

# Morocco as a Great Centre of Islamic Science and Civilisation

**Author:** Salah Zaimeche PhD  
**Chief Editor:** Lamaan Ball

**Release Date:** October 2004  
**Publication ID:** 4070

**Copyright:** © FSTC Limited, 2003 2004

#### **IMPORTANT NOTICE:**

All rights, including copyright, in the content of this document are owned or controlled for these purposes by FSTC Limited. In accessing these web pages, you agree that you may only download the content for your own personal non-commercial use. You are not permitted to copy, broadcast, download, store (in any medium), transmit, show or play in public, adapt or change in any way the content of this document for any other purpose whatsoever without the prior written permission of FSTC Limited.

Material may not be copied, reproduced, republished, downloaded, posted, broadcast or transmitted in any way except for your own personal non-commercial home use. Any other use requires the prior written permission of FSTC Limited. You agree not to adapt, alter or create a derivative work from any of the material contained in this document or use it for any other purpose other than for your personal non-commercial use.

FSTC Limited has taken all reasonable care to ensure that pages published in this document and on the MuslimHeritage.com Web Site were accurate at the time of publication or last modification. Web sites are by nature experimental or constantly changing. Hence information published may be for test purposes only, may be out of date, or may be the personal opinion of the author. Readers should always verify information with the appropriate references before relying on it. The views of the authors of this document do not necessarily reflect the views of FSTC Limited.

FSTC Limited takes no responsibility for the consequences of error or for any loss or damage suffered by readers of any of the information published on any pages in this document, and such information does not form any basis of a contract with readers or users of it.

**FSTC Limited**

9 Conyngham Road, Victoria Park, Manchester, M14 5DX, United Kingdom

Web: <http://www.fstc.co.uk> Email: [info@fstc.co.uk](mailto:info@fstc.co.uk)

# MOROCCO AS A GREAT CENTRE OF ISLAMIC SCIENCE AND CIVILISATION

## Introduction

There is plenty of writing on the role of Baghdad, Spain and Sicily in the rise of Islamic science and civilisation and its impact on the world. Little is said or written about other places. Morocco is one such place, which played a great part in elevating the human condition. Morocco's role was in fact decisive, for it was the principal route by which ideas and also people voyaged between East and West, especially as the Mediterranean became increasingly unsafe for Muslim travellers following the loss of Sicily by the Muslims (late 11<sup>th</sup> century).

To highlight the role of Morocco as a passage point, one illustration is the example of paper manufacturing. It first started in the furthest eastern parts of the Islamic lands. Paper, originally, was brought by the Muslims from China. From a Chinese art, the Muslims developed it into a major industry.<sup>1</sup> The first paper mill was built in Baghdad in the late years of the 8<sup>th</sup> century and early years of 9<sup>th</sup> century. Then, paper production, like much else passed on to Syria on the way West. From Syria, it progressed further West to Palestine, then reached Egypt around 850. From Egypt it continued further West to reach Morocco first by the early 10<sup>th</sup> century, and then, from there crossed into Spain in 950.<sup>2</sup> From Spain and Sicily paper making spread to the Christians in Spain and Italy.<sup>3</sup>

This is just one aspect of Morocco's role. Another is the close relations between the two countries as far as contacts of the learned. Maghribi students, for instance, down to the 13<sup>th</sup> century considered a sojourn in Cordova, Murcia, or Valencia necessary to finish their course.<sup>4</sup>

In fact, the period that extends from the end of the 8<sup>th</sup> to the end of the 11<sup>th</sup> century, as Vernet and Samsó note, is characterised by the development, in both the Maghreb and Muslim Spain of two, more-or-less linked, scientific traditions encouraged by scholars who,

*...beyond the social contradictions and the differences of statute or of religion, were relatively united both by the way of life of the Islamic city and by the cultural and scientific environment that had been established favouring different human contributions and multiple contacts with the scientific foyers of the Muslim East.*<sup>5</sup>

Glick also explains how the economic links between Morocco and Muslim Spain were very close. The closest sphere of Andalusí commercial activities was North Africa; Morocco acting as both a source of raw materials

---

<sup>1</sup> For more accounts on the growth of the industry see:

- J. Pedersen; *The Arabic Book*, trans by Geoffrey French; Princeton University Press; Princeton, New Jersey (1984).

- M. M. Sibai; *Mosque Libraries: An Historical Study*, Mansell Publishing Limited: London and New York: 1987.

<sup>2</sup> D. Hunter; *Papermaking: the History and technique of an ancient craft*; Pleiades Books; London; 1943; p.470.

<sup>3</sup> T.K Derry and T.I Williams; *A Short History of Technology*; Oxford Clarendon Press, 1960. P. 232; W. M.Watt: L'Influence de l'Islam sur l'Europe medievale; *Revue d'Etudes Islamiques*; vol 40; p.36..

<sup>4</sup> E.L. Provençal: entry: Al-Maghrib; in *Encyclopaedia of Islam*; New edition; Vol 5; 1986; pp 1208-9.

<sup>5</sup> J.Vernet, 1978; J Vernet and J.samsó, 1981, and J. Samsó, 1992, in A Djebbar: Mathematics in medieval Maghreb; *AMUCHMA-NEWSLETTER-15*; Universidade Pedagógica (UP), Maputo (Mozambique), 15.9.1995 at [http://www.math.buffalo.edu/mad/AMU/amu\\_chma\\_15a.html](http://www.math.buffalo.edu/mad/AMU/amu_chma_15a.html)

(wood, alum, antimony) and finished cloth. In Morocco, Andalusí merchants sold their own finished cloth (Valencian brocade, according to al-Shaqundi), and copper was a staple export.<sup>6</sup> In particular, under the rule of the Almoravids and Almohads who united Spain with the Maghrib, the great Moroccan cities, Marrakech and Fes, especially, became extensions of the Andalusí urban economy. Merchants moved back and forth freely, bearing Spanish goods on camelback.<sup>7</sup> Many businesses were family operations and therefore members of the same family would be stationed in different countries to ease commercial arrangements. Glick mentions in particular Jewish families (who were very much involved in Muslim trade) who owned houses on either side of the straight.<sup>8</sup>

Morocco's main contribution to Spain, and the whole region, however, was to provide two of its most powerful Muslim forces, which shaped history decisively: the Berber Almoravids and Almohad Dynasties.

### The Moroccan Berber Dynasties

Generally, when reading through literature, historical or other, and at the cinema, or in documentaries of various sorts, the image presented of the Almoravids and Almohads is very poor. Thus, in the famed film, *El-Cid*, for instance, the Almoravids are portrayed as evil incarnate. Their leader Yusuf Ibn Tashfin, called Yusuf in the film, is darkened in deeds more than in skin; cruel as much as ugly; his being and manners all oozing with malevolence and wickedness. His opponent the Cid is the reverse, handsome, kind, generous, merciful, courageous etc. In truth, *El-Cid* was a mercenary, bloodthirsty renegade, unfaithful to his word, who slaughtered the woman and robbed and slaughtered the orphan. He was a cruel, violator of altars, says Lane Poole.<sup>9</sup> Yusuf Ibn Tashfin was, on the other hand, by far one of the greatest men in Islamic history, who deserves a whole article in appreciation.

The Almohads come out even more poorly than the Almoravids. Even authors usually kind to Muslims abhor the Almohads as fanatical, orthodox, who harmed Muslim civilisation.

*'Fanatic barbarians, of the eleventh and twelfth centuries,'*

Lea tells us.<sup>10</sup>

*'The savage instincts of the Berbers were indulged by tortures and all the arts of the most exquisite cruelty. Whenever these barbarians encountered a monastery not one of the holy fathers was left alive. There was now visited upon the Christians a severe retaliation for the unspeakable horrors which they had been in the habit of inflicting upon their infidel adversaries in the name of the Gospel of Peace,'*

Scott tells us.<sup>11</sup>

'Almohad' persecution' was particularly stressed by Durant.<sup>12</sup> Yet, reality was far, very far, from that.

---

<sup>6</sup> Al-Shaqundi in T.Glick: *Islamic and Christian Spain in the early Middle Ages*, Princeton University Press, New Jersey, 1979. pp.130-1.

