

TOLEDO

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TOLEDO

Toledo is a Spanish town in the centre of the Iberian Peninsula 60 miles S.S.W. of Madrid.¹ It is built on the banks of the River Tajoh (Tagus) over which once stood a magnificent bridge consisting of only one arch, supported by large stone piers on both sides of the river, measuring three hundreds ba'as in length and eighty in width.² Built 2000 feet above sea-level on a granite hill and surrounded on three sides by a bend of the Tagus, it commands in its immediate vicinity a fertile Vega which runs to N.E. and N.W. along the river and beyond it is the plain denudation of the Castilian Plateau.³

Today Toledo is the capital of the province of the same name and the see of the premier Archbishop of Spain.⁴

The Muslim geographers who described the Iberian peninsula in its medieval Islamic times more or less give long accounts of Toledo. Al-Idrisi writes about it in the *Iklm* of al-Sharat (las Sierras). In his time the city had already been taken from the Muslims (although the rest of Spain was not).⁵ He describes its excellent strategic position, its ramparts and the surrounding gardens intersected by canals from which the water is raised for irrigation by means of norias.⁶ Maqqari describes it as:

'One of the great cities belonging to the central division,' says the 16th century historian al-Maqqari, is 'Toleytalah, which at the beginning of the 6th century of the Hijra (early 11th century of Christian calendar) became the capital of a kingdom founded by the Beni Dhi nun, one of the petty dynasties which sprung out of the ruins of the Cordovan Caliphate. Caesar, who is said to have founded Toledo, called it in his language Zaleyta, which means in Arabic 'thou art content;' but in the course of time the name was corrupted by the Arabs, who changed it into Toleytalah (Toledo). During the reign of Beni Umeyyah all the territories subject to Toledo were designat3ed under the generic name of Al-Thagheru-I-Adna, or lower frontier, to distinguish it from Saragossa and its district, which were called Al-Thagheru-al-Ala, or upper frontier. Toledo was further known under the name of Medinatu al-Muluk, the city of the kings, owing to its having been the court of seventy two kings of various infidel dynasties. We have said elsewhere that the Goths made it their capital; it is also supposed to have been for some time the residence of Suleyman, son of Daud (on whom be peace) as well as for some time the residence of Jesus son of Mariam, and Dhu al-Karneyn (Alexander). It was there that Tarik, son of Ziyad, found the table of Suleiman which formed part of the treasures which Ishban, king of the Romans, and founder of Ishbillia, brought from the sack of Jerusalem. The table was made out of one solid emerald, and when presented by Musa (Ibn Nusayr) to the Caliph al-Walid, was valued at one hundred thousand gold dinars. It is generally believed to be now in Rome, but God only knows. This inestimable jewel was not the only treasure which Tarik found at Toledo; there were among other things one hundred and seventy royal diadems, set with pearls, rubies, and other precious stones; a spacious temple filled with gold and

¹ E.L. Provençal: Toledo; in *Encyclopaedia of Islam*; vol 3; first series; Leyden; pp. 809-12; at p. 809.

² Al-Maqqari: *Nafh Al-Tib*. Translated by P.De Gayangos: *The History of the Mohammedan Dynasties in Spain* (extracted from *Nifh Al-Tib* by al-Maqqari); 2 vols; The Oriental Translation Fund; London, 1840-3. vol 1; P.47.

³ E.L. Provençal: Toledo; op cit; p. 809.

⁴ E.L. Provençal: Toledo; p. 809.

⁵ Al-Idrisi in E.L. Provençal: Toledo; p. 809.

⁶ Al-Idrisi in .L. Provençal: Toledo; p. 809.

silver vases, which temple is further said to have been is such dimensions as to have afforded, when its riches were removed, sufficient room for the Muslim cavaliers to exercise in throwing the spear and other military sports. This latter circumstance, indeed, would seem almost incredible had it not been related by trustworthy people and eye witnesses. But God is all knowing.⁷

It is in the year 714 CE that the Muslim army under the command of a young Berber officer called Tarik Ibn Ziyad took Toledo. It is in Toledo that the Muslim chroniclers locate the meeting of Tarik and the Muslim general, Musa Ibn Nusair; the latter only staying there a short while before proceeding north to seize Saragossa.⁸

The 18th century historian, Gibbon, narrates at great length the Muslim arrival in Spain. This is a brief extract from his concluding lines:

‘The conditions of peace agreed and sworn between Abdelaziz, the son of Musa, the son of Nassir, and Theodemir prince of the Goths. In the name of the most merciful God, Abdelaziz makes peace on these conditions: that Theodemir shall not be disturbed in his principality; nor any injury be offered to the life or property, the wives and children, the religion and temples, of the Christians: that Theodemir shall freely deliver his seven cities, Orihuela, Valentola, Alicanti Mola, Vacasora, Bigerra, (now Bejar,) Ora, (or Opta,) and Lorca: that he shall not assist or entertain the enemies of the caliph, but shall faithfully communicate his knowledge of their hostile designs: that himself, and each of the Gothic nobles, shall annually pay one piece of gold, four measures of wheat, as many of barley, with a certain proportion of honey, oil, and vinegar; and that each of their vassals shall be taxed at one moiety of the said imposition. Given the fourth of Regeb, in the year of the Hegira ninety- four, and subscribed with the names of four Mussulman witnesses.” Theodemir and his subjects were treated with uncommon lenity; but the rate of tribute appears to have fluctuated from a tenth to a fifth, according to the submission or obstinacy of the Christians. In this revolution, many partial calamities were inflicted by the carnal or religious passions of the enthusiasts: some churches were profaned by the new worship: some relics or images were confounded with idols: the rebels were put to the sword; and one town (an obscure place between Cordova and Seville) was razed to its foundations. Yet if we compare the invasion of Spain by the Goths, or its recovery by the kings of Castile and Aragon, we must applaud the moderation and discipline of the Arabian conquerors.⁹

Toledo’s Muslim history remained convulsed, though. Many rebellions against central rule were carried by the Toledans and in 845, they allied themselves with the Christians. It was then that the Amir Mohammed I fought them and defeated the alliance and after besieging the city took it. Abbas Ibn Firnas alluded to the taking of Toledo, chanting the victory of Emir Mohammed against the alliance of Toledans and Christians¹⁰ and the destruction of its bridge in the following verses:

‘When morning came Toledo appeared deserted, and like a bird in the claws of a falcon. Its houses uninhabited, its streets without people, the whole city as empty and as silent as a tomb. The wrath

⁷ Al-Maqqari: Nafh Al-Tib. Pp. 46-7.

⁸ E.L. Provencal: Toledo; op cit; p. 810.

⁹ E. Gibbon: *Decline and Fall of the Roman Empire*; vol 5; Methuen and Co; London; fifth edition; 1923; pp. 481-2.

¹⁰ E. Teres: le Development de la Civilisation Arabe a Toled; in *Cahiers de Tunisie*, vol 17-8; 1969-70; pp. 73-86, at p. 75.

*of heaven has fallen heavily upon it; even the bridge through which the inhabitants held communication with the Infidels has not been spared.*¹¹

Yet despite such upheavals, Toledo remained a major centre of Islamic culture and civilisation especially under the Berber Dynasty of Banu Dhi Nun (11th century) as will be amply explored further on. All authors who have described Toledo also say that it has pleasant orchards, a beautiful river, gardens, groves, fine fruits of every kind and description; that its jurisdiction embraces extensive districts, good arable lands, rich meadows and pastures, fine cities and strong castles; one of the peculiarities of the place being that wheat can be kept under ground for a number of years without decaying and is transmitted from father to son as any other article of property.¹² The saffron, of which large quantities were yearly exported in caravans, is of itself a source of wealth to the inhabitants as well as the tincture made with it which dyes of a beautiful butter colour.¹³

According to an Andalusian poet:

*Toledo surpasses in beauty the most extravagant descriptions. She is indeed the city of pleasures and delight. God has lavished upon her all sorts of ornaments; He has given her walls for a turban, her river for a girdle, and the branches of trees for stars.*¹⁴

The geographer-historian-ruler of Hama, Abul'Feda (1273-1331), also praises the beauty of its orchards among which grew pomegranates with enormous flowers whilst according to Yaqut (d. 1229), the cereals grown around Toledo could be kept for 70 years without deterioration and its saffron was of excellent quality.¹⁵

However today there are very few traces left in Toledo of its long Muslim presence. At most, the remains of the little mosque of Bab Mardun (Cristo de la Luz) and some parts of the palace of Las Tornerias and of the old gate of Visagra can be dated back to the period of the Muluk al-Tawaif. On the other hand in the Vega near the town, a considerable number of epitaphs of Toledo Muslims have been found, mainly engraved on the shafts of columns.¹⁶

It is in 1085 that Toledo became one of the earliest and most important Muslim cities to be lost and to be never recovered again. This loss was to have a dramatic impact on both the future of Islamic Spain, and also the rise of the West. These crucial points will be looked at in great length after Toledo's great Islamic scholarly role has been considered.

Muslim Scholars of Toledo

In spite of its position as a frontier town with a population containing a large proportion of Christian elements, Toledo, especially at the end of the Umayyad Caliphate and in the reign of al-Mamun (d. 1074),

¹¹ Al-Maqqari: Nafh Al-Tib. op cit; Pp. 47-8.

¹² Al-Maqqari: Nafh Al-Tib.; p. 48.

¹³ Al-Maqqari: Nafh Al-Tib.; p. 48.

¹⁴ Al-Maqqari: Nafh Al-Tib.; p. 48.

¹⁵ Abu'l Fida and Yaqut al-Hamawi in E.L. Provençal: Toledo; op cit; p. 809.

¹⁶ E.L. Provençal: Toledo; op cit; p. 811.

was reckoned one of the intellectual centres of Muslim Spain.¹⁷ A large number of the articles in the collections on the biography of Muslim Spain are devoted to scholars and jurists of Toledan origin.¹⁸ From the early years of the Muslim presence in the Peninsula, can be found a group of personalities from the city who studied letters and sciences, travelling to the East where they listened to the masters there such as Malik Ibn Anas. Then, on their return, they spread such learning as teachers themselves amongst their countrymen.¹⁹ People of Toledo travelled to study in Al-Qayrawan, Tunisia which was a great centre of learning under the 9th century Aghlabids (see article Al-Qayrawan). They would listen most particularly to the teaching of Sheikh Sahnun.²⁰ Amongst the disciples of Sheikh Sahnun we find three Toledans who became Qadis in Toledo whilst others became virtuous Muftis and others amongst such learned people died in combat against the Christians.²¹ Hence Yahya B. Haggag of Toledo, disciple of Shanun, died as a martyr in one of the great battles fought against the Christians and near to him stood another companion of study, Yahia B. al-Qasir who was the only one of such group of learned friends who did not lose his life in the battle and saw this as a dishonour; only to die in the field of battle in the following year.²² Then there is Sulayman al-Qaysi of Toledo, an ascetic scholar and expert in the Qur'an and hadith, who shared all his possessions with the poor of the city and when not teaching, he would be found fighting on the frontier as a Holy Warrior, finally dying at the Battle for the Castle of Gormaz. Such was his reputation, even the Christians believed they obtained benediction when they visited his grave.²³

These are not the only learned Muslims who came to Toledo to teach and fight but they were joined by many others from all other parts of the Muslim world for precisely the same purposes. It must be remembered that Toledo was the northern Muslim outpost facing the Christians. Thus learned men came from Al-Qayrawan itself to fight and die and when not fighting, they exerted in their vocation as teachers, whilst leading an ascetic life.²⁴

In keeping with the tradition current in the Islamic world during its golden era (7th - 13th century), more than one ruler excelled in sciences and the promotion of sciences. Toledo was an excellent example of this. Thus the first Berber ruler, Al-Zafir (1018-1043) of the Banu Dhi Nun, who received great praise from Ibn Bassam for his defence of Islam and his uncompromising stance against the enemies of the faith, was a great supporter of scholarship.²⁵ Around him we find a great number of scholars of letters and sciences, such as: his secretary Muhammad B. Hurayra; his adviser, the scientist Ibn Bagunis, a man of letters and a renowned mathematician; as well as Ibn Labban; Ibn al-Farag and Ibn Mahqur; all of who were men of letters, poets and men of sciences, especially the exact sciences.²⁶

It is particularly under al-Mamun (who ruled 1043-1073), the penultimate Berber ruler of the Banu Di Nhun dynasty (11th century), that learning thrived to a greater extent. During his reign, Toledo was enriched considerably. He had magnificent buildings erected such as the Majlis al-Mukaram (The Holy Council), the Bustan al-Na'ura (The Garden of the Noria) in which was constructed Qubbat al-Naim (The Cupola of

¹⁷ E.L. Provençal: Toledo; op cit; p. 811.

