

Radiocarbon Dating and the Origins of the Qur'an

As we noted at the end of the preceding chapter, the radiocarbon dating of certain early manuscripts of the Qur'an has become something of a flashpoint in recent studies of the Qur'an.¹ For those who wish to maintain the accuracy of the traditional Sunni account of the Qur'an's composition, as well as its contrived scholarly offspring, the Nöldekean-Schwallian paradigm, some radiocarbon analyses of these early manuscripts could appear to validate their convictions. Yet at the same time, repeated attempts to date these same early codices have yielded drastically different results in some cases, seeming to indicate that something is not working quite right with this method of dating, at least for parchments from the early medieval Near East. Nevertheless, scholars committed to the traditional narrative of the Qur'an's origins have fervently upheld the accuracy of those studies favoring their position, while searching out reasons to impugn the results that do not.

The scientific luster of these results can and often does beguile scholars (particularly when the results support their presuppositions), even as it seems increasingly clear that this method is not entirely accurate for dating early Qur'ans, at least not within a range narrower than a century or two. Indeed, scholars of the Dead Sea Scrolls faced very similar difficulties when trying to radiocarbon date documents from that collection. A deeper look into the ins and outs of radiocarbon dating can help us to understand why, for the time being at least, radiocarbon dating has not proved a reliable method for determining the date of the Qur'an's formation. While these methods of scientific analysis are welcome and useful for the contribution that they can bring, they nevertheless have so far failed to deliver any sort of "silver bullet" that can instantly resolve the many complex issues surrounding the early history of the Qur'an. Instead, it seems that for the time being we must continue the hard work of historical-critical analysis, alongside the data

from radiocarbon analysis, in order to understand the history of the Qur'an's composition and canonization.

THE METHOD OF RADIOCARBON DATING OR ^{14}C ANALYSIS

Radiocarbon dating is a method capable of dating organic materials on the basis of the steady radioactive decay over time of a particular isotope of carbon, Carbon-14 or radiocarbon (^{14}C), that is present in the atmosphere of the earth and in all life forms.² The nucleus of a ^{14}C atom contains six protons and eight neutrons, in contrast to the more common, stable isotope ^{12}C , which has six protons and six neutrons. ^{14}C exists in trace amounts in the atmosphere, where it is the result of cosmic rays from the sun acting on ^{14}N , one of the stable isotopes of nitrogen, and changing it into the unstable (radioactive) carbon isotope ^{14}C in very small amounts: there is approximately one ^{14}C atom in the atmosphere for every one quadrillion (1,000,000,000,000,000) atoms of ^{12}C and ^{13}C (another rare but stable isotope of carbon). Since ^{14}C is unstable, over time it decays into ^{14}N at a predictable rate, so that in approximately 5,730 years, ± 40 years, half of the original ^{14}C has become instead ^{14}N . In another 5,730 years, half of the remaining ^{14}C has turned into ^{14}N , so that only 25 percent of the original amount remains after roughly 11,460 years.

This is the "half-life" of ^{14}C : approximately, every 5,730 years the original amount of ^{14}C is reduced by half through radioactive decay. Of course, for living organisms, the amount is constantly replenished from the atmosphere. Plant life absorbs ^{14}C along with other isotopes of carbon in the process of photosynthesis, and humans and other animals then absorb ^{14}C by consuming plants and other animals. Yet at death, the amount of ^{14}C in organic material becomes fixed at the level in the atmosphere at the time of decease. This means that if we know exactly the amount of ^{14}C present in the atmosphere when some particular organic matter ceased to be alive, we can calculate the approximate age of the material in question, or at least, when the organism died. So, if the amount of atmospheric ^{14}C at an organism's death is x amount, and a tool or a manuscript that was produced from its remains contains $\frac{x}{2}$ amount, then the organism from which the artifact was fashioned died approximately 5,730 years ago, ± 40 years; if the amount is $\frac{x}{4}$, then the age of death would be approximately 11,460 years before the present.

⁴ This method affords a deceptively simple way of identifying the approximate date at which organic material ceased to be alive. At death, the amount of ^{14}C is fixed and will decay steadily over time. The only problem with this method, however, its underlying complexity, lies in determining the precise amount of ^{14}C present in the atmosphere at the time and place of the organism's death. The earliest efforts at radiocarbon dating simply assumed that the amount of ^{14}C in the atmosphere remains effectively constant over time, so that the current levels of ^{14}C could be used as the x amount from which to measure an artifact's age. To a limited

extent, this is true: there are not massive fluctuations in the amount of atmospheric ^{14}C over time. Nevertheless, at the same time the amount does regularly change, resulting especially from changes in solar activity that determine the number of cosmic rays hitting the earth's upper atmosphere at any given time. Any increase or decrease in cosmic rays will affect a corresponding rise or fall in the amount of ^{14}C in the atmosphere, and by consequence, also in any organisms alive at that time. So, if something dies at a time when the amount of ^{14}C is particularly higher or lower due to changes in the sun's activity, the x amount from which we measure the decay of ^{14}C must be specifically determined for that particular moment in order to achieve an accurate assessment.

Since the amount of ^{14}C in the atmosphere can vary in time and even according to place, radiocarbon scientists recognized that they must find a way to calculate more specific ^{14}C amounts for different times in the past. This is particularly necessary if one wishes to narrow the dating of an object down to a particular century, a refinement that becomes increasingly important for more recent objects, from the Middle Ages for instance, such as early Qur'anic manuscripts. Yet, even in the case of materials from more than forty thousand years before the present, it is necessary to calibrate the amount of ^{14}C found in an object, so that the measurement will reflect as closely as possible the amount of atmospheric ^{14}C present at the time when the organic source of the object died. This marks an important refinement in radiocarbon dating that was pioneered in the late 1950s by Hessel de Vries (as well as others), which has since made the method more accurate in identifying the age at which an organism had expired. It turns out that tree rings provide an annual series of sealed carbon reservoirs that can be used to determine more precisely the atmospheric ^{14}C levels of a given time and place. By using measurements taken from dated tree rings, we can calculate the level of ^{14}C for a given year, and, using this data, we can better calibrate the initial ^{14}C level for an object. In this way, we can determine the date of the object's decease with much greater accuracy, at least for items from ten thousand years before the present, which is the chronological limit of our tree ring data. In the case of older objects, different carbon reservoirs are used to establish historical ^{14}C levels.

Yet, despite the refinements that calibration according to tree ring data has brought, there is still a high level of uncertainty that comes with radiocarbon dating. Eva Mira Youssef-Grob, for instance, expertly describes the limitations of this method, particularly with regard to objects from the early Islamic period, as follows:

^{14}C dating alone, with no further evidence available, hardly yields meaningful and hard results. A single test result may prove that a document, i.e. the material it is written upon, is medieval and no modern forgery. Under good conditions and with a careful experimental set up . . . , we might reach a highly probable 50-year window for dating, but day-to-day business is rather the assignment of a century.³

Therefore, if one is interested in dating an object generally to a particular historical period, the method of radiocarbon dating is quite accurate and reliable. For example, one of the most famous cases employing radiocarbon dating to determine the age of an object involved the famous Shroud of Turin, the alleged burial shroud of Christ, which was suspected to be a forgery even in the Middle Ages. Thanks to radiocarbon dating, we can now be absolutely certain that this relic is indeed a medieval forgery, since such analysis dates the material of the shroud to sometime between 1260 and 1390 CE.⁴ This is a wide range, of course, but it is sufficient to exclude any possibility that the shroud is from the first century CE, as had long been claimed. And so as Brent Nongbri rightly notes of this method, “the most compelling results of radiocarbon analysis emerge when an object’s date is disputed by a matter of several centuries or more.”⁵

It is therefore customary for the results of radiocarbon dating to be given in a relatively broad range of dates, so that it might date an object to sometime around five thousand years ago, give or take a few centuries or so, to borrow an example from Doug Macdougall. At this level, the method is highly accurate in its application, and in such a case we would be dealing with an artifact fashioned sometime between 4,700 and 5,300 years before the present with near certainty. Yet it is important to note that *any* date within this given range is equally probable, so that “it is as likely to be 4,795 years, or 5,123 years, or anything else in that range, as to be exactly 5,000 years.”⁶ In the era that concerns us, the early Middle Ages, it is not possible in most cases to date an object with greater precision than to a one-hundred-year interval at best. For this reason, François Déroche observes of this method, particularly in reference to dating early Qur’anic manuscripts, that “the results of ¹⁴C analysis are quite valuable as a first indication of the age of the copies, but their accuracy is insufficient when it comes to arranging the material within a period which lasted less than a century.”⁷ Moreover, as if to compound the problem, many of the results obtained so far in attempts to radiocarbon date early Qur’anic manuscripts suggest that there are some problems specific to using this method to date parchment codices from the early medieval Near East, issues that we currently are not able to fully understand.