<sup>7</sup>T.Glick: *Islamic and Christian Spain*; pp.131.

<sup>8</sup>T.Glick *Muslim and Christian Spain*; pp.131.

<sup>9</sup> S. Lane-Poole: *The Moors in Spain*; Fisher Unwin; London; 1888; p.192.

<sup>10</sup>H.C. Lea: *The Moriscos of Spain*; Burt Franklin; New York; 1968 reprint. p.1.

<sup>11</sup> S.P. Scott: *History of the Moorish Empire*; The Lippincott Company; Philadelphia; 1904; Vol 1; p.584.

## The Almoravids (Mid 11<sup>th</sup> -1147)

Decades before the Almoravid intervention in 1086 in Spanish affairs, anarchy had spread in Muslim Spain as it disintegrated into thirty or so small feuding kingdoms (called the Taifas de Reyes). This chaos was exploited by the northern Christian neighbours to start their 'Reconquista'.<sup>13</sup> They saw their opportunity, and they made the most of it, observes Lane Poole.<sup>14</sup> It culminated in a vast offensive, which resulted in the taking of the first major Muslim town Barbastro in 1065 by a combined army of papal, Norman, and Spanish forces. There, wholesale massacre of Muslims and mass rape of Muslim women took place. Many of the Reyes had thought their military alliance on the side of the Christian northern forces against fellow Muslims would save their realm, instead, they were conquered. A certain 'monk of France,' possibly Hugh of Cluny himself, had sent a letter to Muqtadir ibn Hud of Saragossa advising him to accept Christianity; a new attitude, more aggressive, toward the Muslims was taking shape.<sup>15</sup> As the threat to their little kingdoms and principalities rose, it made it clear to the Reyes, Lane Poole observes, that the Spaniards meant nothing less than re-conquest of all Spain, and the extermination of all Muslims.<sup>16</sup> The Muslim populations also became painfully aware of the relative helplessness of their own princes to stem the Christian advance, and acceding to pressures from below, the Taifa leaders were forced to appeal to the Almoravids in an attempt to halt the enemy.<sup>17</sup>

In 1086, the Almoravids, tribesmen from the Moroccan High Atlas, crossed into Spain, and manoeuvring en masses to the sound of drums, they inflicted on the Christian knights a shattering defeat at Zallaqa near Bajadoz.<sup>18</sup> The Christian forces were awed and intimidated by the continuous drumming, which accompanied the swiftly executed manoeuvres of the Almoravid army.<sup>19</sup> Ibn Tashfin slaughtered the Christian army so much so that Alfonso barely escaped with some five hundred horsemen. Thousands of the best knights of Spain 'lay stiff and nerveless on that fatal field.'<sup>20</sup> Before the battle, Alfonso as he looked upon his own splendid army exclaimed:

*'With men like these I would fight devils, angels, and ghosts!'*<sup>21</sup>

Twice the Almoravids were asked to intervene before being summoned to depart, their puritan faith hardly of the taste of the rather morally loose Reyes. Some such Reyes even plotted to have Ibn Tashfin, the Almoravid ruler, poisoned so as to rid themselves of an incumbent guest.<sup>22</sup> The third time he was invited, in 1090, Ibn Tashfin crossed the straight of Gibraltar from Morocco, removed the Reyes, and installed Almoravid rule all over the country.

<sup>12</sup> W. Durant: *The Age of faith*, Simon and Shuster, New York; 6<sup>th</sup> printing; 1950. p.395.

<sup>13</sup> C. Cahen: *Orient et Occident au temps des Croisades*, Aubier Montaigne, 1983..p.21.

<sup>14</sup> S. Lane-Poole: *The Moors*; op cit; pp. 176-7.

<sup>15</sup> See D.M. Dunlop, 'A Christian Mission to Muslim Spain in the eleventh century,' *Al-Andalus*, XVII (1952), 259-310; Alan Cutler: 'Who was the Monk of France' and when did he write?', *Al-Andalus*, XXVIII (1963), pp 249-269.

<sup>16</sup> S. Lane-Poole: *The Moors*. p.178.

<sup>17</sup> J.T. Monroe: *The Hispanic-Arabic World*: in: *Americo Castro, and the meaning of Spanish Civilisation*. Jose Rubia Barcia ed; University of California Press, Berkeley, 1976 pp 69-90; p. .83.

<sup>18</sup> G. Wiet et al: *History of mankind*; Vol 3: *The Great medieval Civilisations*; Trsltd from the French; George Allen &Unwin Ltd; UNESCO; 1975 p.269.

<sup>19</sup> A.Thomson; M.A. Rahim: *Islam in Andalus*; Taha Publishers; Revised edt; 1996; p. 90.

<sup>20</sup> S. Lane-Poole: *The Moors in Spain*; op cit; p.179.

<sup>21</sup> S. Lane-Poole: *The Moors in Spain*. p.179.

<sup>22</sup> A.Thomson; M.A. Rahim: *Islam in Andalus*; p. 92.

The Andalusian Al-Bakri, surrounded by the intellectual and material comforts of his country and his milieu (amidst the Reyes), considered these puritans of Islam as enemies.<sup>23</sup> He was not alone. The Christians, concerned at this new conquering thrust of Islam, were

*'disconcerted by these veiled adversaries who charged on camel back to the sound of drums.'*

As a result, the historical reputation of the Almoravids suffered from great prejudices.<sup>24</sup> The Almoravid conquest, Wiet et al, note, was not, as Al Bakri described it,

*'a bloody holy war waged by fanatical disciples of a strange religion.'*

They had conquered the whole of Morocco patiently, with the littlest amount of blood spilled. Their installation at Marrakech, their rapid expansion in southern Morocco, as revealed by excavations, emphasize the considerable degree of their cultural evolution, their faculty of assimilation and inventiveness, that of a people, whom Ibn Hawqal in the tenth century, just as Al-Bakri in the 11<sup>th</sup> century, wrongly regarded as little better than savages.<sup>25</sup>



Largest Extent of the Almoravid Empire around 1100 CE

(Source: <http://i-cias.com/e.o/almoravids.htm>)

<sup>23</sup> G. Wiet et al: *History of Mankind*: Vol III op cit; p.857.

<sup>24</sup> G. Wiet et al: *History of Mankind*:; p.857.

<sup>25</sup> G. Wiet et al: *History of Mankind*:; pp.857-8.

The Almoravids also drew upon the African goldmines for minting coinage, and secured great prosperity for the region. They were the first to achieve the unity of Spain and North West Africa, which had the greatest possible repercussions on economic affairs and also on cultural affairs, even though the Almoravid Empire did not last very long.<sup>26</sup>

More importantly, the Almoravid intervention kept Spain in Muslim hands for another half century at least (that is until the end of their rule in 1147). They also halted the Spanish advance, which, as it was going to do in the following centuries, was to progress further south into North Africa. Hence, other than saving the Muslim realm for this period of time, the Almoravids also allowed Muslim civilisation to prosper for longer than it would have been had the Spaniards retaken the country.

Coming after them, the Almohads were going to extend both Muslim political survival and the prosperity of Muslim civilisation until nearly the middle of the 13<sup>th</sup> century. Thus, the crucial role of these two powers from Morocco can be seen if one thinks of all the eminent names who lived in the realm of Islam under Almoravid and Almohad rule, such as the herbalists Al-Ghafiqi (d. 1165) wrote *Kitab al-Adwiyat al-Mufradah* (The Book of Simple Drugs) and Ibn al-Baytar (1197-1248), of Malaga, the author of the largest pharmacological encyclopedia that has survived to our time; the traveller Ibn Jubair (Ibn Jubayr); Ibn Rushd (1126-1192); the astronomer Jabir Ibn Aflah (d. 1145) and so many more, who would have been lost to Islamic civilisation had Spain been lost prior to the Almoravids, and their successors, the Almohads.

## The Almohads (1147- 1269)

The Almoravids, were at first, great warriors, but soon after Ibn Tashfin's death succumbed to the same corruptions of their predecessors (The Reyes de Taifa).