¹⁸ E.L. Provençal: Toledo; p. 811.

¹⁹ E. Teres: Le Development de la Civilisation Arabe; op cit; p. 74.

²⁰ E. Teres: Le Development de la Civilisation Arabe; p. 74.

²¹ E. Teres: Le Development de la Civilisation Arabe; p. 76.

²² E. Teres: Le Development de la Civilisation Arabe; p. 76.

²³ E. Teres: Le Development de la Civilisation Arabe ; p. 77.

²⁴ E. Teres: Le Development de la Civilisation Arabe; p. 77.

²⁵ E. Teres: Le Development de la Civilisation Arabe; p. 78.

²⁶ E. Teres: Le Development de la Civilisation Arabe; p. 78.

Happiness), and other edifices which fill the lines of poets.²⁷ The prince was surrounded by prestigious men as the historian Al-Higari describes:

*There never was amongst the Reyes of Taifas another ruler as powerful and as famed as him (Al-Mamun). In his Majlis (council) gathered Muhammad B. Saraf, a glory of al-Qayrawan, Abd. Allah B. Khalifa al-Misri, al-Hakim, Abu' Farraj al-Baghdadi al-Adib and amongst his viziers were the scholars: Abu Isa B. Labbun; Ibn Sufyan; Abu Amar b. al-Farrag, and Abu'l Mutarrif b. Mutanna.*²⁸

The sciences of religion and tradition thrived in Toledo just as always in this frontier city. Theology, Fiqh, Hadith and Qur'anic exegesis had many specialists, some such specialists with encyclopaedic knowledge. Thus there were people like Abd' Walid al-Waqqali, a most learned man who studied deeply the letters and sciences, who excelled at languages, grammar, rhetoric, the secrets of poetry and who was also a faqih (expert in Islamic law) able to write notarial acts. He was an expert in the science of inheritance and succession, an authority in mathematics and geometry and he was acquainted with all the scholarly ideas.²⁹ Yet, he says:

It is saddening for me to think that human sciences are only two without anyone able to add any to them.

*One science is that of Truth whose acquisition is impossible, and another (science) of vain things, whose acquisition is of no use.*³⁰

At the court of Emir al-Mamun lived the celebrated doctor Ibn al-Wafid³¹ to whom Al-Mamun granted the high position of vizier.³² Ibn Al-Wafid (Latin name: Abenguefit) was from Toledo where he was born in 997 and where he died in ca 1074. He was a Hispano-Muslim physician and pharmacologist who applied himself to studying simples - a field where he surpassed all his contemporaries.³³ What characterised Ibn Wafid was his immense knowledge of medical matters and therapeutics and his skills in treating grave diseases and afflictions.³⁴ He preferred to use dietetic measures, and if drugs were needed, he gave preference to use the simplest ones before he recommended composed medicines. When he did use composed medicines, he gave priority to those less complex.³⁵

His main work on simple drugs (*Kitab al-adwiya al-mufrada*) is partly existing in a Latin translation (*De medicamentis simplicibus*).³⁶ According to a later Muslim writer, Ibn al-Wafid spent twenty-five years gathering the information he included in his treatise which was five hundred pages long and of which the Latin translation is only a fragment.³⁷ There are also translations of it in Catalan and Hebrew.³⁸ *De*

²⁷ E. Teres: *Le Development de la Civilisation Arabe*; p. 73.

²⁸ E. Teres: *Le Development de la Civilisation Arabe*; p. 79.

²⁹ E. Teres: *Le Development de la Civilisation Arabe*; p. 79-80.

³⁰ H. Peres: *Poesie*; p. 456 in E. Teres: *Le Development*; p. 80

³¹ G.S. Colin: *Filaha*; *Encyclopaedia of Islam*: New edition: Leiden; 1986, Vol 2, p. 901.

³² L Leclerc: *Histoire de la medecine arabe*; vol. 1, Paris; 1876; p. 545.

³³ L Leclerc: p. 545.

³⁴ L Leclerc: p. 545.

³⁵ E. H. F. Meyer: *Geschichte der Botanik*; I-IV, Königsberg, 1854-7; vol. 3, pp. 205-8.

³⁶ F. Wustenfeld: *Geschichte der arabischen Aerzte*, Göttingen; 1840; p. 82.

³⁷ L Leclerc: *Histoire*; op cit; p. 546.

³⁸ Emilia Calvo: Ibn Wafid: in the *Encyclopaedia of the history of Science, technology, and Medicine in Non Western Cultures*; H. Selin Editor; Kluwer Academic Publishers. Dordrecht/Boston/London, 1997. p.438.

medicamentis simplicibus has been printed frequently together with the Latin translation of the works of Masawaih al-Mardini³⁹ or of Ibn Jazla's *Taqwim (Dispositio corporum de constitutione hominis)*⁴⁰.

Ibn Wafid is also the author of a pharmacopoeia and manual of therapeutics entitled *al-wisad fi'l Tib* (book of the Pillow on Medicine), which according to Vernet could be a misreading of the Arabic title *Kitab al-Rashad fi'l tibb* (Guide to Medicine).⁴¹ This work can be considered complementary to the preceding one because Ibn Wafid describes compound medicines in it and it is a practical book as the information given is based on experience.⁴² Ibn Abi Ussaybiya, the Muslim medical historian, attributes to Ibn Wafid a work entitled *Mujarabat fi'l Tibb* (Medical experiments) which could probably be identified with this book just cited.⁴³

Ibn Wafid is also the author of two works entitled *Tadqiq an-Nazar fi ilal hassat al-Bassar* (Observations on the treatment of illness of the eyes) and *Kitab al-Mughith* (Book on Assistance) which are not preserved and a treatise on balneology which is preserved in a Latin version entitled *De balneis sermo* printed in Venice in 1553.⁴⁴ Amongst the matters Ibn Wafid investigates is the action of drugs,⁴⁵ sleep, bathing and he also writes on farming.⁴⁶

On this latter point, the early nucleus of the school formed in Toledo where Ibn Wâfid was employed in the royal garden of al-Ma'mûn. But after the conquest of the city in 1085, Ibn Wafid's student Ibn Luengo and Ibn Bassâl, his colleague in the royal garden moved to Seville where they came into contact with another nucleus of agronomists: Ibn al-Hajjâj, Abu'l-Khayr and the mysterious "anonymous botanist" of Seville (studied by Asín Palacios) as well as al-Tignarî of Granada.⁴⁷ The pattern of their personal contracts and citations of one another's works illustrates the kind of complex network that was bound to underlie the "dense climate of botanical study and experimentation" described by J. M. Millás Vallicrosa.⁴⁸

Another scholar of Toledo, equally protected and sponsored by Al-Mamun, was Muhammad b. Ibrahim Ibn Bassal (fl. 11th century) who devoted himself exclusively to agronomy.⁴⁹ He regularly performed the pilgrimage to Mecca, travelling via Sicily and Egypt and bringing back many botanical and agronomic notes.⁵⁰ He also visited Khurâsân for the same purpose of research.⁵¹ Ibn Bassal wrote for Al-Mamun a lengthy treatise on agronomy, *Diwan al-Filaha*, which was eventually abridged into one volume with sixteen chapters with the *Kitab al-Kasd wal bayan* (Book of Concision and Clarity).⁵² The treatise by Ibn Bassal is singular in that it contains no reference to earlier agronomists; it appears to be based exclusively on the personal experiences of the author who is revealed as the most original and objective of all the Hispano-

³⁹ Venice, 1549 sq.

⁴⁰ Strasbourg, 1532.

⁴¹ Emilia Calvo: Ibn Wafid; op cit; p.438.

⁴² Emilia Calvo: Ibn Wafid; p.438.

⁴³ Emilia Calvo: Ibn Wafid; p.438.

⁴⁴ Emilia Calvo: Ibn Wafid; p.438.

⁴⁵ G. Sarton: *Introduction to the History of Science*; 3 vols; The Carnegie Institute of Washington; 1927-48. vol 1; p. 728.

⁴⁶ L. Leclerc: *Histoire de la medecine arabe*; vol. 1, Paris; 1876; p. 547.

⁴⁷ T. Glick: *Islamic and Christian Spain in the early Middle Ages*, Princeton University Press, New Jersey, 1979. p. 255.

⁴⁸ T. Glick: *Islamic*; p. 256.

⁴⁹ V. Lagardere: *Campagnes et paysans d'Al Andalus*; Maisonneuve; Larose; Paris; 1993; at p. 264;

G.S. Colin: *Filaha*; op cit; p. 901.

⁵⁰ G.S. Colin: *Filaha*; p. 901.

⁵¹ T. Glick: *Islamic*; op cit; p. 259.

⁵² G.S. Colin: *Filaha*; p. 901.

Muslim specialists.⁵³ Ibn Bassal's treatise was eventually translated into Castilian in the Middle Ages, and was published in 1953 with a modern Castilian introduction.⁵⁴

Al-Mamun was also known as 'the great garden lover'⁵⁵ and his garden had a pavilion called *Majlis an-Naura* which raised water from the Tajo to supply elegant fountains in which lions made of stone spouted water.⁵⁶ In al-Andalus water-driven wheels were found in conjunction with canal systems in Murcia where the mammoth wheel at La Nora was driven by the current of the Aljufia canal; most typically in Toledo where, as described by al-Idrisi (b. 1099/1100 - d. 1166), they were surrounded by gardens interlaced with canals on which were established wheels for irrigation; in Cordoba where al-Shaqundi (13th century) described 5000 water wheels (probably including both lifting and milling devices) on the Guadalquivir.⁵⁷ The extensive agronomical literature of the 11th-12th century Andalusí writers strongly accentuates the role of irrigation agriculture to the detriment of dry-farming techniques.⁵⁸ But the irrigation described is not fluvial but from wells from which the water is lifted by a noria with a chain of pots and deposited directly into a channel or into a holding basin. Indeed, these writers came largely from Seville and Toledo, two cities towards which the cultural centre of gravity had shifted after the fall of the Caliphate and where Valencian-style irrigation was not practiced.⁵⁹

Ibn Bassal advises the placement of wells near rivers so that water continuously filters in and the level remains constant. If not, the water will fall below the level at which the noria's chain of pots can reach it.⁶⁰ Moreover wells should be dug in August when the flow of water is most sluggish. For deep wells, Ibn Bassal recommends a counterbalance device which had the advantage over the noria, for the latter would have required a chain of pots of excessive length.⁶¹

Ibn Bassal eventually fled to Seville from Toledo when it was captured by Alfonso VI of Castile. He was at the court of Al-Mutamid for whom he created a new royal garden.⁶² His works and activities there are considered under the entry on Seville.

