

RAVY (RAYY)

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RAVY (RAYY)

Rayy is a city in the old Persian region of Media, during the Islamic times in the province of Djibal and the city's ruins are visible 5 miles south-south east of Tehran.¹

The town is situated in the fertile zone which lies between the mountains and the desert on the southern slopes of the Elburz range that skirts the south of the Caspian Sea.²

In the tenth century, Rayy was well described in Muslim geographical works; it was said to be one of the four capital cities of the Jibal province and except for Baghdad, it was reported to be finest city of the whole east according to the geographer Ibn Hawqal.³ Rayy covered at that time an area of a league and a half square.⁴ According to al-Istakhri, the town covered an area of 1 ½ by 1 ½ farsakhs (about 8km by 8km); the buildings were of clay, but bricks were also used and plaster as well.⁵ All writers agree on the commercial role played by the city; Ibn al-Fakih mentions silks, items of wood and lustre dishes.⁶ The town had five gates and eight large bazaars; Al-Muqaddasi calls Rayy one of the glories of the land of Islam.⁷ Al-Muqaddasi focuses on two great buildings in Rayy, the fruit market and the Dar al-Kutub, or library, lying below Rudhab in a khan, (caravanserai).⁸

Rayy, at the height of its glory produced one of the greatest figures of Muslim scholarship - Al-Razi.

Al Razi was born in 854 CE and died in 934-5 CE. He was known as Rhazes in the medieval West and was a writer of rare and incredible productiveness as well as the greatest clinician of Islam.⁹ In his youth he studied literature, philosophy, music and chemistry.¹⁰ He left more than two hundred works some of which are, of course, only short monographs or opuscles but others were more voluminous treatises. He wrote on medicine, natural science, chemistry, mathematics, optics, astronomy, theology and philosophy.¹¹ One of the inhabitants of Rayy says that al-Razi was a generous man and so compassionate to the poor and sick that he used to distribute alms to them freely and even nurse them himself.¹² He was always reading or copying and as the witness said: `I never visited him without finding him at work on either a rough or a fair copy.'¹³ His eyes were always watering on account of his excessive consumption of beans and he became blind towards the end of his life dying in his native town at the age of sixty and two months.¹⁴ However,

¹ V. Minorsky: Rayy; *Encyclopaedia of Islam*, new Series; Vol 8; pp. 471-3; p.471.

² E. J. Holmyard: *Makers of Chemistry*, Oxford at the Clarendon Press; 1931; p. 63.

³ G. Le Strange: *The Lands of the Eastern Caliphate*; Cambridge University Press; 1930; p. 214.

⁴ G. Le Strange: *The Lands*; p. 214.

⁵ V. Minorsky: Rayy; p.471.

⁶ V. Minorsky: Rayy; op cit; p.471.

⁷ Al-Muqaddasi: *Ahsan al-taqasim fi Ma'rifat al-Aqalim*; is in M.J. de Goeje ed., *Bibliotheca geographorum arabicum*, 2nd edition., III (Leiden, 1906); a partial French translation is by Andre Miquel, Institut Francais de Damas, Damascus, 1963. There are also English and Urdu versions of the work.; p. 391.

⁸ G. Le Strange: *The Lands*; op cit; p. 215.

⁹ G.Wiet; V. Elisseeff; P. Wolff; and J. Naudu: *History of Mankind*; Vol 3: The Great medieval Civilisations; Translated from the French; George Allen &Unwin Ltd; UNESCO; 1975; p. 653.

¹⁰ E. J. Holmyard: *Makers*; op cit; p. 63.

¹¹ G.Wiet; V. Elisseeff; P. Wolff; and J. Naudu: *History of Mankind*; op cit; p. 653.

¹² E. J. Holmyard: *Makers*; op cit; p. 64.

¹³ E. J. Holmyard: *Makers*; p. 64.