THE RADIOCARBON DATING OF EARLY QUR’ANIC MANUSCRIPTS: SANAA

For much of the early history of radiocarbon dating there was some reluctance to subject manuscripts to such analysis because the process is destructive, and the samples required for investigation were too large. In more recent years, however, the process has become more refined so that one can now make ¹⁴C measurements of an object by taking only a minuscule sample from somewhere on the empty margins of the text. Utilizing these new procedures, the first radiocarbon study

of an early Qur'anic manuscript, to my knowledge, was undertaken in 2007, and the initial results were then published in 2010 by Behnam Sadeghi and Uwe Bergmann.⁸ The manuscript in question was a single folio taken from a very famous early Qur'an, *Ṣaṇ'ā' 1*, one of the oldest manuscripts to emerge from an important genizah of Qur'ans in Yemen during the 1970s.⁹ Somehow a stray folio from this manuscript came onto the antiquities market, and an anonymous collector purchased it from Sotheby's in 1993: the provenance is suspicious, and one suspects that the acquisition of this folio was not entirely legal, which certainly raises ethical issues regarding its use in academic study.¹⁰ In any case, when the results were published, the authors of the article announced that radiocarbon analysis of the palimpsest, done at the Accelerator Mass Spectrometry (AMS) Laboratory at the University of Arizona, was able to date the manuscript with a high degree of probability (95 percent) to the period between 578 and 669 CE, and with somewhat less probability (68 percent) to 614–56 CE and a 75.1 percent probability of dating it to before 646 CE. On this basis, the authors concluded that there is a very high probability that this manuscript “was produced no more than 15 years after the death of the Prophet Muḥammad.”¹¹ Such a dating, they further note, comports well with and thus confirms the accuracy of the canonical reports of the Qur'an's collection under 'Uthmān, although it may have sat around for a few decades if the actual date is before 646.

Case closed then. The Nöldekean-Schwallian stands vindicated. Such, at least, has been the conclusion of many scholars of the Qur'an and early Islam following this article's publication.¹² Even Patricia Crone acquiesced to the dating of the Qur'an indicated by the radiocarbon analysis of the Stanford fragment (although she had already come to favor an early dating for the Qur'an at least a decade before this, suspecting that much of it might be even pre-Muhammad).¹³ The dating of this and other early Qur'ans has been widely publicized online and in print, so that the general public has also been led to believe that science has indeed rescued us from the complexities of historical analysis in regard to the Qur'an's origins.¹⁴ Unfortunately, however, there appear to be real problems with obtaining an accurate dating for this folio and for other early Qur'anic manuscripts as well, and accordingly, such unquestioned confidence in the results of the radiocarbon dating of a single folio by a single lab appears greatly misplaced. For instance, other samples from the same manuscript were obtained in Yemen by Christian Robin, who sent them for analysis to the Centre de datation par le Radiocarbone at the University of Lyon (Université Claude Bernard Lyon 1). In this instance, the French laboratory's radiocarbon analysis of samples taken from the same manuscript that originally contained Sadeghi and Bergmann's Stanford 2007 study yielded radically different datings for its parchment leaves. The table below gives the datings of folios from this same manuscript as they were published by Robin.¹⁵

TABLE 1. Radiocarbon Dating of Folios from Sana MS 01-27-1

Folio	Laboratory Code	Date
01-27-1 fol. 2 (sura 6.159)	Lyon-6042 (SacA 15616)	543–643 CE ^a
01-27-1 fol. 11 (sura 20.74)	Lyon-6043 (SacA 15617)	433–599 CE ^b
01-27-1 fol. 13 (sura 21.72)	Lyon-6045 (SacA 15619)	388–535 CE ^c

^a1475 ± 30 years BP. The uncalibrated radiocarbon dates for these and other folios dated by Lyon are available online through the Banque Nationale de Données Radiocarbones pour l'Europe et le Proche Orient of the Lyon Laboratory, Centre de datation par le Radiocarbone, <http://carbon14.univ-lyon1.fr/p1.htm>.

^b1530 ± 30 years BP.

^c1530 ± 30 years BP.

So much for the case being closed. One will surely be quick to notice that the datings of these folios effectively indicate the manuscript's production before Muhammad ever began his prophetic mission. As Déroche notes, one could perhaps explain datings that were too late as the result some sort of contamination by another substance that was interfering with obtaining a correct analysis of the amount of ¹⁴C present in the parchment leaves. Such early datings are much harder to explain, and yet, Déroche concludes, "they cannot be accepted." Instead, he speculates that "the problem may lie with the conditions (arid or semi-arid climate) under which the cattle, the hides of which were later turned into parchment, were raised."¹⁶ Perhaps, although this explanation amounts to little more than pure speculation, and we still need to find better solutions to the confounding results from radiometric analysis of this and other early Qur'ans. It also tells us clearly that for some reason, whether it is the arid climate or something else, this method of dating is not working as it should when applied to materials from this time and place. Indeed, to make matters only worse, samples from the third folio in the table above, 01-27-1 fol. 13, were subsequently tested at the Research Laboratory for Archeology and the History of Art at the University of Oxford (OxA-29409), the Swiss Federal Institute of Technology in Zürich (ETH 52910), and at the Labor für Altersbestimmung und Isotopenforschung at Christian-Albrecht-Universität Kiel (KIA50087). The results from these labs for this same artifact, which the Lyon lab dated to between 388–535 CE (now 406–543 CE using the new IntCal 20 calibration curve), are 565–660 CE from Zürich (575–655 CE with IntCal 20) and 430–95 CE or 530–610 CE from Kiel (441–636 CE with IntCal 20), and 595–658 CE from Oxford (599–655 CE with IntCal 20).¹⁷ Thus, these assays have yielded significantly different results for the very same parchment leaf! Such results hardly settle the matter but instead only confirm that, again, something clearly is not working correctly with this method. For some reason, this method of analysis has shown itself incapable in its current practice of producing consistent and reliable results for objects fashioned in western Asia during the early Middle Ages: at the very least, it certainly is not working in the case of this manuscript.

It could be that this manuscript has somehow become contaminated, making an accurate dating of it according to radiocarbon impossible. Other environmental factors could indeed have affected the levels of ^{14}C in the manuscript's parchment folios. Parchment in particular is sensitive to damage from "environmental pollution, harsh cleaning, improper conservation and restoration," as well as extremes in humidity, temperature, light, pollution, and saturation, all of which can make an accurate radiocarbon dating impossible.¹⁸ As Alba Fedeli notes, the folios of this ancient manuscript were stored in two different locations in Sanaa: al-Maktaba al-Sharqiyya, the library of the Great Mosque of Sanaa, and Dār al-Makḥṭūṭāt, the "House of Manuscripts." The samples obtained by Robin were taken from folios at the House of Manuscripts, with official permission and in the context of a scientific analysis of the early manuscripts kept there. The Stanford folio, it seems, likely came from folios of this manuscript now at the library of the Great Mosque, although this is not certain, since it is unprovenanced and was purchased from an antiquities dealer, who presumably obtained it on the black market.¹⁹

According to Fedeli, who was on site in Sanaa with the French expedition in 2008, the parchment folios at the Great Mosque were in good condition at the time. The folios from the House of Manuscripts, however, "were stored in the false ceiling of the Great Mosque of Ṣanʿāʾ for centuries, thus exposed to hot conditions and heavy rain." These ancient manuscripts were only discovered on account of restorations necessitated by damage from heavy rains and floods to the structure housing them. For this reason, Fedeli suggests, the margins of a manuscript, the location from which samples are ordinarily taken, may have been more susceptible to environmental damage, and so samples should instead be taken from a different part of the manuscript. Likewise, the various labs may have used different pretreatment methods to prepare their samples, which could also have affected the outcome.²⁰ Other factors that can possibly affect the measurable amount of ^{14}C in an artifact, including, but not limited to, "*in situ* production of ^{14}C in plant structures (particularly wood) at relatively high altitudes by the direct action of cosmic-ray-produced neutrons" (Sanaa is at 2,300 m) and "the presence of high organic content materials such as peats, . . . and the proximity of petroleum products such as asphalt or tar or fossil organics such as lignite or coal."²¹