However the glory of Toledo in the 11th century was the development of exact sciences. Here can be found the mathematicians al-Waqqadi and al-Tugibi; the geometers Ibn al-Attar and Ibn Hamis who were also astronomers.⁶³ Amongst these illustrious figures was Mohammad B. Assafar, who in 1029 made an astrolabe which, centuries after, was found in the Sprenger collection. It was later transferred to the Staatsbibliothek of Berlin and can today be located in the Westdeutsche Bibliothek of Marburg (still in Germany).⁶⁴ Here could be found Ibn al-Bagunis and Ibn Wafid and here could be seen the rising star of Muslim scholarship, the young al-Zarqali. Said al-Andalusí (al-Tulaytuli) (of Toledo) has left us important

⁵³ G.S. Colin: Filaha; p. 901.

⁵⁴ Ibn Bassal: *Libro de agricultura*, Jose M. Millas Vallicrosa and Mohammed Azinan eds, Tetuan: Instituto Muley al-Hasan, 1953.

⁵⁵ G.S. Colin: Filaha; op cit, p. 901.

⁵⁶ T. Glick: Islamic; op cit; p. 237.

⁵⁷ T. Glick: Islamic; p. 75.

⁵⁸ T. Glick: Islamic; p. 75.

⁵⁹ T. Glick: Islamic; p. 75.

⁶⁰ T. Glick: Islamic; p. 238.

⁶¹ T. Glick: Islamic; p. 238.

⁶² G.S. Colin: Filaha; op cit; p. 901.

⁶³ E. Teres: *Le Développement de la Civilisation Arabe*; op cit; p. 79.

⁶⁴ L. A. Mayer: *Islamic astrolabists and their works*; Albert Kundig; Geneva; 1956; p. 75.

information on this subject in his *Tabaqat al-Umam* (The Classification of Nations) which has been studied by illustrious historians.⁶⁵

Al-Zarqali (Arzachel) (1029-1087) was a Spanish Muslim of a family of artisans who entered the services of Qadi Ibn Sa'id of Toledo as a maker of delicate instruments. He lived in Toledo until the city became insecure following Christian attacks.

Al-Zarqali prepared the famous Toledan Tables, the original version of which were in Arabic are lost but two Latin versions have survived. Ptolemy's exaggerated estimate of the length of the Mediterranean Sea at 62° were first cut by al-Khwarizmi to 52° then probably by al-Zarqali to the near the correct value of 42°. ⁶⁶ Al-Zarqali's work was translated into Latin by Gerard of Cremona and was very popular for more than two centuries. ⁶⁷ All subsequent tables for different locations in the Christian West were based on al-Zarqali's measurements such as the tables of Marseilles, and his tables were also adapted to the meridians of London, Paris and Pisa. ⁶⁸ Robert of Chester's work was less a translation than an adaptation of the tables of al-Battani and al-Zarqali for the coordinates of London, 1149. ⁶⁹

Al-Zarqali was also a renowned instrument maker. As Barron Carra de Vaux tells us, he was given the surname 'Al-Nekkach' which means the engraver of metals. ⁷⁰ According to established tradition he was a mechanic and metal craftsman who was very able with his hands. ⁷¹ It was as an instrument maker that al-Zarqali entered the services of Qadi Ibn Said of Toledo. He was needed to make delicate instruments essential to continue astronomical observations begun in 1060, possibly by Yahia Ibn Abi Mansur. ⁷² First Al-Zarqali built instruments for other scholars, but when they realised his great intellect, they became interested in him. As he told them that he was man of little learning, having never studied any science nor touched a book, they put him to task and made him study and learn, ⁷³ putting at his disposal the books he needed to educate himself. ⁷⁴ Two years later, in 1062, he became a member of the group and soon after its director. ⁷⁵ Al-Zarqali continued to make instruments requested by others but now began to invent his own and he also began to teach his own masters to the point that they soon began to follow his example. ⁷⁶ He invented and constructed an astrolabe - a *safiha* - about which he wrote a treatise out of which a whole literature developed. ⁷⁷ A Jew from Montpellier in France translated it into Latin; King Alfonso of Castile made two translations of it into Romance (Spanish) whilst Regiomontanus in the fifteenth century published a collection of problems on the 'noble instrument of the safiha'. ⁷⁸ Around 1062 Al-Zarqali constructed the water clocks

⁶⁵ E. Teres: *Le Development de la Civilisation Arabe*; op cit; p. 79.

⁶⁶ P.K.Hitti: *History of the Arabs*, MacMillan, London, 1970 ed. p. 571.

⁶⁷ G. Sarton: Introduction; Vol II, op cit; p.11.

⁶⁸ J.L. E. Dreyer: *Mediaeval astronomy*; in Robert M. Palter ed: *Toward Modern Science*; The Noonday Press; New York; 1961; Vol 1, pp 235-256; p.243.

C.H. Haskins: *Studies in the history of Mediaeval Science*; Frederick Ungar Publishing Co. New York. 1967 ed. p. 98.

⁶⁹ G. Sarton: Introduction; Vol II, op cit; p.11.

⁷⁰ Carra de Vaux: *Les Penseurs de l'Islam*; Geuthner, Paris, 1921; vol 2; p. 228.

⁷¹ Barron Carra de Vaux; p. 228.

⁷² J.Vernet: Al-Zarqali: *Dictionary of Scientific Biography*; Charles Scribners' Sons; New York; vol 14; p. 592.

⁷³ Barron Carra de Vaux: *Les Penseurs*; op cit; p. 228.

⁷⁴ J.Vernet: Al-Zarqali; op cit; p. 592.

⁷⁵ J.Vernet: Al-Zarqali; p. 592.

⁷⁶ Barron Carra de Vaux: *Les Penseurs*; op cit; p. 228.

⁷⁷ Barron Carra de Vaux: *Astronomy and Mathematics*, in *The Legacy of Islam*; T. Arnold and A. Guillaume Ed; 1931; Oxford; p. 394.

⁷⁸ Ibid, p. 395.

of Toledo, descriptions of which can be found in Al-Zuhri as conveyed to us in Spanish by Millas Vallicrosa⁷⁹ and partly in English as in the following extract from Thomson:

The clocks consisted of two basins, which filled with water or emptied according to the increasing or waning of the moon. At the moment when the new moon appeared on the horizon, water would begin to flow into the basins by means of subterranean pipes, so that there would be at day-break the fourth of a seventh part, and at the end of the day half a seventh part, of the water required to fill the basins. In this proportion the water would continue to flow until seven days and as many nights of the month had elapsed, by which time both basins would be half filled. The same process during the following seven days and nights would make the two basins quite full, at the same time that the moon was at its full. However, on the fifteenth night of the month, when the moon would begin to wane, the basins would also begin to lose every day and night half a seventh part of their water, until by the twenty-first of the month they would be half empty, and when the moon reached her twenty-ninth night not a drop of water would remain in them. It is worthy of remark that, should anyone go to any of the basins when they were not filled, and poured water into them with a view to quicken its filling, the basins would immediately absorb the additional water and retain no more than the just quantity; and, on the contrary, were anyone to try, when they were nearly filled, to extract any or the whole of their water, the moment the hands are raised, the basins would pour out sufficient water to fill the vacuum in an instant.⁸⁰

The clocks were in use until 1133 when Ibn Zabara was given permission by Alfonso VII (the new Christian ruler) to see how they worked but he failed to reassemble them after dismantling them. With Al-Zarqali now dead, details of his techniques were lost.⁸¹

Ibrahim B.Sa'id al-Wazzan is known to have been a prominent instrument maker working in Valencia and Toledo.⁸² From 1085 onwards his son Muhammad worked with him.⁸³ He made at least six astrolabes, one of which he constructed in Toledo in June 1067 and which centuries later became part of the collection of D. Faustino de Borbon before ending up in the Archaeological Museum of Madrid (there is an electrotype of it in the London Science Museum).⁸⁴ The following year, he made another astrolabe also in Toledo, which now is in the Lewis Evans Collection in the Museum of the History of Science, Oxford.⁸⁵ His four other astrolabes are today scattered in different museums, mostly in Rome at the Museo Astronomico and the Museo Kircheriano.⁸⁶ In 1085, with his son, he made a celestial globe with its stand (Kursi) for the Vizier Abu Issa B. Labban (the minister at the Toledo court mentioned above).⁸⁷ The globe was formerly in the Belluomini Collection, but is now in the Museo di storia della Scienza in Florence.⁸⁸ Tracing the works of this remarkable instrument maker and giving him due credit through raising awareness of his achievements is

⁷⁹J.M. Millas-Vallicrosa: *Estudios Sobre Azarquiel*, Madrid-Grenada, 1943-1950, pp. 6-9.

⁸⁰A. Thompson-M.A.Rahim: *Islam in Andalus*; Ta-Ha Publishers, London 1996; p. 45.

⁸¹C. A. Ronan: The Arabian Science in *The Cambridge Illustrated History of the World's Science*: Cambridge University press. Newness Books, 1983. pp 201-244; p. 215.

⁸²L.A. Mayer: *Islamic astrolabists*; op cit; p. 50.

⁸³L.A. Mayer: *Islamic astrolabists*; p. 50.

⁸⁴L.A. Mayer: *Islamic astrolabists*; p. 50.

⁸⁵L.A. Mayer: *Islamic astrolabists*; p. 51.

⁸⁶L.A. Mayer: *Islamic astrolabists*; p. 51.

⁸⁷L.A. Mayer: *Islamic astrolabists*; p. 51.

⁸⁸L.A. Mayer: *Islamic astrolabists*; p. 51.

highly necessary. There is a vast but widely scattered bibliography mainly in Spanish that can be researched through.⁸⁹

Toledo was the residence of a great number of able architects. Fath B. Ibrahim (Fl. 934; d. 1013) was known as al-Qashari, a scholar, pious man and architect who, although flourishing in the Caliph court of Cordova, was also credited for building two mosques in Toledo. He also restored the fortifications of Makkada and Waqqash.⁹⁰ His contemporaries were the architects Musa. B. Ali, al-Banna (the constructor) and Saada, who erected the mosque of Bab Mardum* known now as San Cristo de la Luz and is dated from the years 999-1000.⁹¹ Jairazbhoy offers an excellent summary of this Toledan edifice.⁹²



Bab Mardum Mosque, Toledo⁹³

"Above the triple-doored entrance are interlacing semi-circular arches, followed by a cellular cross hatched band of brick ornament between denticulated mouldings, and a brick inscription still further above which says that the mosque was built for Ahmad Ibn al-Hadid by his architects Musa Ibn Ali and Saada. Over the round horseshoe doors of the lateral façade are larger engaged semi circular arches in rectangular frames, and above the filled in window voids of round horseshoe form with flaming voussoirs, are trefoil arches in relief. A break appears in the brickwork of the apsidal end, in the zoning of the composition, and in the features themselves, for the windows this time are of pointed horseshoe form and are encompassed by multifoil arches in relief. Leaving aside the apse which was a 12th century Mudejar (Muslim under Christian rule) addition, the remaining edifice

⁸⁹ See, for instance, J. Millas Vallicrosa: *Assaig d'història de les idees físiques i matemàtiques a la Catalunya medieval*, vol 1; Barcelona; 1931.