¹⁴ E. J. Holmyard: *Makers*; p. 64.

this is the only version that records his blindness. The other tells that his eye was continually fixed and exposed to serious mishaps, for his perseverance with fires and sharp odours affected it and he had to have recourse to medical treatment. He studied continually and engaged unremittingly in research, placing his lamp in a niche in the wall facing him, leaning his book against it, so that when overcome by sleep, the book fell from his hand and wakened him so that he might return to his studies. It was this, together with his fondness for beans, which affected his sight, till in the end he became blind, for a cataract affected him at the close of his life.¹⁵

Al-Razi wrote on most of the recognised sciences of his lifetime, and in particular on mathematics and metaphysics, but much of this seems to have been lost unlike his works on medicine and chemistry. At the same time he was studying philosophy and writing poetry on metaphysical subjects (apparently not too successfully), he earned his living in Ray as a banker or money changer, as indicated by the book: *A Compendium of the Mansuri*, written by Muhammad Ibn-Zakariya' al-Razi, the Money Changer.¹⁶ He wrote an encyclopaedia on music entitled *Fi Jamal-il-Musiqi* (On the Beauty of Music).¹⁷ He also composed 19 chemical works according to al-Fihrist and a set of 12 books, variously titled, the most important, which seems to summarize the chemistry of al-Razi, is *Sir al-Asrar* (the *Book of the secret of secrets*).¹⁸

Al-Razi, and the Rise of Modern Chemistry

In his work *Sir al-Asrar*, Al-Razi launches the science of chemistry. There is no trace in it of mystical theories or allegories as with alchemy - Al-Razi departed from the well-trodden path of mysticism and symbolism.¹⁹ His supreme merit lay in his rejection of magical and astrological practices and his adherence to nothing that could not be proved, by experiment and test, to be actual fact.²⁰ He gives precise results of technical experiments, with a detailed description of substances and instruments.²¹ It may be said that it was he who laid the basis of scientific chemistry: certainly

*he struck the match that sparked off a whole immense trail of literature on the natural properties of minerals, plants and animals.*²²

He only uses experimentation and technical operations; he describes in great detail the substances and the sort of equipment he uses detailing experiments and how he reaches his results.²³ He went further in the cataloguing and in the descriptions of his experiments, methods and the conditions of his experiments.²⁴ All these can be found in his Secret of Secrets, translated in Latin as *Liber secretorum bubacaris*, which describes the chemical processes and experiments conducted by him, and which can be identified in their

¹⁵ D.M. Dunlop: *Arab Civilisation, to AD 1500*, Longman, Librarie du Liban, 1971. p. 239.

¹⁶ C. Elgood: *A Medical history of Persia*; Cambridge University Press; 1951. pp. 196-8.

¹⁷ A. Whipple: *The Role of the Nestorians and Muslims in the History of Medicine*. Microfilm-xerography by University Microfilms International Ann Arbor, Michigan, U.S.A. 1977. p.37.

¹⁸ R.P. Multhauf: *The Origins of chemistry*; Gordon and Breach Science Publishers; London, 1993. p.130.

¹⁹ G.Wiet; V. Elisseeff; P. Wolff; and J. Naudu: *History of Mankind*; Vol 3: The Great medieval Civilisations; Translated from the French; George Allen & Unwin Ltd; UNESCO; 1975; p. 654.

²⁰ E. J. Holmyard: *Makers*; op cit; p. 67.

²¹ G. Wiet et al: *History*; op cit; p. 654.

²² G. Wiet et al: *History*; p. 654.

²³ A. Mieli: *La Science Arabe et son role dans l'evolution mondiale*, Leiden, E. J. Brill, 1966. p.132.

²⁴ A. M. Kettani: *Science and Technology in Islam*; in Z. Sardar ed: *The Touch of Midas*; Manchester University Press; 1984; pp 66-90. p. 79.

modern equivalent from distillation to calcination, crystallization etc Some of Al-Razi's revolutionary experiments, derived from his *Secret of Secrets* include ways of smelting of metals, the sublimation of mercury, the preparation of caustic soda, the use of Mercury Ammonium Chloride solution as a dissolving reagent and the preparation of Glycerine from Olive Oil.²⁵ Al-Razi's lead in careful experimentation and observations demonstrated, as Holmyard put it,

*that a by-product of alchemy was a steadily increasing body of reliable chemical knowledge, a trend which Al-Razi did most to establish and for which he deserves the gratitude of succeeding generations.*²⁶

