

## Appendix: On the travel of the A.D. 807 delegation (and other consequences)

In order to explain the mechanical water clock and to find the destination, a scholar with astronomical and/or geographical knowledge must have joined the Arabic delegation – several such scholars are known around that time like al-Kindī, al-Khwārizmī, or al-Farghanī.<sup>1</sup> Their motivation for eclipse observations could be, in addition to basic science and calendar issues (societies with pure lunar calendars more often observe around new and full Moon), to derive geographical longitudes of places on-route (e.g. to obtain longitude differences from simultaneous eclipse observation, or to determine the *qibla*, the direction of prayer towards Mecca) – latitudes could more easily be obtained from the altitude of stars. A large project to construct a world map was under way, al-Kindī: “For al-Rashīd [caliph A.D. 786-809], a map of the whole world was prepared on a roll.”<sup>2</sup> Slightly later, under Caliph al-Ma’mūn (caliph A.D. 813-833) a new map of the world was generated for the first time giving geographical longitudes in degrees.<sup>3</sup> While Ptolemy’s work *Geography* was translated to Arabic already in the 8th century, al-Ma’mūn’s map is in many respects an improvement over Ptolemy’s work.<sup>4</sup> While al-Ma’mūn’s map exists only as a 14th century copy,<sup>5</sup> a table with geographic coordinates by al-Khwārizmī (ca. AD 780-850) is extant; from this table, al-Ma’mūn’s map was reconstructed<sup>6</sup> – all based on previous longitude measurements. This map shows the Italian peninsula, mountains north of it (Alps), and two large rivers running in south-north direction through central Europe ending at the coast of the north-central European mainland, probably Rhine and Elbe.<sup>7</sup> Al-Khwārizmī’s work shows modifications compared to Ptolemy’s *Geography*: (a) a location called *Alāmanīā*’ identified as Frankia, (b) the East-German region called *ṣaqāliba*, the first Arabic mentioning of Saxonina (or

<sup>1</sup> F. Sezgin, *Geschichte des arabischen Schrifttums VI, Astronomie* (Leiden: Brill, 1978), pp. 135-157.

<sup>2</sup> F. Sezgin, *Geschichte des arabischen Schrifttums*, vol. X, *Mathematische Geographie*, part 1 (Leiden: Brill, 2000), p. 79.

<sup>3</sup> F. Sezgin, *Geschichte des arabischen Schrifttums VI, Astronomie* (Leiden: Brill, 1978), pp. 80-140.

<sup>4</sup> F. Sezgin, *Geschichte des arabischen Schrifttums VI, Astronomie* (Leiden: Brill, 1978), pp. 80-140; F. Sezgin, *Geschichte des arabischen Schrifttums*, vol. XIII, *Mathematische Geographie – Autoren* (Leiden: Brill, 2007), p. 169.

<sup>5</sup> F. Sezgin, *Geschichte des arabischen Schrifttums*, vol. XII, *Mathematische Geographie – Kartenband* (Leiden: Brill, 2007), pp. 2-3.

<sup>6</sup> F. Sezgin, *Geschichte des arabischen Schrifttums X, Mathematische Geographie*, part 1 (Leiden: Brill, 2000), p. 4; C.A. Nallino, *Al-Khuwarizmi* (Rome: Accademia dei Lincei, 1894).

<sup>7</sup> F. Sezgin, *Geschichte des arabischen Schrifttums X, Mathematische Geographie*, part 1 (Leiden: Brill, 2000), p. 4.

Slavia), and (c) several cities and rivers in Germany not listed by Ptolemy, e.g. the Oder in Saxony.<sup>8</sup> Maybe, the Arabic delegation heard about these East German locations at the court of Charlemagne, who had just finished the 33-year Saxon war; one of its members could be Al-Khwārizmī, also known as member of a later delegation (between A.D. 842 and 847) to the Jewish Khazar kingdom in the northern Caucasus, which had vivid connections to China and Arabia including Palestine.<sup>9</sup>

Long-distance diplomatic delegations between the Orient and Frankia typically consisted of at least several dozen members, only the leaders were named.<sup>10</sup> The Arabic delegation from Baghdad probably traveled via Jerusalem, because monks from there arrived with them at the Frankish court, and the conditions of Christians and their buildings in Palestine (then part of the caliphate) was probably a major topic of the discussion with Charlemagne, who afterwards sent own *missi* to Jerusalem (see below). After landing at Treviso, the group may have traveled north via Salzburg. A trip from the Levant or Alexandria (Egypt) to the northern Adriatic Sea took on average about 2-3 months, depending on the type of ship, weather and wind, whether blue-water or coastal sailing was undertaken, during the bright day or also at night, and on stop-overs and side-trips; e.g. Bernard's (pilgrim monk from France) return trip probably from Jaffa to Salerno in A.D. 867 took 60 days (even though possibly of both day- and night-sailing, which became more frequent during the 9th century).<sup>11</sup> In general, traveling westwards against the prevailing wind took on average twice as long as eastwards; much time was spent waiting for wind.<sup>12</sup> Less than 20% of datable Mediterranean Sea travel A.D. 650-970 took place Nov to Feb (*mare clausum*), these were urgent diplomatic or military action.<sup>13</sup> For leaving the Levant by sea, March to May were the best months, because the rare easterly winds blow slightly more often; winds were also favorable in autumn (October), but this could be too late to be sure to arrive in Italy before the winter.<sup>14</sup>

