent itself to numerous decorative forms and abstract patterns, some of which were developed particularly for transcribing copies of the *Qur'an*, the holy text of Islam revered by Muslims as both the written form of revelation and the actual word of God. The Arabic script was also adopted for other languages, including Persian and Turkish, and calligraphers using these languages developed distinctive decorative scripts and styles of illumination.

The calligraphic skills of the scribe or specialist illuminator were applied to presentation copies of treatises on every subject, including scientific and medical books. In contrast to the illuminated initials used in Western manuscripts which draw the attention to one focal point on the page, in Islamic manuscripts the entire text itself is part of the design. A treatise frequently opened with a broad decorative panel heading, often enclosing the *bismillah* ("In the name of God, the Merciful and Compassionate") or the title of the treatise. Occasionally the entire first page or double opening will be surrounded by a broad decorative frame with lines of text written in cloud bands. Gilt as well as inks and opaque watercolors were employed in these illu-



The Aphorisms of Hippocrates in the Latin translation made by Constantinus Africanus (d. 1087) of the Arabic version prepared in the 9th century by Hunayn ibn Ishāq. This manuscript copy was produced in Oxford in the middle of the 13th century.

NLM Latin MS 78, fols. 24v-25r

to receive the attention of illustrators.
Prophetic Medicine

A genre of medical writing intended as an alternative to the exclusively Greek-based medical systems derivative from Galen was that called *al-ṭibb al-nabawī*, Prophetic Medicine. The authors were clerics, rather than physicians, advocating the traditional medical practices of the Prophet Muḥammad's day and those mentioned in the *Qur'an* over the medical ideas assimilated from Hellenistic society, thereby producing a guide to medical therapy acceptable to the religiously orthodox. Therapy consisted of diet and simple drugs (especially honey), bloodletting, and cautery, but no surgery. Other topics included fevers, leprosy, plague, poisonous bites, protection from night-flying insects, protection against the evil eye, rules for coitus, theories of embryology, proper



Portrait of a scribe at work, artist unknown. Perhaps intended as a portrait of Sayyid Ḥusayn Yazdī, the scribe of the treatise on wonders of the world comprising the volume. It was painted in Iran sometime before 1546 (953 H), when a large owner's stamp was placed below the painting.

NLM MS P29, fol. 173a

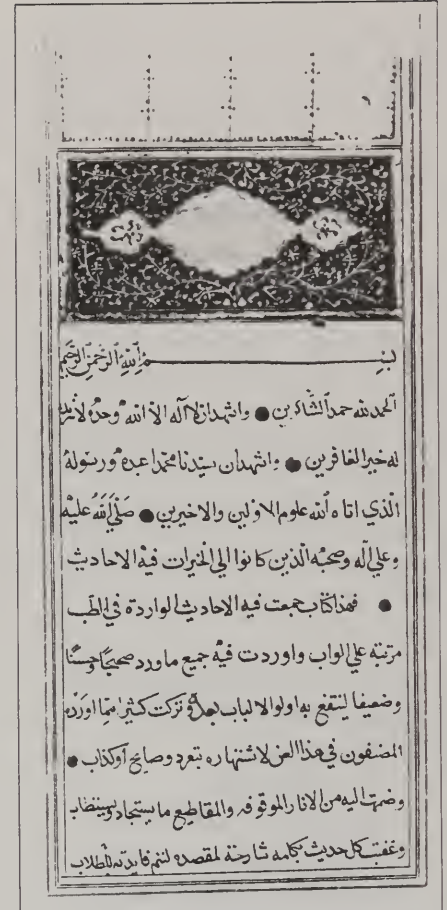
minations.

Figural imagery does not normally appear in a religious context, but there was a vigorous tradition of figural representation in other contexts, particularly that of science and medicine. Many of the Arabic versions of Dioscorides preserved today are testimony to a continuing and flourishing tradition of scientific illustration. Several profusely illustrated copies were produced, for example, in Baghdad in the 13th century, one of which is notable for its scenes of people gathering and preparing medicaments. Human anatomy was also a topic

في العلاج السن والعادة والفعل والصاعده ولايجوز ان
 يحس لمر ولاس بعد رب البطن ولاطفا صغير ولاصا
 كدوتعب ولاسرحامر ولاصعب الفوه ولاصعد
 جيل ولاسعين جذا ولاسود ولاس به ترحد في الساعه
 ولا في سده الخ والبره ولاس بعد الدوا ودد بعد مر
 صداد لا سعي ان يسعل الدوا الابد السع لتار الحمار
 فتل الدوا بعين عليه والنور على الدوا الضعيف بفضه
 وضعفه وعلى القوي نموي فعله وبمسح لاكل على الدوا
 ومن عان الدوا الطبع نمله الطرحون او وري العباب
 ولينم البصل واذا خاف الفل في شدا طرا ده سدا نوما
 ولينم اريمان المزدر الرباس وانفاج ومن وحده بعضا
 بلنجع ماء حار او يمتي حطوات وعند طع الدوا
 بلنجع ماء حار كثيرا ونفيا وبعد الفل فينا حدر بر
 فظون اشرب التفاح وبعد ساعه فليس اول الا براف
 الساجده ولا تمنع من سحلت في يوم واحد ونصد
 العقال للدماغ والباسلس للصدر والاخل سترك
 والاسلم الامن لاوحاع الحمز الكد والاسرد حاء

A treatise on Prophetic Medicine by al-Dhahabī, who died in 1348 (748 H). A Syro-Egyptian copy completed on 19 August 1464 (14 Dhū al-Hijjah 868 H).

NLM MS A79, fol. 17b



An illuminated presentation copy of the treatise on Prophetic Medicine by Jalāl al-Dīn al-Suyūṭī (d. 1505/911 H). Illuminated opening in gilt and opaque watercolors, with text framed in gold and ink lines and important words highlighted in blue.

Timurid, late 15th or early 16th century.

NLM MS A41, fol. 1b

conduct of physicians, and treatment of minor illnesses such as headaches, nose-bleed, cough and colic. It was prohibited to drink wine or use soporific drugs as medicaments. The treatises also provided numerous prayers and pious invocations to be used by the devout patient, with the occasional amulet and talisman, and they were particularly popular in the 13th to 15th centuries, with some still available today in modern printings.

In contrast to many writers on the topic, the historian and theologian al-Dhahabī, who died in 1348 (748 H), attempted greater reconciliation of the traditional medicine of Arabia and the revelations of the Prophet Muḥammad with the ideas and terminology from the Greek-based system, and he frequently cited Hippocrates and Galen as well as medieval Islamic physicians. On the other hand, the popular treatise by the religious scholar Jalāl al-Dīn al-Suyūṭī, who died in 1505 (911 H), was based almost exclusively upon what was known of the practices current in the days of the Prophet, derived from the *Qurʾān*, the reports about the Prophet (called *ḥadīth*), and the practices of the early Muslim community.

Although a considerable number of Prophetic Medicine treatises were written, we do not have the name of any medical practitioner known for practicing this type of medicine. The reason for this, of course, may well be that our written sources are for the most part skewed toward the Greek-based system and omit details of other practices.

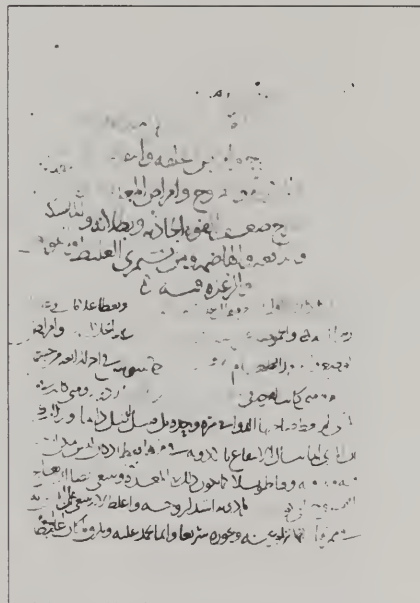
The treatises on Prophetic Medicine appear to have been addressed to the same audience as the Islamic plague tracts. Both types of writings were especially popular in the 13th and 14th centuries and later. The plague tracts have as their primary focus the collection and interpreting of various traditions (*ḥadīths*) which were considered relevant to the concept of infection and dealt with the proper social reaction to contagion. They also attempted some medical explanations and remedies for plague and sometimes a history of plagues up to the time of composition. They, like the treatises on Prophetic Medicine, were written for the most part by religious scholars, although a few were composed by writers trained both as physicians and theologians.

Al-Rāzī, the Clinician

One of the greatest names in medieval medicine is that of Abū Bakr Muḥammad ibn Zakarīyāʾ al-Rāzī, who was born in the Iranian City of Rayy in 865 (251 H) and died in the same town about 925 (312 H). A physician learned in philosophy as well as music and alchemy, he served at the Sāmānid court in Central Asia and headed hospitals in Rayy and Baghdad. A story is related that he was instrumental in determining the location in Baghdad of the hospital founded by ʿAḍud al-Dawlah, for he is said to have chosen its position by hanging pieces of meat in various quarters of the city and finding the quarter in which

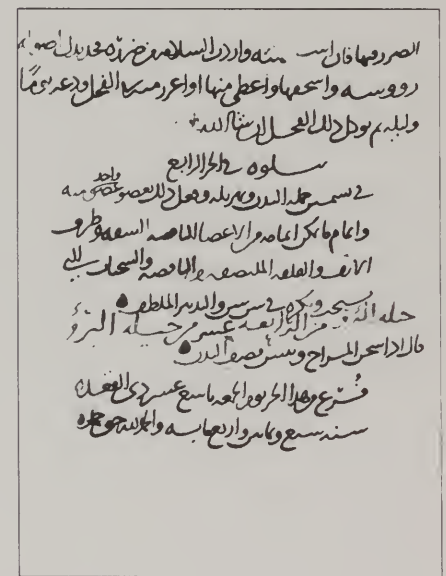
the putrefaction of the meat was the slowest. Since, however, the ʿAḍudī hospital was founded in 980 (370 H), more than 50 years after al-Rāzī died, it must be an earlier hospital, probably the one founded during the reign of al-Muʿtaḍid (ruled 892-902/279-289 H), which he helped locate and of which he was later director.

The most sought after of all his compositions was *The Comprehensive Book on Medicine* (*Kitāb al-Ḥawī fī al-ṭibb*) — a large private notebook or commonplace book into which he placed extracts from earlier authors regarding diseases and therapy and also recorded clinical cases of his own experience. The material comprising the *Ḥawī* is arranged under headings of different diseases, with separate sections on pharmacologi-



The section on gastrointestinal diseases from *The Comprehensive Book on Medicine* (*Kitāb al-Ḥawī fī al-ṭibb*) composed in Arabic by Abū Bakr Muḥammad ibn Zakarīyāʾ al-Rāzī (d. ca 925/312 H). Copy finished on 30 November 1094 (19 Dhū al-Qaʿdah 487 H) by an unnamed scribe probably working in Baghdad.

NLM MS A17, p. 1, showing the beginning of the section



The final page of the copy of the *Ḥawī* by al-Rāzī, with the colophon in which the unnamed scribe gives the date he completed the copy as Friday, the 19th of Dhū al-Qaʿdah in the year 487 (= 30 November 1094). It is the oldest volume in NLM and the third oldest Arabic medical manuscript known to be preserved today.

NLM MS A17, p. 463.



cal topics. The National Library of Medicine is fortunate in having the oldest recorded copy of this treatise, or rather part of the treatise, for the manuscript contains only the section on gastrointestinal complaints. The unnamed scribe completed the copy on the 19th of the month Dhū al-Qa`dah in the year 487 of the Muslim era, which is equivalent to 30 November 1094.

Following al-Rāzī's death, Ibn al-`Amīd, a statesman and scholar appointed vizier to the Persian ruler Rukn al-Dawlah in 939 (327 H), happened to be in the town of Rayy and purchased from al-Rāzī's sister the notes comprising the *Hawī*, or *Comprehensive Book*. He then arranged for the pupils of al-Rāzī to put the notes in order and make them available. The *Hawī* is an extremely important source for our knowledge of Greek, Indian, and early Arabic writings now lost, for al-Rāzī was meticulous about crediting his sources. Moreover, the clinical cases, while not unique, are the most numerous and varied in the Islamic medieval medical literature.

Europe knew al-Rāzī by the Latinized form of his name, Rhazes. His *Comprehensive Book on Medicine*, the *Hawī*, was translated into Latin in 1279 under the title *Continens* by Faraj ben Salim, a physician of Sicilian-Jewish origin employed by Charles of Anjou to translate medical works. Even more influential in Europe was al-Rāzī's *Book of Medicine Dedicated to Manṣūr*, a short general textbook on medicine in ten chapters which he had dedicated in 903 (290 H) to the Sāmānid prince Abū Salih al-Manṣūr ibn Iṣḥāq, governor of Rayy. The treatise was translated into Latin in Toledo by Gerard of Cremona (d. 1187) and was known as *Liber ad Almansoris*. It became one of the most widely read medieval medical manuals in Europe, and the ninth chapter, on therapeutics, frequently circulated by

itself under the title *Liber nonus ad Almansorem*. In the Renaissance many editions of it were printed with commentaries by the prominent physicians of the day, such as Andreas Vesalius.