Al-Razi gave laboratory work pre-eminence over theoretical observations. Hill points out that Al-Razi's *Book of secrets* 'foreshadows a laboratory manual' and deals with substances, equipment and processes.²⁷ Al-Razi gives a list of the apparatus used in chemistry such as Crucible; Descensory; Alembic; Beakers; Heating lamps; Large Oven; Cylindrical Stove; Flat stone mortar; etc.²⁸ Al-Razi's laboratory appeared to be very well equipped and included many items still in use today.²⁹ This includes: Crucible; Decensory; Cucurbit or retort for distillation (qar) and the head of a still with a delivery tube (ambiq, Latin alembic); various types of furnace or stove etc.³⁰ Al-Razi completes the subject by giving details of making composite pieces of apparatus and in general provides the same kind of information as is to be found nowadays in manuals of laboratory arts.³¹

This crucial contribution to the science lead to many other consequences including the development of modern pharmacy. Hence Abu al-Mansur al-Muwaffaq mentions for the first time some chemical facts to distinguish certain medicines.³² Al-Razi himself was interested in the medical uses of chemical compounds.³³ And in his work *Secret of Secrets*, he made the very useful classification of natural substances, dividing them into earthly, vegetable and animal substances, to which he also added a number of artificially obtained ones such as lead oxide, caustic soda and various alloys. The mineral substances include mercury, gold, silver, pyrites, glass etc; vegetables substances were mainly used by physicians, whilst animal substances divided into hair, blood, milk, eggs, bile etc...³⁴. Worth noting here is that it was the twelfth century Italian translator, Gerard of Cremona, who composed the significant translations of Al-Razi's study and classification of salts and alums (sulphates) and their related operations in *De aluminibus et salibus* whose Arabic original is preserved.³⁵ The many versions of this work had a decisive influence on subsequent operations in the West particularly on mineralogy.³⁶

²⁵ Holmyard quoted in G. Anawati: 'Science', op cit, at p. 777.

²⁶ Holmyard quoted in G. Anawati: 'Science', op cit, at p. 777.

²⁷ D.R. Hill: *Islamic Science and engineering*; Edinburgh University Press; 1993; p. 83.

²⁸ E. J. Holmyard: *Makers*; op cit; p. 66.

²⁹ Carra de Vaux: *Les Penseurs de l'Islam*; Geuthner; Paris; 1921; vol 2; p. 390; D.R. Hill: *Islamic Scienc*; op cit; p. 84.

³⁰ D.R. Hill: *Islamic Science*, op cit, p. 83..

³¹ E. J. Holmyard: *Makers*; p. 66.

³² E.J. Holmyard: *Alchemy*, London, 1957, p. 88, quoted in G. Anawati: *Alchemy*, op cit, p. 869.

³³ C. Ronan: *The Arabian science*, in *The Cambridge Illustrated History of the World's Science*; Cambridge University Press, 1983; pp 201-44. p. 239.

³⁴ Georges C. Anawati: *Arabic Alchemy*, in *Encyclopaedia of the History of Arabic Science*; edited by R. Rashed; pp. 853-85. at p. 869.

³⁵ J. Ruska: *Das Buch der Alaune and salze*, Berlin, 1935, mentioned in R. Halleux: *The Reception of Arabic Alchemy in the West*, in the *Encyclopaedia of the history of Arabic Science*; edited by R. Rashed; Routledge; 1996; pp 886-902, at p. 892.

³⁶ R. Halleux: *The Reception*, op cit, p. 892.

Al-Razi the Medical Scholar

The majority of the works by Al-Razi have been translated into Latin and printed many times, principally in Venice in 1509 and in Paris in 1528 and 1548; his treatise on small verole, for instance, was reprinted in 1745.³⁷ Courses in medical schools and universities of Europe have always relied on his works; along with those of Ibn Sina, they were the foundation of teaching in Louvain up to the seventeenth century as seen by the 1617 settlement hence the need for some works to be re-printed until the 18th century.³⁸ The same settlement shows that Greek authors had little place with the exception of the aphorisms of Hippocrates and the *Ars parva* of Galen.³⁹