Casiri: *Bibliotheca Arabico-Hispana Escorialensis*. 2vols. Folio. Matriti, 1760.

L.A.Sedillot: *Memoire sur les instruments astronomique des Arabes*, *Memoires de l'Academie Royale des Inscriptions et Belles Lettres de l'Institut de France* 1: 1-229; Reprinted Frankfurt, 1985.

⁹⁰ L.A. Mayer: *Muslim architects and their works*; A. Kundig; Geneva; 1956; p. 62.

* <http://www.muslimheritage.com/topics/default.cfm?ArticleID=264>

⁹¹ L.A. Mayer: *Muslim architects and their works*; p. 107.

⁹² R.A. Jairazbhoy: *An Outline of Islamic architecture*; Asia Publishing House; Bombay; London; 1972; pp. 89-91.

⁹³ (Source http://www.islamfrance.com/photos_andalousie.html)

resolves itself into 9 bays, each covered individually by separate vaults. The central vault is carried on four Visigothic columns, and is raised higher than its mates by the addition of an octagonal zone above the mock triforium. The ingenuity and variety of the ribbed vaulting in this mosque is extraordinary, even if the workmanship be somewhat crude. One of the vaults forms a square with the ends of the ribs meeting the centres of the sides of the square bay; one has two pairs of ribs crossing each other axially; another has ribs starting from above squinch arches and forming a cross, while another has lobed tripod squinches with lobed arms of a cross starting from the angles of the inscribed square, others form stars with non-ending intersecting lines, etc. The ribs of the central vault form one star shape with another, and within the centre of the inscribed star rises an octagonal shell. It will be noted that there are three examples of ribs intersecting in the centre; the germ, in fact, of the quadripartite vault that later became standardised in Europe. Following the recapture of Toledo in 1085, this mosque was turned into a cathedral. Other than this mosque, an 11th century horseshoe arcade on Visigothic columns preserved in the Church San Salvador, the Mosque of the Tornerias which is raised on the first storey and utilises ribs in its central vault, and the Puerto Visagra (Bab Shakra), a clean sweep has been made of the pre-reconquest buildings of Muslim Toledo.⁹⁴

All the great names of Toledo and of Muslim sciences who have significantly influenced the rise of modern science and civilisation, as just seen, correspond precisely to this Berber phase of the Banu Dhi Nun rule. Yet, as in the overwhelmingly dire recording of Islamic history where the Seljuks, Mamluks and Ottomans are falsely accused of being fanatical hordes who destroyed civilisation, likewise the same terrible verdict is delivered on the Berbers. This issue is detailed under the entry on Seville. But briefly here, one quotes Renan, the French 19th century `scholar`:

`Here, is according to me the most curious lesson which results from this whole history. The Arab philosophy offers the example, more or less unique of a very high culture suppressed nearly instantly without leaving any traces, and forgotten by the people who have created it. Islamism unravelled in this circumstance what was irremediably narrow in its genius. Christianity, too, had been little favourable to the development of positive science. It had managed to stop in Spain and hinder it in Italy; but did not suffocate it, and even the prominent branches of the Christian family had ended up reconciling themselves with it. Incapable to transform itself, and to admit any element of civilian and profane life, Islam tore out of its bosom every germ of rational culture. This fatal tendency was fought whilst Islam was in the hands of the Arabs, a refined and highly spiritual race, and the Persians, a race that leans strongly towards speculation; but it could not rule since the barbarians (Turks, Berbers etc...) took over the lead of Islam. The Islamic world then entered in a period of ignorant brutality, from which it emerged only to fall into the mournful agony in which it is struggling at present.⁹⁵

Somehow just as Renan, Le Bon says:

`The Arab race was very delicate and very indulgent, and never departed from a tolerant spirit. However, when in the thirteenth century, the Arabs disappeared from the scene, and power fell in the hands of Turks and Berbers: `heavy` races, `brutal` and `brainless`,` intolerance began to rule

⁹⁴ R.A. Jairazbhoy: *An Outline of Islamic architecture*; pp. 88-91.

⁹⁵ E. Renan: *Averroes et l'Averroisme*, 4th edition, Calman Levy, 1882. p. iii.

amongst the Muslims. It is not doctrines that are intolerant, but men from amongst those entities just cited...Intolerance is the mark of the 'inferior' races: Turks and Berbers.⁹⁶

For Wiet and his group:

'We may date the apogee of the Moslem world in the tenth century, when Arab control of the Mediterranean and its environs was at its height. But already its future decomposition was heralded by the opposition between three rival caliphates. In the eleventh century the Moslem world was subjected to major invasions, those of the Berbers and especially of the Turks.'⁹⁷

Yet, whilst these Western authors and others with similar views (especially the likes of Le Bon, Lane Poole, Monroe etc...) are at least competent and do provide many good and positive facts in relation to the history of Islam even if they do state facts this author contests, modern historians are much less generous towards Islam (one here avoids using strong words in depicting the latter out of respect for this site). Here, indeed, is the new history of Spain according to one such modern historian: Fletcher who attacked Anthony Burgess of the newspaper daily The Independent who on 21 August 1991 wrote and praised the beauty, tolerance and learning of Muslim Spain. In response, Fletcher asks:

'Learning? Outside the tiny circles of the princely courts, not a great deal of it could be seen. Good order? Among the feuding Berber tribesmen?...'⁹⁸

Instead, Fletcher narrates that favourable images of Muslim Spain are due to:

'The nostalgia of Maghribi writers, reinforced by the romantic vision of the nineteenth century. This could be flavoured by a dash of Protestant prejudice from the Anglo Saxon world: it can be detected in Lane Poole's reference to the Inquisition. A powerful mixture!⁹⁹

Had Fletcher, just like the rest amongst the hordes of modern 'historians', paid more attention to the facts, they would have realised how false some of their assertions are. As the previous heading shows and as will be illustrated further on, the rise of modern science and civilisation precisely dates and comes from the 'fanatic' Berber period and it is precisely from the libraries and manuscripts left by these very Berbers that the Western translators acquired all books of science and learning which were to lead to the West coming out of the dark ages. Whilst we are on the point of decadence in the Islamic civilisation, it is neither the Berbers nor Islam which caused its decline but the destruction of Islamic civilisation is the work of the ancestors of those who today sit and with determination pour their invective on Islam and its defenders. And this is shown in the following with focus placed on the city of Toledo.

The Loss of Toledo and the Beginning of the End of Muslim Power and Civilisation

⁹⁶G. Le Bon: *La civilization des Arabes*; Cyracuse; 1884; pp. 447; 453.

⁹⁷ G.Wiet; V. Elisseeff; P. Wolff; and J. Naudu: *History of Mankind*; Vol 3: The Great medieval Civilisations; Trsltd from the French; George Allen &Unwin Ltd; UNESCO; 1975. p.7,

⁹⁸ R. Fletcher: *Moorish Spain*; Phoenix; London; 1992. p.172.

⁹⁹ R. Fletcher: *Moorish Spain*; p.172-3.

We briefly return to the history of Spain under Islam. The Muslim entered and conquered Spain in 711. The country was ruled by the Umayyad dynasty until 976 CE. Then Ibn Abi Amir al-Mansur rose to power. He was one of the greatest and most able rulers of Islam and died in 1002. At his death, his son was too inept in comparison to his father and after six years his rule collapsed. What followed was the break of the Peninsula into thirty or so independent kingdoms: the Reyes of the Taifas. Toledo became the capital of an independent kingdom of the Banu Dhi Nun who were nobles of Berber origin.¹⁰⁰ They were able rulers, especially Al-Mamun who in 1044 came to power and ruled an expanding kingdom until 1075. Whilst Al-Mamun's reign is marked with great successes and growth of the kingdom, that of his successor and grandson, Al-Kadir, was comparatively disastrous.¹⁰¹ The incapacity of this prince brought a period of decadence which culminated in his making an alliance with the Christian King of Castile and Leon, Alfonso VI.¹⁰² The latter demanded payment of tribute from the Muslim ruler, a payment which grew larger and larger until Al-Kadir was forced to impose unbearable taxes on his subjects and put to death those who rebelled against it.¹⁰³ The Christian ruler, Alfonso then entered the kingdom and seized power supposedly for the benefit of his troubled Muslim ally (Al-Kadir) but, in truth, it was a result of self-interest and so in 1085, Toledo passed under Christian hands.

The fall of Toledo was to have dramatic effects on Islam, its power and civilisation. But first it raised some far reaching questions on the causes of Muslim weakness. In various poems of the period the blame fell both on the rulers, for their indolence and preoccupations with their own pleasures, and on the Muslim community which had lost touch with the practices of its faith.¹⁰⁴ Ibn Bassam quotes a verse describing the Andalusian rulers:

*Their minds were occupied with wine and song, and listening to music.*¹⁰⁵

Ibn Hazm was even sharper in his denunciation of the Taifa kings:

*By God, I swear that if the tyrants were to learn that they could attain their ends more easily by adopting the religion of the Cross, they would certainly hasten to profess it! Indeed, we see that they ask the Christians for help and allow them to take away Muslim men, women and children as captives to their lands. Frequently they protect them in their attacks against the most inviolable land, and ally themselves with them in order to gain security.*¹⁰⁶

Abu'l Kassim B. Faraj al-Ibiri, writing some time later, also pours vindictive words on these rulers, whose betrayal was to take a more substantial form after the fall of Toledo with dramatically significant effect in the loss of Muslim Spain and eventually, centuries down the line, the extermination of millions of Muslims there. Hence, he composes:

*Call the kings and say to them,
What have you brought about?*

¹⁰⁰ E.L. Provencal: Toledo; op cit; p. 811.

¹⁰¹ E.L. Provencal: Toledo; p. 811.

¹⁰² E.L. Provencal: Toledo; p. 811.

¹⁰³ E.L. Provencal: Toledo; p. 811.

¹⁰⁴ C. Melville and A. Ubaydli: *Christians and Moors in Spain*; vol 3; Arabic sources; Aris and Phillips Ltd; Warminster; UK; 1992; p. 90.

¹⁰⁵ Ibn Bassam: Dhakhir; I; part ii; p. 430 in D. Wasserstein: *The Rise and Fall of the Party Kings*; Princeton University Press; 1985; p. 280.