A third treatise by al-Rāzī that was also influential in Europe was his book on smallpox and measles (*Kitāb fī al-jadari wa-al-ḥaṣbah*). His was not the earliest monograph on the subject — that honor goes to Thābit ibn Qurrah, a 9th-century Sabian Syriac-speaking translator and scholar working in Baghdad who became one of the great names in the history of Islamic science, especially in mathematics and astronomy. Al-Rāzī's treatise on smallpox and measles was, however, the more influential and was twice translated into Latin in the 18th century at a time when there was much interest in inoculation or variolation around 1720 following the description of the procedure in Turkey by Lady Mary Wortley Montagu, wife of the Ambassador Extraordinary to the Turkish Court in Istanbul.

Among al-Rāzī's smaller medical tracts were treatises on colic, on stones in the kidney and bladder, on curing diseases in one hour (such as headache, toothache, haemorrhoids, and dysentery in small children), on diseases of children, on diabetes, on food for the sick, on maladies of the joints, on medicine for one who is unattended by a physician, on medical aphorisms, and on the fact that some mild diseases are more difficult to diagnose and treat than the serious ones. He also composed a book on the reason why the heads of people swell at the time of the roses and produce catarrh, in which he was apparently the first to relate hay fever to the scent of roses.

Throughout his writings, al-Rāzī displayed a primary interest in therapeutics, lacking the concern of later writers for refining the classification of symp-

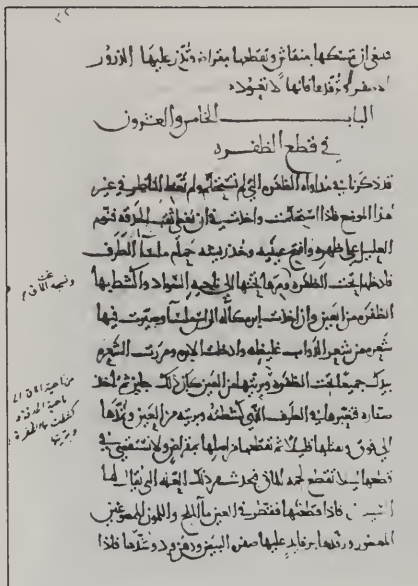
toms. He was not in such awe of Galen that he refrained from correcting him, but his criticism was in the areas of logic and clinical applications. For example, he said that in his experience in hospitals in Baghdad and Rayy he had seen as many cases whose courses did not follow Galen's description of fevers as did. He also stated in regard to a certain urinary ailment that, while Galen had seen only three cases, he had seen hundreds and consequently knew more about it. While al-Rāzī was critical of specific points, one can only conclude that he considered the medical theory adequate for his purposes, for he displayed no interest in altering its theoretical foundations.

The Great Systematizers

Although the *Hawī* by al-Rāzī is an extraordinary collection of medical observations and extracts, it was not without its critics. `Ali ibn al-`Abbas al-Majūsī (d. 994/384 h) was born into a Zoroastrian family from the Iranian city of Ahwāz about the time of al-Rāzī's death. Al-Majūsī practiced medicine in Baghdad and served as physician to the ruler `Aduḍ al-Dawlah, founder of the `Aḍudī hospital in Baghdad. It was to him that al-Majūsī dedicated his only treatise, *The Complete Book of the Medical Art* (*Kitāb Kāmil al-ṣinā'ah al-tibbiyah*), also called *The Royal Book* (*al-Kitāb al-Malaki*). It is one of the most comprehensive and well-organized compendia in early medical literature. In Europe the treatise was known as *Liber regius* or *Pantegni* and the author as Haly Abbas.

Al-Majūsī began his influential Arabic encyclopedia with a critical survey of his sources, which included Hippocrates and Galen as well as al-Rāzī. While commending al-Rāzī's medical epitome dedicated to Manṣūr, al-Majūsī criticized the *Comprehensive Book on Medicine*, the *Hawī*, for being too long (the modern printed version is incomplete at 23 volumes) and not well organized, since it had been intended as an aide-mémoire and general medical record for al-Rāzī's own private use. Al-Majūsī stated that the *Hawī* was so enormous that few could afford copies of it, and that in fact he knew of only two people who owned a copy, "both of whom were people of culture, learning, and wealth."

Al-Majūsī then proceeded himself to produce a model of organization and systematization. He divided his encyclopedia into two large books, one on theoretical principles and the other on



The Complete Book of the Medical Art (*Kitāb al-ṣinā'ah al-tibbiyah*) by `Ali ibn al-`Abbas al-Majūsī (d. 994/384 H). The copy was finished on 15 May 1208 (7 Dhū al-Qa'dah 604 H) by the Christian scribe Tawmā ibn Yūsuf ibn Sarkis al-Masīhī, who copied it for Maḥmūd ibn Zākī al-Ruqīy al-Shihābī. Shortly afterward it became the property of `Atīyah a Jewish physician of Damascus.

NLM MS A26.1, fol. 33a, open to the chapter on the eye condition pterygium (zafarah).

practical aspects. Each book had 10 chapters, with divisions and subdivisions under these, typical of the elaborate organizational format of medieval Arabic writings. The chapters of the first book cover the following topics: (1) historical sources and the general principles of elements and humors; (2) anatomy of the homogeneous parts (bones, bloodvessels, cartilage, membranes, hair, etc.); (3) anatomy of the heterogeneous parts (brain, eyes, nose, lungs, heart, kidney, etc.); (4) the three faculties (natural, animal, and psychical), causes of death, and sense perception; (5) the six 'non-naturals', being air and

winds, movement and rest, eating and drinking, sleeping and waking, evacuation and retention (including bathing and coitus), and emotions; (6) classification and causes of diseases; (7) symptoms of diseases and diagnosis from pulse, urine, fevers, sputum, saliva, and perspiration; (8) visible external diseases, including fevers, tumors, superficial conditions (smallpox, leprosy, scabies, lice, etc.), wounds and lesions, animal and insect bites and stings, and poisons; (9) causes and symptoms of internal afflictions (headache, epilepsy, eye diseases, digestive disorders, etc.); (10) warning signs of the onset of diseases, of severe and lengthy illness, of death, or recovery, and of the crisis of a disease.

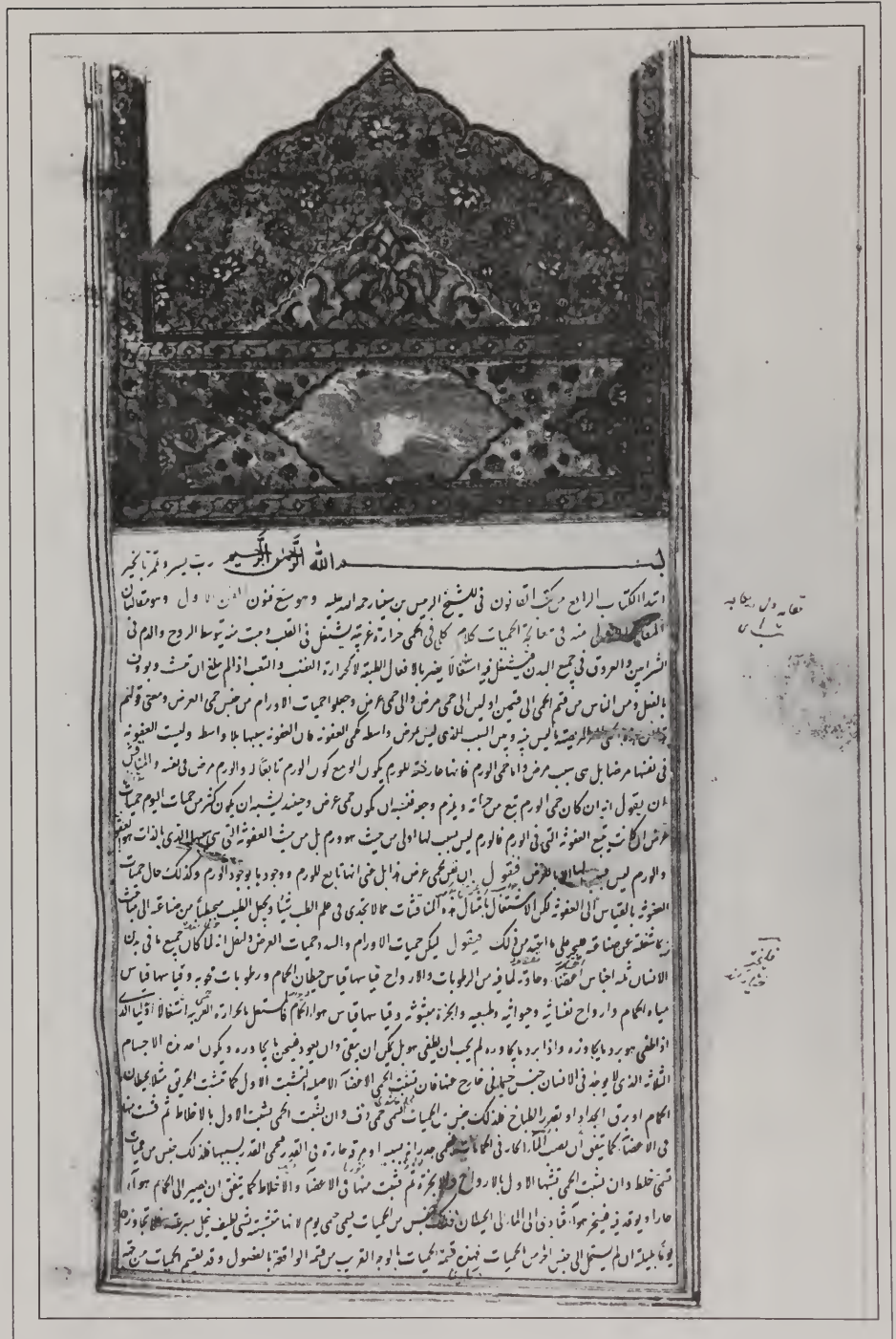
The second book had 10 chapters on the following topics: (1) the general principles of hygiene, dietetics, cosmetics, and therapy; (2) therapy with simple drugs; (3) the treatment of fevers and swellings; (4) treatment of skin diseases and burns, bites, and poisons; (5) therapy for diseases of the head, eyes, ears, nose, and mouth; (6) therapy for diseases of the respiratory organs; (7) therapy for diseases of the digestive organs; (8) therapy for diseases of the genitalia and reproductive organs; (9) surgery, including bloodletting, cauterization, the setting of fractures and dislocations, and surgery of the parts of the body in order from top to bottom; and (10) recipes for compound medicaments.

A contemporary of al-Majūsī, but working independently in the far western Islamic lands, was Abū al-Qāsim Khalaf ibn al-`Abbās al-Zahrāwī, latinized as Albucasis, who worked in Córdoba sometime during the reign of the Spanish Umayyad ruler `Abd al-Rahmān III al-Nāṣir from 912 to 961 (300-350 H). Al-Zahrāwī also composed a major synthesis of medical knowledge available in his day, *Kitāb al-*

Taṣrīf li-man `ajiza `an al-ta'lif, a title rather difficult to translate but meaning the arrangement of medical knowledge for one who is not able to compile a book for himself. Of the 30 books making up the *Taṣrīf*, the first was concerned with general principles (elements, humors, temperaments, anatomy), while the second, much larger than any of the other books, was concerned with symptoms and treatments of 325 diseases discussed in sequence from head to foot. Except for the last book, all the rest are rather short and are concerned with some aspect of pharmacology or diet. The final book was devoted to surgery and was very influential, often circulating by itself apart from the rest of the encyclopedia.

Of all Islamic physicians, the best known name is that of Abū `Alī al-Ḥusayn ibn `Abd Allāh ibn Sīnā, known to Europe as Avicenna. He was born in 980 (370 H) in Central Asia and traveled widely in the eastern Islamic lands, composing nearly 270 different treatises. When he died in 1037 (428 H) he was known as one of the greatest philosophers in Islam, and in medicine was so highly regarded that he was compared to Galen.

Ibn Sīnā's magnum opus by which he was known East and West is the *Kitāb al-Qānūn fī al-ṭibb* or *Canon of Medicine*. It was composed over a lengthy period of time as he moved westward from Gurgān, in northern Iran, where it was begun, to Rayy and then to Hamadān even further southwest, where he completed it. The large comprehensive Arabic encyclopedia rivaled the popularity of al-Majūsī's compendium and in many quarters surpassed it. He divided his treatise into 5 books, the first concerned with general medical principles, the second with materia medica, the third with diseases occurring in a particular part of the body, the fourth on



The Canon of Medicine (*Kitāb al-Qānūn fī al-ṭibb*) by Ibn Sīnā (d. 1037/428 H). A rare complete copy made in Iran probably at the beginning of the 15th century. NLM MS A53, fol. 368b, the illuminated opening of the 4th book

diseases not specific to one bodily part (such as fevers), with the final book containing a formulary giving recipes for compound remedies. *The Canon* was known to Europeans through the Latin translations of Gerard of Cremona and Andrea Alpago and remained in use in medical schools at Louvain and Montpellier until the 17th century. Complete manuscript copies, in either the Arabic original or in Latin, are exceedingly rare, no doubt due to the enormous length of the entire work. The National Library of Medicine is fortunate to have a carefully executed complete copy probably made at the beginning of the 15th century, with illuminated headings opening each of the 5 books.