About the age of thirty, Al-Razi made his first visit to Baghdad where he had a life-changing experience. He decided to visit the Muqtadiri Hospital out of curiosity and became interested in a conversation with an old pharmacist. He returned the following day and happened to meet a physician at the hospital who showed him a human foetus with two heads.⁴⁰ So interested was he in this and in what he heard from the druggist that he became determined to study medicine. He stayed in Baghdad and there received a thorough grounding in his new profession, although it is usually asserted that he made his medical studies in Rayy.⁴¹

On his return to Rayy, Al-Razi became the *mutavalli* or administrator of the city's hospital but he did not hold this post for long. Some time between 902 and 907 he returned to Baghdad and took charge of the Muqtadiri Hospital.⁴² As chief physician of Baghdad the fame of Al-Razi spread through the lands of the caliph and his services were in constant demand even in distant cities.⁴³ Al-Razi ultimately became chief physician of the hospital at Rayy which he attended regularly, surrounded by his pupils and the students of his pupils; every patient who presented himself was first examined by the latter; and if the case proved too difficult for them it was passed on to the Master's immediate pupils then finally, if necessary, to himself.⁴⁴ It is clear that al-Razi, in diagnosing illness as well as in treating it, sought to follow the dictates of practical common sense.⁴⁵

In the recording of the writings of al-Razi, the *Fihrist* of Ibn al-Nadim, the oldest authority, enumerates 113 major and 28 minor works by him.⁴⁶ Al-Razi wrote an entertaining tract on the success of charlatans and quacks in acquiring fame often denied to the competent and properly qualified physician but of his general works on medicine the two most important were his *Mansuri*, known in Latin as *Liber Almansoris*, and his monumental and most important work, the *al-Hawi*.⁴⁷ The treatise known as Mansuri is primarily a treatise on anatomy where each bone, muscle, or organ is described in the light of its function and purpose; its novelty being that the terminology used throughout is in Arabic.⁴⁸ The *Kitab al-Hawi* was translated in the

³⁷For the most comprehensive work on Muslim impact in medical sciences, see: D. Campbell: *Arabian medicine, and its influence on the Middle Ages*; Philo Press; Amsterdam; 1926; reprinted 1974.

³⁸ P.K. Hitti: *History of the Arabs*, MacMillan, London, 1970 ed. pp 366-7.

³⁹ G. Le Bon: *La Civilisation des Arabes*; Imag; Cyracuse; 1884; p.387.

⁴⁰C. Elgood: *A medical History*; *op.cit.*. pp. 196-198.

⁴¹A. Whipple: *The Role*; *op cit*; 37-8.

⁴² Whipple 38.

⁴³ Whipple 38.

⁴⁴ E.G. Browne: *Arabian medicine*; Cambridge University Press, 1962. p. 45.

⁴⁵ G. Wiet; V. Elisseeff; P. Wolff; and J. Naudu: *History of Mankind*; *op cit*; p. 653.

⁴⁶ Ibn al-Nadim: *Fihrist*; Edition Flugel; 1857.

⁴⁷ A. Whipple: *The Role*; *op cit*; p. 39.

⁴⁸ G. Wiet et al: *History*; *op cit*; p. 653.

medieval period as *'liber Continens'* and was mistaken at first, in view of its length, for an encyclopaedia prepared by Al-Razi's disciples from his collected papers.⁴⁹ Its appearance is an event rare enough to merit emphasis due to its being an absolutely first-rate dossier of available clinical observations quite undogmatically assembled.⁵⁰

Browne points out how the study of the Hawi is fraught with peculiar difficulties, for not only has it never been published in the original, but no complete manuscript exists and, indeed,

*'so far as my present knowledge goes,' Browne points out, 'I doubt if more than half of this immense work exists at all at the present day, while the extant volumes are widely dispersed, three volumes in the British Museum, three in the Bodleian, four or five in the Escorial, others at Munich and Petrograd and some abridgments in Berlin. Moreover there is some uncertainty as to the number and contents of the volumes which the work comprises, for while the Fihrist enumerates only twelve, the Latin translation contains twenty-five, nor is there any correspondence in subject matter or arrangement. This confusion arises partly, no doubt, from the fact that the Hawi was a posthumous work, compiled after the death of Razi by his pupils from unfinished notes and papers which he left behind him, and lacking the unity of plan and finishing touches which only the author's hand could give, and partly from the fact that the same title seems to have been sometimes applied to another of his larger works. Moreover the Hawi, on account of its enormous size and the mass of detail which it contained, appalled the most industrious copyists, and was beyond the reach of all save the most wealthy bibliophiles, so that Ali ibn ul-Abbas (Haly Abbas) who wrote only 50 or 60 years after Razi's death, tells us that in his day he only knew of two complete copies.'*⁵¹