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<sup>8</sup> R. Wieber, *Nordwesteuropa nach der arabischen Bearbeitung der Ptolemäischen Geographie von Muhammad B. Musa Al-Hwarizmi* (Walldorf: Verlag für Orientkunde, 1974), pp. 109-139.

<sup>9</sup> J. Needham and L. Wang, *Science and civilization in China*, Vol. 3, Cambridge: Cambridge University Press, 1959, pp. 681-682.

<sup>10</sup> M. McCormick, "Diplomacy and the Carolingian Encounters with Byzantium", in B. McGinn and W. Ottem (eds), *Erigena: East and West* (Notre Dame, IN: University of Notre Dame Press, 1994), pp. 25-30 - for Byzantine delegations, probably similar for Arabic missions; M. McCormick, *Origins of the European Economy* (Cambridge: Cambridge University Press, 2001), pp. 479-80.

<sup>11</sup> M. McCormick, *Origins of the European Economy* (Cambridge: Cambridge University Press, 2001), pp. 489-500 and 940.

<sup>12</sup> M. McCormick, *Origins of the European Economy* (Cambridge: Cambridge University Press, 2001), pp. 492-493, 854.

<sup>13</sup> M. McCormick, *Origins of the European Economy* (Cambridge: Cambridge University Press, 2001), table 15.1, p. 452.

<sup>14</sup> M. McCormick, *Origins of the European Economy* (Cambridge: Cambridge University Press, 2001),

The last entry in the RFA for A.D. 806 before Christmas reports that “the envoys ... sailed through the very anchoring places of the Greek ships and returned to Treviso ... without being noticed by one of the enemies”, i.e. probably in fall 806. Except the compilation of all the astronomical observations (806/807), the first event reported in A.D. 807 was the arrival of the delegations at Aachen. Since they arrived in Aachen only in 807, they probably arrived at Treviso too late to cross the Alps before the winter – except maybe through a more relaxed route from Treviso to Salzburg mainly through valleys plus only one pass (Radstädter Tauern, 1738 meter, eastern Alps, now Austria, already used since antiquity<sup>15</sup>). In any case, arrival in Treviso before the A.D. 806/807 winter “mare clausum” means that they left the Levant early enough, so that the members from Baghdad and Jerusalem were together when the first eclipse happened (806 Sep 2). If the Muslim delegates wanted to avoid travel during Ramaḍān (A.D. 806 mid July to mid Aug), they may have spent this month in Jerusalem, crossed the Sea afterwards, and spend the winter in Treviso or Salzburg. The lunar eclipse of 806 Sep 1/2 was well visible in the Levant. The mixed delegation may not yet have been in Aachen, when they observed and recorded the Jupiter occultation Jan 30/31 and the solar eclipse on Feb 26 – maybe still in Salzburg with computus and astronomy scholar Bishop Arn. To study the effect of geographic *climata* on Ptolemy’s eclipse prediction scheme, they may have been motivated to leave the winter quarter early and traveled north to Aachen to check their solar eclipse prediction for A.D. 807 March. All celestial events recorded in the RFA A.D. 807 were fully visible over Europe and the Near East.

On the return trip, the RFA says: “The emperor [Charlemagne] kept the ambassador and the monks with him for a while and then sent them to Italy and told them to wait there till it was time to set sail [*tempus navigationis*].”<sup>16</sup> McCormick translated “tempus navigationis” with “sailing season” apparently implying the winter closure of the Sea and dated the return trip to A.D. 808.<sup>17</sup> Borgolte argued that it is unlikely that Charlemagne advised experienced travellers to avoid the winter, but would instead meant to wait until the end of the siege of Adriatic ports by the Byzantine fleet.<sup>18</sup>

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pp. 98 and 451.

<sup>15</sup> R.P. Märtin, *Die Alpen in der Antike* (Frankfurt: Fischer, 2017), map on p. 127.

<sup>16</sup> B.W. Scholz and B. Rogers, *Carolingian Chronicles* (Ann Arbor, MI: University of Michigan Press, 1970), p. 87.