*'They came to Spain hardy rough warriors, unused to ease or luxuries, delighting in feats of strength and prowess, filled with a fierce but simple zeal for their religion,'*

says Lane Poole, the following generation, however,

*'lost their martial habits, their love for deeds of daring, their pleasure in enduring hardships in the brave way of war... In twenty years, in place of the former Berber army now was a disorganised crowd of sodden debauchees, miserable poltroons, who had drunk and fooled away their manhood's vigour and become slaves to all appetites that make men cowards.'*<sup>27</sup>

Soon Spain fell back into the usual chaos, the usual infighting between the various factions: Almoravid and Andalusian, Arab and Berber...<sup>28</sup> Muslim Spain disintegrated into another multitude of warring city states just like those of decades before.<sup>29</sup> These divisions were hardly lost on the combined Christian forces, who resumed their assaults under the conduct of King Alfonso I of Aragon, named El-Batallador (The Fighter) because of his deep thrusts into Muslim territory,<sup>30</sup> taking their towns and cities one after the other; and slaughtering the population being the rule. At the taking of Lisbon, this time by an alliance of European

<sup>26</sup> G. Wiet et al: History of Mankind; p.857.

<sup>27</sup> S. Lane-Poole: The Moors in Spain; op cit; p.183.

<sup>28</sup> A.Thomson; M.A. Rahim: Islam; op cit; p. 97.

<sup>29</sup>S and N. Ronart: *Concise Encyclopaedia of Arabic civilization; The Arab West*; Djambatan; Amsterdam; 1966. p. 89.

<sup>30</sup> Jean Read: *The Moors in Spain and Portugal*; Faber and Faber, London, 1974..p.150.

armies, and following the tragic fate of the Muslim population once the city was retaken (1147), the English priest could not hold being moved by the fate of the Muslims:

*'We are inclined to feel pity for our enemies in their evil fortunes, and to feel sorry that the lashes of divine justice are not yet at an end.'*<sup>31</sup>

The Almohads, another Berber dynasty from deep into Morocco crossed into Spain, and again saved Muslim Spain, beating off Christian armies further north. Then, on 18th July, 1196, Abu Yusuf Yaqub, the son of a slave girl,<sup>32</sup> now ruler, who like the famous Ibn Abi-Abi 'Amir', was to take the honorific title of Al-Mansur (The Victorious)<sup>33</sup> inflicted a crushing defeat on Alfonso VIII of Castile at Alarcos, the Christian army being virtually exterminated.<sup>34</sup> So generous in victory was Abu Yusuf, he freed twenty thousand Christian prisoners without ransom.<sup>35</sup> All Spain was at the mercy of Abu Yusuf, but he was obliged to cut short his operations to return to Africa, where a rebellion, sponsored and encouraged by Salah Eddin's successors threatened him from the rear.<sup>36</sup> Abu Yusuf quelled the rebellion, but by the time he returned to Spanish matters, his forces had been drained, and considerably so. Still, Spain, and North Africa were safe in Muslim hands.

Abu Yaqub,<sup>37</sup> other than bringing peace and security in both Spain and North-West Africa, improved the irrigation systems and embellished the cities with fine buildings.<sup>38</sup> In 1170-1171, Abu Yaqub had made Seville his capital, and rebuilt the portion of the wall adjacent to the river, after a calamitous flood. The Alcazar, or citadel, originally built by Abd al- Rahman II, was restored, and was also built the main mosque (1172-1176), of which only the minaret, now called the Giralda, still remains.<sup>39</sup> The three hundred feet high Giralda in Seville was both a minaret and also served as an observatory.<sup>40</sup> When Seville was lost to Ferdinand III of Castile (1248), it boasted seventy-two mosques.<sup>41</sup>

In Morocco, Almohad rule coincided with a great period of prosperity and brilliance of learning. The Almohad built the Marrakech Kutubiya Mosque, which accommodated no less than 25,000 people, but was also famed for its books, manuscripts, libraries and book shops, which gave it its name;<sup>42</sup> the first book bazaar in history.

<sup>31</sup> J Read: The Moors in Spain.p.161.

<sup>32</sup> Al-Marakushi: *Kitab al-Mujib*; Tr into Histoire des Almohades by E. fagnan, Algiers, 1893. p. 189.

<sup>33</sup> J. Read: The Moors in Spain and Portugal; op cit.165.

<sup>34</sup> John Glubb: A Short History of the Arab Peoples; Hodder and Stoughton, 1969. p.190.

<sup>35</sup> J.Glubb: A Short History; op cit; p.190.

<sup>36</sup> J.Glubb: A Short History; op cit; p.190.

<sup>37</sup> Highly crucial here to make the difference between father and son with very close names:

Abu Yaqub Yusuf ruled between 1163 and 1184; his son, the victor at Allarcos: Abu Yusuf Ya'qub al-Mansur ruled 1184-1199. For easier identification, the father will be called Abu yaqub; and Son Abu Yusuf.

<sup>38</sup> S.M. Imamudin: A Political History of Spain; Najmah and Sons Limited Publishers; Dacca; 1961; p. 167.

<sup>39</sup> T.Glick: Seville in *Dictionary of the Middle Ages*; Charles Coulston Gillispied Editor in Chief; Charles Scribner's Sons; New York; 1980 onwards; vol 13; p.213.

<sup>40</sup> S.M.Imamudin; A Political history; op cit; p. 167.

<sup>41</sup> T.Glick: Seville; in the Dictionary of the Middle Ages; p.213.

<sup>42</sup> R. Landau: *Morocco*: Elek Books Ltd, London 1967. p.80.



Minaret of the Kutubiya Mosque in Marrakech

Abu Yaqub, Deverdun says, `had a great soul and love for collecting books.<sup>43</sup> He founded a great library, which was eventually carried to the Casbah, and turned into a public library, under the management of the most erudite. Their service, says Ibn Farhun, was one of the privileged state positions, for which were selected only the best scholars.<sup>44</sup> Some books in the library constituted part of the Almohad treasury, in fact, and were as prized as precious metals.<sup>45</sup> There are, for instance, two copies of the Qur'an written in Mansub character that Salah Eddin, had offered Abu Yaqub.<sup>46</sup>

During the crusades, the Almohads had dispatched 180 vessels to help the Muslims fight the crusaders during the third crusade (which involved Salah Eddin against Richard the Lion Heart) in the east.<sup>47</sup>

Under the Almohads, the sovereigns did not just encourage the construction of schools and libraries, and sponsored scholars of every sort, but also, they were so keen, they even attended their scholars' funerals.<sup>48</sup> Illustrious physicians also lived and worked in the Almohad court, especially under the third Caliph, Abu Yaqub and constituted a sort of corporation presided by one amongst them.<sup>49</sup> Ibn Rushd, Ibn Tufail, Ibn Zuhr, and many more philosophers and scholars found sanctuary and served the Almohad rulers.<sup>50</sup> And, contrary to their accusers who talked of their enmity to learning, libraries thrived under their rule, including private libraries. Three main collections (all dating from the mid 13<sup>th</sup> century) can be cited: the Maktaba of Ibn Tarawa, who was a great amateur of chroniclers, besides being a manuscript writer; the Maktaba of al-Qaysi and the Maktaba of Ibn as-Suqr, the main librarian of the imperial library. His collection required five full camel loads to be carried.<sup>51</sup>

The Almohads checked for a while Christian advances, yet, soon afterwards, their rule was to fall to the same fates as their predecessors. As most often happens, at his death, the illustrious victor at Alarcos, Abu

<sup>43</sup> G.Deverdun: *Marrakech*; Editions Techniques Nord Africaines; Rabat; 1959.p. 265.

<sup>44</sup> G.Deverdun: *Marakech*; . 265.

<sup>45</sup> G.Deverdun: *Marrakech*; p. 265.

<sup>46</sup> G.Deverdun: *Marrakech*; p. 265.

<sup>47</sup> S.M. Imamudin: *A Political History of Spain*; Najmah and Sons Limited Publishers; Dacca; 1961;p. 168.

<sup>48</sup> G.Deverdun: *Marrakech*; op cit;.p. 261.

<sup>49</sup> G.Deverdun: *Marrakech*; p. 261.