Ibn Sīnā in general excelled in logical assessment of a condition and the comparison of symptoms. A conservative but balanced approach to general therapeutics can be seen in his discussion of the means of relieving pain. Analgesics (*mukhaddirāt*) abate the pain, he says, because they destroy the sensation of that part, which they accomplish either through hypercooling or by means of a toxic property. Of the analgesics, the most powerful he considered to be opium, and then mandrake, two varieties of poppy, henbane, hemlock, the soporific black nightshade, and lettuce seeds; he also included cold water and ice among the analgesics. The physician must be careful to determine the cause of the pain and to make certain that it is not due merely to an external cause, such as heat or cold, or an incorrect arrangement of the pillow, or a poor bed, or a fall during drunkenness. Often, he says, there is no need for strong measures, for bathing and sound sleep are sufficient. He recognized the importance of sleep for alleviating pain and stressed that, as analgesics might be harmful, they should be prepared in the

mildest possible way. The physician needs to determine which is more harmful to the patient, the pain or the possible dangers of the analgesia.

Ibn Sīnā was also concerned with other means of relieving pain, such as massage, the application of hot compresses, the use of a hot-water bottle, pleasurable music, or compelling work. What is equally interesting is what is not stated by Ibn Sīnā: There is no mention of the use of wine, though wine is used for other purposes elsewhere in the *Canon*, nor is there any mention of the use of analgesics or soporifics during an operation.

Among Ibn Sīnā's smaller medical writings were a popular didactic poem on medicine, a treatise on cardiac drugs concerned with the physiology and pathology of the heart and how they are influenced by emotions and with the simple remedies for regulating heart beat, treatises on diagnosis from respiration and pulse, on colic, on intermittent fevers, on diabetes, and on hygiene and regimen.

The Canon of Medicine by Ibn Sīnā was not, however, greeted everywhere with praise. In Spain the physician Ibn Zuhr (d. 1131 (525 H), father of the more eminent Ibn Zuhr known in Latin as Avenzoar, wrote a treatise criticizing parts of Ibn Sīnā's book on materia medica, that is, the second book of the *Canon*. When a merchant from Iraq brought Ibn Zuhr a copy, he examined it but then rejected it and would not put it in his library, but rather cut off its margins and used them to write prescriptions for his patients. Our source of information on Ibn Zuhr's opinion of Ibn Sīnā is Hibat Allāh ibn Jumay` al-Isrā'īlī, who was physician to Saladin in Egypt (ruled 1169-1193/564-589 H). From this account it seems that it was about a century before the *Canon* became available in Córdoba after it was

completed in Hamadān. Since this Ibn Zuhr was the first of a five-generation family of prominent Andalusian physicians, the question arises whether Islamic medicine in Spain followed the direction of this patriarch of medical families and developed with less dependence upon the ideas of Ibn Sīnā.

Comprehensive attempts at collecting and systematizing (as well as updating with personal observation) the fragmentary and unorganized Greco-Roman medical literature that had been translated



Ibn al-Nafis's 13th-century treatise *The Concise Book (Kitāb Mujīz)* which epitomized the *Canon* of Ibn Sīnā. The undated copy, written in a fine professional hand with an illuminated heading and opening text in cloud bands, was probably produced in Iran or India in the 17th to 18th century.

NLM MS A44.1, fol. 1b

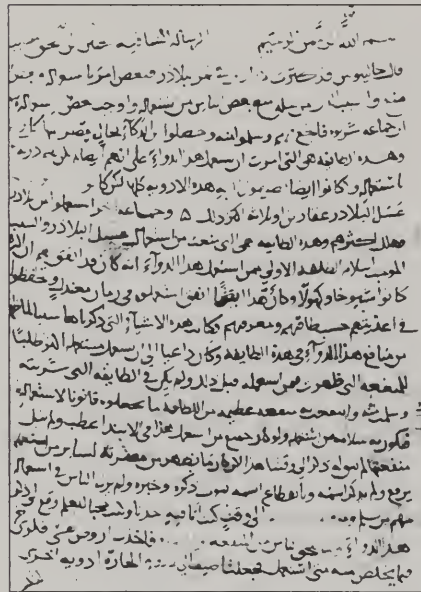


ed into Arabic were enormously successful in producing a coherent and orderly medical system. The medicine of the day was so brilliantly clarified by these compendia (especially those by al-Majusi and Ibn Sina), and such order and consistency was brought to it, that a sense of perfection and hence stultifying authority resulted. The sheer size of these encyclopedias tended to emphasize their authoritative nature. In the case of Ibn Sina, even the title *Qanun*, meaning 'canon' or 'codes of law', contributed to this view.

By the 12th century an awareness set in that these compendia were too large to be really useful for ready reference. Consequently, epitomes of the *Qanun* were produced to make the ideas more quickly accessible, and commentaries were written to clarify the contents. The most popular of all the epitomes of the *Qanun* was that called *Kitab al-Mujiz* or *The Concise Book*. It was written in Syria by Ibn al-Nafis (d. 1288/687 H), known to his contemporaries as 'Ala' al-Din 'Alī ibn al-Hazm al-Qurashī. He was an authority on religious law as well as a prolific writer of medical tracts and a specialist in treating eye diseases. This epitome by Ibn al-Nafis in turn generated many commentaries that expanded on particular points.

Specialized Literature

Large numbers of treatises were devoted to the diagnosis and treatment of a specific disease or to diseases affecting a particular part of the body. Ishāq ibn Hunayn, the son of the famous translator in Baghdad, composed an



The Salutory Treatise on Drugs for Forgetfulness (Risālah al-Shāfiyah fī adwiyat al-nisyān) written in the 9th century by Ishāq ibn Hunayn. The copy is undated, but its script, paper and ink suggest that it was copied at the end of the 14th century. NLM MS A3(part 2), fol. 1b

Arabic tract *The Salutory Treatise on Drugs for Forgetfulness (Risālah al-Shāfiyah fī adwiyat al-nisyān)*. Ishāq, who died in 910 (298 H), was a physician as his father had been, and he composed several medical tracts, though few are preserved today. The National Library of Medicine has one of two recorded copies of this particular treatise, and the present location of the second copy is unknown.

Ibn al-Kattānī, who was in the service of a Spanish vizier in 1002 (393 H), wrote an Arabic treatise *The Treatment of Dangerous Diseases Appearing Superficially on the Body (Mu'ālat al-amraḍ al-khaṭīrah al-bādiyah 'alā al-badan min khārij)*. It was cited by later writers but thought to be now lost until a copy of it was discovered among the manuscripts now at the National Library of Medicine. Poisonous bites are the subject of much of the treatise.

A quite popular short treatise was the Arabic essay on haemorrhoids by the well-known Jewish physician and philosopher Abū 'Imrān Musā ibn 'Ubayd Allāh ibn Maimūn al-Qurṭubī, known in Latin as Maimonides. He was

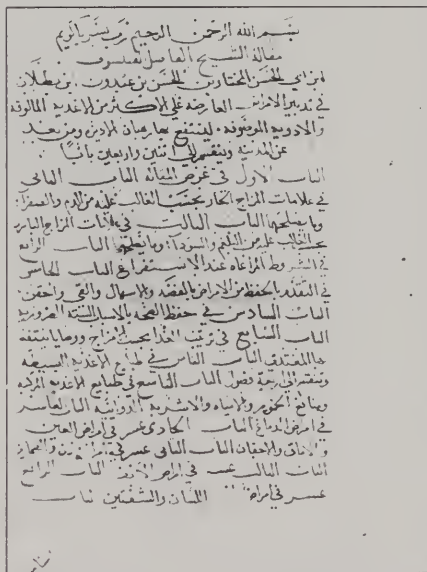


A short Arabic treatise of 4 folios on haemorrhoids (*Fī al-bawāsir*) by Maimonides (d. 1204/601 H). The copy, in a Maghrib (North African) script, was made in 1826 (1241 H) by a scribe named Maḥmūd ibn Muḥammad al-Ībī al-Hanāfī. NLM MS A90, fols. 1b-2a at the beginning of the treatise

born and educated in Córdoba and was later in the service of Saladin, the Ayyūbid ruler of Egypt at the time of the Crusades. Saladin was said to have not less than 18 physicians in his service, 8 of whom were Muslim, 5 Jewish, 4 Christian, and 1 Samaritan. Maimonides, who died in 1204 (601 H),

composed several medical writings, all in Arabic but sometimes written in Hebrew characters.

Numerous other examples can be given of treatises devoted to specific ailments or groups of diseases. Particular classes of potential patients were also the subject of a number of treatises. *Medicine for the Poor and the Destitute* (*Tibb al-fuqara' wa-al-masākin*) was a manual of inexpensive and easily available remedies written in Arabic by Ibn al-Jazzār, who died in 980 (370 H). He was from a family of Tunisian physicians and a very devout Muslim, leading an austere life even though quite wealthy, making a religious pilgrimage every summer, ministering to the poor as well as the wealthy, and giving free medical consultations in his home.



On the Management of Diseases for the Most Part Through Common Foodstuffs and Medicine Specified for the Use of Monks of the Cloister and Whoever is Far From the City, an Arabic manual by Ibn Buṭlān (d. 1066/460 H). Undated incomplete copy; possibly 18th century.

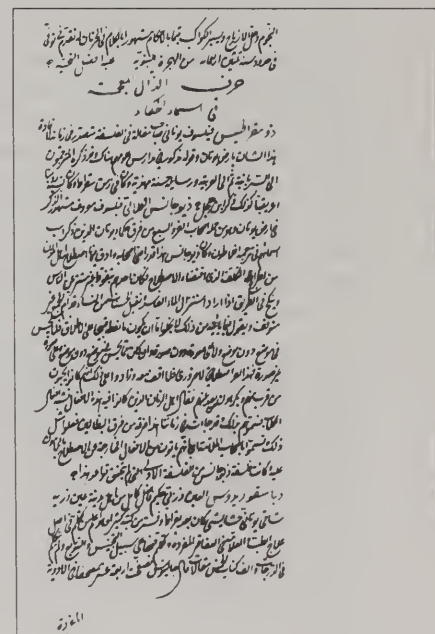
NLM MS A37, fol. 1b, open to start of manual

Treatises for travelers were a very popular form of medical literature. Ibn al-Jazzār also composed one that was later quite influential in Europe in its Latin version *Viaticum peregrinantis*. All such manuals discussed the diseases, fevers, and bites of poisonous insects and animals that could be encountered when traveling and the means of treating them in the absence of a doctor.

The Christian physician Ibn Buṭlān wrote an Arabic medical guide for monks residing in an isolated monastery which could also be of use to anyone away from urban medical care. The treatise had the long title *On the Management of Diseases for the Most Part Through Common Foodstuffs and Medicine Specified for the Use of Monks of the Cloister and Whoever is Far from the City*. Ibn Buṭlān, originally from Baghdad, visited Old Cairo about 1049 (441 H), after which he went to Constantinople before settling at Antioch in Syria and becoming a monk.

Medieval biographical dictionaries are among our most important sources for the lives and writings of early Islamic physicians, as well as accounts of early Greek physicians as they were known to medieval Arabic readers. Two of the most important for medical and scientific biographies were written in the 13th century. The biographical dictionary compiled by `Alī ibn Yūsuf al-Qifṭī, who died in 1248 (646 H), covered 414 learned physicians, philosophers and astronomers, while the one by Ibn Abī Uṣaybi`ah, who died in 1270 (669 H), was exclusively concerned with physicians. Ibn Abī Uṣaybi`ah was born into a family of physicians in Damascus and in his day was a noted oculist practicing at the Nūrī hospital there. Today, however, he is more readily associated with his book *Sources of Information on the Classes of Physicians* in which he gave the biographies of over 380 physicians.

Curiously, his fellow student Ibn al-Nafīs is not mentioned in this bio-bibliographical history, even though Ibn Abī Uṣaybi`ah devoted two chapters to his contemporaries in Syria and Egypt. We can only guess that there was a rivalry, and perhaps even personal enmity, between the two physicians. Medical biographies continued to be included in general biographical dictionaries or medical dictionaries. For example, a medical dictionary called *The Sea of Gems* (*Bahr al-jawāhir*) was composed in 1518 (924 H) by Muḥammad ibn Yūsuf al-Harawī. Written partly in Arabic and partly in Persia, it was arranged alphabetically, covering anatomical and pathological terms and medicinal substances, as well as prominent physicians.

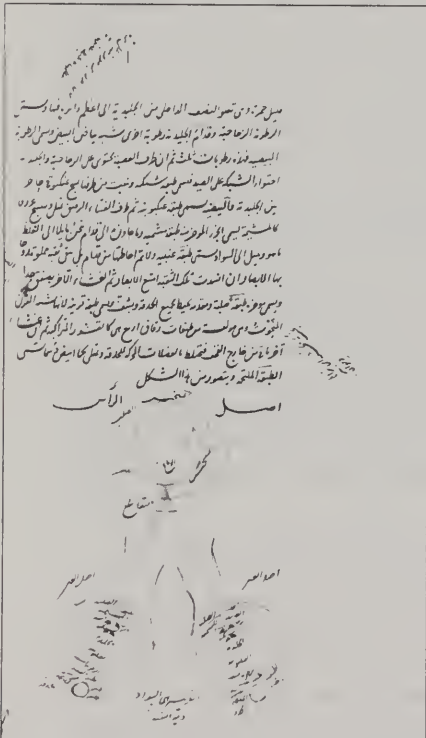


The biographical dictionary (*Ta'rikh al-Hukamā'*) of 414 physicians and scholars written by `Alī ibn Yūsuf al-Qifṭī (d. 1248/646 H). Copy completed 25 January 1636 (16 Sha'ban 1045 H) by scribe Muḥammad ibn Shaykh ...?..ibn Shaykh `Umar al-Akhrawī.