Further complicating efforts to date the Sanaa palimpsest is the evidence provided by the text itself—that is, the format, orthography, and paleography with which the Qur'an was written onto this parchment in its underlying layer. Although Déroche notes that this manuscript still has not received a proper codicological description, he nevertheless provides sufficient analysis of the text in his *Qur'ans of the Umayyads* to be able to date the Qur'anic text that was originally written on it.²² As a palimpsest, this Sanaa manuscript contains two texts at once: an original text that has been erased but that can still be read, and a second text that was written over the erasure. In the original text, which was a Qur'an, the presence of sura titles and decorative features between the suras indicate a later date in the seventh

or in the early eighth century. Likewise, Sadeghi and Bergmann claim to have identified short vowel marks in the text, which, if accurate, as Déroche notes, would further indicate a later dating of this Qur'anic text. Éléonore Cellard has recently compared the original text of this palimpsest with another manuscript from the Sanaa collection, DAM 01–29–1, and she concludes, based on their similarities, that a dating to the early eighth century seems to be indicated for the palimpsest.²³ The upper text of this manuscript is also a Qur'an, which Déroche identifies as a copy of the text made not before the middle of the eighth century.²⁴ Both layers of the manuscript, then, preserve the text of the Qur'an, which of course raises a further question: why was one Qur'anic text erased and written over with another Qur'anic text?

The answer would appear to lie in the fact that the original Qur'anic text of the Sanaa manuscript's erased lower writing is a nonstandard version of the Qur'an that deviates regularly from the received version now identified as the "Uthmānic" Qur'an. As such, it is an extremely rare, although not unique, witness to the diverse ways with which the Qur'an continued to circulate still at the end of the seventh century. Efforts have been made to identify the manuscript's original Qur'an with one of the early Companion codices as described by the later tradition, without much success. Instead, what we have in the undertext of Sanaa 01–27–1 is a witness to a different, early version of the Qur'an.²⁵ Only once the "Uthmānic" text had achieved dominance was it erased and replaced with the canonical version of the Qur'an in the middle of the eighth century. Thus, as Déroche concludes, it would appear that noncanonical versions of the Qur'an were still being produced as late as 700 CE and were only eliminated eventually through the efforts of 'Abd al-Malik and al-Hajjāj to establish a particular version of the Qur'an as canonical.²⁶

Yet Nicolai Sinai writes as if the radiocarbon dating has more or less settled things, alleging that this method has confirmed "that a very considerable part of the Qur'anic text was around, albeit not without variants, by the 650s."²⁷ This is hardly surprising, given Sinai's commitment to defending the Nöldekean-Schwallian paradigm, an explicit aim in a number of his publications.²⁸ Nevertheless, if the Sanaa manuscript's earliest folio dates to the middle of the seventh century, even this finding would effectively disprove the establishment of the Uthmānic version at this time, demonstrating instead that at this time the Qur'an still had not yet been standardized. Furthermore, and from a rather different perspective, professional ethics should perhaps lead us instead in the opposite direction from the one that Sinai suggests. Given that Robin's sources were legitimately obtained in the context of a scientific mission, in contrast to the shady circumstances surrounding the Stanford fragment's origins, perhaps we should give them precedence. Moreover, unlike Sadeghi and Bergmann's folio, which involved one sample tested by one lab, Robin's had three different samples analyzed and employed four different labs to run independent analyses of one sample, which could also favor privileging these results. Nevertheless, there are two additional early

Qur'anic manuscripts that have recently been radiocarbon dated that we need to bring into the discussion.

THE RADIOCARBON DATING OF EARLY QUR'ANIC
MANUSCRIPTS: TÜBINGEN AND BIRMINGHAM

Toward the end of 2014, the University of Tübingen announced the results of radiometric analysis of an early Qur'an in its library collection, originally from Damascus (MA VI 165). A sample of the manuscript was analyzed by the Swiss Federal Institute of Technology in Zürich, which reported a greater than 95 percent probability that the animal from which the folio had been produced died sometime between 649 and 675 CE. Yet this manuscript had previously been dated by experts on the basis of its paleography and format as most likely having been written in the early eighth century.²⁹ Suddenly, with a university press release, this manuscript was widely proclaimed—largely through online media, one must note—as one of the two oldest Qur'ans in the world, equal in age to the Sanaa Qur'an: the results of radiocarbon dating guaranteed it!³⁰ Nevertheless, it is far too simplistic to rely on the results of a single dating from a single lab while completely discounting the evidence for dating the manuscript based on its script and format. As Fedeli rightly notes in the case of this manuscript, radiocarbon dating is often assumed “to possess a sort of supremacy that authorizes the acceptance of its results separate from other methods of relative dating.” Consequently, in this case “the notion of the dating of the parchment has completely been superimposed upon the dating of the text. In this replacement process, no reference has been proposed to the type of script and letter shapes of the text itself or a comparison to contemporary dated documents which exhibit similar features.”³¹

Despite the understandable enthusiasm to proclaim this the world's oldest Qur'an, one certainly must not discount the possibility that, although the animal died in the 660s or 670s, the text of the Qur'an may not have been written onto the palimpsest until the first part of the eighth century. This possibility also applies to the folios of the Sanaa manuscript: perhaps they are indeed quite old but remained unused for decades or even centuries: some of the early datings, if accurate, would effectively require as much if one wishes to maintain a connection between Muhammad and the contents of the Qur'an. Yet Michael Marx and Tobias Jocham maintain that “For economic reasons, it seems unlikely that the time span between the production of the parchment and its acquisition by the producing atelier, on the one hand, and the moment the scribe began to produce the manuscript, on the other, would have encompassed decades.”³² The assumption certainly is not without reason, although it is unsubstantiated. We simply do not know enough about how the market for parchment operated in the late ancient Near East, and especially in the Hijaz, if one believes the traditional narrative of the Qur'an's original production there under 'Uthmān's supervision. Yet, at the same time, Marx

and Jocham also allow that “it is highly possible that the parchments for the manuscripts . . . were bought by a writing workshop and that a certain amount of time passed before they were used as writing material.”³³ There certainly is no “sell by date” on a parchment, and unwritten leaves could sit in storage for generations, let alone decades, before their use. In the words of Youssef-Grob, radiocarbon dating “results do not give the time when the manuscript was written, but only the time of the vegetable or animal organism serving as the writing support,” and accordingly “calibrated radiocarbon dates must always be carefully aligned with further evidence, such as that of paleographic, stylistic, or internal textual nature.”³⁴ Marx and Jocham ultimately also concede this important point: “Because Qur’ān manuscripts can be dated precisely neither by paleography nor ¹⁴C analysis, additional features such as their orthography must be taken into consideration.”³⁵

The date of the Tübingen manuscript is particularly complicated when it comes to considering these qualities. This Qur’an contains elements of ornamentation that seem unlikely in what would purportedly be one of the very first efforts to place Muhammad’s revelations into writing. For example, dots punctuate divisions between the verses, with a hollow red circle surrounded by dots at every tenth verse, a series of triangular dots filling the line to the margin to mark the end of the suras. The manuscript is freely available online, thanks to the Tübingen Universitätsbibliothek, and so interested readers can examine these features for themselves and draw their own conclusions.³⁶ But to my admittedly untrained eye, this does not look like what we would expect from one of the first attempts to put the Qur’an into writing. A far more expert opinion, from Déroche, identifies this manuscript on the basis of the page layout, illuminations, paleography, and other markers from the production of the text on the page, among a larger group of manuscripts produced at end of the seventh and beginning of the eighth centuries under official state patronage at the imperial court. The ornamentation and style of these manuscripts reflect the campaign initiated by ‘Abd al-Malik and al-Hajjāj to establish a new, distinctively Islamic, Arabic scripture to surpass the scriptures of the Christians and Jews. Indeed, Déroche concludes that these elements of ornamentation in the early codices were intended to rival the luxury bibles of the Christians in appearance.³⁷