<sup>50</sup> R. Landau: *Morocco*; Elek Books Ltd, London 1967. p. 431.

<sup>51</sup> G.Deverdun: *Marrakech*; p. 265.

Yusuf (Al-Mansur), was succeeded by his son Al-Nasir (1199-1214), who was of a very different mould. Al-Nasir cared neither for science nor for religion, neglected government, and specialised in pleasure.<sup>52</sup> At the very decisive battle of Navas de Tolosa, in 1212, Al-Nasir's much superior army was too disunited to face effectively a smaller, and yet united Christian army. Al-Nasir's army was crushed. 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.<sup>53</sup> Soon the beginning of the end of Muslim Spain will begin. One after the other Muslim towns and cities were retaken by the Christians: Cordova 1236; Valencia: 1238; Seville: 1248 etc... Only Grenada will be left in Muslim hands, to be taken in 1492. And there will be no strong army from North Africa to hold back the Spanish advance. The local wars between the Spanish monarchies were some relief for the Muslims. By the time the Spaniards and Portuguese resumed their thrust into North Africa, in the 15<sup>th</sup> century, the Ottomans were powerful enough and willing to come and lend a hand, and help keep the place under Islamic rule.

## Morocco a centre of Mathematical Studies

Two famous Moroccans Al-Marakushi and Al-Banna together addressed subjects such as arithmetic, astronomy, geometry, algebra and chemistry<sup>54</sup> and also history.

### Al-Marakushi

Abd al-Wahid Al-Marakushi was born in Marrakech in 1185; he studied there, in Fes, and after 1208 in Spain. In 1217, he went to Egypt, where he seems to have spent the rest of his life. In 1224, he completed a history of the Almohad dynasty, preceded by a summary of Spanish history from the Muslim conquest to 1087 (*Kitab al-mujib fi talkhis akhbar ahl al-Maghrib*).<sup>55</sup> The text has been edited by R.P. A. Dozy.<sup>56</sup> There is a French translation by Fagnan.<sup>57</sup> Extracts can be found in Wustenfled, Brockelman and Levi Provençal.<sup>58</sup>

Hassan-al-Marakushi main work is *Jami al-Mabadi wal-ghayat* (the Unity of the Beginnings and Ends; i.e. Principles and Results), probably completed in 1229-1230. This is a very good compilation of practical knowledge on astronomical instruments and methods, trigonometry and gnomonics.<sup>59</sup> Part of this work has been translated by Sedillot.<sup>60</sup> The Jami of Hassan al-Marakushi was, Sarton holds, the most elaborate trigonometrical treatise of the Western caliphate, the best medieval treatise on practical astronomy, on gnomonics and the best explanation of graphical methods.<sup>61</sup> The part dealing with gnomonics contained studies of dials traced on horizontal, cylindrical, conical, and other surfaces for every latitude.<sup>62</sup> Al-Marakushi gave a table of sines for each half degree as well as tables of versed sines and arc sines (this last one he called the table of al-Khwarizmi). To facilitate the use of gnomons he added a table of arc

<sup>52</sup> W. Durant: *The Age of faith*, op cit; p.314.

<sup>53</sup> 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.

<sup>54</sup> E.L. Provençal: entry: Al-Maghrib; in *Encyclopaedia of Islam*; New edition; Vol 5; 1986; pp 1208-9.

<sup>55</sup> G.Sarton: *Introduction to the History of Science*; 3 vols; The Carnegie Institute of Washington; 1927-48. vol 2; p.681.

<sup>56</sup> R.P. A. Dozy: *The history of the Almohads*; Leiden 1847; again, 1881.

<sup>57</sup> French translation by Edmond Fagnan (*Revue Africaine*, Vols. 36 and 37, passim; separate edition, 332 p., Alger 1893).

<sup>58</sup> Criticism: F. Wustenfled: *Geschichtschreiber der Araber* (109, 1881). C. Brockelmann: *Arabische Litteratur* (vol.1, 332, 1898). E. Levi provençal: *Documents inedits d'Histoire almohade* (440p., Paris, 1928, p; Isis, 13, 221).

<sup>59</sup> G.Sarton: *Introduction*; op cit; vol 2; p.621.

<sup>60</sup> E.L. Provençal: entry: Al-Maghrib; in *Encyclopaedia of Islam*; New edition; Vol 5; 1986; pp 1208-9.

<sup>61</sup> G Sarton: *Introduction*; op cit; p. 508.

cotangents.<sup>63</sup> The second part of *al\_jami* was devoted to the explanation of graphical methods of solving astronomical problems. In al-Marakushi's work are developed the construction of planispheres, astrolabes, quadrants and the need of gnomonics, which constituted the great interest of Sedillot who had written by far the best account on Muslim astronomical instruments.<sup>64</sup>

In the work, Al-Marakushi shows his good acquaintance with the mathematical and astronomical works of al-Khwarizmi, al-Farghani, al-Battani, Abu'l Wafa, al-Biruni, Ibn Sina, al-Zarqali, and Jabir Ibn Aflah. For example, he shared al-Zarqali's belief that the obliquity of the ecliptic oscillates between 23 degrees and 33' and 23 degrees 53', a belief which tallied with the notion of the trepidation of the equinoxes.<sup>65</sup>

It is interesting to note here how Al-Marakushi has devoted much study to trigonometry and associated subjects, and yet we read in some works on the history of science, including by one of the most renowned figure of such history, Crombie, saying the following:

*'The development of modern trigonometry dates from mathematical work done in Oxford and France in the fourteenth century in connection with astronomy.'*<sup>66</sup>

Had Crombie, just like the tens or hundreds of modern historians of science with the same view, just briefly consulted al-Marakushi, he would have realised how far from the truth he was.

## Ibn al-Banna

Ibn al-Banna, also known as Abu'l-Abbas Ahmad ibn Muhammad ibn Uthman al-Azdi, was born in 1256 in the city of Marrakech (or possibly it was the region of Marrakech which was named Morocco by the Europeans).<sup>67</sup> There is a claim that al-Banna was born in Grenada in Spain and moved to North Africa for his education. What is certain is that he spent most of his life in Morocco.<sup>68</sup> This confusion on the place of his birth is explained by O'Connor and Robertson by the fact that the Moroccans, even after Almohad power faded, the Merinids, in this instance, kept trying to save Muslim Spain. The Merinids formerly lived in eastern Morocco before taking control of the whole of Morocco in 1269. The Merinids tried to help Grenada to prevent the Christian advance through their country, and the strong link built between Grenada and Morocco may account for the confusion as to which country al-Banna was a native of.<sup>69</sup>

Ibn al-Banna lived and taught for some time in Fes which became, after the fall of the Almohads, the capital of the Merinids, and which tried to rival, on an intellectual level, Marrakech, the only city which had the privilege of having been, for almost two centuries (1062-1248), the capital of the entire Maghreb, including vast sub-Saharan zones.<sup>70</sup> Ibn al-Banna studied geometry, fractional numbers and learnt much of

<sup>62</sup> G.Sarton: Introduction; op cit; vol 2; p.621.

<sup>63</sup> G.Sarton: Introduction; op cit; vol 2; pp. 508 and 621.

<sup>64</sup> L.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.

<sup>65</sup> G.Sarton: Introduction; op cit; vol 2; p.621.

<sup>66</sup> A.C. Crombie: *Science, optics, and music in medieval and early modern thought*; The Hambledon Press; London; 1990; p. 86.

