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Reconsidering the Date of the En-Gedi Leviticus Scroll (EGLev): Exploring the Limitations of the Comparative-Typological Paleographic Method

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Abstract

Yardeni dated the charred En-Gedi Leviticus scroll (EGLev) to the second half of the first or early second century CE. Paleographic evidence is often ambiguous and can provide only an imprecise basis for dating EGLev. Nevertheless, a series of important typological developments evident in the hand of EGLev suggests a date somewhat later than the Dead Sea Scrolls of the first–second centuries, but clearly earlier than comparanda from the sixth–eighth centuries. The cumulative supporting evidence from the archaeological context, bibliographic/voluminological details (wooden roller and metallic ink), format and layout (tall, narrow columns)—each individually indeterminative—also suggests dating EGLev to the period from the third–sixth centuries CE. I argue that EGLev should be dated to the third–fourth centuries CE, with only a small possibility that it could have been written in the second or fifth centuries, which is possibly supported by radiocarbon dating.

Keywords

En-Gedi – Leviticus – EGLev – Dead Sea Scrolls – paleography – radiocarbon dating – scribal practices

1 Introduction

In the early 1970s, a team of archaeological excavators led by Dan Barag, Ehud Netzer, and Yosef Porath discovered the charred remains of at least one scroll from the location of the Torah ark in the burned ancient synagogue of En-
Gedi.¹ One lump of carbonized parchment² material was held by the Israel Antiquities Authority (IAA) for many years, until Pnina Shor and Yosef Porath arranged for three-dimensional micro-CT scanning, with the help of David Merkel. The scans were then given to Brent Seales and his research team at the Department of Computer Science at the University of Kentucky, and in 2015 the IAA announced that Seales had succeeded in virtually unwrapping the charred remains, revealing two legible columns from the beginning of Leviticus until Lev 2:11. The beginning of Leviticus was preserved on the innermost layers after a blank space for handling the scroll. The full results and composite images were published in 2016 in two articles describing the techniques used to virtually unwrap the scroll and analyzing the contents of the scroll.³

In the Textus article, Ada Yardeni contributes an appendix on the dating of the En-Gedi Leviticus scroll (hereafter EGLev)⁴ that warrants further attention. According to Yardeni, the closest parallels to the script of this scroll are found in the late first century or early second century CE, and thus she dates EGLev to this period.⁵ While Yardeni's consummate skill in analyzing Hebrew

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² Parchment, that is, used loosely in the sense of animal skin prepared as a writing surface. Given the state of the remains, little can be said about the precise methods of preparation of the skin.

³ William Brent Seales, Clifford Seth Parker, Michael Segal, Emanuel Tov, Pnina Shor, and Yosef Porath, “From Damage to Discovery via Virtual Unwrapping: Reading the Scroll from En-Gedi,” Science Advances 2, no. 9 (2016): ea601247 http://advances.sciencemag.org/content/2/9/ea601247 (accessed 5 December 2017); Michael Segal, Emanuel Tov, William Brent Seales, Clifford Seth Parker, Pnina Shor, and Yosef Porath, with an appendix by Ada Yardeni, “An Early Leviticus Scroll from En-Gedi: Preliminary Publication,” Textus 26 (2016): 1–30. In a recent paper, the authors analyzed and sought to correct minimal amounts of distortion (mostly stretching, rather than angular distortion) in their original master view due to the flattening process: C. Seth Parker, W. Brent Seales, and Pnina Shor, “Quantitative Distortion Analysis of Flattening Applied to the Scroll from En-Gedi,” read at: Art & Archaeology, 2nd International Conference, Jerusalem, Israel, December 2016, https://art2016.isas.co.il/wp-content/uploads/sites/10/2017/03/Session-VII-Authentication-Manuscripts-1-Seales.pdf (accessed 5 December 2017). Brent Seales and Seth Parker kindly made their improved ABF master view (Fig. 8) available to me for reference at a late stage in the production of this article, but my paleographic analysis and chart are based primarily on their inverted and enhanced original master view (Fig. 9), also courtesy of Brent Seales and Seth Parker. The increased precision of the ABF image does not substantially alter the paleographic analysis.

⁴ George Brooke helpfully suggested so naming the En-Gedi Leviticus scroll according to conventions used in the study of the Dead Sea Scrolls.

⁵ Segal et al., “Early Leviticus Scroll,” 20: “It seems therefore that we may safely date this scroll to about the second half of the 1st century and at latest, the beginning of the 2nd century CE.”
scripts is beyond doubt, I will nevertheless argue in this paper that limitations in data and method render Yardeni’s early date for EGLev improbable, and that the scroll should rather be dated to approximately the third or fourth century CE. This later dating of EGLev in some respects increases the significance of the scroll, because it provides a securely placed script sample on a soft writing support from the land of Israel from a period with almost no attestation. A third- or fourth-century date for EGLev is strongly suggested by a combination of evidence from paleographic considerations, the archeological context of its discovery, radiocarbon dating, material features of the scroll, and its format and layout.