Yet Marx and Jocham make an attempt to argue instead that the form of the text written in the Tübingen manuscript corresponds with an earlier dating, and thereby they hope to bring the Qur’an nearer to the earlier range of the radiocarbon dates. They point specifically to the use of archaic forms for a few words; there is no consistent pattern, yet, that allows for any significant conclusions on this basis. For instance, they observe the spelling of *shay’* (“something”) according to a more archaic form *sh’y*, but they fail to mention that the word *shay’* is spelled with the correct form overwhelmingly in the manuscript, over 80 percent of the time. Therefore, this and other archaic spellings perhaps merely preserve a form that some scribe had copied from an earlier source along the way, as Marx and Jocham

both elsewhere concede.³⁸ These occasional alternative spellings are simply not enough to date the written text to the middle of the seventh century, and such variants would not be at all unexpected in a manuscript from the early eighth century. And so it remains that “in any case,” as Youssef-Grob underscores, “¹⁴C results have to be interpreted from different angles and with the help of further internal and external evidence (paleographic, stylistic, contextual, etc.) which must be carefully aligned with it.”³⁹ Therefore, given the current state of our knowledge, it remains the fact that the form of the text as written onto the Tübingen parchments corresponds with other Qur’ans from the early eighth century, which bear the hallmarks of production under imperial auspices.⁴⁰

A similar early Qur’an, whose “discovery” was heralded online around the same time as the Tübingen manuscript, has emerged from the Mingana collection at the University of Birmingham. The manuscript had been in the university library’s collection for almost a century at the time (Mingana Islamic Arabic 1572a), overlooked until radiocarbon analysis of a folio, done at Oxford University, dated its parchment to sometime between 568 and 645 CE with a probability of 95.4 percent (1456 BP \pm 21; 578–646 CE with IntCal 20).⁴¹ As with the Tübingen manuscript, following the announcement of these results, the press and online media quickly went into a frenzy over this “oldest” witness to the Qur’an, beguiled once again by the supposedly rock-solid scientific evidence of the radiocarbon dating. The only problem is that if we strictly follow the radiocarbon dating, the parchment seems a bit too early for the tradition of an ‘Uthmānic collection, if not also for Muhammad’s authorship, at least in the case of earlier dates within the range of possibilities. As Gabriel Reynolds notes, the very early results from the radiocarbon dating of this manuscript would in fact seem to confirm that early datings of folios from the Sanaa manuscript are not, as some have suggested, the result of a “botched job,” but are instead relatively accurate datings of the parchments used in this codex.⁴² The so-called “Birmingham Qur’an” consists in fact of just two leaves from an ancient manuscript that have been bound together with seven leaves from another manuscript. Yet Fedeli, who “discovered” the Birmingham manuscript, has also identified sixteen folios in the Bibliothèque nationale de France from the same early manuscript (MS BnF328c). There are thus eighteen total folios from this early manuscript, and their analysis forms a major part of Fedeli’s dissertation, which convincingly demonstrates that the text written on the parchment seems to be significantly more recent. Indeed, despite being credited with discovering the world’s oldest Qur’an in the press, Fedeli has from the start insisted that this witness to the Qur’an should not necessarily be dated as early as this particular radiocarbon analysis might suggest.⁴³

The dating of the Birmingham Qur’an only becomes more complicated after a careful examination of the text that has been written onto the parchment folios. In her dissertation, Fedeli demonstrates that the Birmingham Qur’an, much like the Tübingen Qur’an, bears the marks of production at a relatively later stage in

the history of the Qur'anic text. "On the basis of the analysis of the palaeographical features, i.e. the overall appearance of the script and habits of the scribe, as well as of the analysis of the content from a linguistic point of view," she establishes that "it is likely to assume that the first hand in charge of writing MS PaB [i.e., the Paris and Birmingham fragments] was copying the text from an exemplar, and in accomplishing such a task, he expressed his mastery, e.g. in planning the page layout and in executing a rather well-proportioned relationship between letter blocks and empty spaces."⁴⁴ As she continues to explain,

The mechanism of copying from an exemplar implies consequently that the work could not have been executed very early, as the written exemplar requires a period of time for producing the exemplar and also the establishment of a mechanism of copying from an authoritative text. Moreover, the regular and coherent presence of a blank line between two *sūras* seems to be interpreted as a sign of a later practice, as it was introduced and established during the so-called second *maṣāḥif* project accomplished in the period between 84–85 AH (703–5 CE), whose main initiator was al-Ḥajjāj (d. 95/713).⁴⁵

Déroche likewise identifies a similar date for this Qur'an's production based on the same qualities of the text: it clearly bears the marks of a high level of sophistication in writing that one would associate with production at the imperial chancery of 'Abd al-Malik.⁴⁶

Given the state of the Qur'anic text as it was copied onto this manuscript, it seems extremely unlikely that this Qur'an could possibly date to the time indicated by the radiocarbon analysis of the parchment. If we insisted on such a date, between 568 and 645 CE, then we must revise the traditional narrative of the Qur'an's origins not to a later date, but in the opposite direction, concluding that it took place much earlier than the Nöldekean-Schwallian paradigm would have it. In such a case we must assume that a highly advanced and technical practice of writing was in place well *before* 'Uthmān (who began to reign in 644 CE), but this is extremely unlikely, as we will see in chapter 5. Likewise, such a dating requires the circulation of even older exemplars that could have been copied by the individual who produced this particular manuscript. This manuscript simply is not a first draft of the Qur'an for reasons that Fedeli has amply demonstrated, and so we cannot imagine that this might somehow be one of 'Uthmān's initial codices. Yet the possibility of a pre-'Uthmānic Qur'an leads us in another direction and to another possibility—namely, that the Qur'an, or at least some significant parts of it, is in fact pre-Muhammad. In fact, Reynolds suggested as much following the announcement of the Birmingham Qur'an's radiocarbon dating.⁴⁷

As Reynolds briefly remarks, there are many elements of the Qur'anic text that early Islamic scholarship simply could not understand, which is rather puzzling if the text had a continuous transmission from Muhammad through the early community. This is particularly so in instances where the meaning of certain words and their vocalization is largely unknown—indeed, sometimes

the Qur'an itself does not seem to fully understand some of its own declarations.⁴⁸ James Bellamy convincingly demonstrated in several articles that these passages indicate, at least in some cases, that "there was no oral tradition stemming directly from the prophet strong enough to overcome all the uncertainties inherent in the writing system."⁴⁹ One could readily understand such ignorance if in fact the Qur'an—at least in some parts—were a much older text that predated Muhammad and his new religious movement, written using language that the members of that movement did not always comprehend. Both Michael Cook and Patricia Crone (as noted already above) have suggested this hypothesis in their more recent works, and it is one that we will return to in the final chapter of this book, when we come to consider the context implied by the contents of the Qur'an.⁵⁰

FURTHER PROBLEMS WITH RADIOCARBON DATING EARLY QUR'ANS

In their recent article, Marx and Jocham present the results from radiocarbon analysis of yet another early Qur'an, in this case fragments of a manuscript now in Berlin (ms. or. fol. 4313), folios of which are also in Cairo (*Qāf* 47). Radiocarbon dating of two of the Berlin folios yields a range of 606–52 CE with a 95.4 percent probability (602–54 CE with IntCal 20).⁵¹ Unfortunately, however, to my knowledge there has been no codicological study of this Qur'an and its manuscript yet that we could use to evaluate the radiocarbon dating, as is the case with the Tübingen and Birmingham Qur'ans. Photographs of the manuscript are online, however, and although I am, again, no expert, they look very similar to the other manuscripts we have considered thus far.⁵² Accordingly, one suspects that this manuscript, of Cairene provenance, was likewise produced at the same time as the others, probably sometime around the year 700. Moreover, as Omar Hamdan observes, the fact that the "Uthmānic" codex seems to have been completely absent from Egypt prior to the turn of the eighth century also strongly indicates a later date for this Egyptian manuscript.⁵³ Marx and Jocham also include among their dated early Qur'ans another Sanaa manuscript (DAM 01–29–1), which they give a radiocarbon dating of 633–65 CE. Nevertheless, as noted above, Cellard has recently published a study of this manuscript; based on codicological and orthographic analysis, she concludes that the Qur'anic text copied into this codex dates to the early eighth century, much later than the radiocarbon date would indicate.⁵⁴