<sup>67</sup> J J O'Connor and E F Robertson: Arabic mathematics, a forgotten brilliance at:

<http://www-history.mcs.st-andrews.ac.uk/history/index.html>

<sup>68</sup> J J O'Connor and E F Robertson: Arabic mathematics;

<sup>69</sup> J J O'Connor and E F Robertson

<sup>70</sup> Laroui; 1970; pp. 147-85 in A Djebbar: Mathematics in medieval Maghreb; *AMUCHMA-NEWSLETTER*-15; Universidade

the impressive contributions that the Muslims had made to mathematics over the preceding 400 years.<sup>71</sup> At the university in Fez Al-Banna taught all branches of mathematics, which at this time included arithmetic, algebra, geometry and astronomy. Many students studied under al-Banna in this thriving academic community.<sup>72</sup>

Al-Banna wrote a large number of works, in fact 82 are listed by Renaud; not all are on mathematics.<sup>73</sup> Other sources in fact state that he distinguished himself from his Maghreban predecessors by the richness and diversity of his production, which seems immense. Based on the inventory that was made, at the time, by Ibn Hayder, Ibn al-Banna seems to be in fact the author of more than 100 titles, of which only 32 concern Mathematics and Astronomy, the others being dedicated to disciplines very distant from each other, like Linguistics, Rhetoric, Astrology, Grammar and Logic.<sup>74</sup>

The encyclopaedic character of the production of Ibn al-Banna may have contributed to his social status, honoured by the Merinid, which led him to leave Marrakech in order to install himself for a time in Fes at the invitation of the sultan of the epoch.<sup>75</sup> This eminent position, from which he benefited in the Merinid capital, reinforced the authority that he had already acquired through his scientific works. This double status, both scientific and social, may have helped him solve the problems that preoccupied his contemporaries, and which led him to publish an original book whose contents might be related, because of certain of its aspects, to what Djebbar calls Ethnomathematics.<sup>76</sup> This work is *Tanbih al-albab*, the first part of which contains the precise mathematical answers to domains of everyday life, like the composition of medicaments, the calculation of the drop of irrigation canals, the explanation of frauds linked to instruments of measurement, etc.<sup>77</sup> The second part belongs to the already ancient tradition of judicial and cultural mathematics and joins a collection of little arithmetical problems presented in the form of poetical riddles.<sup>78</sup>

In mathematics, Two "firsts" are claimed for al-Banna, note O'Connor and Robertson. He seems to have been the first to consider a fraction as a ratio between two numbers and he is the first to use the expression almanac (in Arabic al-manakh meaning weather) in a work containing astronomical and meteorological data.<sup>79</sup>

O'Connor and Robertson consider al-Banna's *Talkhis amal al-hisab* (Summary of arithmetical operations) and the *Raf al-Hijab* (Lifting of the veil) which is al-Banna's own commentary on the *Talkhis* as his best. It is in this work that al-Banna introduces some mathematical notation which has led certain authors to believe that algebraic symbolism was first developed in Islam by ibn al-Banna and al-Qalasadi.<sup>80</sup> A matter not agreed upon by the two authors, though. They note, on the other hand, that there are many interesting

---

Pedagógica (UP), Maputo (Mozambique), 15.9.1995.

<sup>71</sup> J J O'Connor and E F Robertson: Arabic Mathematics; op cit;

<sup>72</sup> J J O'Connor and E F Robertson

<sup>73</sup> J J O'Connor and E F Robertson

<sup>74</sup> Al-Balagh and Djebbar, 1995b, in A Djebbar: Mathematics; op cit;.

<sup>75</sup> A. Djebbar: Mathematics.

<sup>76</sup> A. Djebbar: Mathematics.

<sup>77</sup> Al-Balagh; Djebbar, 1995, b, in A Djebbar: Mathematics.

<sup>78</sup> A Djebbar: Mathematics;.

<sup>79</sup> J J O'Connor and E F Robertson: Arabic mathematics; op cit;

<sup>80</sup> J J O'Connor and E F Robertson

mathematical ideas and results which appear in the *Raf al-Hijab*, including continued fractions used to compute approximate square roots.<sup>81</sup>

## Morocco's illustrious geographers

**Al-Idrisi** was born in Ceuta (Morocco) in 1099-1100 CE, and died in 1166 CE. He studied at Cordoba, and although he died in his birth place, Ceuta, he spent his working life at the Norman court of Palermo. At the age of 16, he travelled through Asia Minor, Morocco, Spain and the South of France and even visited England.<sup>82</sup> His description of most of Western Europe is lively and, on the whole, quite accurate.<sup>83</sup> The same is true of his treatments of the Balkans, whilst for the rest of Europe and for most of the Islamic world (with the exception of North Africa, with which he had a first hand acquaintance) his account is based on the writings of others.<sup>84</sup>

It is to al-Idrisi that goes the merit for the invention of mathematical geography. He created the system of cylindrical projection of the earth surface, which was to be claimed some centuries later, in 1569, by the Flemish Gerard Mercator.<sup>85</sup> Al-Idrisi's other merit, according to Udovitch is the extensive information he provides about contemporary Western Europe.<sup>86</sup> Hitti also notes that al-Idrisi's map places the sources of the Nile-supposedly discovered in the latter part of the nineteenth century-in the equatorial highlands of Africa.<sup>87</sup>

At the court of Palermo, Al-Idrisi's patron was King Roger II for whom he wrote *al-Kitab al-Rujari* (Roger's book) also known as *Nuzhat al-mushtaq fi ikhtiraq al-afaaq*. Roger's book is the most elaborate description of the world of medieval times, and for a considerable time thereafter. In the preface of his work, al-Idrisi says that he spent fifteen years on his work.<sup>88</sup>

*'Judging by the level of knowledge and the concept of critical research of his time,' Ronart writes, 'Idrisi's Rogerian Book must have ranked among the most prominent achievements in the history of geographical science.'*<sup>89</sup>

Al-Idrisi later wrote an even larger geographical encyclopaedia entitled *Nuzhat al-Mushtaq fi Ikhtiraq al-Afaq* (Pleasures of Men and Delights of Souls) (the integral text of it is lost). Al-Idrisi also constructed a silver planisphere prepared with the utmost attention to scientific accuracy. This planisphere, Dunlop notes, surely has been lost, melted down, but the book still stood as 'a great monument of Arabic and Muslim geography.'<sup>90</sup>

<sup>81</sup> J J O'Connor and E F Robertson

<sup>82</sup> C.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. 230.

<sup>83</sup> A. Udovitch: Al-Idrisi, in *Dictionary of Middle Ages*; Charles Scribner's Son; New York: Volume Six; p.412 .

<sup>84</sup> A. Udovitch: Al-Idrisi, p.412.

<sup>85</sup> A Kettani: Science and technology in Islam: the underlying value system, in: *The Touch of Midas: Science, values and environment in Islam and the West*, Ziauddin Sardar ed; Manchester University Press, 1984, pp. 67-90; at. p. 83.

<sup>86</sup> A. Udovitch: Al-Idrisi; op cit; p. 412.

<sup>87</sup> P.K. Hitti: America and the Arab heritage: in *The Arab heritage*, N.A. Faris ed; Princeton University Press, 1944.1-24:p.3

<sup>88</sup> D.M. Dunlop: Arab Civilisation, op cit, p. 171.

<sup>89</sup> S and N. Ronart: *Concise Encyclopaedia of Arabic civilization; The Arab West*; Djambatan; Amsterdam; 1966.p. 174.

<sup>90</sup> D.M. Dunlop: Arab Civilisation, op cit, p. 171.

It is worth noting here in completing this brief entry on al-Idrisi that Udovitch, draws attention to a useful bibliography devoted to him, which can be found at the conclusion of the article by G. Oman in The Encyclopaedia of Islam.<sup>91</sup> For those with good knowledge of French, it is also worth looking at the French translation of Jaubert's geography of Idrisi.<sup>92</sup> There is more left and right in English, Dunlop, already cited, constitutes a good source.