¹⁰⁶ Quoted by MacKay: Spain in the Middle Ages; 27 from M. Asin Palacios: Un Codice inexplorado del cordobes Ibn Hazm;

*You have handed over Islam into enemy captivity
And (yourselves) remained seated (and inactive)
We should rise up against you
Since you have given support to the Christians
You take no account of the breaking of the bonds of community of the Prophet.¹⁰⁷*

The Taifa rulers were not alone in being attacked in this way. The Muslims as a whole were also blamed for their laxity and falling away from the ideals of Islam. In a poem mourning the fall of Toledo to Christendom, an anonymous poet says:

*‘If we say, punishment has reached them,
and rejection by God has come to them,
Then we, too, like them, and more than they,
Deviat (from religion), and can one who deviates be safe?
Can we be sure that vengeance will not fall upon us,
When corruption has combined with licence amongst us?
...
The Veil is stripped from a people whenever
Free rein is given to disobedience.¹⁰⁸*

This had the greatest impact upon the Christians¹⁰⁹ who now realised they could wrest Spain from the Muslims. It had also the greatest impact on the Muslims for it began to signal the end of their presence there, and much else besides.

The Christian capture of Toledo in 1085 was of much anguish as demonstrated by the cry of al-Assal, an ascetic figure of Toledo:

*‘Oh people of al-Andalus, urge on your mounts
Stay here only by mistake.
Clothing frays from the edges, but I see the clothing of the Peninsula
Coming apart in the middle.
We are caught up with an enemy who will not leave us alone
How can one live in a basket together with snakes?¹¹⁰*

Another poet said:

*‘O people of al-Andalus, return what you have borrowed; it is not customary to borrow without giving back
Do you not see the pawn of the unbelievers has become a queen, while our king is checkmated on the last square?¹¹¹*

Al Andalus; 2; 1934; p. 42; in D. Wassestein; p. 280.

¹⁰⁷ Ibn Bassam: Dhakhira; I; part ii; p. 374; in D. Wasserstein; p. 280.

¹⁰⁸ Anonymous quoted by Al-Maqqari: Analectes; ii; p. 778 in D. Wasserstein; p. 281.;

¹⁰⁹ E.L. Provencal: Toledo; p. 811.

¹¹⁰ Ibn al-Assal al-Yahsubi in C. Melville and A. Ubaydli: *Christians and Moors in Spain*; vol 3; Arabic sources; Aris and Phillips Ltd; Warminster; UK; 1992; p. 91; also from D. Wasserstein: *The Rise and Fall of the Party Kings*; Princeton University Press; 1985; p. 279.

Little was this poet like the rest far from realising the dangers. The loss of Toledo had devastating effects on both the scholarship of the city and eventually on the whole history of Spain. At the fall of the city, Muslim scholars took flight in their droves or were simply murdered by the Christian invaders. Al-Zarqali was one who fled. Ibn al-Wafid also escaped as did Ibn Bassal who as previously mentioned ran to Seville to the court of Al-Mutamid.¹¹² Ibn Bassam describes how the incessant invasions of the Christians forced him to run away from Santarem in Portugal - 'the last of the cities of the West' - after seeing his lands ravaged and his wealth destroyed; he was a ruined man with no possessions save his battered sword.¹¹³ Many scholars such as Abu Salt of Denia and Abu Behr al-Tortuchi of Tortosa left Spain altogether to take refuge in Egypt.¹¹⁴ Others were still more unfortunate, like the poet Ibn Wahbun who was murdered by Christian raiders on the road from Lorca to Murcia in 1087.¹¹⁵ During the siege of the city, the central figures of Toledo left and never returned. They left for Cordova, Seville, Grenada and even crossed the Mediterranean to reach Ceuta and Fes in Morocco.¹¹⁶ In the biographic repertories there are many people of Toledo who spread all over the Muslim world but principally on the western side of the land of Islam and their names, all of them, were followed by al-Taytuli (The Toledan).¹¹⁷

Once Toledo became Christian, the main mosque was turned into a cathedral, the spoken and written Arabic language continued to be employed by the Mudejars (Muslims under Christian rule), Mozarabs (Christians under Muslim rule) and their descendants especially during the period of the school of translation (see next heading) but with time, the Arabic language in Toledo irremediably disappeared.¹¹⁸

In spite of the victories which the Almoravid ruler Yusuf Ibn Tashfin and subsequently the Almohads won in the Iberian Peninsula, Toledo never again passed into Muslim hands although its recapture remained one of the objectives of their armies for a century.¹¹⁹ It was twice besieged by the Muslims but without success.¹²⁰

Gradually in fact, following Muslim losses, the Muslim territories, day after day, became further and further away from Toledo.¹²¹ As Teres said:

*'that the Eagle of al-Andalus now threatened the Muslims ever more. I said the Eagle of Al-Andalus, because, we Spaniards, where we see the skin of a bull, this land, once was imagined as an eagle. It was Ali B. Tashfin, Emir of the Muslims, Prince of the Almoravids, who imagined it thus. He used to say that the belly of the eagle was at Calatrava, its head at Jaen, its beak at Grenada, its right wing stretched to the West, its left wing stretched to the Orient, and its claws were upon Toledo.'*¹²²

¹¹¹ Anonymous in C. Melville and A. Ubaydli: Christians and Moors in Spain; p. 91.

¹¹² G.S. Colin: Filaha; op cit; p. 901:

¹¹³ C. Dawson: *Medieval Essays*: Sheed and Ward: London; 1953; p. 129.

¹¹⁴ C. Dawson: *Medieval Essays*; p. 129.

¹¹⁵ C. Dawson: *Medieval Essays*: p. 129.

¹¹⁶ E. Teres: *Le Development*; op cit; p. 84.

¹¹⁷ E. Teres: *Le Development*; op cit; p. 84.

¹¹⁸ E. Teres: *Le Development*; op cit; p. 85.

¹¹⁹ E.L. Provençal: Toledo; op cit; p. 811.

¹²⁰ E.L. Provençal: Toledo; p. 811.

¹²¹ E. Teres: *Le Development*; op cit; p. 85.

¹²² E. Teres: *Le Development*; p. 86.

With the loss of Toledo, the eagle lost its claw and soon, the whole eagle was slain by the Christian advance. After Toledo fell, the Christians began to swallow the Muslim principalities of the Taifa rulers one after the other. Realising the danger, the Taifa rulers appealed to the mighty Moroccan Almoravids to save them. The Almoravids, who had just established their rule in Morocco, responded. In 1086, the Almoravid Berber armies, manoeuvring en masse to the sound of drums, inflicted on the Christian knights a shattering defeat at Sagrajas near Bajadoz.¹²³ Ibn Tashfin was then prompted by local Spanish Muslim rulers to withdraw now that the Christian danger had abated. But falling under renewed Christian threats the Muslim princes called upon Ibn Tashfin again and he returned to the Peninsula in 1088 and also in 1090. On the final occasion, he decided govern the country by himself, removing all princes and putting Muslim Spain under Almoravid control.

After an initial reassertion of Muslim power over the Peninsula, at the death of Ibn Tashfin his successors resorted to the same petty squabbling, civil wars and luxuries of the Harem just as their predecessors had done. Ali, Ibn Tashfin's son, was raised in the indolent, poetry-saturated surrounding of urban Andalusia.¹²⁴ He was also very much under the influence of his wife, Qamar - a former captive of Christian origin;¹²⁵ she exerted such influence that in his latter years the country was virtually ruled from the Harem.¹²⁶ The Almoravids, who were at first welcomed by the common people, now behaved with the same flamboyant libertinism of their predecessors¹²⁷ And as moral decadence set in, so their fortunes declined on the field of battle.¹²⁸ Hence, once more, the Christian threat rose and once more, the Moroccan Berbers intervened - this time with the Almohads under their mighty ruler, Yaqub ibn Yusuf (1184-1199), who like the famous Ibn Abi-Abi ` Amir was to take the honorific title of Al-Mansur (The Victorious).¹²⁹ On 18th July 1196, he inflicted a crushing defeat on Alfonso VIII of Castile at Alarcos with the Christian army being virtually exterminated.¹³⁰

Following the death of Yaqub al-Mansur his successors again fell back into the same vain, corrupt life and indulgences. Civil wars followed and the Christian advance resumed. Muslim Spain was then under Al-Nasir, a ruler who cared neither for science nor for religion, and he neglected his governing responsibilities and focused on pleasure.¹³¹ His harem contained nearly seven thousand females.¹³² At the very decisive battle of Navas de Tolosa in 1212, Al-Nasir's much superior Muslim army was crushed and in the wake of the battle, 70 000 Muslim prisoners were slaughtered at the order of the Bishops of Toledo and Narbonne who were at the scene.¹³³

The battle of Navas de las Tolosa, where the Muslim armies were wiped out, is one of the greatest Muslim military defeats in history and resulted in heavy consequences.¹³⁴ With Almohad control effectively gone by 1223, James the Conqueror of Aragon-Catalonia raided the Valencian border in 1225, seized the island of Majorca in 1229 and the Valencian lands in 1232-1245 and tightened control during subsequent

¹²³ G. Wiet et al: *History of mankind*; Vol III: The Great Medieval Civilisations. Part Two: section two; Part three; Translated from the French. George Allen & Unwin Ltd; UNESCO; 1975; p.269.

¹²⁴ S and N. Ronart: *Concise Encyclopaedia of Arabic civilization; The Arab West*; Djambatan; Amsterdam; 1966; p. 81.

¹²⁵ S and N. Ronart: *Concise Encyclopaedia*; p. 81.

¹²⁶ J. Read: *The Moors in Spain and Portugal*; Faber and Faber, London, 1974. p.147.

¹²⁷ J. Read: *The Moors*; op cit; p.147.

¹²⁸ J. Read: *The Moors*; op cit.p.150.

¹²⁹ J. Read: *The Moors in Spain and Portugal*; op cit.165.

¹³⁰ John Glubb: *A Short History of the Arab Peoples*; Hodder and Stoughton, 1969. p.190.

¹³¹ W. Durant: *The Age of faith*, Simon and Shuster, New York; 6th printing; 1950. p.314.

¹³² S.P. Scott: *History of the Moorish Empire*; in three volumes; The J.B. Lippincott Company; Philadelphia; 1904. vol 3; p. 643.

¹³³ T.B. Irving: *Dates, Names and Places: The end of Islamic Spain*; in *Revue d'Histoire Maghrebine*; No 61-62; 1991; pp 77-93; at p. 81.

¹³⁴ E.L. Provencal: *Toledo*; op cit; p. 811.

campaigns.¹³⁵ Meanwhile the kingdom of Castile-Leon, under Ferdinand III and his son Alfonso X the Learned, took Cordoba (1236), Jaen (1246), Seville (1248), Murcia (1243-1244 provisionally, 1266 definitively) and Cadiz (1262). While James intruded into Algerian-Tunisian affairs, Alfonso raided Moroccan Sala thus inaugurating the African penetration that El Cid had envisioned.¹³⁶

This invasion was resumed in the late 15th and early 16th century and the Spaniards and Portuguese, the two greatest powers of the time, threatened to wipe out the whole Islamic presence in North Africa, advancing and occupying one Muslim city after the other: Melila (1497); Mers el-Kebir (1505); Wahran/*Oran* (1509) and, in 1510, Bejaia and Tripoli.¹³⁷ The Tunisian and Algerian Sheikhs invited the Ottomans to intervene¹³⁸ and so beginning in 1516, the Christian advance was checked and Muslim North Africa was saved. Arooj recaptured Algiers from the Spaniards.¹³⁹ Bejaia was retaken from the Spaniards in 1555 by Salah Reis, Beylerbey of Algiers whilst Tripoli was recovered in 1551 by Sinan Pasha and Turgut. North Africa was safe in Muslim hands, but in Spain, gradually and finally in 1609-10, the whole Muslim population was wiped out.¹⁴⁰

The loss of Toledo, thus, marked the beginning of the end of Muslim Spain. Oddly enough, it also marked the emergence of Western Christendom out of its relatively dark period.