Of Al-Razi's many monographs the most celebrated in Europe is his treatise on smallpox and measles, known in Latin as *De Peste* or *De Pestilentia*. This work of importance on small pox and measles is the oldest reliable account of these two diseases.⁵² According to Neuburger, it ranks high in importance in the history of epidemiology not just as the earliest monograph upon smallpox, it also shows us Al-Razi as a conscientious practitioner, almost free from dogmatic prejudices.⁵³ As a sample of Al-Razi pioneering spirit on the subject, we pick extracts from Dunlop which show Al-Razi's treatment of some parts of the body

'As soon as the symptoms of smallpox appear, drop rose-water into the eyes from time to time, and wash the face with cold water several times in the day, and sprinkle the eyes with the same. For if the disease be favourable and the pustules few in number, you will by this mode of treatment prevent their breaking out in the eyes. This indeed is to be done for greater caution; for when the smallpox is favourable, and the matter of the disease is scanty, it seldom happens that any pustules break out in the eyes. But when you see that the ebullition is vehement and the pustules numerous in the beginning of the eruption, with itching of the eyelids and redness of the whites of the eyes, some places of which are redder than others, in this case pustules will certainly break out there unless very strong measures be adopted; and therefore you should immediately drop into the eyes several times in the day rose-water in which sumach has been macerated. It will be still more

⁴⁹ G. Wiet; p. 653.

⁵⁰ G. Wiet; p. 653.

⁵¹ E. G. Browne: *Arabian medicine*; op cit; p. 48.

⁵² G. Wiet et al: *History of Mankind*; op cit; p. 653.

⁵³ Neuburger Quoted by E.G. Browne: *Arabian medicine*; Cambridge University Press, 1962. p, 47.

*efficacious to make a collyrium of galls in rose-water, and drop some of it into the eyes; or to drop into them some of the juice of the pulp of the acid pomegranate, first chewed, or squeezed in a cloth. Then wash the eyelids with the collyrium composed of the red horn poppy, the juice of unripe grapes, rusot, aloe and acacia, of each one part, and a tenth part of saffron; and if you also drop some of this collyrium into the eyes, it will be useful at this time.*⁵⁴

Dunlop then elaborates further on al-Razi's treatment of the same disease when it reached violent stages, as well as other matters, all needless to repeat here, but well summed up by Dunlop's erudition.⁵⁵

Yet it is as a clinical, accurate observer that al-Razi excelled. One of the most telling of these notes is to be found in the Bodleian Library.⁵⁶ This has been translated by Browne as follows:

*ʿAbdu'llah Abd Allah ibn-Sawada used to suffer from attacks of mixed fever, sometimes quotidian, sometimes tertian, sometimes quartan and sometimes recurring once in six days. These attacks were preceded by a slight rigor, and micturition was very frequent. I gave it as my opinion that either these accesses of fever would turn into quartan, or that there was ulceration of the kidneys. Only a short while elapsed when the patient passed pus in his urine. I thereupon informed him that these feverish attacks would not reoccur, and so it was. The only thing which prevented me at first from giving it as my definite opinion that the patient was suffering from ulceration of the kidneys was that he had previously suffered from tertian and other mixed types of fever, and this to some extent confirmed my suspicion that this mixed fever might be from inflammatory processes which would tend to become quartan when they waxed stronger. Moreover, the patient did not complain to me that his loins felt like a weight depending from him when he stood up; and I neglected to ask him about this. The frequent micturition also should have strengthened my suspicion of ulceration of the kidneys.... So when he passed the pus I administered to him diuretics until the urine became free from pus, after which I treated him with terra sifilil- lata, Boswellia thurifera and Dragon's Blood, and his sickness departed from him, and he was quickly and completely cured in about two months. That the ulceration was slight was indicated to me by the fact that he did not complain to me at first of weight in the loins. After he had passed pus, however, I enquired of him whether he had experienced this symptom, and he replied in the affirmative. Had the ulceration been extensive, he would of his own accord have complained of this symptom. And that the pus was evacuated quickly indicated a limited ulceration. The other physicians whom he consulted besides myself, however, did not understand the case at all, even after the patient had passed pus in his urine.*⁵⁷