Moreover, Robin also had two folios from this same Sanaa manuscript (DAM 01–29–1), dated by the Lyon lab, which returned results of 439–606 CE and 603–62 CE (436–640 CE and 598–665 CE with IntCal 20); but for whatever reason, Marx and Jocham do not mention these divergent datings in their study. We should note that, according to Reynolds, additional folios of DAM 01–27–1 have been radiocarbon dated, and the results, which still remain to be published, confirm

the early dating of the other folios from this codex.⁵⁵ On this basis, then, it would seem that the evidence from radiocarbon dating leaves us with two possible conclusions: either the Qur'an is largely pre-Muhammadan, a possibility that by no means should be completely excluded, or we must accept the fact that radiocarbon dating cannot provide us with a basis for dating the texts of the earliest Qur'ans with much precision at all. If the Qur'an does not somehow predate Muhammad and we maintain these radiocarbon datings, then we must accept as a fact that parchment folios would often remain in storage for decades—even more than a century—before they were used for writing. In such cases we clearly cannot rely on the radiocarbon age of these early manuscripts alone to date these early Qur'ans, and other methods must be employed.

Moreover, further radiocarbon measurements need to be taken for all these manuscripts. More folios need to be sampled, and we likewise need to have samples from the same folios analyzed independently by different labs. The latter is especially necessary since some scholars, particularly those who wish to maintain the traditional Nöldekean-Schwallian paradigm, have sought to dismiss any results that do not conform with this paradigm as resulting from improper analyses by these labs—notably, those at the University of Lyon and the University of Kiel.⁵⁶ It is quite troubling to find young scholars, some of whom are not even trained in any field related to early Islamic studies, carelessly launching allegations about the shabby work done at these institutions with no basis other than the fact that the results do not agree with their presuppositions. One will find such comments mostly on social media, the use of which as an often uncritical, unreviewed, and unprofessional academic forum to disseminate opinions has become highly problematic. Islamic history should not be the product of social media influencers, regardless of their academic credentials.

Yet there are far more substantial issues that require datings of the same object independently by different labs. If multiple AMS labs are given samples from the same artifact, and their analyses yield significantly different datings, as we know to have been the case with Sanaa 01-27-1 fol. 13 (and also 01-29-1 fol. 8), then we must fundamentally question the accuracy and value of this method of dating, at least for the dating of parchments from the early medieval Near East. As anyone who ever paid attention in high school science class will know, reproducibility and replicability of experimental results are fundamental principles of the scientific method, and without these qualities, a result cannot be considered scientific. Judging from the analyses of this folio from Sanaa, radiocarbon dating of this object has not produced a scientifically valid dating, beyond the conclusion that the parchment almost certainly dates to sometime around the sixth or seventh century. Four other folios from Sanaa have been dated by both the Lyon and Zürich labs, and while similar results were returned for two folios, the results were again significantly different for the other two.⁵⁷ In light of the method's relative failure thus far, when early Qur'an parchments have been tested independently by different labs, we must conduct further

TABLE 2. Radiocarbon Dating of Folios from Early Qur'anic Manuscripts in Sana according to IntCal 13 and IntCal 20

	Published Date / IntCal 13	IntCal 20 Date
01-27-1 fol. 2 (Lyon)	543–643 CE	554–645 CE
01-27-1 fol. 2 (Zürich)	589–650 CE	598–649 CE
01-27-1 fol. 11 (Lyon)	433–599 CE	434–603 CE
01-27-1 fol. 11 (Zürich)	611–660 CE	605–660 CE
01-27-1 fol. 13 (Lyon)	388–535 CE	406–543 CE
01-27-1 fol. 13 (Zürich)	590–650 CE	598–649 CE
01-29-1 fol. 8 (Lyon)	439–606 CE	436–640 CE
01-29-1 fol. 8 (Zürich)	638–669 CE	641–669 CE
01-29-1 fol. 13 (Lyon)	603–662 CE	598–665 CE
01-29-1 fol. 13 (Zürich)	615–660 CE	605–662 CE

independent tests of singular artifacts in order to establish that the method actually works with the level of precision that has generally been expected. So far, this seems in doubt, and, for the time being, we should not rely on datings using radiocarbon analysis for ranges of less than a century or two until the problematic results obtained so far are better understood.

Also complicating matters is the fact that some of the results published by the Corpus Coranicum project are a product of combining the data from samples taken from several different folios within the same manuscript. As Marx and Jochem explain, “This is due to the underlying assumption that in order to produce a codex, parchment of the same or of only slightly differing age was used.”⁵⁸ As we have seen by now, this assumption is not at all warranted and could easily lead to inaccurate results, since different folios from the same manuscript have produced very different dates on occasion. If the data for the Sanaa Qur'an from both Arizona and Lyon are accurate, as they should be if they are scientific, then we clearly have folios of greatly different age used in producing one codex. Indeed, one imagines that codices were often made using whatever parchments were on hand at the time, and the available stock could very well have varied significantly in age. Therefore, combining the radiocarbon measurements from multiple folios in a manuscript in order to give a date for the whole manuscript is highly problematic, and the assumption underlying it is not valid.

Thus, we are presented with a radiocarbon age for the Tübingen manuscript as a whole of 1,355 BP \pm 14 years, which seems to have been produced through a certain sleight of hand. The three individual leaves from this manuscript that were tested yielded the following raw dates (see table 3).⁵⁹ We are not given calibrations for these individual folios, but one of the folios returned a raw radiocarbon date of 1,319 BP \pm 24. The calibrated radiocarbon dating of this folio is not 649–75 CE, as the Berlin project falsely would suggest, but it instead dates

TABLE 3. Radiocarbon Datings of Folios from Tübingen MA VI 165

fol. 23:	1,357 BP ± 24 years
fol. 28:	1,388 BP ± 24 years
fol. 37:	1,319 BP ± 24 years

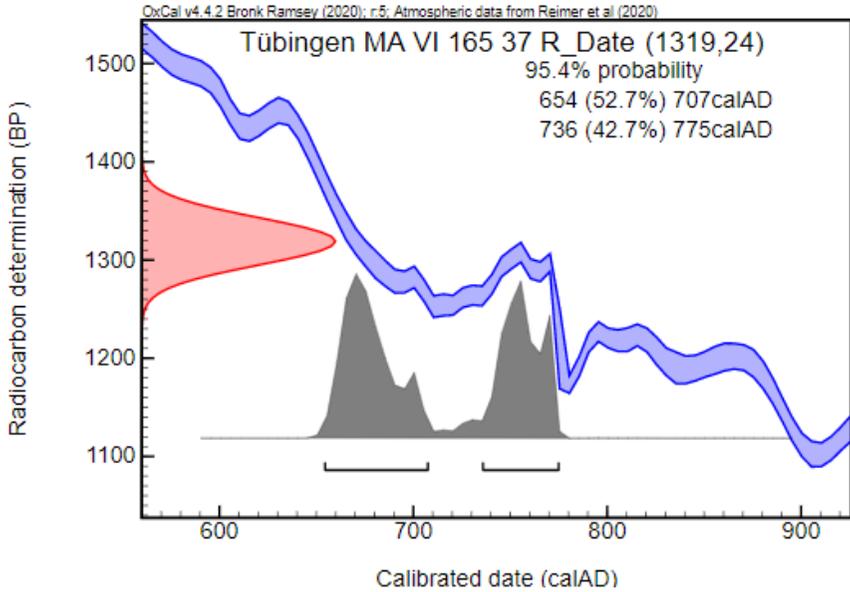


FIGURE 1. Radiocarbon Dating of Tübingen MA VI 165 f. 37.

to 654–775 CE with a 95.4 percent probability, with almost a 50 percent chance of being dated to the middle of the eighth century!⁶⁰ One can see the calibrated data in figure 1. If the radiocarbon dating of this folio is at all accurate, then the Tübingen manuscript as a whole clearly should be dated instead to 654–775 CE, or the late seventh or eighth century, the age of its most recent folio, as presently known. Moreover, one should also note that folio 23 from this same manuscript now dates to sometime between 641 and 686 CE or 743 and 773 CE, according to the latest calibration data (IntCal 20).