The Loss of Toledo and the Beginning of Western Revival

The Muslims' loss was Western Christians' gain and not just in territory and riches, but above all in intellectual and scientific endeavours. Toledo was the city which gave rise to modern Western science and civilisation more than any other place in the world and in history.

First, to appreciate what the Muslims left to the West through Toledo, we must return to the former's state before it discovered Islamic learning. Only the shortest outline is necessary to appreciate the impact the introduction of Islamic science had on the West. Draper thus tells us:

*When Europe was hardly more enlightened than Caffraria is now, the Saracens were cultivating and even creating science. Their triumphs in philosophy, mathematics, astronomy, chemistry, medicine, proved to be more glorious, more durable, and therefore more important than their military actions had been.*¹⁴¹

When the Muslims entered Spain in the early 8th century, in the Spanish Asturias, according to Scott, the local Christian inhabitants lived in

¹³⁵ R.I. Burns: Spain; In the Dictionary of the Middle Ages; J.R. Strayer Editor in Chief; Charles Scribner's Sons; New York; 1980 fwd. vol 11; pp. 374-83; at p. 378.

¹³⁶ R.I. Burns: Spain; p. 378.

¹³⁷ A C. Hess: *The Forgotten Frontier*; The University of Chicago Press, Chicago and London, 1978.p.42.

¹³⁸ G. Fisher: *The Barbary legend*; Oxford; 1957 p. 36.

¹³⁹ J. Glubb: *A Short History of the Arab Peoples*; op cit; p.262.

¹⁴⁰ See: H.C. Lea: *The Moriscos of Spain*; Burt Franklin; New York; 1968 reprint.

Rodrigo de Zayas: *Les Morisques et le racisme d'etat*, Edt Les Voies du Sud; Paris, 1992..

¹⁴¹ J.W. Draper: *A History of the Intellectual Development of Europe*; George Bell and Sons; 1875; Vol I; p. 412.

‘rude hovels constructed of stones and unhewn timber, thatched with straw, floored with rushes and provided with a hole in the roof to enable the smoke to escape; their walls and ceilings were smeared with soot and grease, and every corner reeked with filth and swarmed with vermin.’¹⁴²

The pre-Islamic inhabitants, Scott pursues, were ‘in appearance and intelligence, scarcely removed from the condition of savages’. They wore sheepskins and hides of wild beasts, which would remain in one family for many generations and ‘*the salutary habit of ablution was never practised by them. Their garments were never cleansed, and were worn as long as their tattered fragments held together.*¹⁴³

Throughout Western Christendom, the few blessed with the capacity to read were ecclesiastics, they were the rare souls lost in wide stretches of rural ignorance.¹⁴⁴ Haskins writes that the monasteries were,

‘islands in a sea of ignorance and barbarism, saving learning from extinction in Western Europe at a time when no other forces worked strongly to that end.’¹⁴⁵

This, at the time, Campbell writes, when the Caliphs of Baghdad and Cordova endowed and fostered education among their subjects (both Muslims and non-Muslims) to such an extent that in the latter city every boy and girl of twelve was able to read and write.¹⁴⁶

The following account by Scott highlights perfectly the contrast that once stood between Islamic civilisation and Western Christendom, and how Islam subsequently shaped the Christian West. Despite its excessive length, it is worth reproducing so as to capture the overall picture. Thus Scott narrates:

‘Under the conditions of intellectual culture which characterized Moslem and Christian society even a greater inequality prevailed... In the thirteenth century, when Baghdad was sacked by the Mongols, the books cast into the Tigris completely covered its surface, and their ink dyed its waters black, while a far greater number were destroyed by fire; the public collections of the Moorish khalifate of Spain were seventy in number, and the great library of A1-Hakem II alone included six hundred thousand volumes. The collections of many private individuals were proportionately large. In that of Ibn-al-Mathran, the physician of Saladin, were ten thousand manuscripts; upon the shelves of Dunasch- Ben- Tamin, the great Jewish surgeon of Cairo, were more than twenty thousand. Four centuries afterwards few books existed in Christian Europe excepting those preserved in monasteries; the royal library of France consisted of nine hundred volumes, two-thirds of which were theological works; their subjects were limited to pious homilies, the miracles of saints, the duties of obedience to ecclesiastical superiors,— their sole merit consisted in the elegance of their choreography and the beauty of their illuminations. During the Hispano-Arab domination it was difficult to encounter even a Moorish peasant who could not read and write; during the same period in Europe many great personages could not boast these accomplishments. From the ninth to the thirteenth century the Spanish-Arabs possessed an educational system not inferior to the most improved ones of modern times; they taught astronomy from globes and

¹⁴² S.P. Scott: *History of the Moorish Empire in Europe*; op cit; vol 1; p.339.

¹⁴³ S.P. Scott: *History*; op cit; Vol 1; p.339.

¹⁴⁴ C.H. Haskins: *The Renaissance of the twelfth Century*, Harvard University Press, 1927: 32-4.

¹⁴⁵ C.H. Haskins: *The Renaissance*: 32-4.

¹⁴⁶ D.Campbell: *Arabian medicine, and its influence on the Middle Ages*, Philo Press; Amsterdam; 1926; reprinted 1974:pp.xiii-xiv:

planispheres; they measured the circumference of the earth; they observed the motions of the planets, they calculated the density of the atmosphere; they were familiar with the natural and artificial conditions under which vapours and gases are generated. For the European of that epoch there were no schools, for popular learning was discountenanced as conducive to heresy; education was confined to the cloister; the stars were but celestial lamps, whose only office was the nocturnal illumination of the earth; the latter was flat, and above it rose, in regular gradation, the seven regions of heaven; the ebullition and the explosion of gases were attributed to demoniac influence and to the agency of mischievousimps and goblins. Five centuries after the Moorish physicians of Spain had treated disease by the rational principles of medicine, surgery, and hygiene, Europe still adhered to the archaic conceptions of barbaric ignorance; to the belief that all illness was a manifestation of divine displeasure; to the possession by evil spirits; to the delusive expedients of priestly artifice,—the exhibition of relics, the muttering of texts, the performance of exorcisms. Six hundred years after the celebrated astronomer, Ibn-Yunis—who constructed the Hakemite Table, advanced proofs of the eccentricity of the earth's orbit, and utilized the pendulum for the purposes of chronometry — was honoured and awarded with the friendship of the Khalif of Egypt, Galileo, in the degrading robe of the penitent, horrible with painted flames and devils, was forced, kneeling before the familiars of the Holy Office, to abjure, as dangerous heresies, the scientific truths he had subjected to mathematical and ocular demonstration,—the grand discoveries which have made his name immortal; and Bruno was sent to the stake for admitting the philosophical doctrine of the all-pervading Divine Essence, for teaching the heresy of a plurality of worlds, and for insisting that the earth revolved on its axis and round the sun. Seven hundred years after universal toleration was enforced throughout the domain of the Umayyad Caliphate, —where even the populace had learned to respect the weaknesses of senile eccentricity, and the belief in demoniacal possession had been contemptuously abandoned to the most-ignorant of the provincial rabble, — the Duke of York was subjecting the unhappy Covenanters of Scotland to promiscuous massacre and to the excruciating torture of the boot, and Cotton Mather was burning witches on Salem Common. More than twenty generations had elapsed since the Arab geographer was first regarded by his country-men as a public benefactor, by his king 'as worthy of the highest honours that royalty can bestow, by the learned with the respect attaching to the possessor' of unusual attainments; when Calvin tortured Servetus at Geneva for publishing the unscriptural assertion that Palestine, so far from being a land flowing with milk and honey; was, in fact, a barren waste of volcanic desolation,— Servetus, the great anatomist, who came within a hair's-breadth of anticipating Harvey in his discovery of the circulation of the blood. From time immemorial among unenlightened races insanity has been attributed to the influence of malignant spirits, who could only be expelled by the un-sparing use of the scourge or by the intervention of the priest. The Arabs were the first of nations to discard this idea, to use kindness and the administration of remedies in the treatment of the demented, and to establish asylums. These conditions disclose the comparative value of two great politico-religious systems, both claiming divine authority, each uniting in its head the functions of Church and State,—one the exponent and zealous promoter of every scientific impulse, the other the ever-consistent representative of intellectual repression. The influence of Moslem genius is felt today in the numerous inventions, the insatiable thirst for knowledge, the marvellous development of art, science, and letters which have made the closing years of the nineteenth century ever memorable in the annals of civilization. Apparently extinguished by the noxious vapours of superstition that had darkened the Christian world for so many ages, the vital spark of learning still remained, which, rekindled in an epoch more propitious-to mental culture, was destined to advance in an even more

*marked degree the material interests, as well as the most noble aspirations, of mankind. The law of human progress even under the ' most unfavourable conditions is constant, invariable, eternal; Its manifestations differ only in the degree of their advancement. The latter may be checked but its retardation is only temporary. The ground lost by scientific truth in one century it will surely make up in the next, and, despite the hostile agencies which may conspire for its suppression, it is destined eventually to triumph. The consideration of Arabic intellectual life, and especially of its culmination in the Spanish Peninsula, the astonishing energy, curiosity, and perseverance that characterized every stage of its development from its very origin to its extinction, the phenomenal rapidity of its advance, the superhuman greatness of its deeds, suggest the infinite possibilities to which its revival may ultimately give rise as affecting the destiny of nations.*¹⁴⁷

Islam's impact stretches to all forms and manners of civilisation, a contrast, here, kept as brief as can be feasible. Thus, when medieval Muslim cities thrived with beautiful houses, gardens and baths, medieval Muslim visitors to Christian towns complained — as Christian visitors to Muslim towns do now — of the filth and smell of the "infidel cities."¹⁴⁸ At Cambridge, now so beautiful and clean, sewage and offal ran along open gutters in the streets, and "gave out an abominable stench, so . . . that many masters and scholars fell sick thereof."¹⁴⁹ In the thirteenth century some cities had aqueducts, sewers and public latrines; in most cities rain was relied upon to carry away refuse; the pollution of wells made typhoid cases numerous; the water used for baking and brewing was usually — north of the Alps — drawn from the same streams that received the sewage of the towns.¹⁵⁰

The 11th century Spanish Muslim Said al-Andalusi, in his book *The Categories of Nations* which singles out the people who had cultivated the sciences, finds no place for Western Christendom.¹⁵¹

It was Islam, which, in the expression of Lombard: 'dragged Western Christendom out of its 'barbarian night'.¹⁵² It was Islam which promoted trade and culture and which dragged the West into 'an astonishing progress and the re-launching of its civilisation'.¹⁵³ An opinion also adhered to by Smith:

*'The dark ages of Europe would have been doubly, nay trebly dark; for the Arabs who alone by their arts and sciences, by their agriculture, their philosophy, and their virtues, shone out amidst the universal gloom of ignorance and crime, who gave to Spain and to Europe an Averroes and an Avicenna, the Alhambra and the Al-Kazar..... It was the Arabs who developed the sciences of agriculture and astronomy, and created those of Algebra and chemistry; who adorned their cities with colleges and libraries, as well as with mosques and palaces; who supplied Europe with a school of philosophers from Cordova, and a school of physicians from Salerno.*¹⁵⁴

¹⁴⁷ S.P. Scott: History; op cit; vol 3; pp. 522-5.