NLM MS A72, fol. 58b.

Ophthalmology and Surgery

For ophthalmology there developed an extensive specialist literature. Islamic physicians displayed particular concern and skill in the diagnosis and treatment of eye diseases, perhaps because blindness was the major cause of disability throughout the Islamic lands. Nearly every medical compendium had chapters on eye diseases, but the most comprehensive coverage was to be found in the large number of monographs devoted solely to the subject.



A commentary on the *Mujiz* or *Concise Book* of Ibn al-Nafīs, called the *The Key to the Mujiz* and composed in Arabic by al-Aqsarā'i, who died in 1370 (771H). The copy was completed in October of 1407 (Jumādā I 810 H) and is one of the earliest preserved copies.

NLM MS A67, fol. 167b showing a schematic diagram of the visual system.

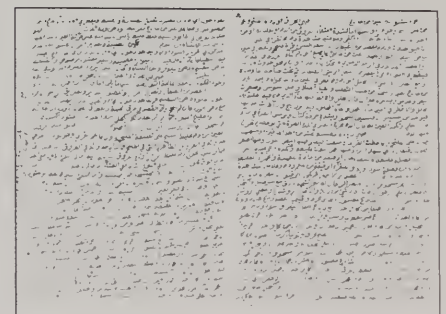
In the 9th century the physician-translator Ḥunayn ibn Ishaq wrote monographs on ophthalmology, including the influential *Ten Treatises on the Eye* that showed considerable advancement in knowledge over that in the Greco-Roman treatises preserved today. One of the most highly regarded of ophthalmological manuals was that covering 130 eye ailments written by `Alī ibn `Isā al-Kaḥḥal (d. 1010/400 H) who practiced in Baghdad. A contemporary of his was `Ammār ibn `Alī al-Mawṣilī, who was originally from Iraq but moved to Egypt where he dedicated his only writing, a treatise on eye diseases, to the Faṭimid ruler al-Ḥakim, who ruled from 966 to 1020 (386-411 H). The latter work only discussed 48 diseases but contains some clinical cases and adaptations of surgical instruments, including a hollow cataract needle which he asserted could be used to remove a cataract from the eye by suction. This hollow tube is mentioned by later ophthalmologists, and the removal of a cataract by suction using a hollow needle was said to have been observed by the oculist and historian Ibn Abī Uṣaybi`ah about 1230 (628 H) in the Nūrī hospital in Damascus. The 14th-century Egyptian oculist Sadaqah ibn Ibrahīm al-Shadhilī, however, said he had not seen it used and questioned its validity.

In treating cataracts, the technique commonly employed was couching. This method consisted of pushing the lens of the eye out of the way by inserting into the eye a needle or probe through the edge of the cornea. Infection and glaucoma were the major causes for failure. Considering that an untreated cataract results in blindness and the success rate for couching is about 4 in 10, it is not unreasonable that couching found widespread acceptance.

Impressive surgical and diagnostic skill was displayed in the treatment of

trachoma, the major cause of blindness, and its sequelae trichiasis, entropion, and pannus. Trachoma itself was treated by everting the eyelid and scraping the interior with a selection of scrapers. Intricate surgical procedures were used for dealing with trichiasis and entropion (superfluous and ingrown eyelashes and rolled in eyelids). Trachomatous pannus, a vascularization which invades the cornea, was not apparently known to Greek physicians, but it was clearly described and treated by peritomy by the earliest of the Islamic doctors and was recognized to be a sequela of trachoma. The excision of pannus employed an instrument for keeping the eye open during surgery, a number of small hooks for lifting, and a very thin scalpel or couching needle. Similar instruments were used in excising pterygium, a triangular-shaped encroachment of the bulbar conjunctiva onto the cornea. Such surgical procedures are intricate and painstaking and cause considerable pain to the patient. Yet they appear to have been occasionally, if not routinely, performed.

For reasons as yet unknown, there was during the 12th and 13th centuries



The Result of Thinking about the Cure of Eye Diseases (Natiqat al-fikar fi `ilāj amrad al-baṣar) written in Cairo by Faṭḥ al-Dīn al-Qaysī (d. 1259/657 H). Copy finished by unnamed scribe on 16 November 1501 (5 Jumādā I 907 H).

NLM MS A48, fols. 7b-8a, open to chapter on pannus (sabal).



unprecedented interest in composing Arabic treatises on ophthalmology. In Spain Muḥammad ibn Qassūm ibn Aslam al-Ghāfiqī, of whom essentially nothing is known, wrote a *Guide to Ophthalmology* that was illustrated with instruments. In Cairo the oculist Faṭḥ al-Dīn al-Qaysī, who died in 1259 (657 H) wrote *The Result of Thinking about the Cure of Eye Diseases* (*Natijāt al-fikar fī `ilāj amrād al-baṣar*). Al-Qaysī was one of a three-generation family of court physicians in Cairo and was himself `Chief of Physicians' in Egypt and physician to two Ayyubid rulers, including Saladin. The treatise consists of 17 chapters dealing with the anatomy and physiology of the eye and the causes, symptoms and treatment of 124 eye conditions, some apparently described here for the first time. About a decade later, another comprehensive ocular manual was composed in Syria by Khalīfah ibn Abī al-Maḥasin al-Ḥalabī, who included elaborate charts of instruments. Other ophthalmological manuals were written in Egypt and Syria in the 13th and 14th centuries, including a comprehensive survey of ophthalmology by the Syrian epitomizer of Ibn Sīna's *Canon*, Ibn al-Nafis who practiced in both Damascus and Cairo.

Surgery in general tended to be viewed as distinct from the rest of general medical care, and at least one specialized treatise was written on it. Of major importance in the history of general surgery was the lengthy surgical chapter from the 10th-century medical encyclopedia composed in Spain by al-Zahrāwī. This illustrated surgical section circulated by itself and later was influential in Europe through the Latin translation made two centuries later in Toledo by Gerard of Cremona.

Al-Zahrāwī divided his discourse on surgery into three parts: on cautery, on incisions and bloodletting, and on bone-

setting. He included in it copious illustrations and descriptions of instruments, which made the treatise particularly valuable even though scribes often misunderstood the illustrations when copying the treatise. He combined the surgical ideas derived from Greco-Roman sources with his own observations and experiences, and modified many of the earlier instruments as well as designing some new ones. For example, he described a bevel-ended cannula, instead of the earlier straight one, for use in drawing off liquid when treating abdominal dropsy. He introduced a technique using a fine drill inserted through the urinary passage for treating a calculus impacted in the urethra, and he designed a concealed knife for opening abscesses in a manner that would not alarm the nervous patient. Variations in the design of a vaginal speculum or dilator were introduced, and forceps described, though not for use in live births.

In the 13th century, a Syrian physician, Ibn al-Quff, composed a specialized surgical manual, in which he omitted all ophthalmological procedures because he considered these the province of a specialist. Nearly all the other general discussions of surgery did include some ophthalmological practices, though not with the detail and thoroughness evident in the monographs devoted solely to ophthalmology. The 16th and 17th-century surgical practices in the Ottoman empire and in Safavid Iran and Mughal India are largely derivative from these earlier Arabic ones, but some new techniques emerged including the treating of gunshot wounds.

The lack of antisepsis and anaesthesia were significant limitations on the surgery of the day. The precise extent to which sepsis was a factor in the success, or failure, of an operation is difficult to determine. With the exception of oph-

thalmological surgery, the vast majority of operations were following accidents or battle wounds, in which case infection may have already set in. Throughout the surgical writings, the Islamic physicians display a sensible and humane reluctance to undertake the riskiest and most painful operations.

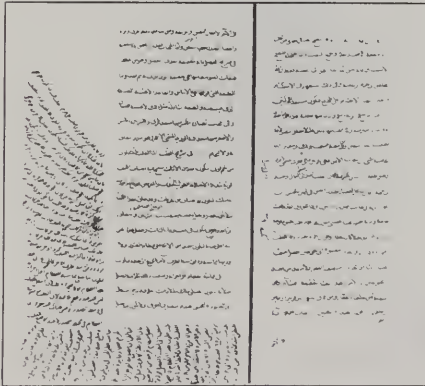
Anatomy

Systematic human anatomical dissection was not a pursuit of medieval Islamic society any more than it was in the contemporaneous Christian lands. Many scholars in Islam lauded the study of anatomy, primarily as a way of demonstrating the design and wisdom of God, and there are some references in medical writings to dissection, though to what extent these reflect actual practice is problematic. There were, nonetheless, two noteworthy contributions made to the history of anatomy and physiology by medieval Islamic writers — namely, the improvement in the description of the bones of the lower jaw and sacrum by `Abd al-Laṭīf al-Baghdādī (d. 1213/629 H) following the chance observation of skeletons during a famine in Egypt, and the description of the movement of blood through the pul-

monary transit by the Syrian jurist-physician Ibn al-Nafīs, who died in 1288 (687 H).

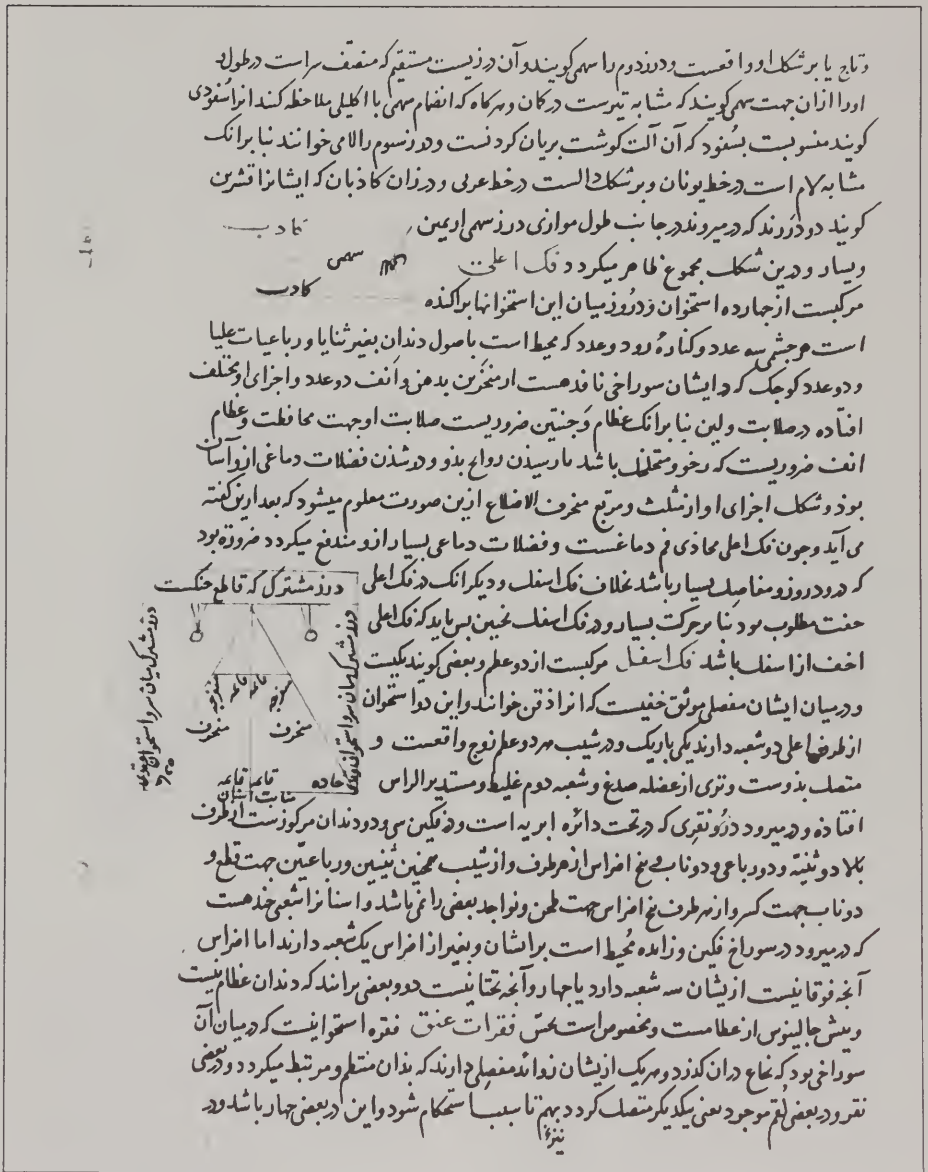
In addition to his popular epitome of the *Canon of Medicine* by Ibn Sīnā, Ibn al-Nafīs also composed a commentary

on the *Canon* in which he criticized Ibn Sīnā for spreading his discussion of anatomy over several different sections of the *Canon*. Ibn al-Nafīs consequently prepared a separate commentary on just the anatomical portions, and it was



The anatomical sections of the *Canon of Medicine* by Ibn Sīnā (d. 1037/428 H) assembled by an anonymous compiler into one volume. Notes in the margins include quotations from the commentary on the anatomy of the *Canon* written by Ibn al-Nafīs (d. 1288/687 H), who is referred to as al-Qurashī, the name by which earlier writers knew him. Copy completed by unnamed scribe on 13 July 1584 (5 Rajab 992 H).