**Ibn Battuta** was born in Tangier on 24 February 1304, and died ca 1368-9. Ibn Battuta, left his native Tangier on 14 January 1325 in order to make his pilgrimage to Mecca, he returned to Morocco, Fes, almost a quarter of a century later, in November 1349.<sup>93</sup> Soon after his return to Morocco, Ibn Battuta left on a trip for Spain, and then turned south to visit the Mali Madinka state, especially the cities of Timbuktu and Gao. He returned to Morocco in 1354, dicatated the story of his travels to Ibn Juzayy, a scholar at the court of Sultan Innan of Fes.<sup>94</sup>

Ibn Battuta's *Rihla* is an account of his travels crossing many countries to India, where he occupied an important official function. Then, by sea he travelled to China, Java and the Maldives. His *Rihla* was translated into French by Defremey and Sanguinetti,<sup>95</sup> - a translation accompanied by the Arabic version. There is also an abridged version by H.R. Gibb,<sup>96</sup> who only translated chosen extracts (thus the Arabic and French versions remaining more comprehensive and whole). Ibn Battuta's *Rihla* is very instructive for all the vegetation he names and describes, but also, as Rosenthal recognises, for its treatment of India in the 14<sup>th</sup> century, which remains unique, and even more so for the description of the Maldives, southern Russia and Black Africa.<sup>97</sup> The merit of Gibb's version,<sup>98</sup> which is used in the following to illustrate some of Ibn Battuta's descriptions of places he visited, is that it gives a very useful and lengthy introduction on Ibn Battuta's life, relating to his ascetic regime, resigning all his offices and giving away all his possessions at some stage, before he was urged into accepting office again by Sultan Muhammad and became his envoy at the head of an important mission to the most powerful ruler in the world then, the Emperor of China. Gibb also tells of how Ibn Battuta was a hunted fugitive for eight days and was left only with the clothes he was wearing and his prayer mat, forcing him to seek refuge in Malabar, where he became judge again (p.6). During his journey from Alexandria to the Maghreb, and on two occasions, he narrowly escaped capture by Christian pirates; still his love for travel was never exhausted (p.8). From each part visited, Ibn Battuta relates his experiences and observations. Thus, on the River Nile (p.52), he states:

*‘The Egyptian Nile surpasses all rivers of the earth in sweetness of taste, length of course, and utility. No other river in the world can show such a continuous series of towns and villages along its banks, or a basin so intensely cultivated. Its course is from south to north, contrary to all other [great] rivers. One extraordinary thing about it is that it begins to rise in the extreme hot weather, at the time when rivers generally diminish and dry up, and begins to subside just when rivers begin*

<sup>91</sup> G. Oman: Al-Idrisi *The Encyclopaedia of Islam*: 2nd ed; Leyden Brill; 1971; p. 111.

<sup>92</sup> P. A Jaubert: *Geographie d'Edrisi*, 2 vols. (1836-1840).

<sup>93</sup> F.Rosenthal: Ibn battuta: *Dictionary of Scientific Biography*; Charles Coulston Gillispie; Editor in Chief; Charles Scribner's Sons; New York; 1970 fwd; vol1; pp 516-7. at p. 516.

<sup>94</sup> F.Rosenthal: Ibn battuta; p. 516.

<sup>95</sup> Ibn Battuta: *Voyages d'Ibn Battuta*, Arabic text accompanied by French translation by C. Defremery and B.R. Sanguinetti, preface and notes by Vincent Monteil, I-IV, paris, 1968, reprint of the 1854 edn.

<sup>96</sup> Ibn Battuta: *Travels in Asia and Africa*; trsltd and selected by H.A.R. Gibb; George Routledge and Sons Ltd; London, 1929.

<sup>97</sup> R.Rosenthal: Ibn Battuta; op cit; p. 517.

*to increase and overflow. The river Indus resembles it in this feature.... Some distance below Cairo the Nile divides into three streams, none of which can be crossed except by boat, winter or summer. The inhabitants of every township have canals led off the Nile; these are filled when the river is in flood and carry the water over the fields.'*

The Turks, Ibn Battuta observes (p.143), leave their livestock free to graze without guardians or shepherds. This is due to their strict laws against theft. Anyone caught with a stolen horse is forced to restore it with nine others; if he cannot do this, his sons are taken instead.

China amazes Ibn Battuta (p. 282 forward) for its porcelain; the huge size of hens' eggs, bigger than `our' goose eggs, he notes. The skills of the Chinese are what thrills him most, though, "very talented and precise people" he admits. He has this to say:

*'I never returned to any of their cities after I had visited it a first time without finding my portrait and the portraits of my companions drawn on the walls and on sheets of paper exhibited in the bazaars..... Each of us set to examining the other's portrait [and found that] the likeness was perfect in every respect.... They had been observing us (in the palace) and drawing our portraits without our noticing it. This is a custom of theirs, I mean making portraits of all who pass through their country. In fact they have brought this to such perfection that if a stranger commits any offence that obliges him to flee from China, they send his portrait far and wide. A search is then made for him and wheresoever the [person bearing a] resemblance to that portrait is found is arrested.'*

For briefer regional accounts on Ibn Battuta's travels, it is worth looking at M.Husain for India, Ceylon and the Maldives.<sup>99</sup> For Africa, in English, there is G.S.P. Freeman-Greenville on the east African coast.<sup>100</sup> Sarton's Introduction,<sup>101</sup> includes useful shorter extracts. The best and most works on Ibn Battuta are though, only in French.

## Other Geographers

Worth mentioning here also is a little known Moroccan geographer, but rightly noted by Sarton, Ali Ibn Musa Ibn Sa'id, whose work although containing much of his predecessors' also included many novelties, for example many coordinates not given by Al-Idrisi.<sup>102</sup> Ibn Said had some knowledge of the Senegal River, and of the northern countries of Europe, including Iceland. He had travelled extensively throughout the Islamic world and his work was much used, and later corrected, by Abu'l Fida in the following period.<sup>103</sup>

And, finally, the name of Al-Marrakushi cited above should be added for his contribution in the field. He crossed southern Spain and all northern Africa down to Egypt, himself determining the coordinates of the principal towns and cities.<sup>104</sup>

<sup>98</sup> Ibn Battuta: trans H.A.R. Gibb; op cit.

<sup>99</sup> M.Husain : *The Rehla of Ibn Battuta*; Baroda, 1953;

<sup>100</sup> G.S.P. Freeman-Greenville: *The East African Coast*; Oxford; 1962.

<sup>101</sup> G.Sarton;: Introduction; op cit; Vol 3;

<sup>102</sup> G. Sarton: Introduction, op cit; Vol II, p.775.

<sup>103</sup> G. Sarton: Introduction, Vol II, p.775.

<sup>104</sup> G.Deverdun; Marrakech; op cit: p. 262.

## Marrakech

Marrakech was founded about 1070 by the Almoravids as the headquarters of their army north of the High Atlas, close to Aghmat, the existing centre for trade across the mountains to the south.

In 1147 Marrakech fell to the Almohads of the High Atlas, who made it the capital of their own. Even when residing in Seville, the city was the centre of the Almohad community with its scholars and military. Marrakech became by desire of its rulers the centre of attraction for Maghribi scholars and even a certain number from Spain.<sup>105</sup>

It is, thus, in Marrakech that Ibn Rushd in 1153 became engaged in astronomical observations and was associated with the Almohad court. He had been introduced and recommended to Abu Yaqub by the philosopher Ibn Tufayl (1105-1185).<sup>106</sup> Ibn Tufayl was also based in the same city.



Ibn Rushd worked in Marrakesh for the Almohad court

Marrakech is reputed for the Kutubiya Mosque cited above, famed for its books, manuscripts, libraries and book shops, which gave it its name.<sup>107</sup> The Kutubiya had a hundred or so librarians gathered in the shade of the minaret; and next to them there were many intermediaries who rushed between places searching for rare and new manuscripts to copy; and also the *dallals* who bought and sold ancient works from and to the scholars of the city.<sup>108</sup> The sultans themselves collected both works and their authors, whom they wanted to have very close to them.<sup>109</sup>

In Marrakech there was also a great tradition of constructors of astrolabes,<sup>110</sup> and a good deal of detail on such figures and their accomplishments can be found in Mayer.<sup>111</sup> Many historians flourished in Marrakech, most living in the surrounding of Caliphs, such as Abu Bakr al-Sanhadji, who wrote extensively on the Almohads, and whose works were traced by Levi Provencal to the Spanish collection at the Escorial.

<sup>105</sup> E.L. Provencal: entry: Al-Maghrib; in *Encyclopaedia of Islam*; New edition; Vol 5; 1986; Leyden; pp 1208-9.

<sup>106</sup> M. Brett: Marrakech in *Dictionary of the Middle Ages*; op cit; vol 8; pp 150-1.

<sup>107</sup> R. Landau: Morocco; op cit; p.80

<sup>108</sup> G.Deverdun: Marrakech; op cit; pp. 264-5.