¹⁴⁸ Munro and Sellery; p. 266 in W. Durant: The Age; op cit; p. 1003.

¹⁴⁹ In Coulton: Panorama; 304 in W. Durant: The Age; op cit; p. 1003.

¹⁵⁰ Jackson: Byzantine and Romanesque Architecture; I; p. 142. Barnes: Economic History; p. 165 in W. Durant: The Age; op cit; p. 1003.

¹⁵¹ P. Benoit and F. Micheau: The Arab intermediary; in *A history of Scientific Thought*; M. Serres editor; Blackwell, 1995; pp 191-221; p. 202.

¹⁵² M. Lombard: at <http://www.archipress.org/batin/ts20lombard.htm>.

¹⁵³ Ibid.

¹⁵⁴ R.B. Smith: *Mohammed and Mohammedanism*; London; Smith Elder; 1876 pp. 125-6; and 217.

The discovery of Islamic learning, Levey points out, did not just arrive at a time when the movement of ideas was 'at a relative standstill' but also with a new outlook, a sense of enquiry into the old to the point 'where Western Europe could take over this thoroughly examined knowledge and endow its ripeness with a completely fresh approach of its own.'¹⁵⁵

The Western appropriation of Islamic science to build Western civilisation is one of the matters which most Western history is very much at unease with and which many Western historians and opinion makers seek to remove or distort.

*'The debt of Europe to the 'heathen dog' could, of course, find no place in the scheme of Christian history, and the garbled falsification has imposed itself on all subsequent conceptions,' says Briffault.*¹⁵⁶

*'The history of the rebirth of Europe from barbarism,' he adds, 'is constantly being written without any reference whatsoever, except to mention 'the triumphs of the Cross over the Crescent,' and 'the reclamation of Spain from the Moorish yoke',' to the influence of Arab civilisation - the history of the Prince of Denmark without Hamlet.*¹⁵⁷

Draper tells of:

*'the systematic manner in which the literature of Europe has contrived to put out of sight our scientific obligations to the Muhammadans...'*¹⁵⁸

Indeed, had Western history accepted the Islamic role in the rise of the West, it would be harder to justify the past occupation and colonisation of Muslim lands and today's daily onslaught on the 'fanaticism and barbarism of Islam.'

Yet, it is Islam which dragged the West into light and Toledo played one of the most central roles. The Western twelfth century Renaissance dates precisely from the entry of the West into contact with Islamic learning, and translations of the scientific lore in that city of Toledo. The activity of the twelfth century was so intense that it has been possible to speak of "the Renaissance of the twelfth century" (C. H. Haskins), and the beginnings of European science and culture in the thirteenth century so striking that a Catholic enthusiast (J. J. Walsh) did not hesitate to call the thirteenth century "the greatest of centuries."¹⁵⁹ Sarton, for his part, holds:

'I have shown in volume 1 that almost every age is a renaissance in some respect, and so is every age a "middle age." Is it not the offspring of the preceding age and the begetter of the following? If one looks at it from the proper angle, each age is a compromise between the past and the future. However if the term Middle Ages had not already a definite meaning, or rather too many confusing meanings, it would be very tempting indeed to apply it to that period of one and a half centuries extending from about 1100 to about 1250..... Indeed I can think of no other period during which the transitional elements were more conspicuous, and the compromise on a greater scale and more

¹⁵⁵ M. Levey: *Early Arabic Pharmacology*, Leiden, E.J. Brill,, 1973, p. 71.

¹⁵⁶ R. Briffault: *The Making of Humanity*, George Allen and Unwin Ltd, 1928, p., 189.

¹⁵⁷ R. Briffault: *The Making of Humanity*, p., 189.

¹⁵⁸ J.W. Draper: *A History*; op cit; Vol 2; p. 42.

¹⁵⁹ G. Sarton: Introduction; op cit; vol 2; p. 2.

pregnant. It involved nothing less than a conflict between the three main civilizations of the Mediterranean world, itself a phase— and the major one—in the immemorial conflict between East and West. We now know that the outcome was the triumph of the West, triumph which has never been reversed since but has increased as time went by—but this was far from obvious in the days of the Crusades. However when we speak of a western triumph, we must not think of it as if eastern ideals had been then and there superseded by western ones. The western victory consisted rather in an assimilation of the East by the West...

The transfer of all these elements and their assimilation and elaboration took place in a number of ways, but toward the end of the thirteenth century most of them finally emerged under a Latin label. Thus the Western victory did not imply for mankind a change of purpose or direction, but simply a change in leadership. The twelfth century (or more generally the period 1100-1250) was a period of transition and compromise as defined above; it was also a period of absorption and fusion. It is then that the conflicting cultures were brought most closely together, especially the Christian and Muslim, and that their interpenetration constituted the solid core of the new Europe. From this point of view, the twelfth century might be called a Renaissance, and a tremendous Renaissance it was. Needless to say the fusion remained incomplete.

Even so—and much more so—when civilizations meet and coalesce, the fusion extends only to the parts which are assimilable, and these are far smaller than the others. Hence the conflict between East and West was not by any means solved in the twelfth century, but simply transformed. The achievement was nevertheless immense.¹⁶⁰

This is not the place to dwell on all the aspects Toledo influenced Western culture, such as in architecture, but only sum up some of its scientific impacts. Beginning first with its direct impact on some sciences such as astronomy. From the days of Maslama (Al-Majriti) and Al-Zarkali (both 11th century) to the days of Alfonso the Wise (13th century), the meridian of Toledo was long the standard of computation for the West.¹⁶¹ The tables for the meridian of Toledo by both Muslim authors were adapted to various European places. This was done by Raymond of Marseilles in Marseilles; Walcher of Malvern in England; Roger of Hereford who adapted the astronomical tables that existed for Toledo and Marseilles to the meridian of the city of Hereford using the Christian calendar 'because the years of the Arabs and their months are difficult to our people who are not accustomed to them.'¹⁶² The construction of astronomical tables implied trigonometrical theories and computations which were generally explained in the introductory chapters to these tables.¹⁶³ This was the case, for example, for the Toledan Tables computed by Al-Zarqali and others in the second half of the eleventh century. Al-Zarqali gave an account of the trigonometrical knowledge of his time and of the means of constructing his tables. His work was translated into Latin by Gerard of Cremona and was very popular for more than two centuries.¹⁶⁴

The transmission of the numerals bears a strong Toledan stamp. In Toledo, al-Khwarizmi's book was translated into Latin, and the beginning of "algorithm" is derived from al-Khwarizmi's name).¹⁶⁵ The numerals themselves became so strongly identified with the translation movement centred in Toledo that they were known in Europe as Toletan numbers / Toletane figures. The presence or absence of the zero in

¹⁶⁰ G. Sarton: Introduction; op cit; vol 2; p. 2.

¹⁶¹ C.H. Haskins: *Studies in the history of Mediaeval Science*; Frederick Ungar Publishing Co. New York. 1967 ed. P. 18.

¹⁶² D. Metlitzki: *The Matter of Araby in Medieval England*, Yale University press, 1977; p.38.

¹⁶³ G. Sarton: Introduction; Vol II, op cit; p.11.

¹⁶⁴ G. Sarton: Introduction; Vol II, op cit; p.11.

¹⁶⁵ T. Glick: *Islamic*; op cit; p. 269.

medieval manuscripts is the strongest indication of whether or not the place-value concept was known.¹⁶⁶ The term "zero" itself comes from Arabic *sifr* ("void"). *Sifr* was Latinized as *zephirum* and then, since among Castilian speakers *f* was confused with *h* and was often lost, *zephirum* gave rise to zero. Through a parallel transmission, *sifr* gives Spanish *cifra*, English "cipher" and so forth.¹⁶⁷

It is, however, the 12th century massive translations from Arabic carried in Toledo which triggered the biggest awakening of modern science in history. Following the recapture of the city from the Muslims in 1085 and the failure by the Muslims to recapture Toledo, in the view of Burckhardt, this was

...to affect the intellectual life of the entire Roman Christian world, for the acquisition of Toledo had brought with it an undisturbed centre of Islamic culture, complete with its scholars, artists, and libraries under Christian rule.¹⁶⁸ This gave rise to a regular school for the translation of science which drew from all lands those who thirsted for knowledge.¹⁶⁹ The influx into Spain of translators from Italy, Germany, England and elsewhere, there to seize on the wondrous secrets of the world of thought.¹⁷⁰

The penetration into its 'treasure chests' of learning brought about the excited discovery that it was, indeed, the Muslims who were the true representatives of classical knowledge and 'the giants on whose shoulders Latin science and philosophy had to be placed.'¹⁷¹ Amongst those who had flocked to Toledo were Robert of Chester, Gerard of Cremona, Plato of Tivoli, Daniel of Morley and many more who now laboured incessantly to acquire Islamic learning.¹⁷² Daniel of Morley, for instance, who fled in horror from England and Paris and hastened to hear 'wiser philosophers of the universe' at Toledo where 'the teaching of the Arabs was greatly famous in those days.'¹⁷³

Translators were from all over the Christian West. Many of course were Spaniards: John of Seville, Hugh of Santalla and those working under the patronage of King Alfonso; another named Hermann, hailed from Dalmatia; two came from Flanders, Rudolph of Bruges and Henry Bate; many from southern France: Armengaud son of Blaise, Jacob Anatoli, Moses ib Tibbon, Jacob ben Mahir; from Italy: Plato of Tivoli, Gerard of Cremona, Aristippus of Catania, Salio of Padua, John of Brescia.¹⁷⁴

In his voluminous Introduction to the History of Science, Sarton provides, by far, the most comprehensive analysis of the translations from Arabic into Latin that took place in the city of Toledo, above all.¹⁷⁵ It is countless chapters, and nearly a hundred pages, which he devotes to the issue, which is even impossible to outline adequately here in view of the lack of space in this article. Thus, the shortest of summaries is provided, and readers interested in the matter are sent to the work in question. Thus, Sarton begins by listing the main translators, first amongst them:

¹⁶⁶ T. Glick: *Islamic*; op cit; p. 269.

¹⁶⁷ T. Glick: *Islamic*; op cit; p. 269.

¹⁶⁸ T. Burckhardt: *Moorish Culture in Spain*, George Allen & Unwin, London; 1972. p 161.

¹⁶⁹ V. Rose: 'Ptolemaeus und die Schule von Toledo' in *Hermes*, viii. 327; (1874); in C.H. Haskins: *Studies*, op cit, p. 12.

¹⁷⁰ G. Wiet et al: *History*; op cit; p.465.

¹⁷¹ D. Metlitzki: *The Matter*; op cit; p.6.

¹⁷² V. Rose: *Ptolemaeus und die Schule von Toledo*; op cit, p. 12.

¹⁷³ See: Daniel of Morley's praise to the Bishop of Oxford, in C. Burnett: *The Introduction of Arabic Learning into England*, The Panizzi Lectures, 1996; The British Library; 1997. pp 61-2.