NLM MS A27, fols. 11b-12a.
Open to discussion of the heart.



Diagrams of cranial sutures (above) and the bones of the upper jaw (below). From *The Anatomy of the Human Body* (Tashriḥ-i badan-i insān) written in Persian at the end of the 14th century by Maṅṣūr ibn Ilyās. Undated copy, probably 15th century.
NLM MS P19, fol. 5a

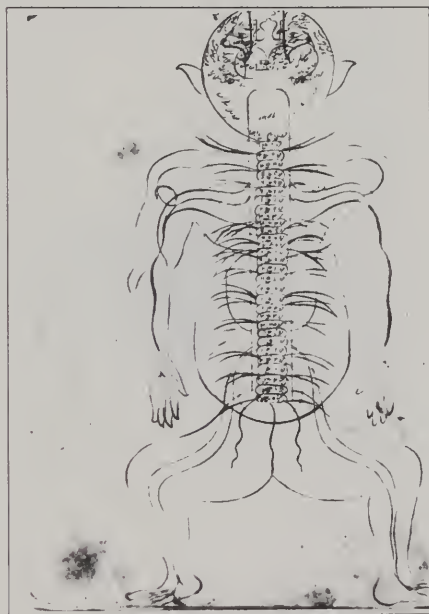
in this commentary that he explicitly stated that the blood in the right ventricle of the heart must reach the left ventricle by way of the lungs and not through a passage connecting the ventricles, as Galen had maintained. This formulation of the pulmonary circulation was made three centuries before Michael Servetus (d. 1553) and Realdo Colombo (d. 1559), the first Europeans to describe the pulmonary circulation.

Knowledge of anatomy in medieval Islam was firmly based on the anatomical writings by the 2nd-century Greek physician Galen, who to a large extent argued from analogy with animal struc-

tures. All the major Arabic and Persian medical encyclopedias had sections on anatomy, summarizing the Galenic anatomical concepts. These were occasionally illustrated with schematic diagrams of the eye or the cranial sutures or the bones of the upper jaw. No full-page anatomical illustrations of the body are preserved from the Islamic world before those which accompanied the Persian treatise composed by Manşur ibn Muḥammad ibn Aḥmad ibn Yusuf ibn Ilyas, descended from a Shiraz family of scholars and physicians. His illustrated treatise, often called 'Manşur's Anatomy,' was dedicated to a grandson

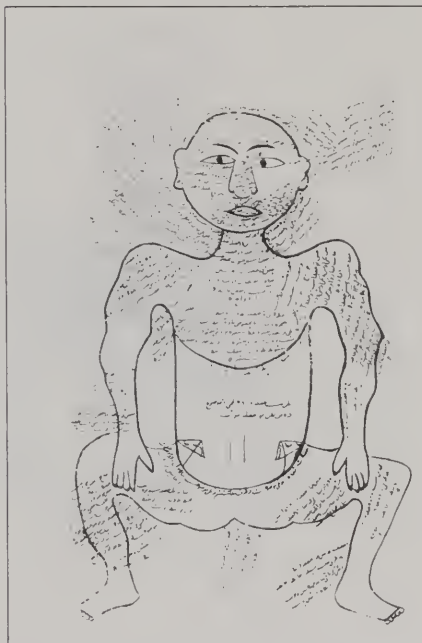
of Timūr (Tamerlane) who ruled the province of Fars from 1394 to 1409 (797-811 H). It consists of an introduction followed by 5 chapters on the 5 'systems' of the body: bones, nerves, muscles, veins and arteries, each illustrated with a full-page diagram. A concluding section on compound organs, such as the heart and brain, and on the formation of the foetus, was illustrated with a diagram showing a pregnant woman.

Historians have noted the similarity between 5 of the 6 illustrations accompanying this Persian-language treatise and certain early Latin sets of anatomi-



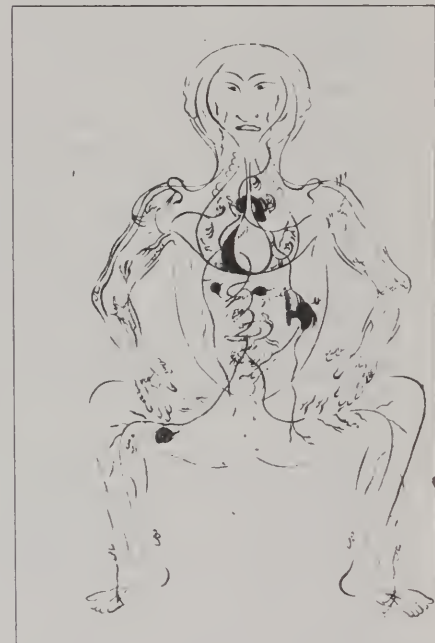
Nerve diagram, with figure viewed from the back, with the head hyperextended so that the mouth is at the top of the page. The pairs of nerves are indicated by colored inks. From *The Anatomy of the Human Body (Tashriḥ-i badan-i insan)* written in Persian at the end of the 14th century by Manşur ibn Ilyas. Copy undated, probably 15th century.

NLM MS P19, fol. 11b



Muscle figure, shown frontally, with extensive text denoting muscles. From *The Anatomy of the Human Body (Tashriḥ-i badan-i insan)* written in Persian at the end of the 14th century by Manşur ibn Ilyas. Copy completed 8 December 1488 (4 Muḥarram 894 H) by Ḥasan ibn Aḥmad, a scribe working in Isfahan.

NLM MS P18, fol. 20a



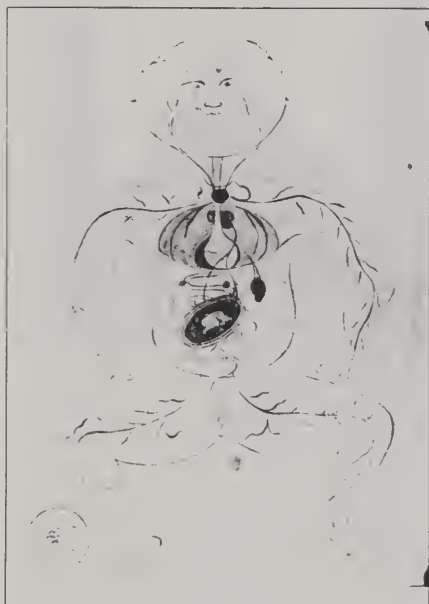
The venous system, with figure drawn frontally and the internal organs indicated in opaque watercolors. From *The Anatomy of the Human Body (Tashriḥ-i badan-i insan)* written in Persian at the end of the 14th century by Manşur ibn Ilyas. Copy completed 8 December 1488 (4 Muḥarram 894 H) by Ḥasan ibn Aḥmad, a scribe working in Isfahan.

NLM MS P18, fol. 25b



cal illustrations. This similarity is particularly evident in the diagram of the skeleton, which in both the Latin and Islamic versions is viewed from behind, with the head hyperextended so that the face looks upward and with the palms facing backward — in a posture, some have noted, suggestive of a dissection table. All the figures are in a distinctive squatting posture. The earliest Latin version dates from the 12th century while the earliest dated Islamic set is one of the two now at the National Library of Medicine, completed 8 December 1488 (4 Muḥarram 894 H).

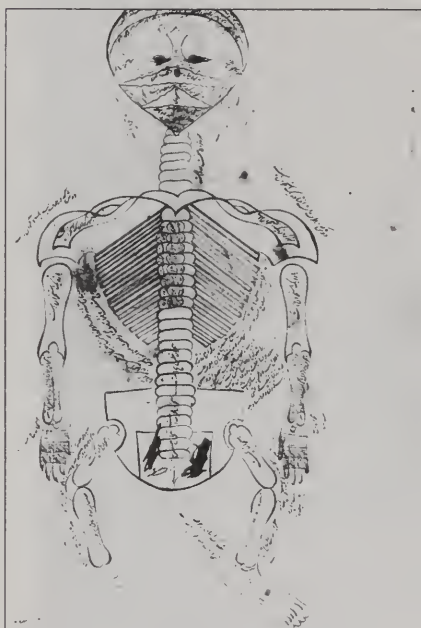
The origin of this anatomical series,



The figure of a pregnant woman. From *The Anatomy of the Human Body (Tashriḥ-i badan-i insān)* written in Persian at the end of the 14th century by Maṣṣūr ibn Ilyās. Copy completed 8 December 1488 (4 Muḥarram 894 H) by Ḥasan ibn Aḥmad, a scribe working in Isfahan.

NLM MS P18, fol. 39b

which clearly predates the Timurid treatise by Maṣṣūr ibn Ilyās, remains a puzzle. There are nearly 70 preserved sets of the Islamic full-page anatomical diagrams, of which about two-thirds are associated with copies of the treatise by Maṣṣūr ibn Ilyās. The sixth figure in the Islamic series, the pregnant woman, has no parallel in the earlier Latin series and was probably a contribution by Ibn Ilyās himself. It was constructed from the arterial figure without the labels and superimposed with an oval gravid uterus having the foetus in a breech or transverse position.



The skeleton, drawn in red and black ink, viewed from behind with the head hyperextended so that the face looks upward. From *The Anatomy of the Human Body (Tashriḥ-i badan-i insān)* written in Persian at the end of the 14th century by Maṣṣūr ibn Ilyās. Copy completed 8 December 1488 (4 Muḥarram 894 H) by Ḥasan ibn Aḥmad, a scribe working in Isfahan.

NLM MS P18, fol. 12b. Earliest recorded copy.

Pharmaceutics and Alchemy

In the field of materia medica and its applications, Islamic writers surpassed their earlier models, primarily because their broader geographic horizons brought them into contact with drugs unknown to earlier peoples, such as camphor, musk, sal ammoniac, and senna. In later Arabic works, medicinals were used that came from as far afield as China, Southeast Asia, the Himalayas, southern India, and Africa.

The preparation and use of medicinal drugs was a topic that also had its own specialized literature. Knowledge of medicinal substances was based initially upon the approximately 500 substances described in the 1st century AD by Dioscorides in his Greek treatise on materia medica. Numerous Arabic and Persian treatises were subsequently written on medicaments. Medical encyclopedias usually had one chapter on materia medica and another on recipes for compound remedies. Formularies were often composed as larger independent collections of recipes, and some were written for specific use in hospitals.

The largest and most popular of materia medica manuals was that by Ibn al-Bayṭār, who was born in Malaga in the kingdom of Granada towards the end of the 12th century and became 'Chief of Botanists' in Cairo in the first half of the 13th century. His Arabic treatise, *The Comprehensive Book on Materia Medica and Foodstuffs (Kitāb al-Jāmi` li-mufradāt al-adwiyah wa-al-aghḥiyah)*, was an alphabetical guide to over 1400 simples taken from his own observations as well as from 150 written sources that he names.