It seems extremely careless to date this manuscript earlier than the age of its youngest known folio. In reality, then, we can only be certain that this manuscript was produced using writings materials that were prepared sometime between 654 and 775 CE. Contrary, then, to what Marx and Jocham suppose, the Tübingen manuscript would appear to falsify their “underlying assumption that in order to produce a codex, parchment of the same or of only slightly differing age was used.” Instead, we find in this manuscript that parchments of varying ages seem to have been used. Likewise, this manuscript also appears to demonstrate that it is

possible for a codex to contain parchment folios that are significantly older than the date of the production of the codex itself. An eighth-century dating, by the way, which fits perfectly with the corrected figures for these folios, corresponds very well with the codicological and paleographical analysis of the Qur'anic text copied onto this manuscript. Therefore, in the Tübingen Qur'an we have a manuscript that was most likely produced in the early eighth century but that used at least one piece of vellum, folio 28, that was produced much earlier—sometime between 605 and 669 CE according to the radiocarbon dating. This means that we *cannot* simply use the radiocarbon datings of individual folios to determine the age of the Qur'anic text that is copied into a particular manuscript. In the Tübingen Qur'an we have clear evidence of a folio being used for a Qur'anic manuscript fifty to one hundred years after it had originally been produced. One must assume that this was not entirely uncommon, particularly given vellum's durability and value. It must also be noted that there are similar problems in the Berlin project's presentation of the data for the Sanaa palimpsest: the variant datings from Lyon and Kiel are completely ignored in determining the age of this Qur'an. I could find no explanation whatsoever for their exclusion from the analysis.

If one is still clinging to some hope that we might be able to find a way out of the messiness of this method, well, things are about to get even more complicated. I know of two instances in which early Islamic documents with known dates were subjected to radiocarbon analysis, and the results were not at all reassuring. Déroche had samples from two dated Qur'ans analyzed by the Lyon lab: one with a known date indicating its production in 1020 CE and the other in 907 CE. The radiocarbon dating of the first Qur'an came in at 1130 BP \pm 30 years, or between 871 and 986 CE with a 95 percent probability (774–994 CE with IntCal 20). “The most probable dates,” Déroche further reports, “arranged in decreasing order of probability were 937, 895 and 785AD. The closest result, that is to say 937 AD, is separated by eighty-three years from the date provided by the colophon.” Even if we use the upper limit of the date range—that is to say, 986 CE—the difference still amounts to thirty-four years, around a third of a century.⁶¹ For the second Qur'an, the radiocarbon date was determined at 1205 BP \pm 30, with a calibrated date of between 716 and 891 CE (704–941 CE with IntCal 20). Déroche identifies the most probable dates, “once again in decreasing order of probability: 791, 806 and 780AD. The most probable result, 791AD, is 116 years earlier than the actual date.”⁶² It is true, however, that in this case the uppermost date is reasonably close to the actual year in which the Qur'an was copied. Nevertheless, absent this specific information regarding its production, we would be very much at sea in dating this Qur'an, and it is certainly quite possible that the parchment used for this codex was a century or so older than the text itself. Or it may be that, again, for whatever reason, something is not working with our calibration of historical C-14 levels.

Fred Donner has also performed similar tests of this method and its accuracy. Although the results have not yet been published, Donner revealed them

publicly during the question and answer session at the presidential address for the International Association of Qur'anic Studies in November 2018. Professor Donner was kind enough to allow me to relate the gist of his findings in advance of their pending formal publication.⁶³ He took samples from an undated papyrus, which, based on content, he is quite sure dates to early in the seventh century. He sent samples to two labs. The first one returned a dating in the early 800s CE. The second lab, Oxford, gave a result of 650–700 CE, which is closer to the suspected date, but still a little too late. In light of these results, he sent samples from two dated papyrus letters to the Oxford lab, without revealing that he already knew the dates. One letter was dated to 715 CE, and the other to 860 CE; both samples came back with dates around 780 CE, much too late for the former, while indicating use of an eighty-year-old papyrus in the case of the later. In both instances the radiocarbon date was an altogether inaccurate indicator of the age of the texts in questions, beyond a general dating to the eighth or ninth centuries. And here, once again, we also see dramatically different results obtained from different labs for the same artifact. If this is a method whose results are truly scientific, it seems that the results should be able to be reproduced and replicated with regularity.

POSSIBLE PROBLEMS WITH CALIBRATION

Finally, we come to the thorny issue of the calibration of raw C-14 datings. As noted above, relatively soon after the development of radiocarbon dating, experts on this technique came to the recognition that we cannot simply assume that the amount of ¹⁴C remained constant across the ages. Rather, it has in fact fluctuated over time, in relation to the sun's activity and the number of cosmic rays striking the earth's upper atmosphere at a given point in time. Tree rings were identified as the solution to this problem, since it was possible to date their individual rings, and each ring provided an annual time capsule of the amount of ¹⁴C in the tree's atmosphere for a given year. The method has allowed for great refinements in the precision of radiocarbon dating in many instances, to be sure. But the levels of atmospheric ¹⁴C vary significantly over time, with the result that in some eras it is possible to be more precise than in others. Furthermore, the data set for making the needed adjustments to the raw datings has changed over the years, as more information from tree rings and other carbon deposits has become available. The standard calibration curve for radiocarbon dating has thus been revised several times since this first became a standard practice in the 1960s, with the most recent standard established in late 2020 as the IntCal20 dataset.⁶⁴ Nevertheless, there is increasing evidence to suggest that a single calibration standard may not be universally valid for every location on earth. It is well known now that the amount of ¹⁴C can differ significantly between the Northern and Southern Hemispheres at a given point in time, and, as a result, a separate set of calibration data has been established to use for dating objects from the Southern Hemisphere since 2004.

In more recent years, scholars have become aware that there is also a likely variation in C-14 levels according to different regions even within the hemispheres. It is of particular importance that scholars have recently shown the need for a different set of calibration data to ensure accuracy for dating objects from the broader region in which these early Qur'ans were produced: Egypt and the Near East.

First, we should consider the nature of the calibration data drawn from tree ring samples. All the carbon measurements used to establish the historical levels of atmospheric ^{14}C for radiocarbon calibration were taken from trees very geographically distant from the Near East. The data were collected almost exclusively from trees in the western United States, the British Isles, and the northwestern European continent.⁶⁵ For the period here in question, the most precise calibration is based primarily on data from oak trees in the southern part of Ireland that was collected only within the last twenty years.⁶⁶ The narrow geographic range of these samples raises important questions regarding the assumption that this data should be universally valid for every region of the planet, in the Northern Hemisphere at least. It has been widely presumed in the field of radiocarbon dating that this hypothesis is valid, since circulation within the atmosphere of the Northern Hemisphere ensures that ^{14}C levels should be standard in every location in any given year. Yet at the same time, there is widespread acknowledgement that “ ^{14}C calibration should be seen as a work in progress” in need of constant refinement through measurement of further carbon archives and “that the calibration data set should be considered with some degree of uncertainty, because it represents a set of measurements (with inherent analytical uncertainty) of past atmospheric ^{14}C levels.”⁶⁷

Despite this general operating assumption that the calibration data collected from these ancient trees is universally valid, it is nevertheless becoming increasingly apparent that this is not the case. One of the most significant recent developments in radiocarbon dating is an emerging recognition of regional variation in the carbon measurements taken from tree rings. For this reason, experts in radiocarbon analysis have become more attentive to the likelihood that significant interhemispheric variations in the amount of atmospheric ^{14}C can exist in different regions during the same year. Differences in latitude and in ocean surface area have a significant impact on the amount of regional ^{14}C , although even within similar latitudes, longitudinal differences are also evident.⁶⁸ This was evident already in the early 1980s, through comparison of tree ring data taken from sequoias in western Washington state and German oaks. Prior to the publication of the new data from southern Ireland in recent decades, these were the primary measurements used to date materials from the early Middle Ages. And yet the tree samples from these two sources showed that “a substantial systematic difference exists between the Seattle Sequoia and Heidelberg German Oak radiocarbon ages,”

amounting to differences of as much as fifty-eight years.⁶⁹ Continued comparison of these samples has led to the conclusion “that the ¹⁴C activity of contemporaneous wood from different locations may not be the same at all times.”⁷⁰ Indeed, there is now even some doubt that in light of such variations, data taken from the western United States may not accurately calibrate the calendar date of materials from the eastern United States.⁷¹