<sup>17</sup> M. McCormick, *Origins of the European Economy* (Cambridge: Cambridge University Press, 2001), p. 450, and travel number R277, p. 893; M. McCormick, *Charlemagne’s survey of the Holy Land* (Washington: Dumbarton Oak, 2011), pp. 174-175.

<sup>18</sup> M. Borgolte, *Der Gesandtenaustausch der Karolinger mit den Abbasiden und mit dem Patriarchen von Jerusalem* (München: Ardeo, 1976), pp. 92 and 105.

There are two other lines of evidence on the timing of the return trip: (i) almost at the end of the yearly record (RFA 807), it is said: “Nicetas who was staying in Venice with the fleet of Constantinople made peace with King Pippin. After concluding an armistice until the month of August, he weighed anchor and returned to Constantinople”<sup>19</sup> – Pippin (A.D. 773-810) being the 2nd son of Charlemagne and King of Italy (since A.D. 781). Such a ceasefire was normally agreed upon for one year, here Aug 807 to Aug 808; news about it could reach Aachen a few weeks after the agreement – maybe anticipated by Charlemagne, hence his “tempus navigationis”. (ii) A consequence of the visit of A.D. 807 is the *filioque* dispute: the monks coming back from Aachen to Jerusalem brought the Frankian version of the *Credo* with *filioque* (the Holy Spirit would come from *both* the Father “*and* the Son”); since this dispute started just around Christmas at the turn of A.D. 807/8,<sup>20</sup> the delegates must have been back by then.

It would be plausible that the Muslim delegation waited with the departure from Aachen until after Ramaḍān, which ended in A.D. 807 with the first crescent on Aug 7. Given favourable weather (RFA: “808. The winter [807/8] was extremely mild”<sup>21</sup>), they could reach Venice early enough to set sail for the Levant in the fall. If they observed the lunar eclipse on 807 Aug 21/22 while already heading back, the data about it in the RFA could originate either from scholars at Aachen (confirmed as predicted by the visitors), or it could be sent to court by the returning monks (or Agamus and Roculf) traveling with the Arabic delegation after their last observations somewhere on route. It is quite certain that the Arabic delegation was accompanied by Franks up to Treviso (RFA: “the emperor ... sent *them* to Italy ... to set sail”). Even if none of the observations were performed in Aachen, the RFA record shows Arabic knowledge transfer.

As a consequence of the positive results of the visit of the mixed delegation in Aachen A.D. 807, Charlemagne sent Agamus and Roculf (Hroculf) to Jerusalem, they may have travelled with the visitors returning to Jerusalem.<sup>22</sup> In the Holy Land, then under °Abbasid rule, they collected information on Christian establishments like number and names of priests and monks etc., their financial needs, as well as the status of partly

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<sup>19</sup> B.W. Scholz and B. Rogers, *Carolingian Chronicles* (Ann Arbor, MI: University of Michigan Press, 1970), pp. 87-88.

<sup>20</sup> M. Borgolte, *Der Gesandtenaustausch der Karolinger mit den Abbasiden und mit dem Patriarchen von Jerusalem* (München: Ardeo, 1976), pp. 104-105; M. McCormick, *Charlemagne's survey of the Holy Land* (Washington: Dumbarton Oak, 2011), pp. 174-175.

<sup>21</sup> B.W. Scholz and B. Rogers, *Carolingian Chronicles* (Ann Arbor, MI: University of Michigan Press, 1970), p. 88; Lat: „Hiemps mollissima ac pestilens fuit in illo tempore”.

<sup>22</sup> M. Borgolte, *Der Gesandtenaustausch der Karolinger mit den Abbasiden und mit dem Patriarchen von Jerusalem* (München: Ardeo, 1976), pp. 101-107.

damaged churches, to be found in the “Basel Roll”<sup>23</sup> of A.D. 808; Charlemagne’s envoys went back to Europe and arrived in Rome in A.D. 808 spring/summer to bring a letter from Thomas, patriarch of Jerusalem, to pope Leo III on the *filioque* dispute, who forwarded a copy to Charlemagne and called Agamus and Roculf “faithful servants“ of Charlemagne. They returned to Aachen bringing the original Basel Roll.<sup>24</sup> Later, Charlemagne sent financial resources to Jerusalem to renovate damaged churches and to support Christian pilgrims (e.g. Einhard’s *Vita*) – it is well possible that the Arabic delegation of A.D. 807 informed Charlemagne that the caliph would agree not to damage Christian churches, but that Charlemagne would need to pay for renovations.

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<sup>23</sup> M. McCormick, *Charlemagne’s survey of the Holy Land* (Washington: Dumbarton Oak, 2011).

<sup>24</sup> M. McCormick, *Charlemagne’s survey of the Holy Land* (Washington: Dumbarton Oak, 2011), pp. 166-177.