His manual formed the basis of many subsequent manuals on medicinal substances, including that written in the

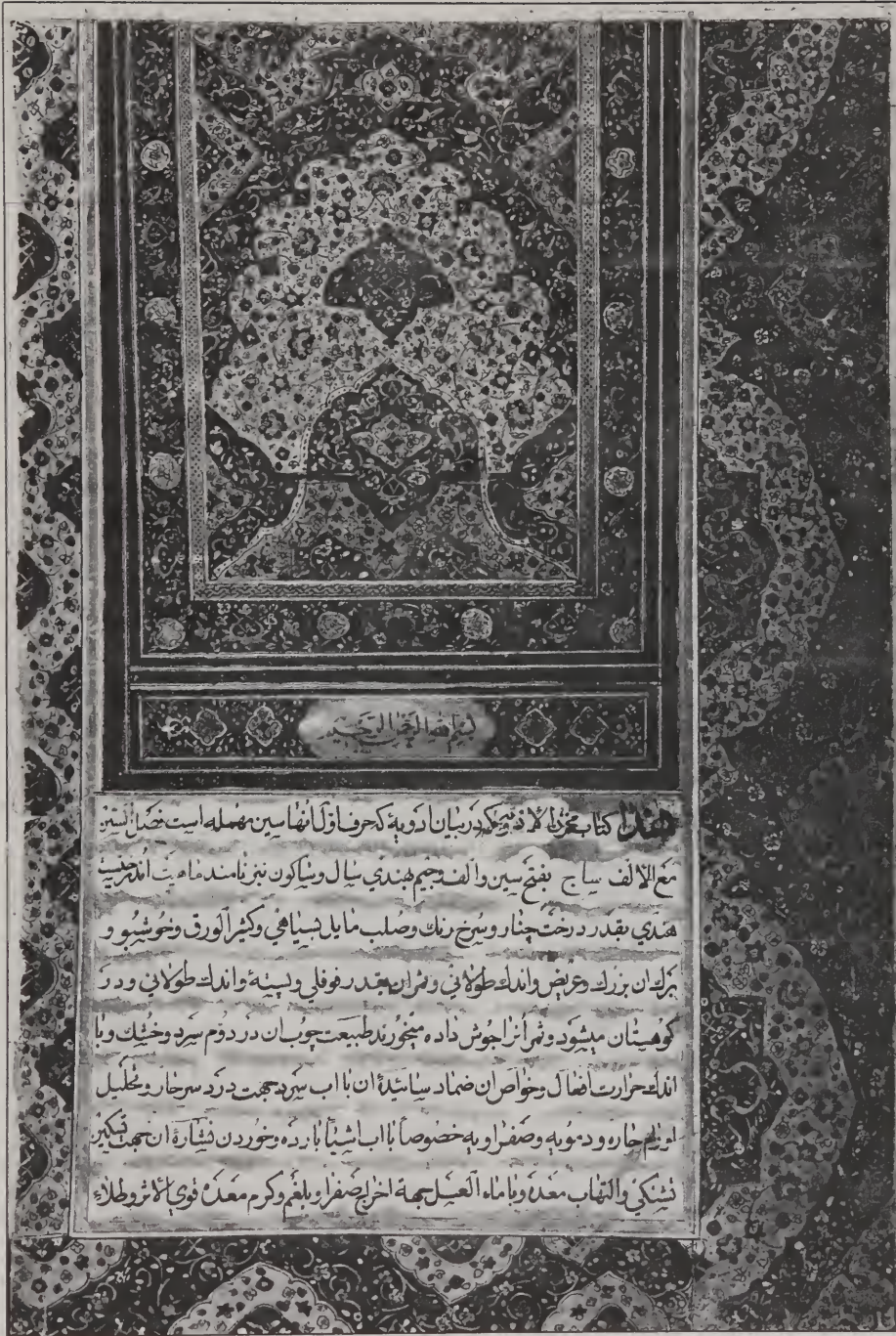
الحضرة الامير الامير السلطان

18th-century by Muḥammad Ḥusayn ibn Muḥammad Ḥādī al-ʿAqīlī al-ʿAlavī, a practitioner in India and grandson of a well-known Indian practitioner. The illuminated presentation copy, now at the National Library of Medicine, of this alphabetical Persian treatise on materia medica titled *The Storehouse of Medicaments Concerning the Explanation of Materia Medica (Makhzan al-adwiyah dar-i bayan-i adwiyah)* is typical of late Safavid Persian manuscript workshops, though it is likely that the Safavid artisan had moved to the Mughal court at Delhi



Illuminated opening of *The Storehouse of Medicaments Concerning the Explanation of Materia Medica (Makhzan al-adwiyah dar-i bayan-i adwiyah)* by the 18th-century physician Muḥammad Ḥusayn ibn Muḥammad Ḥādī al-ʿAqīlī al-ʿAlavī, a practitioner in India.

The frontispiece of a printing in 1875 at the famous Bulaq press in Cairo of *The Comprehensive Book on Materia Medica and Foodstuffs (Kitāb al-Jāmiʿ li-mufradāt al-adwiyah wa-al-aghdhīyah)* by Ibn al-Bayṭār (d. 1248/646 H).



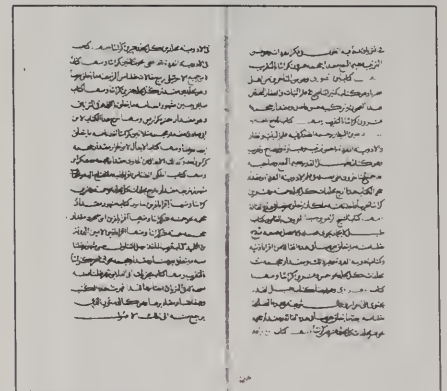
Copy finished 3 May 1732 (4 Dhu al-Hijjah 1144 H) by the scribe Hasan ibn `Abd al-[?] Musavi.

NLM MS P12

since the volume was produced in 1732 (1144 H), the year the Safavid dynasty in Iran collapsed and effectively ceased to rule.

The topic of poisons was of great interest in both antiquity and the medieval world and it also generated its own literature. Snake and dog bites as well as the ill effects of scorpions and spiders and other animals caused much concern, while the poisonous properties of various minerals and plants, such as aconite, mandrake, and black hellebore, were exploited. Galen and Dioscorides were considered ancient authorities on the subject, and many spurious treatises on the subject were attributed to them. Numerous Islamic writers discussed poisons and particular theriacs, the antidotes for poisons.

A particularly important Arabic treatise on antidotes for poisons was written in 1270 (669 H) in Syria by `Alī ibn `Abd al-`Azīm al-Anṣārī. The treatise provides information regarding medical learning in the Crusader States as well



A unique copy of an Arabic treatise on antidotes for poisons written in 1270 (669 H) in Syria by `Alī ibn `Abd al-`Azīm al-Anṣārī. The opening shows part of the 33rd chapter in which the author lists treatises that he consulted. Undated copy; probably 16th century.

NLM MS A64, fols. 303b-304a.
No other copy recorded.

as the plants that the author describes as having been found in Syria at the time. Moreover, al-Anṣārī incorporated into the study extensive quotations from other treatises on plants and antidotes. Among these were the writings of the 10th-century Egyptian physician al-Tamīmī and the Syrian physician Rashīd al-Dīn al-Manṣūr ibn al-Sūrī, who died in 1243 (641 H). The latter is known to have prepared an illustrated herbal with figures drawn from plants he observed on his travels. Both the illustrated herbal by Ibn al-Sūrī and the treatise on antidotes by al-Tamīmī are lost today, making the citations given by al-Anṣārī our only source of information regarding their contents.

Islamic physicians not only contributed to the recording of new medicinal substances and compound remedies, but also, in collaboration with other artisans, developed new equipment for the pharmacy. 'Albarello' is the name given to drug jars having a waisted form with slightly concave sides which became popular in Europe from the 15th century onward. The design employed by the pharmaceutical potters of Europe was taken directly from the medieval Islamic world, for the earliest examples preserved today were made in Syria near the end of the 12th century. The contracted waist of these jars allowed them to be easily removed from a row when set side by side on a shelf. They were used for storage of a variety of herbs, roots, seeds, spices and other medicinal substances.

Many of the techniques employed in drug production were also part of the realm of alchemy. The Arabic word al-kīmīyā, from which we derive the word alchemy, was used for both chemistry and alchemy, and no clear distinction was made between the two activities. A wide range of chemical processes was undertaken by both the druggist and the

alchemist, and the workshops would be stocked with a large number of vessels such as alembics (the head of a distilling device), curcubits (the lower part of the distilling apparatus), receiving vessels, funnels, water-baths, filters, and crucibles, in addition to the mortars and pestles for pulverizing and crushing substances and braziers and stoves for heating them. In the distillation process, a substance would be heated in the curcubit and the distillate would form in the alembic and pass through the delivery tube into a receiving vessel.

Distillation was one of the most important processes in Islamic chemical technology and was employed for both

medicinal preparations and a variety of other technological and industrial uses, including the preparation of acids and the distillation of perfumes, rose-water and essential oils. As the equipment and processes of alchemy developed — with its methods of evaporation, filtration, sublimation, crystallization, and distillation — they came to influence pharmacy and medical chemistry.

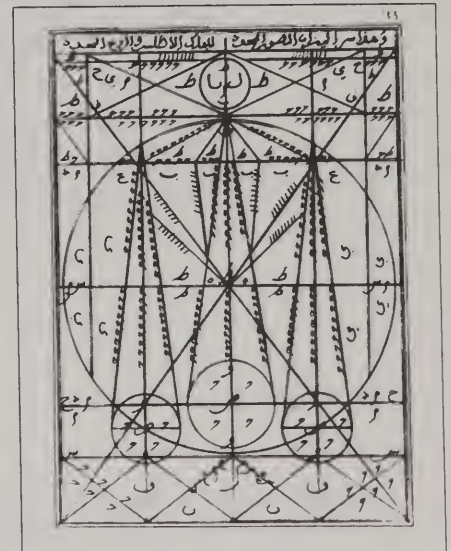
The formative Arabic treatises on alchemy were those under the name of Jabir ibn Ḥayyān, an 8th-century polymath familiar to Western readers as Geber. In these writings there was elaborated for the first time the idea of an elixir that served as a general medicine or life-giving potion. Numerous subsequent books were composed on alchemy, including some by the physician al-Razi in the late 9th century.

One of the last Arabic alchemical treatises — and the most comprehensive —



Ink drawings of a triple alembic, with 3 distilling heads, only the top one having a delivery tube. The lower drawing shows a cold still or 'Moor's head still' in which the distillate when it rises is cooled by water placed in a trough at the top of the alembic. From an alchemical commentary on a poem composed in Spain by Ibn Arfa` Ra's (d. 1197/593 H). Copy made in 1712 (1123 H).

NLM MS A65, fol. 81b (old 82b)



A chart used to determine the 'balance' of a substance's attributes. From the alchemical treatise by `Izz al-Dīn Aydamir al-Jildakī (d. 1342/743 H). Undated copy made in Morocco in the late 19th century.

NLM MS A7, part 1, fol. 155b

الحضرة الاميرة زين العابدين

was that by the Egyptian alchemist `Izz al-Dīn Aydamir al-Jildakī, who died in 1342 (743 H). His treatise *The Proof Regarding Secrets of the Science of the Balance* (*Kitāb al-Burhān fī asrār `ilm al-mīzan*) was concerned to a large extent with the classification of plants, animals, and minerals, and with the concept of `balance'. The alchemist attempted to assess the `balance' of any given substance by a system employing numerology, the 28 letters of the Arabic alphabet, and the numerical value of the name of the substance in order to determine the proportional structure of the substance's attributes — that is, heat, dryness, coldness, and fluidity. Al-Jildakī's treatise represents the mystical and allegorical trend in alchemy, but it is also evident that the author had much experience with practical chemical operations and substances.

A popular treatise, al-Jildakī's alchemical manual continued to be copied through the 19th century. The copy at the National Library of Medicine is one of the finest recorded products of a workshop of illuminators in Morocco during the reign of Sultan al-Ḥasan I, who ruled from 1873 to 1894 (1290-1312 H), and is a fine example of modern Islamic calligraphy and illumination.



An illuminated opening from the alchemical treatise *The Proof Regarding Secrets of the Science of the Balance* (*Kitāb al-Burhān fī asrār `ilm al-mīzan*) by `Izz al-Dīn Aydamir al-Jildakī (d. 1342/743 H). Undated copy made in Morocco in the late 19th century.

NLM MS A7, part 1, fols. 1b-2a



Hospitals

The hospital was one of the great achievements of medieval Islamic society. The relation of the design and development of Islamic hospitals to the earlier and contemporaneous poor and sick relief facilities offered by some Christian monasteries has not been fully delineated. Clearly, however, the medieval Islamic hospital was a more elaborate institution with a wider range of functions.

In Islam there was generally a moral imperative to treat all the ill regardless of their financial status. The hospitals were largely secular institutions, many of them open to all, male and female, civilian and military, adult and child, rich and poor, Muslims and non-Muslims. They tended to be large, urban structures.

The Islamic hospital served several purposes: a center of medical treatment, a convalescent home for those recovering from illness or accidents, an insane asylum, and a retirement home giving basic maintenance needs for the aged and infirm who lacked a family to care for them. It is unlikely that any truly wealthy person would have gone to a hospital for any purpose, unless they were taken ill while traveling far from home. Except under unusual circumstances, all the medical needs of the wealthy and powerful would have been administered in the home or through outpatient clinics dispensing drugs. Though Jewish and Christian doctors working in hospitals were not uncommon, we do not know what proportion of the patients would have been non-Muslim.

An Islamic hospital was called a *bīmāristān*, often contracted to *marīstān*, from the Persian word *bīmār*, 'ill person', and *stān*, 'place.' Some accounts

associate the name of the early Umayyad caliph al-Walid I, who ruled from 705 to 715 (86-96 H), with the founding of a hospice, possibly a leprosarium, in Damascus. Other versions, however, suggest that he only arranged for guides to be supplied to the blind, servants to the crippled, and monetary assistance to lepers.

The earliest documented hospital established by an Islamic ruler was built in the 9th century in Baghdad probably by the vizier to the caliph Ḥarūn al-Rashīd. Few details are known of this foundation. There is no evidence to associate the construction of the earliest hospital with any of the Christian physicians from Gondeshapur in southwest Iran, but the prominence of the Bakhtīshū` family as court physicians would suggest that they also played an important role in the function of the first hospital in Baghdad.