<sup>109</sup> G.Deverdun: Marrakech; 1959, pp. 264-5.

<sup>110</sup> G.Deverdun: Marrakech; .p. 262.

<sup>111</sup> A.L. Mayer: *Islamic astrolabists*, Albert Kundig edition, Geneva, 1956.

Because he observed from very close up the events he describes, he bears the best of authenticity on the Almohad movement in history.<sup>112</sup>

Another historian born in Marrakech in 1185, but who studied at Fes, was Abd al-Wahid al-Marakushi<sup>113</sup> He wrote towards 1224 his *Kitab al-Mujib fi talkhis akhbar al-Maghrib*, which is a good personal account of the author's history of the Western Maghrib; and where, of course, Marrakech has a leading place.<sup>114</sup>

Marrakech has its other great historical attractions, such as the walled Agdal Gardens, stretching for two miles south of the Casbah, and also dating from Almohad times.<sup>115</sup>

These gardens were irrigated, just as the city was supplied, by mainly subterranean canals from the mountains twenty miles to the south.<sup>116</sup> One of the greatest accomplishments of Almohad rule was the Marrakech hospital, also called the Bimaristan of Amir al-Muminin al-Mansur Abu Yusuf. On this, al-Marakushi wrote:

*Abu Yusuf built a bimaristan in Marrakech, which I believe has no equal in the world. For this purpose he chose a very extensive area in the centre of the city. He ordered the masons and the builders to carry out his plans with the greatest perfection possible. He decorated the hospital with inscriptions and designs of surpassing beauty....He ordered that flowers should be planted and cultivated in the courtyard, as well as fruit trees, and to have flowing water conducted to all the wards and rooms. Of the sources of water one was paved with marble. He ordered the hospital to be equipped with furniture and to be covered with tapestries of wool, linen and silk, which gave an indescribable richness. He endowed it with ample waqfs and donations, providing the hospital with a daily sum of forty dinars for its expenses.*

*Pharmacists were employed to prepare food and drink and needed medicaments, as well as clothing for the summer and winter for the patients. When a poor patient left the hospital he was given a sum of money until he could find employment. When a rich patient was discharged he received his money and belongings beforehand. The hospital was accessible to rich and poor alike. If a stranger was taken ill in the city he was admitted and treated until he was well or until he died. Every Friday the monarch rode to the hospital and visited the sick, asking about the state of their health and making inquiries about their needs. The caliph continued this custom until his death.*<sup>117</sup>

<sup>112</sup> G.Deverdun: Marrakech; op cit; .p. 263.

<sup>113</sup> R.Brunschvig: *Un aspect de la literature history-geographique de l'Islam*; Melanges Gaudefroy Demombynes.

<sup>114</sup> G.Deverdun: Marrakech; op cit; p. 263.

<sup>115</sup> M.Brett: Marrakech; op cit; p. 151.

<sup>116</sup> M.Brett: Marrakech; op cit; p. 151.

<sup>117</sup> Abdel Wahid al-Marrakashi, *The History of the al-Mohades*, edited by R.Dozy ; Leiden ; 1881 ; p.209.

## Fes

Fes is admirable in every respect. Browsing through Burckhardt<sup>118</sup> one is simply amazed by the uniqueness of the beauty of the city, the purity of colours, and, it seems, all the expertise of Muslim art gathered in every edifice of the city, its most renowned site, the Qarrawiyin Mosque University, most of all.

There is an excellent outline on the founding of Fes by Levi Provençal, originally published in the *Annales of the Institute of Oriental Studies in Algiers*,<sup>119</sup> and reproduced in his *Islam d'Occident (Islam in the West)*, which is used here.<sup>120</sup> It seems two separate cities were founded in an interval of one year, but needless to dwell on this. The date of the foundation is from the early 9<sup>th</sup> century, the work of the Idrisids.<sup>121</sup> Fes soon received an influx of people of diverse origins, Arabs, Berbers, Jews, and also Spanish Muslims from Cordoba who had just been severely repressed by the ruler Al-Hakem I.<sup>122</sup>

The city grew in size and in cultural importance. Available information shows that a strong scientific tradition was established in Fes, although such research requires more to assert the full scale of this tradition, its links with that of al-Andalus, and the profile of the men of science who lived there.<sup>123</sup> The Merinid princes made it the political capital, but also they were able to attract to this city a host of students from all parts of the country by the foundation of a series of colleges or madrassas around the Djami al-Qarrawiyin and mosque of New Fes.<sup>124</sup> The city's greatest claim on the intellectual front is the Qarrawiyin Mosque-University.



General view of the courtyard of Qarawiyyin mosque univertisy

<sup>118</sup> T.Burckhardt: *Fes City of Islam*; The Islamic Text Society; Cambridge; 1992.p.73

<sup>119</sup> E.Levi Provençal: la Fondation de Fes; in *Annales d'Etudes Orientales de l'Universite d'Alger*; Vol 4; 1938; pp. 23-53.

<sup>120</sup> E.Levi Provençal: La Fondation de Fes; in *Islam d'Occident*; Librairie Orientale et Americaine; Paris; 1948; pp. 1-32.

<sup>121</sup> E.L. Provençal: La Fondation; pp.3-4.

<sup>122</sup> E.L. Provençal: La Fondation; pp. 6-7.

<sup>123</sup> A. Djebbar: Mathematics in medieval; op cit.

<sup>124</sup> E.L. Provençal: entry: Al-Maghrib; in *Encyclopaedia of Islam*; New edition; Vol 5; 1986; pp 1208-9.

Al-Qarrawiyin was first built in 859, and was for some time one of the three or four schools of the city, before becoming the principal centre of higher learning in Morocco.<sup>125</sup> It had a great impact on learning both around the Mediterranean and Europe. It is said that from the beginning of the 12th century until our time, 'the glory' of the Qarrawiyyin, it is held, was its body of scholars (ulamas).<sup>126</sup> Among the scholars who studied and taught there were Ibn Khaldoun, Ibn al-Khatib, al-Bitruji, Ibn Harazim, Ibn Maymoun, and Ibn Wazzan, and possibly even the future pope Gerbert (d.1003), who later became Pope Sylvester II, and who introduced the Arabic numerals into Europe.<sup>127</sup>

Al-Qarrawiyin was endowed principally by royal families and received students from all parts, near and distant, from the Maghreb, the Sahara and also Europe. Students lived in residential quadrangles, which contained two and three story buildings, accommodating between sixty and a hundred and fifty students, who all received a minimal assistance for food and accommodation.<sup>128</sup>

At the Qarrawiyin, there were courses on grammar, rhetoric, logic, elements of mathematics and astronomy,<sup>129</sup> and possibly history, geography and elements of chemistry.<sup>130</sup> To have, an even better idea of such teaching, surely, consultation of manuscripts is de rigueur, and here can be cited some possible leads.<sup>131</sup>

As for Fes, I have no better conclusion than this short and yet enlightening outline from a contemporary chronicler:

*'It was during the reign of the Almohads,' writes the chronicler, that, 'in its richness and splendour Fes shone at its most magnificent. At that time, it was the most flourishing town in the Maghrib. In the reign of al-Mansur and his followers there were in Fes seven hundred and eighty five mosques and zawiya's. There are about 250 today; 240 places of convenience and purification, and 80 public fountains, which were all fed with water from springs and brooks. There were 93 public baths and 472 mills within and alongside the walls, not counting those outside the city.'*

The same chronicler goes on to mention 89036 dwelling houses, 19041 warehouses, 467 funduks(hotels) for the convenience of merchants, travellers, and the homeless; 9082 shops, two commercial districts, one in the Andalusian district, near the river Masmuda, and the other in the Qairounese district; 3064 workshops, 117 public wash-houses; 86 tanneries; 116 dye works; 12 coppersmitheries; 136 bread ovens; and 1170 other ovens.... In Fes there were also 400 paper making shops, which were later destroyed in the years of famine 1221-1241.<sup>132</sup>

<sup>125</sup> Bayard Dodge: *Muslim Education in Medieval Times*; The Middle East Institute, Washington D.C, 1962.

<sup>126</sup> *Encyclopedia of Islam*: Vol IV, p 633.