The reality of significant regional differences in ¹⁴C is beginning to dawn on scholars in the field, and it still remains unaccounted for in the current methodologies. Of course, if one is content to employ radiocarbon analysis for what it is most useful—dating an object broadly within an era, such as the early or late Middle Ages or sometime in the seventh or eighth centuries, then such variations become largely irrelevant. Otherwise, the only way to adjust for such differences will be to develop regional datasets of historical ¹⁴C amounts. In the case of ancient Egypt, a group of scholars recently undertook a massive project of interdisciplinary study to evaluate the accuracy of radiocarbon dating for plant-based materials from this time and place.⁷² In developing their new model, they did not simply defer to the data from radiocarbon dating; historical methods were given equal footing in order to refine all the methods available for analyzing the age of an object. As a part of this effort, more recent objects from Egypt with known dates were analyzed to determine if there were persistent regional differences in the levels of ¹⁴C in Egypt. The results identified a need to account for a 0.25 percent difference in radiocarbon amounts for Egypt from the accepted norms for the Northern Hemisphere. Although this may seem like a small difference, in actuality it amounts to a difference of 19 ± 5 radiocarbon years, and the tendency has been to correct conventional calibrations so that the objects turn out to be more recent. The hypothesis is that an earlier growing season in Egypt relative to other places forms a basis for the difference.⁷³ This new calibration for Egypt appears to be a finding with “major ramifications for the chronologies and cultural syntheses of the wider east Mediterranean and ancient Near East.”⁷⁴

As it turns out, the Mediterranean region and the Near East in general are both areas that have recently been identified as very likely standing in need of similar regional offsets for radiocarbon calibration.⁷⁵ For the southern Levant in particular, an area that concerns us very much in the present context, it seems that radiocarbon datings for this region have been, as was found to be the case in Egypt, off by about twenty years or so. The suspected cause is the same as with Egypt: seasonal fluctuations in the amount of ¹⁴C in the atmosphere and an earlier growing season than in northern Europe and the northwestern United States.⁷⁶ The basis for identifying this new inaccuracy in the calibration of radiocarbon dates from this region came from the measurement of ¹⁴C ages of calendar-dated tree rings from 1610 to 1940 CE from southern Jordan. The measurements were compared with ¹⁴C levels given by the previously used standard calibration data

(IntCal13), which were found to be inaccurate by approximately 19 ± 5 radiocarbon years on average, the same as for ancient Egypt, it turns out. Again, while this may seem like a small amount, further analysis of some published radiocarbon dates determined that the calibrated calendar years were off from the actual dating of the object by an average of 60 percent.⁷⁷ According to the study's lead investigator, their evidence indicates that the fundamental basis for such datings using the standard calibration dataset "is faulty—they are using a calibration curve that is not accurate for this region."⁷⁸ Of course, this finding is again of very little significance if one merely wishes to date an object within a century or so. But a twenty-year variance, when trying to distinguish among decades, is highly significant and problematic. In the case of the manuscripts of Cairene and Damascene origin, this would mean that the actual radiocarbon dating ranges of these manuscripts may in fact be two decades or so later than dates calculated using the current calibration data. Accordingly, we must clearly exercise even greater caution with regard to radiocarbon dating and we should refrain from believing it to be some sort of magical instrument capable of providing certainty regarding the age of early Qur'anic manuscripts. Historic levels of atmospheric C-14 still remain too uncertain in this region to lean on the method for datings more precise than a range of a couple of centuries or so.

WHICH HEMISPHERE?

As mentioned already, over the past couple of decades, scientists have come to recognize that C-14 levels differ between the Northern and Southern Hemispheres, which have separate systems of atmospheric circulation.⁷⁹ Accordingly, objects from the Southern Hemisphere require a different set of data for calibration, since in any given year the amount of atmospheric ¹⁴C can vary significantly between the Northern and Southern Hemispheres.⁸⁰ The difference "is thought to be due to the larger expanse of the Southern Hemisphere oceans and slightly higher wind speeds resulting in more ¹⁴C-depleted CO₂ from the ocean entering the southern atmosphere than the northern."⁸¹ Therefore, a separate dataset for radiocarbon calibration has been developed for the Southern Hemisphere, on the basis of tree rings from Chile, South Africa, New Zealand, and Tasmania.⁸² But this should be irrelevant, since all the early Qur'anic manuscripts are from the Northern Hemisphere, right? Actually, the matter is not so simple as it may at first seem. The boundary between the atmospheric hemispheres is not the equator, as one might imagine, since this is the line that divides the earth physically into two hemispheres. The atmospheric separation between the Northern and Southern Hemispheres occurs instead along the earth's thermal equator, which is different from the standard equator. Moreover, unlike the standard equator, the thermal equator, also known as the Intertropical Convergence Zone (ITCZ), is not stationary. Instead, it moves between north and south across the equator as the seasons

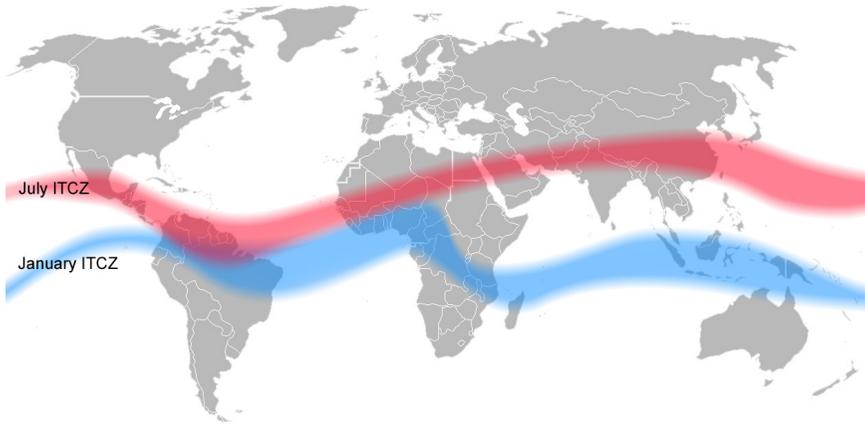


FIGURE 2. The Intertropical Convergence Zone / Thermal Equator.

change. What this means is that, atmospherically, the Southern and Northern hemispheres cover different areas of the earth's surface in July than they do in January. The extent to which this boundary between the Northern and Southern Hemispheres shifts varies from location to location and is determined largely by difference in land mass and ocean area.

For our purposes the main importance of this annual atmospheric shift is that for a significant part of the year, roughly the southern half of the Arabian Peninsula is not in the Northern Hemisphere but experiences instead the atmospheric circulation of the Southern Hemisphere. One can easily see the impact of this effect in figure 2, in which the red band marks the earth's thermal equator in July and the blue band marks its location in January.⁸³ This seasonal shift in the earth's thermal equator means that Sanaa and the rest of the southern half of the Arabian Peninsula spend much of the year, including the summer, in the Southern Hemisphere, exposed to the differing radiocarbon levels circulating in this part of the planet. Accordingly, any parchment or other organic materials from Sanaa or elsewhere in southern Arabia is within a mixed radiocarbon zone, in which, it would seem, neither the northern nor the southern datasets for radiocarbon dating would give an entirely accurate reading. Organisms in Intertropical Convergence Zone, by their very nature, will be exposed to some mixture of the radiocarbon levels of the two hemispheres in any given year, which will affect efforts to calculate the calendar years for raw radiocarbon dates. There is no calibration data for the ITCZ yet, and it seems that scientists are only beginning to recognize the significance of the complexities posed by this region for radiocarbon dating. Data for radiocarbon levels on both sides of the equator in this region from the past seventy years are only beginning to be compiled, and this may give us some idea of what needs to be done in order to determine more accurate

TABLE 4. Calibrated Dating of Folios from Early Qur'anic Manuscripts in Sana according to Hemispheric Differences