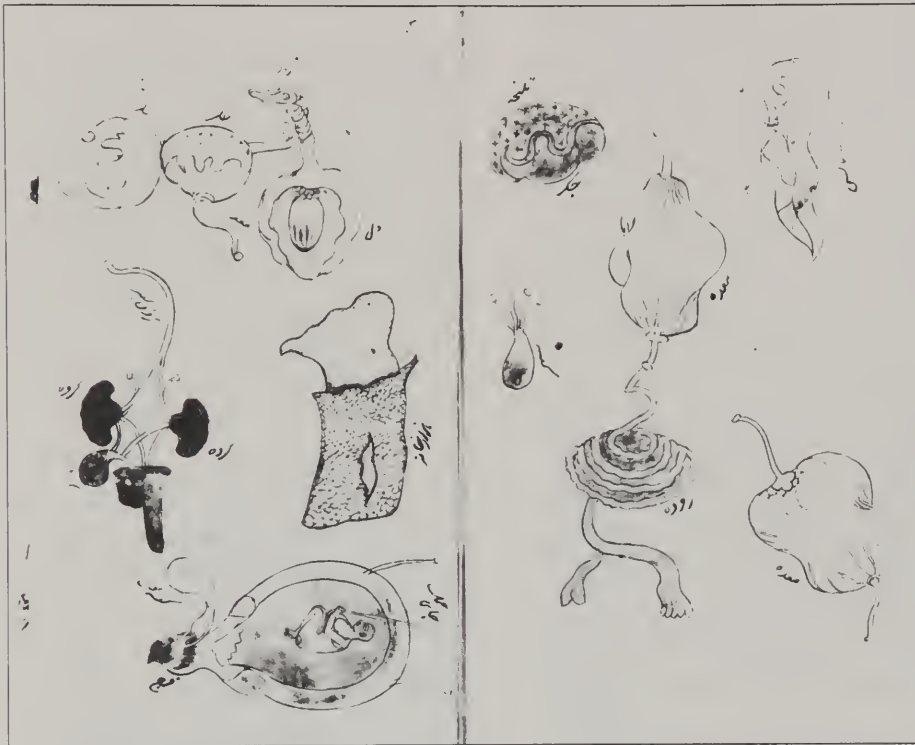
In little more than a hundred years, 5 additional *bīmāristāns* had been built in Baghdad. According to some accounts, directions were given by a vizier in the early 10th century to provide medical care to prisons on a daily basis and visits by doctors with a traveling dispensary to villages in lower Iraq. The most important of the Baghdad hospitals was that established in 982 (372 H) by the ruler `Aḍud al-Dawlah. When it was founded it had 25 doctors, including oculists, surgeons, and bonesetters. In 1184 (580 H) a traveller described it as being like an enormous palace in size.

In Egypt, the first hospital was built in the southwestern quarter of present-day Cairo in 872 (259 H) by Aḥmad ibn Ṭulūn, the `Abbāsīd governor of Egypt. It is the earliest for which there is clear evidence that care for the insane was provided. By the end of the century, two hospitals were also said to have been built in Old Cairo (Fuṣṭāṭ), though the evidence on this point is questionable.

In the 12th century, Saladin founded the Naṣīrī hospital in Cairo, but it was surpassed in size and importance by the Maṣṣūrī, completed in 1284 (638 H) after eleven months of construction. The Maṣṣūrī hospital remained the primary medical center in Cairo through the 15th century. The Nūrī hospital in Damascus was a major one from the time of its foundation in the middle of the 12th century well into the 15th century, by which time the city contained 5 additional hospitals.

Besides those in Baghdad, Damascus, and Cairo, hospitals were built throughout Islamic lands. In al-Qayrawān, the Arab capital of Tunisia, a hospital was built in the 9th century, and early ones were established at Mecca and Medina. Iran had several, and the one at Rayy was headed by al-Rāzī prior to his moving to Baghdad. Ottoman hospitals flourished in Turkey in the 13th century, and there were hospitals in the Indian provinces. Hospitals were comparatively late in being established in Islamic Spain, the earliest possibly being built in 1397 (800 H) in Granada.

Of the great Syro-Egyptian hospitals of the 12th and 13th centuries, we possess a considerable amount of information. They were built on a cruciform plan with four central iwāns or vaulted halls, with many adjacent rooms including kitchens, storage areas, a pharmacy, some living quarters for the staff, and sometimes a library. Each iwān was usually provided with fountains to provide a supply of clean water and baths. There was a separate hall for women patients and areas reserved for the treatment of conditions prevalent in the area — eye ailments, gastrointestinal complaints (especially dysentery and diarrhoea), and fevers. There was also an area for surgical cases and a special ward for the mentally ill. Some had an area for rheumatics and cold sufferers



Individual organs drawn in inks and opaque watercolors. Two of six leaves of anatomical drawings appended to a Persian translation of an Arabic medical compendium. On the righthand page are the liver with gallbladder, the stomach with intestines, the testicles, and detail of the stomach. On the left are a composite rendering of the tongue, larynx, heart, trachea, stomach and liver; a composite drawing of the ureters, urethra, kidneys, testicles, and penis; and a composite rendering of the bladder with female genitalia, womb and foetus. Undated, probably 18th century India.

NLM MS P20, fols. 556-557a

(*mabrudun*). There frequently were out-patient clinics with a free dispensary of medicaments. The staff included pharmacists and a roster of physicians who were required at appointed times to be in attendance and make the rounds of patients, prescribing medications. These were assisted by stewards and orderlies, as well as a considerable number of male and female attendants who tended the basic needs of the patients. There were also instructors (*mu'allimūn*), possibly aspiring medical students, who trained the non-professional staff. The budget of such institutions must have been considerable, and

in fact the budget of the *Manṣūrī* hospital in Cairo was the largest of any public institution there. Over the entire staff and responsible for the management of the hospital was an administrator who was not usually trained in medicine. In most instances he was a political appointment, subject to the unpredictable fluctuations of political favor, for the position of controller of a hospital was a very lucrative one. The chief of staff, on the other hand, was a medical man.

All the hospitals in Islamic lands were financed from the revenues of pious bequests called *waqfs*. Wealthy men,

and especially rulers, donated property as endowments, whose revenue went toward building and maintaining the institution. The property could consist of shops, mills, caravanserais, or even entire villages. The income from an endowment would pay for the maintenance and running costs of the hospital, and sometimes would supply a small stipend to the patient upon dismissal. Part of the state budget also went toward the maintenance of a hospital. The services of the hospital were to be free, though individual physicians might charge fees.

Little detailed information is available regarding the hospitals as teaching institutions. We have accounts of teaching at certain hospitals, such as the *ʿAḍūdī* hospital in Baghdad, but how many hospitals had such formal classes is not known. Clinical training at bedside in a hospital, whether as an apprentice or through formal instruction, was, however, a part of medical learning for a substantial number of formally trained physicians. In the medical writings, such as the encyclopedia by *al-Majūsī*, there was frequent encouragement of students to acquire clinical training.

The Art as a Profession

Information regarding the number of medical practitioners in medieval Islamic cities is meagre and difficult to interpret. It has been estimated that in Baghdad in 931 (319 H) there was a ratio of about one physician per 300 inhabitants. Doubtless there were areas, particularly rural ones, where there was no formally trained physician at all, for there were many self-help guides to basic medical care intended for use in traveling and when no physician was available.

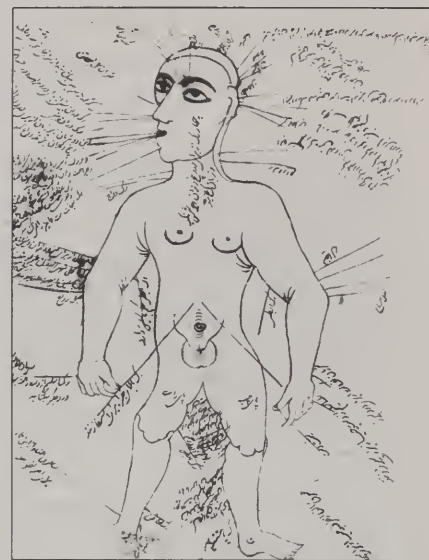
At the top of the profession in terms of prestige and income were those enjoying the patronage of a caliph, ruler or vizier. Such positions were not without risk, however, for the patron could be at times ruthless or whimsical. Rulers were known even to confiscate libraries or imprison their physician, and more than one physician lost favor rapidly through failing to cure a powerful patron. Some of the most learned physicians excelled in other fields, such as theology and philosophy, and won acclaim and income by teaching or writing in these areas. It seems that association with a hospital was a mark of prominence, and only the more respected had such positions. Aside from those who enjoyed the favor of a wealthy person, it is likely that the majority of doctors had incomes similar to those of shop-keepers or merchants.

Among the writings of nearly all the learned physicians are anecdotes about inept physicians, quacks, and charlatans. The extent to which charlatans were a serious problem is difficult to gauge. Descriptions and criticisms of the inept and the fraudulent were also frequently part of treatises dealing with the general topic of medical ethics. In Arabic literature such deontological treatises, which

also outlined the behaviour and training of good physicians, were part of a wider genre known as *adab*, devoted to proper social conduct. As there was a literature concerned with codes of conduct, the question arises whether there was any way of enforcing such standards. There was certainly no uniformity in the education and training of a physician. There were families of physicians in which the training was primarily within the family. The Bakhtīshū family is the most obvious, but there were also many others, such as the Ibn Zuhīr family consisting of 5 generations of Spanish physicians, including two women physicians who served the household of the Almohad ruler Abu Yūsuf Ya`qub al-Manṣūr, who ruled from 1184 to 1199 (580-595 H). There were self-taught physicians, such as Ibn Sīnā, who claimed to be self-taught in medicine though he studied other subjects with masters.

Most medical instruction was probably acquired through private tutoring and supervision. Some teaching occurred in hospitals, especially in Baghdad and later in Damascus and Cairo. There were also some *madrasahs*, or mosque schools, which offered instruction to a few of its students in medicine and other ancillary subjects such as mathematics. Islamic law (*fiqh*), however, was the primary focus of these institutions. There is evidence that the great medical teacher of Damascus, al-Dakhwār, established upon his death a *madrasah* which was devoted solely to instruction in medicine. The school opened, with considerable ceremony, in 1231 (628 H), about a month after al-Dakhwār died. Later sources state that it was still in existence in 1417 (820 H), when it underwent some repairs.

With such a mixed system of education, the curriculum and training of



A loose sheet with a bloodletting figure having points labeled that were thought best for phlebotomy. Such figures are derivative from late medieval European bloodletting figures. Undated, probably 18th century

NLM MS P5, fol. A

physicians was not at all uniform, standardized, or controlled. In certain regions the functioning of the medical profession was overseen by a Chief of Physicians (*ra'īs al-aṭibbā'*) and an Inspector of Public Services (*muḥtasib*). We know very little about the actual duties of the Chief of Physicians. Of the *muḥtasib*, or Inspector of Public Services, we know considerably more. Some of his responsibilities might include seeing that correct weights and measures were employed, insisting upon proper street cleaning, seeing that a ramshackle building was condemned, ensuring a supply of clean water, and other related matters, but the functions varied to some extent by locality. A number of manuals were written as guides for an Inspector in the performance of his duties. Prior to the 12th century they only briefly mentioned the medical pro-

الحضرة الاميرة الجليلة
الطبيبة
الفاطمة بنت محمد

fession, and then mostly in relation to matters of drugs, weights, and measures. During the reign of Saladin, however, a physician working in Aleppo by the name of al-Shayzari wrote a manual in which he discussed in considerable detail the supervising of the medical community. According to his manual, the Inspector was to administer the Hippocratic oath to physicians. The oculists were to be qualified on the basis of the book *Ten Treatises on the Eye* written by Hunayn ibn Ishāq; bonesetters were to be tested with the Arabic translation of the surgical portion of a Greek medical encyclopaedia written about 642 in Alexandria by Paul of Aegina; and surgeons had to know a par-

ticular book of Galen. Later manuals repeated these requirements.

We have little evidence as to what extent and how uniformly such a practice of examination was actually carried out. It has been sometimes asserted that a physician in the medieval Islamic world was granted a license (*ijazah*) following the completion of his education.

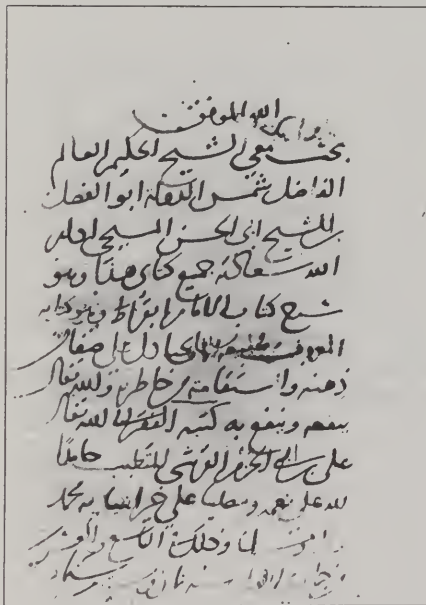
There are isolated examples of students being given a signed statement that they successfully read and mastered a particular treatise. The National Library of Medicine has one of these very rare documents. The certificate is written at the end of a commentary on the Hippocrate treatise *On the Nature of Man* by the Damascene physician Ibn al-Nafis, who spent much of his life in Cairo, where he became 'Chief of Physicians', dying there in 1288 (687 H) and bequeathing his house and library to the recently constructed Manṣūrī hospital. The certificate occurs at the end of the manuscript in the handwriting of Ibn al-Nafis himself, and reads as follows:

[In the name of] God the Provider of Good Fortune. The wise, the learned, the excellent shaykh Shams al-Dawlah Abū al-Faḍl ibn al-shaykh Abī al-Ḥasan al-Masīhī, may God make long lasting his good fortune, studied with me this entire book of mine — that is, the commentary on the book by the imam Hippocrates, which is to say his book known as 'On the Nature of Man' — by which he demonstrated the clarity of his intellect and the correctness of his thought, may God grant him benefit and may he make use of it. Certified by the poor in need of God, 'Ali ibn Abī al-Ḥazm al-Qurashi [known as Ibn al-Nafis] the physician. Praise be to God for his perfection and prayers for the best of His prophets, Muhammad, and his family. And that is on the twenty-ninth of Jumadā I [in the]

year six hundred and sixty eight [= AD 25 January 1270].