The following outline derived from Dunlop is a very good window to show how Muslim science, in general, and Al-Razi's medical science in particular, passed into Europe well into the 18th century.⁵⁸

ʿFor knowledge of Al-Razi in Europe,ʿ Dunlop writes, ʿthe date 1766 is of considerable importance. In that year the Londoner John Channing published, for the first time, a work of Al-Razi in the original Arabic—an edition, Arabic and Latin, of the Kitab fi al-jadar oa'l-Hasba (On Smallpox and Measles), which had already in 1747 attracted the attention of the celebrated Dr Mead (1673- 1754) and which has been described as 'the oldest and most important original work on smallpox and

⁵⁴ M. Dunlop: *Arab Civilisation, to AD 1500*, Longman, Librarie du Liban, 1971. pp. 235.

⁵⁵ M. Dunlop: *Arab Civilisation*, pp. 235-ff.

⁵⁶ Bodleian Library, MARSH 156, particularly ff. 2396-2456.

⁵⁷ E.G. Browne: *Arabian medicine*; op cit; p. 52.

⁵⁸ D. M. Dunlop: *Arab Civilisation*; op cit; pp. 234-5.

measles' and as 'probably the most concise and most original treatise in Muslim medical literature'. Mead knew no Arabic, but had given a Latin translation with the help of several eighteenth-century Orientalists, Salomon Negri, J. Gagnier and Thomas Hunt. Channing used the same basis as his predecessors, a Leiden manuscript of the Arabic original, which had belonged to the collection of Levinus Warner, and he was now able to produce an elegantly printed if not very correct Arabic text and a readable and clear Latin version. Channing says of his method of translation: The version is what is called a literal one. It is close and renders word for word as far as possible, while avoiding incorrect expressions, so that not only Al-Razi's sentences but also his way of thinking, words and style are exhibited. Where the genius of the Latin language did not admit this, the Arabic phrase is noted at the bottom of the page. The reader is not to be irritated by Arabic words appearing in the Latin text, the explanation of which you will see in the margin. These have not been translated because no Latin word exactly corresponds to their sense, or because the meaning is doubtful. We do not possess, as it happens, any medieval translation of the work on smallpox and measles with which Channing's may be compared, but it is interesting to observe the learned eighteenth-century translator adopting exactly the same practice of retaining in the text difficult Arabic words as a Gerard of Cremona in the twelfth century. Nor are the Latinized Arabic words which Channing cites here noticeably closer to their originals than their medieval counterparts.⁵⁹

To Al-Razi, Wiet et al conclude, the Muslim world owed its first formulation of the faith in a continuous scientific advance, with emphasis on the provisional nature of all research whose conclusions can be revised at all times.⁶⁰

Rayy, just like the rest of the eastern Muslim realm was devastated permanently by the two scourges of the Mongols and Timur the Lame which caused that once thriving region to slumber into the scholarly and economic barren land it has become today. Regarding the first Mongol scourge that befell the city, Ibn al-Athir wrote in his treatise, *al-Kamil fi'l tarikh*, that all the population of Rayy was massacred in 1220 and the survivors put to death in 1224.⁶¹ Then Timur arrived in 1384 to finish off the place or whatever had begun to revive. When the European historian/traveller Clavijo⁶² passed through the country in 1404, he confirmed that Rayy was no longer inhabited (agora deshabitada).⁶³

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⁵⁹ D. M. Dunlop: Arab Civilisation; op cit; pp. 234-5.

⁶⁰ G.Wiet et al: *History of Mankind*; op cit; p. 653.

⁶¹ Ibn al-Athir: *Al-kamil fil Tarikh*; ed K.J. Tornberg; 12 vols; Leiden; 1851-72. XII; p. 184.

⁶² ed. Sreznevsky; p. 187.

⁶³ V. Minorsky: Rayy; op cit; p.472.

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