Folio	Northern Hemisphere (IntCal20)	Southern Hemisphere (SHCal20)
Stanford '07 (Arizona)	583–670 CE	602–774 CE
01-25-1 fol. 22 (Lyon)	554–645 CE	578–661 CE
01-27-1 fol. 2 (Lyon)	543–643 CE	576–660 CE
01-27-1 fol. 2 (Zürich)	598–649 CE	605–669 CE
01-27-1 fol. 11 (Lyon)	434–603 CE	529–643 CE
01-27-1 fol. 11 (Zürich)	605–660 CE	645–680 or 751–767 CE
01-27-1 fol. 13 (Lyon)	406–543 CE	415–574 CE
01-27-1 fol. 13 (Zürich) ^a	598–649 CE	605–669 CE
01-27-1 fol. 13 (Kiel)	441–635 CE	544–642 CE
01-27-1 fol. 13 (Oxford)	599–655 CE	607–680 or 750–768 CE
01-29-1 fol. 8 (Lyon)	436–640 CE	541–644 CE
01-29-1 fol. 8 (Zürich)	641–669 CE	654–772 CE
01-29-1 fol. 13 (Lyon)	598–665 CE	636–773 CE
01-29-1 fol. 13 (Zürich)	605–662 CE	647–680 or 750–768 CE

^a Using the data from Marx and Jocham 2019, 216 rather than Robin 2015b, 65, since the former is more recent and gives more precision.

radiocarbon datings of historical artifacts produced in this region.⁸⁴ For the time being, however, it would appear that we must again refrain from ascribing anything more than a general accuracy to radiocarbon dates from this region to within a century or two, which is, after all, what radiocarbon dating has always been best for.

How any refinements in radiocarbon dating for this region will impact our calibration of the raw radiocarbon dates for the parchments from Sanaa and anywhere else in southern Arabia remains unknown and will likely continue to remain unknown for some time to come. Therefore, it would be prudent to abandon any efforts to assign dates to these materials on the basis of radiocarbon measurements with any greater precision than a century or so for the foreseeable future. Just to give an idea of how much the differing radiocarbon levels from the southern hemisphere that would affect Sanaa seasonally could have an impact on calibration of radiocarbon age to dates CE, we give the dates calculated for each object according to the Northern and Southern hemispheric datasets with a 95 percent probability side by side (see table 4).⁸⁵ In some cases, the differences are relatively minimal, yet in others they are significant. In general, one will note, the concentrations of ¹⁴C in the Southern Hemisphere yield later datings, as is the trend of this calibration dataset. In some cases, the difference is only a couple of decades; in others, dating with the data from the Southern Hemisphere could change the date of an object by a century. We would

therefore be wise, I think, to use such data with greater caution than some scholars have hastily proposed and resist the temptation to misuse the method of radiocarbon analysis in attempting to date an object with greater precision than the method can presently provide. Clearly, these are all early manuscripts from the beginnings of Islam: radiocarbon dating affirms this, which we already knew. But what it cannot do, at least not as of yet, is date the text of the Qur'an in these manuscripts with any precision to a time before the very end of the seventh century, at the earliest.

RADIOCARBON DATING AND ANCIENT MANUSCRIPTS

Scholars in other fields of historical study have long recognized both the enormous value and also the inescapable limitations of radiocarbon dating, particularly in the case of dating ancient manuscripts. Indeed, here it would appear that specialists on early Islam and the Qur'an have again missed an opportunity to learn from the results of earlier, similar investigations in biblical studies. Several decades ago, specialists on the Dead Sea Scrolls sought assistance from radiocarbon dating in trying to better understand the history of this collection of documents, which were produced and collected over a period of centuries. Most of these texts were written, like our early Qur'ans, on parchment, and of the total of more than nine hundred documents that were discovered at Qumran, over two hundred preserve some of the earliest witnesses to the Hebrew Bible, or the Christian Old Testament. Precise dating of these writings thus holds enormous significance for understanding the history of the biblical text. No less important is the precious information that the remaining texts provide for understanding the development of Judaism between 250 BCE and 70 CE, a decisive moment in the history of Near Eastern religions that would ultimately give birth to both Christian Judaism and Rabbinic Judaism.

The ages of the various fragments and scrolls discovered at Qumran in the Dead Sea valley were initially determined using traditional means of archaeological context and paleography, following examination and study by numerous experts on such matters. In the 1990s, however, samples from over twenty different scrolls were analyzed by the Zürich and Arizona labs, in most cases returning dates ranging over a span of more than a century.⁸⁶ The results thus did little more than affirm matters on which there was widespread agreement, while failing to provide answers to questions that were in dispute. On the whole, the results were not inconsistent with the paleographic datings of the manuscripts, and it was accordingly decided that "Paleography, the study of ancient writings, is often a more accurate method of dating."⁸⁷ As Nongbri aptly summarizes this endeavor to radiocarbon date the Dead Sea Scrolls, "The results of these tests showed that some of the samples could be as early as the third century BCE and some as late as the end of the first century CE, with many of the ranges clustering in the first

century BCE. This outcome thus did not end the debates about the precise time that the scrolls were copied, and in fact the analysis may have created as much controversy as it resolved.⁸⁸ One can say with some confidence, I think, that efforts to radiocarbon date early Qur'anic manuscripts have produced a nearly identical result.

Ingo Kottsieper, in a chapter on “Scientific Technologies” published in a recent handbook on the Dead Sea Scrolls, summarizes the *status quaestionis* regarding the use of radiocarbon dating in the study of the Qumran library quite well, and in so doing he provides some sound and experienced advice for those of us in Qur'anic studies. Firstly, Kottsieper draws attention to the narrow geographic range from which the tree ring samples that underly the calibration process have been taken. More reliable radiocarbon dating of the Dead Sea scrolls manuscripts, he notes, will require calibration data taken from the region in which they were produced—a point that, as we saw above, recent studies have confirmed.

Different regions of the world require different sets of data to calibrate, and there are different sets available for the Northern and Southern hemispheres and for marine versus nonmarine areas. These data sets are constantly refined, and data provided by labs should always be recalibrated according to the most up-to-date set. . . . For Qumran the data set is currently IntCal13 for the Northern hemisphere. However, this set is based predominantly on material from Northern Europe (Ireland) and North America providing data for periods of only 10–20 years each. The implications of applying such a calibration to material found in Palestine and to organisms from an extreme environment such as the Dead Sea region are still unknown.⁸⁹

Likewise, Kottsieper rightly insists that even in the best cases, radiocarbon dating must not be treated like some sort of infallible dating method that can allow us to simply disregard all other historical evidence that would indicate an alternative date—a point that we have already stressed several times. As he concludes, “radiocarbon analysis offers valuable data on probabilities allowing us to estimate the periods when a scroll was produced and—assuming it was not stored first—also the date of its inscription. One should use the data cautiously and not misuse them to date manuscripts into a timeframe of only a few decades.” As a general rule, then, “If the results [of radiocarbon dating] do not fit a certain hypothesis, the reason could be that either the measurement or the hypothesis or both are wrong—a scenario which cannot be totally excluded even if all the data fit!”⁹⁰

Therefore, while radiocarbon dating adds an important new tool for studying the early manuscripts of the Qur'an, it must be used with caution, fully acknowledging its limitations and in conjunction with other methods of historical analysis. To invoke the results of radiocarbon dating as if it were the only data that matters is intellectually irresponsible and should be avoided, particularly since we have seen just how complex and often uncertain the process still remains. Indeed, Yasin Dutton similarly observes that a clear tendency can be observed in the results that

leans toward dating manuscripts much earlier than otherwise seems to be likely, and he accordingly concludes as follows: “while the technique is broadly useful, it cannot be expected to yield the accuracy of dating that would be important.”⁹¹ And so, it seems, we ourselves are left to conclude that, despite the sensational claims of a few scholars, which have been amplified by the internet, the radiocarbon dating of a number of early Qur’anic manuscripts does not prove the historical accuracy of the Nöldekean-Schwallian paradigm. On the contrary, the convergence of all the presently available evidence—radiocarbon and historical—is not at all incompatible with the Qur’an’s composition into its present form only around the turn of the eighth century under the direction of ‘Abd al-Malik and al-Ḥajjāj; indeed, it would seem to favor this conclusion.