In another recorded example, also from the 13th century, the physician Muwaffaq al-Dīn Ya`qub al-Sāmīrī wrote at the back of a copy of a commentary on a treatise by Hunayn ibn Ishāq that a student named Amin al-Dawlah Tadrus had read the text before him with the purpose of understanding, questioning and verifying its contents.

These individual cases of the certified completion of a reading course, as important as they are for the history of medical education, are not, however, equivalent to the licensing of physicians upon completion of an approved period of training. In addition, the term *ijazah*, often translated as 'license,' is not entirely applicable to these examples, for an *ijazah* was traditionally given in the fields of law and theology (especially *fiqh* and *ḥadīth*) and were recorded in medieval bio-bibliographical registers for those fields in order to establish chains of authorities. There is no similar role for certificates in the medical literature. While many advocated high medical standards and the exposure of frauds, there is at present insufficient evidence to substantiate the claim that there was an organized and centralized system of official examination and testing of physicians, even in a relatively restricted geographical area.



The signed statement made by Ibn al-Nafis (d. 1288/687 H) that his student, a Christian named Shams al-Dawlah abū al-Faḍl ibn Abī al-Ḥasan al-Masīhī, had read and mastered Ibn al-Nafis's commentary on a Hippocratic treatise. The certificate is in the handwriting of Ibn al-Nafis himself and dated the 29th of Jumadā I in 668 H (25 January 1270).

Late Medieval and Early Modern Medicine

As the Islamic world became increasingly fragmented, the patronage and accompanying prestige and security enjoyed by the leading physicians declined. Spain was lost, European crusaders made repeated invasions into the central lands, and in the 13th century Mongol invasions from the east disrupted life. The Mamluk rulers in Egypt managed to hold off the Mongol invasions, and it is no doubt for that reason that the medical community there remained active longer than elsewhere, with the exception of Safavid Iran.

The hospitals were dependent upon charitable endowments for their maintenance, and with time these funds became insufficient to support them, or, not infrequently, the lands supporting the endowment were confiscated. Consequently, the hospitals tended to deteriorate and eventually fall into disuse, except for a few such as the Nūrī hospital in Damascus which continued to operate as a hospital until the end of the 19th century. With the expansion of the population, the remaining hospitals and dispensaries proved inadequate. Nonetheless, the learned medical community remained quite productive through the 14th century, particularly in Syria and Egypt. Within two more centuries, however, vitality and creativity had disappeared, the medical literature had stultified, and the practice of medicine deteriorated to the point where it no longer represented the medieval tradition at its best. In the latter half of the 16th century, Islamic medicine then became receptive to some of the ideas, techniques, and drug therapies developing in Europe.

Early modern European influence can first be seen in the earliest Islamic treatise on syphilis. This was written by

Imad al-Dīn Mas'ūd Shirāzī, a physician at the hospital in Mashhad in north-east Iran. In his Persian treatise on syphilis written in 1569 (977 H), he followed the European practice of advocating for its treatment the use of China Root (*Chub-chini*), the rhizome of an



The illuminated opening of the Arabic treatise on Paracelsian medicine, *The Culmination of Perfection in the Treatment of the Human Body* (*Ghāyat al-iṭqān fī ṭabīb badan al-insān*), written in the 17th century by Ibn Sallūm. A provincial Ottoman copy finished 26 October 1749 (2 Sha'ban 1162 H) by scribe Samī' Muṣṭafā Efendi al-Shā'ir.

NLM MS A13, fol. [5b].

Old World species of *Smilax* found in eastern Asia. This new drug for treating a new disease was rapidly incorporated into Arabic medical writings. For example, Dā'ud al-Anṭakī, a Syrian physician who died in 1599 (1008 H), included a similar description of syphilis and China Root in his Arabic medical encyclopedia. Dā'ud al-Anṭakī also relied heavily upon medieval Islamic writers and earlier Greek sources, for which he learned Greek so as to study them directly.

In the 17th century, early modern European medical theory had an impact upon Islamic medicine through the writings of the Paracelsians, followers of Paracelsus (d. 1541), whose 'chemical medicine' employed mineral acids, inorganic salts, and alchemical procedures in the production of remedies. Ṣāliḥ ibn Naṣr ibn Sallūm, a physician born in Aleppo, Syria, and later court physician in Istanbul to the Ottoman ruler Mehmet IV (ruled 1648-1687/1058-1099 H) was greatly influenced by these writings.

Ibn Sallūm incorporated into his book *The Culmination of Perfection in the Treatment of the Human Body* (*Ghāyat al-iṭqān fī ṭabīb badan al-insān*) Arabic translations of several Latin Paracelsian writings, such as those by Oswald Croll (d. 1609), professor of medicine at the University of Marburg, and Daniel Sennert (d. 1637), professor of medicine at Wittenberg. Therapy was primarily a drug therapy, with diseases explained in terms of salt, quicksilver and sulphur rather than the Galenic theory of the balance of humors. Many of the medications required distillation processes and plants that were indigenous to the New World, such as guaiacum and sarsaparilla. The treatise not only reflects the new chemical medicine of the European Paracelsians, but also described for the first time in Arabic a number of 'new' diseases, such as scurvy, chlorosis,



anaemia, the English sweat (a type of influenza), and plica polonica (an eastern European epidemic of matted and crusted hair caused by infestation with lice).

Occasionally bloodletting and cautery figures, clearly derivative from similar illustrations in medieval European manuscripts, are found in some Islamic manuscripts of about the 17th century or later. By the 17th century it appears that Vesalius's Latin treatise *The Fabric of the Human Body* (*De humani corporis*

fabrica) printed in 1542-3 was also known in the Safavid and Ottoman empires, for a number of preserved ink sketches of the 17th through 19th century indicate familiarity with illustrations from the *Fabrica*.

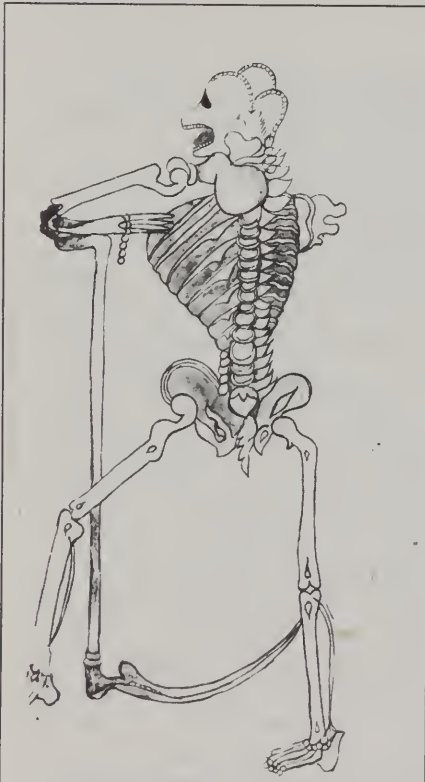
In the 17th century not only did early modern European medical ideas filter into the Middle East, but Europeans became interested in learning of the medical practices then current in the Islamic world. One example is Joseph Labrosse, who was born in Toulouse in

1636 and entered the order of Discalced Carmelites, taking the name of Fr. Angelus of St. Joseph. In 1662 he went to Rome and studied Arabic for two years, and then in 1664 went to Isfahan and studied Persian. While in Iran, he used medicine as a means of propagating Christianity and in the process read many Arabic and Persian books on medicine and "visited the houses of the learned people of Isfahan and paid hundreds of visits to the shops of the druggists, the pharmacists, and the chemists."

After Labrosse returned to France, he published his *Pharmacopoea persica* and a few years later a *Gazophylacium linguae persarum*, which was a dictionary of Persian words with Italian, Latin and French definitions, with much attention paid to medical terms. The *Pharmacopoea persica ex idiomate persica in Latinum conversa*, published in Paris in 1681, consists of a Latin translation made by Father Angelus de Sancto Josepho (Joseph Labrosse) of a Persian book on compound remedies by an otherwise unknown writer Muẓaffar ibn Muḥammad al-Ḥusaynī, with additional comments by Labrosse.

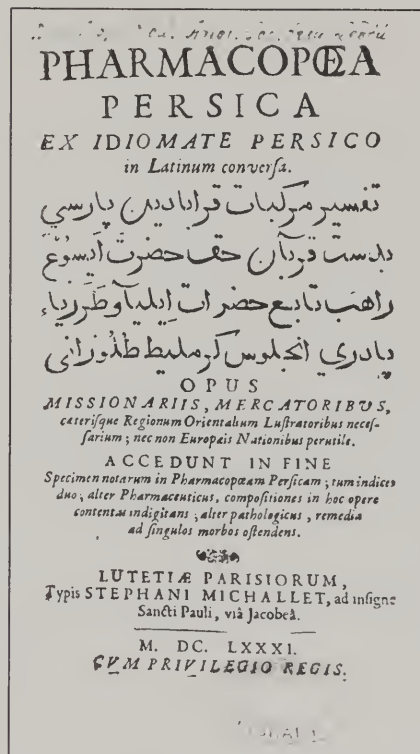
In the middle of the 18th century the plague befell Istanbul, and the traditional Islamic medicine seemed to do little to combat it. Consequently, the Ottoman sultan Muṣṭafá III ordered a Turkish translation to be made of two treatises by Hermann Boerhaave (d. 1738), a Dutch medical reformer and advocate of bedside instruction. The Turkish versions were completed in 1768 by the court physician Şubḥī-Zade `Abd al-'Azīz with the assistance of the Imperial Austrian interpreter Thomas von Herbert. Şubḥī-Zade attempted not only to translate Boerhaave's ideas but to reconcile and harmonize them with traditional Islamic medicine.

It was not until the 19th century that



A drawing in ink and light gray wash of a skeleton leaning on a scythe. One of six leaves of anatomical drawings appended to a Persian translation of an Arabic medical compendium, showing some knowledge of the illustrations of Vesalius's *Fabrica*. Undated, probably 18th century India.

NLM MS P20, fol. 559a



Frontispage of *Pharmacopoea persica ex idiomate persica in Latinum conversa*, published in Paris in 1681. The treatise consists of a Latin translation, with comments, made by Father Angelus de Sancto Josepho [Joseph Labrosse] of a Persian book on compound remedies by Muẓaffar ibn Muḥammad al-Ḥusaynī.



profound changes occurred in the teaching of medicine in the Near East. In 1825 Antoine-Barthélemy Clot was appointed surgeon-in-chief to the Egyptian army. Clot had been a physician at Montpellier prior to coming to Egypt, and by 1828 he established a medical school near Cairo at which French, Italian and German professors taught. In 1850 a military medical school, the Dār al-Funun, was founded in Tehran in Iran, where instruction was given in French by professors from Austria and Italy. A number of European medical texts were translated into Persian at this school.

The most recent Islamic manuscript in the collections of the National Library of Medicine is an important document for the nature of medical care in one region of the Middle East just prior to the establishment of medical schools on a European model. It is an autograph copy of a *Miscellany on the Art of Medicine* (*Khālīṭah fī ṣināʿat al-ṭibb*) completed on the 6th of January 1814 (14 Muḥarram 1229 H) by a North African physician Aḥmad ibn Muḥammad al-Salāwī. Following 48 years of experience, he discussed the diseases most common in North Africa in his day, warning against the use of some drugs approved by older authorities and occasionally advocating the methods used by European doctors.

Then, as now, however, aspects of traditional medieval Islamic medicine continued to coexist alongside the modern European medicine. In the late 19th century treatises of Ibn Sīnā, al-Majūsī, and Ibn al-Bayṭar, among others, were printed at the Būlāq press in Cairo because they continued to represent a vital tradition, which the Yunani medical colleges of Pakistan and India are continuing, at least in part, to maintain today.



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إنَّ الطَّيِّبَ بِطِبِّهِ وَدَوَانِهِ . لَا يَسْتَطِيعُ دِفَاعَ أَمْرٍ قَدْ أَتَى .
مَا لِلطَّيِّبِ يَمُوتُ بِالْإِذَاءِ الَّذِي . قَدْ كَانَ يَبْرِئُ مِنْهُ فَيَهْمًا قَدْ مَضَى .
مَاتَ الْمَدَاوِي وَالْمَدَاوِي وَالَّذِي . جَلَبَ الدَّاءَ وَبَاعَهُ وَمَنْ اشْتَرَى .

*The physician, with his medical art and his drugs,
Cannot avert a summons that has come.
What ails the physician that he dies of the disease
That he would have cured in time gone by?
There died alike he who administered the drug and he who took it,
And he who imported and sold the drug, and he who bought it.*

Verses upon the death in Baghdad of the physician Yūḥannā ibn Māsawayh in 857 (243 H).