¹⁷⁴ G. Sarton: *Introduction*; Vol II, op cit; p.6

¹⁷⁵ G. Sarton: *Introduction*; op cit; vol 2; pp. 125-130; then chapters on the translators: pp. 167-81; then pp. 338-fwd..

the Englishman, Adelard of Bath, who translated in 1126 the astronomical tables of al-Khwarizmi, as revised by Maslama ibn Ahmad al-Majriti of Madrid, and probably the *Liber ysagogarum Alchorismi*, the mathematical treatise of the same al-Khwarizmi. The tables introduced Muslim trigonometry, chiefly the use of the sine and tangent functions, into the West.

A large number of other Muslim mathematical works were published in Latin during this period, because it happened that the most active translator, John of Seville, was especially interested in the mathematical sciences. He translated various treatises by Mashallah, Abu Ma'shar, al-Kindi, 'Umar ibn al-Farrukhan, Ahmad ibn Yusuf ibn al-Daya, al-Battani, Thabit ibn Qurra, al-Qabisi, and Ibn abi al-Rijal. He also translated al-Farghani's astronomy (1134); a treatise on the astrolabe by Maslama ibn Ahmad al-Majriti and one on algorism, *Liber alghoarismi de practica arismetrice*, which is an elaboration of al-Khwarizmi's earlier work.

Hermann the Dalmatian translated treatises of Sahl ibn Bishr and Abu Ma'shar, and the astronomical tables by al-Khwarizmi. The chief translation by Hugh of Santalla was al-Biruni's commentary on al-Farghani's astronomy. He also translated two of Mashallah's treatises. Robert of Chester translated an astrological work of al-Kindi's, a treatise on the astrolabe, besides compiling tables for the longitude of London (1149) derived from those of al-Battani and al-Zarqali, and his revision of the tables translated by Adelard of Bath. His main claim to esteem, however, is his translation of the algebra of al-Khwarizmi (1145), a fundamental landmark in the history of that subject, as it may be considered the beginning of European algebra. Robert was the first to use the word sinus (sine) in its modern sense.

Hermann's pupil, Rudolf of Bruges, translated a book on the astrolabe by Maslama Ibn Ahmad and is said also to have written original astronomical treatises.

Plato of Tivoli was assisted by Abraham bar Hiyya and translated mathematical works not only from the Arabic but from the Hebrew. In fact, his translation from the Hebrew of Abraham's *Liber embadorum*, completed in 1145; he also translated the astronomy of al-Battani, Ibn al-Saffar's treatise on the astrolabe, and treatises by al-'Imrani, Abu 'Ali al-Khaiyat, and Abu Bakr al-Hasan.

However the main translator operating from Toledo was the Italian Gerardo of Cremona. Gherardo Cremonese, born about 1114 in Cremona, Lombardy, died in 1187 in Toledo. He went to Toledo, where he studied Arabic and carried on an almost unbelievable activity as a translator until the time of his death. A biography appended by his pupils to his translation of Galen's *Tegni* contains a list of seventy-one works translated by him, some of them of immense size - for example, Ibn Sina's Qanun and that list is far from being complete for we know of various other translations credited to him. Gerard himself, unassisted, could not possibly have made all the translations ascribed to him. It is probable that he himself was tremendously active and actually completed many translations alone but that many others were made under his direction and corrected by him. He was certainly the head of a school of translators and that many of the translations credited to him were made partly or completely by collaborators or pupils. It is possible also that later translations were ascribed to him because he was considered the translator par excellence.

The number of translations ascribed to Gerard of Cremona is so large, and includes:

1. Logic; 2. Philosophy; 3. Greek mathematics and astronomy; 4. Muslim mathematics and astronomy; 5. Physics and mechanics; 6. Greek medicine; 7. Muslim medicine; 8. Muslim astrology; 9. Muslim chemistry.

Works by Muslim mathematicians, for instance, here include the name of scientist, the work, and the later editions of such works in the West (there were earlier editions as well):

- Banu Musa (first half of the ninth century): *Liber trium fratrum*. Edited by Max. Curtze (Halle 1885).
- Al-Khwarizmi (first half of the ninth century): *De jebra et almucabala*; Edited by Guillaume Libri: *Histoire des sciences mathematiques* (vol. 1, 253-297, 1838).
- Al-Farghani (first half of the ninth century): *De aggregationibus scientiae stellarum et de principiis coelestium motuum*. An earlier translation by John of Seville was printed in Ferrara in 1493. The Latin text (probably Gerard's) was translated into French and from French into Italian by Zuccherio Bencivenni in 1313. Gerard's translation was paraphrased in Hebrew by Jacob Anatoli about 1232 and Anatoli's Hebrew version was retranslated into Latin by Jacob Christmann (Frankfurt 1590).
- Ahmad ibn Yusuf (second half of the ninth century): *De arcubus similibus*. Edited by Max. Curtze (Mitt. des Copernikus Vereins, 48-50, 1887).
- Ahmad ibn Yusuf: *De proportione et proportionalitate*.
- Al-Nairizi (second half of the ninth century): Commentary on Euclid's Elements, Books I to X. Edited by M. Curtze, (420 p., Leipzig 1899).
- Thabit ibn Qurra (second half of the ninth century): *De figura alchata*.
- Thabit ibn Qurra: *De expositione nominum Almagesti*.
- Thabit ibn Qurra: *De motu accessionis et recessionis*. Printed under the title *De motu octavae sphaerae* (1480, 1509, 1518).
- Abu Kamil (first half of the tenth century): *Liber qui secundum Arabes vocatur algebra et almucabala*.
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Sarton, finally notes that Gerard's medical translations were even more important, if possible, than his mathematical and astronomical ones. Incidentally they introduced into the European languages a number of new technical terms. For example, his translation of the *Qanun* introduced the words (vena) basilica (*al-basiliq*), retina, saphena, cephalica, clavicula, true and false ribs, etc.; and his translation of al-Razi

introduced the words *albugo* and *albugineus* (*albugo*, or *leucoma*, is a white opacity in the cornea; cf. *Al-bayad al-'ain*—white of the eye) and *iris*.¹⁷⁶

Hence, thanks to this outline derived from Sarton, the crucial role of Toledo as a passage of Islamic learning to the Christian West and its role in its awakening becomes obvious.

As translations proceeded in Toledo in the 12th century, the Christians had just taken Sicily from the Muslims (1089) where they began to suck out Islamic knowledge. At also precisely the same time, the Christians were engaged in the east in the crusades (see articles on Mosul, Aleppo, Hama and Damascus). Thus bringing from there further knowledge of technology (windmills, water wheels, hospitals, madrasas, military fortifications, trade mechanisms etc...) Hence the 12th-13th centuries witnessed widespread changes which we see taking place in the Christian West and which gave us our modern civilisation.

Final Words: Matters of Decadence of Islam and Rise of the West

Western writing on Islam, and Western opinion making apparatus, in their near totality, are always prompt to attribute barbarism and other dire qualities to Islam. Indeed, not much evidence is needed to attribute any misdeed upon Islam and its adherent, such a daily rant of negative labelling that a Muslim has become weary of opening any daily or watching any television channel, or listening to any radio station for fear of hearing the usual labels of barbarism and terrorism, of which one has grown sickened, especially as Muslims, in their near totality would never wish any harm to Westerners, people with whom they share the land and the future, and especially as one sees countless Muslim deaths, daily victims of those who label them with terror, unless, of course, the loss of a Western life equates that of hundreds of Muslims.

The same Western writing and media on the other hand, also in their near totality, are very shy to grant Islam anything too favourable. We are more likely to witness in modern history departments and amongst the majority of modern writers on Islam-related matters a trend which consists in suppressing anything that constitute Islamic achievements and instead attributing it to the Christian West and the Greeks and, if not, others. It is needless to dwell on this, but any researcher looking at history will find that from the rise of the Gothics, to experimentation to the numerals to surgical instruments to the pendulum etc... are all attributed by early Western scholars to Islam but now these achievements and others are being gradually taken away from the Muslims by modern scholarship always eager to write about the Greeks and others when they are supposed to be writing about Islam and insist, that no Islamic achievement could have been possible without the Greeks; that somehow, the Muslims are lame and impotent. Yet, as shown in this entry and in all others, there is hardly one Muslim scholar, among many thousands, who did not rise to criticise the Greeks and not to write in their refutation.

The instance of Toledo is also a very enlightening example of how reality is re-shaped in modern Western historical writing. Toledo shows precisely that two major events happened at once, that whilst Toledo and soon the rest of Spain and the East were lost and destroyed, simultaneously the power of the West rose somehow at the expense of Islam. Yet modern Western historians in their majority explain these facts in two other ways.

First, they explain as seen in the above article, and other articles on this site such as the 'the Myths', that the decadence of Islamic civilisation was due to its faith and to its 'fanatic, barbaric' entities such as the

¹⁷⁶ G. Sarton: Introduction; op cit; ending at p. 339.

Seljuks, the Berbers, the Mamluks, the Ottomans etc... whilst in this article, and in other articles on Seville, Baghdad, Damascus, Aleppo etc... it is demonstrated that it is instead the destruction of the Muslim realm by Western Christianity which is the principal cause of decline of the Muslims lands.

Second, just as they falsify the decline of the Islamic land, Western historians in their vast majority, equally falsify the rise of the West. Indeed, in the 12th century the Christian West acquired its science from both the translations in Toledo and also from what it took from Sicily and from the East during the crusades. Yet whilst these contacts with the Muslims civilisation and borrowings are easily traceable for anyone studying the question, the major part of Western historians, whilst agreeing that the Western revival did indeed take place in the 12th century, each in his or her own field, deliver tens of explanations for such revival. Each of these historians explains that suddenly, out of barbarism, Western Christendom saw the light. Out of centuries of darkness, the Christian West began to devise water wheels, windmills, build hospitals, universities, castles, understand optics, mathematics, new textile products, new farming techniques, discover paper, the compass etc... It is as if in six or so centuries from now, Muslim historians will explain that today's backward Muslim world, out of immense backwardness, suddenly built all its planes and devised all its computers, and built all its refineries, and factories and the rest out of its own Muslim genius, whilst in truth everything is borrowed from the West. It is the same nonsense one finds in most of Western history today, that a backward nation borrows heavily from the more civilised one and yet denies it completely by attributing it to its own 'genius'. Yet, the instance above from the translations in Toledo shows that there was no such a thing, for early Western scholars descended upon Toledo. They did not go to Greece or to other places to translate there; these early Western scholars translated precisely what was soon to be found taught in the Christian West. If we look at the entries on Salerno, Bejaia, Sicily and the South of France, we see the same thing: learning, in all its forms, in the Christian West was acquired from the Muslim land or the Muslim influenced lands. Credit to all early Western scientists, without one single exception - especially the English amongst them such as Adelard of Bath and Daniel of Morley, attested to one thing rare in modern history, their admiration for, and their indebtedness to their 'Arab masters'.¹⁷⁷

Finally, distorting historians refer to each other and build on each other's distortions, hence scholarly techniques (i.e. referencing) which give legitimacy to facts become in the hands of modern historians techniques which render fallacies into truths, and thus emerges a new history founded on fallacies, a new history whereby the land of Islam declined due to the innate barbarism of its people and the barbarism of its faith and the West rose to dominate thanks to its innate genius.

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¹⁷⁷See: C. Burnett: *The Introduction of Arabic Learning into England*; The Panizzi Lectures, 1996; The British Library; 1997.

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