<sup>127</sup> Rom Landau, The karaouine at Fes, *The Muslim World* 48 (April 1958): pp. 104-12; at p. 105.

<sup>128</sup> B. Dodge: *Muslim Education*, op cit, p 27.

<sup>129</sup> R. Le Tourneau: *Fes in the age of the Merinids*, trsl from French by B.A. Clement, University of Oklahoma Press, 1961, p.

122.

<sup>130</sup> Ibid.

<sup>131</sup> For manuscripts see:

-E,Levi provencal: *Les Manuscrits Arabes de Rabat*, Paris; 1921.

-I.S. Allouche and A. Regragui: *catalogue ds manuscrits arabes de Rabat*, Rabat 1954-8.

-Muhammed al-Fasi: *Al-Khizana al-ilmiiyya bi fas*, Rabat; 1960.

<sup>132</sup>(Rawd al-Qirtas) in T.Burckhardt: *Fez City of Islam*; op cit; .p.73

## Conclusion

This is only a brief sketch of the Moroccan contribution to Muslim civilisation. The most unfortunate thing is that, although Morocco's heritage is much the object of admiration, there is no study that has gone into Morocco's history from the early days of Islam, and shown how, not just architecture and arts, but many other sciences thrived in the country. Indeed, there is a need for a study that shows the true role of Morocco in the brilliance of Muslim civilisation, and how much of what went into Europe, via Spain, passed by Morocco.

## Bibliography

- R. Brunschvig: *Un aspect de la littérature history-geographique de l'Islam*; Melanges Gaudefroy Demombynes.
- T. Burckhardt: *Fez City of Islam*; The Islamic Text Society; Cambridge; 1992.
- C. Cahen: *Orient et Occident au temps des Croisades*, Aubier Montaigne, 1983.
- A. Cutler: 'Who was the Monk of France' and when did he write?', *Al-Andalus*, XXVIII (1963), pp 249-269.
- A.C. Crombie: *Science, optics, and music in medieval and early modern thought*; The Hambledon Press; London; 1990.
- T.K. Derry and T.I. Williams: *A Short History of Technology*; Oxford Clarendon Press, 1960.
- G. Deverdun: *Marrakech*, Editions Techniques Nord Africaines; Rabat; 1959.
- A. Djebbar: Mathematics in medieval Maghreb; *AMUCHMA-NEWSLETTER-15*; Universidade Pedagógica (UP), Maputo (Mozambique), 15.9.1995 at [http://www.math.buffalo.edu/mad/AMU/amu\\_chma\\_15a.html](http://www.math.buffalo.edu/mad/AMU/amu_chma_15a.html)
- D.M. Dunlop, 'A Christian Mission to Muslim Spain in the eleventh century,' *Al-Andalus*, XVII (1952).
- B. Dodge: *Muslim Education in Medieval Times*; The Middle East Institute, Washington D.C., 1962.
- W. Durant: *The Age of faith*, Simon and Shuster, New York; 6<sup>th</sup> printing; 1950.
- G.S.P. Freeman-Greenville: *The East African Coast*, Oxford; 1962.
- T. Glick: *Islamic and Christian Spain in the early Middle Ages*, Princeton University Press, New Jersey, 1979.
- T. Glick: Seville in *Dictionary of the Middle Ages*; Charles Coulston Gillispie Editor in Chief; Charles Scribner's Sons; New York; 1980 onwards; vol 13; p. 213.
- John Glubb: *A Short History of the Arab Peoples*; Hodder and Stoughton, 1969.
- P.K. Hitti: America and the Arab heritage: in *The Arab heritage*, N.A. Faris ed: Princeton University Press, 1944.1-24
- M. Husain: *The Rehla of Ibn Battuta*, Baroda, 1953;
- D. Hunter: *Papermaking: the History and technique of an ancient craft*; Pleiades Books; London; 1943.
- P. A. Jaubert: *Geographie d'Edrisi*, 2 vols. (1836-1840).
- Ibn Battuta: *Voyages d'Ibn Battuta*, Arabic text accompanied by French translation by C. Defremery and B.R. Sanguinetti, preface and notes by Vincent Monteil, I-IV, Paris, 1968, reprint of the 1854 edn.
- Ibn Battuta: *Travels in Asia and Africa*; trsltd and selected by H.A.R. Gibb; George Routledge and Sons Ltd; London, 1929.
- S.M. Imamudin: *A Political History of Spain*; Najmah and Sons Limited Publishers; Dacca; 1961.
- T.B. Irving: Dates, Names and Places: The end of Islamic Spain; in *Revue d'Histoire Maghrebine*; No 61-62; 1991; pp 77-93.
- A. Kettani: Science and technology in Islam: the underlying value system, in: *The Touch of Midas: Science, values and environment in Islam and the West*, Ziauddin Sardar ed; Manchester University Press, 1984, pp. 67-90.
- S. Lane-Poole: *The Moors in Spain*; Fisher Unwin; London; 1888.
- H.C. Lea: *The Moriscos of Spain*; Burt Franklin; New York; 1968 reprint.
- R. Landau: *Morocco*; Elek Books Ltd, London 1967.
- Rom Landau, The karaouine at Fes, *The Muslim World* 48 (April 1958): pp. 104-12; at p. 105.
- R. Le Tourneau: *Fes in the age of the Merinids*, trsl from French by B.A. Clement, University of Oklahoma Press, 1961.
- Al-Marakushi: *Kitab al-Mujib*; Tr into Histoire des Almohades by E. fagnan, Algiers, 1893.
- A.L. Mayer: *Islamic astrolabists*, Albert Kundig edition, Geneva, 1956.
- J.T. Monroe: The Hispanic-Arabic World: in: *Americo Castro, and the meaning of Spanish Civilisation*. Jose Rubia Barcia ed; University of California Press, Berkeley, 1976 pp 69-90.
- J J O'Connor and E F Robertson: Arabic mathematics, a forgotten brilliance at: <http://www-history.mcs.st-andrews.ac.uk/history/index.html>
- G. Oman: Al-Idrisi *The Encyclopaedia of Islam*: 2nd ed; Leyden Brill; 1971; p. 111.
- J. Pedersen; *The Arabic Book*, trans by Geoffrey French; Princeton University Press; Princeton, New Jersey (1984).
- E.L. Provencal: entry: Al-Maghrib; in *Encyclopaedia of Islam*; New edition; Vol 5; 1986; pp 1208-9.

- E.Levi Provençal: La Fondation de Fes; in *Islam d'Occident*; Librairie Orientale et Americaine; Paris; 1948; pp. 1-32.
- Jean Read: *The Moors in Spain and Portugal*; Faber and Faber, London, 1974.
- S and N. Ronart: *Concise Encyclopaedia of Arabic civilization; The Arab West*; Djambatan; Amsterdam; 1966.
- C.A.Ronan: The Arabian science; in *The Cambridge Illustrated History of the World's Science*; Cambridge University press. Newness Books, 1983; pp 201-244.
- F.Rosenthal: Ibn battuta: *Dictionary of Scientific Biography*; Charles Coulston Gillispie; Editor in Chief; Charles Scribner's Sons; New York; 1970 fwd; vol1; pp 516-7. at p. 516.
- G.Sarton: *Introduction to the History of Science*; 3 vols; The Carnegie Institute of Washington; 1927-48. vol 2.
- L.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.
- S.P. Scott: *History of the Moorish Empire*; The Lippincoat Cmpany; Philadelphia; 1904; Vol 1.
- M. M. Sibai: *Mosque Libraries: An Historical Study*; Mansell Publishing Limited: London and New York: 1987.
- A.Thomson; M.A. Rahim: *Islam in Andalus*; Taha Publishers; Revised edt; 1996.
- A.Udovitch; Al-Idrisi, in *Dictionary of Middle Ages*; Charles Scribner's Son; New York:Volume Six; p.412
- M.Watt: L'Influence de l'Islam sur l'Europe medievale; *Revue d'Etudes Islamiques*; vol 40.
- G. Wiet et al: History of mankind; Vol 3: The Great medieval Civilisations; Trsltd from the French; George Allen &Unwin Ltd; UNESCO; 1975 p.269.