2 Paleographic Analysis

The primary evidence that led Yardeni to propose an early date for EGLev was paleographic in nature. In order to properly appraise the role of paleography in dating EGLev, I will first discuss several limitations inherent in the traditional comparative-typological method and then highlight pertinent paleographic features of the script of EGLev that suggest a later date than Yardeni proposes.6

2.1 The Limitations of the Comparative-Typological Method

The traditional method of paleographically dating ancient manuscripts is fundamentally comparative and typological in nature. It is comparative, in that scripts of unknown dates are compared with script samples of known dates in order to determine their closest parallels. The former are then dated in relation to the latter on the supposition that similarity in script implies temporal proximity. This can work reasonably well with a well-populated dataset that is representative of the various styles, developments, and ranges of variation that characterized ancient scripts. But in poor-quality and poor-quantity datasets with few documented and dated samples, highly fragmentary remains, and countless missing links, the comparative method runs into severe limitations. In particular, I would suggest that in such cases there is a strong potential for bias towards well-documented periods and script styles to the detriment of poorly attested periods and script styles. In other words, if paleographers date manuscripts on the basis of preserved comparanda, they may be more likely to date manuscripts close to these comparanda, rather than to periods

6 I am grateful to Edna Engel, who kindly agreed to read and comment on the paleographic aspects of this study.
for which no comparanda can be presented, even if this does not reflect the actual ancient historical situation.

The mid-second to the sixth centuries CE are precisely such a “dark age” in Hebrew paleography, which makes any attempts at paleographic dating within this period perilous at best. Aside from some roughly datable stone inscriptions and mosaics (mostly from the land of Israel) and a few Jewish fragments on soft supports (mostly papyri from Egypt, but also fragments from Dura-Europos), there is very little evidence for the varieties and development of the Hebrew script in this long period. To the best of my knowledge, internally dated materials consist only of a single papyrus from Egypt dated to 417 CE (see comparandum G below), more than fifty explicitly dated Jewish Aramaic tombstone inscriptions from Byzantine Zoora south of the Dead Sea ranging from the fourth to the sixth centuries CE (see comparandum H below), a few additional inscriptions, and a handful of explicitly dated Aramaic incantation bowls ranging from the mid-sixth century to the early seventh century CE. There are absolutely no comparative examples dating between the mid-second and the sixth centuries in a formal script on a soft writing support from the same region as EGLev.

To counter this lack, Yardeni identifies two roughly (paleographically) datable comparanda among the earlier Dead Sea Scrolls from the first century CE or the beginning of the second century, which she considers to be the clos-

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7 For a useful, if somewhat dated, comprehensive survey, see Edna Engel, The Development of the Hebrew Script from the Period of the Bar-Kokhba Revolt to 1000 A.D. (PhD diss., Hebrew University of Jerusalem, 1990) (Heb. with Eng. sum.), 44–45, 52–56, 62–67, 79–88. For the Egyptian papyri (and parchments), see Colette Sirat, Les papyrus en caractères hébraïques trouvés en Égypte (Paris: C.N.R.S., 1985). Ada Yardeni, The Book of Hebrew Script (Jerusalem: Carta, 1997), 79, who also surveys the extant remains, stresses that most of our evidence from the Byzantine period is in the form of non-calligraphic hands or inscriptions.

8 Yiannis E. Meimaris, Kalliopi I. Kritikakou-Nikolaropoulou, in collaboration with Sebastian P. Brock, Inscriptions from Palaestina Tertia, Vol. Ic: The Jewish Aramaic Inscriptions from Ghor es-Safi (Byzantine Zoora), MELETHMATA 73 (Athens: Eptalofos, 2016).

9 Engel, Development of the Hebrew Script, 79–88, incorporates the following according to her numbering system: ABI 36 (a Latin-Hebrew bilingual inscription on marble from Sicily dated to 383 CE), ABI 12 (a tile inscription from the synagogue at Dura-Europos from 245 CE), BSII 3 (a dedicatory inscription from the synagogue in Kefar Nevoraya from 564 CE; Engel gives the date as 561/562), BSII 4 (a Latin-Hebrew bilingual inscription from Venosa, Italy dated to 524 CE), BSIII 5 (a damaged dedicatory inscription from the synagogue in Beth Alpha, dated either to the reign of Justin I [518–527 CE] or Justin II [565–578 CE]).

10 Shaul Shaked, James Nathan Ford, and Slam Bhayro, Aramaic Bowl Spells: Jewish Babylonian Aramaic Bowls, Vol. 1, Magical and Religious Literature of Late Antiquity 1 (Leiden: Brill, 2013), 1 n. 2. Daniel Waller helpfully alerted me to these bowls, which have yet to feature sufficiently in paleographic analysis.
est extant parallels to EGLev. Because the script of EGLev is closest to those of these early scrolls, Yardeni proposes a similarly early date for EGLev. And yet, even if we grant for the sake of argument that Yardeni’s parallels are the closest extant, that does not then guarantee that EGLev dates to the same period. Because there are few appropriate comparanda from the third and fourth centuries, Yardeni simply cannot exclude the possibility that now-lost third and fourth century scripts were even closer parallels. In this case, the traditional comparative method employed by Yardeni breaks down due to insufficient evidence and potentially creates a bias (in my view unrealistically) towards an early date for EGLev.

The traditional method of paleographic dating is also typological in nature, in that scholars must “connect the dots” between dated and datable documents to identify typological developments that take place over time and in different script styles. In lieu of near-perfect parallels, undated manuscripts are often placed in relation to a constructed (and unverifiable) typology pegged at points to a calendar, i.e., where a given script fits within perceived trajectories of broader script developments. These typologies always lack a certain level of resolution, and factors such as long transition periods, gaps in the typology, the idiosyncrasies of individual scribes, conservatism and archaism (particularly in formal hands like that of EGLev), parallel trajectories of script development, interference from different script traditions and styles, and a host of unknowable and unquantifiable sociological and material factors mean that it is only possible to suggest approximate ranges of dates for manuscripts dated typologically. The formal Hebrew (proto-)square script is particularly notorious for its long-term stability, greatly exasperating the problems, though it too, of course, can be shown to have undergone evolutionary development.

11 For important methodological reflections on typologies of handwriting in this period, see Frank Moore Cross, “Alphabets and Pots: Reflections on Typological Method in the Dating of Human Artifacts,” in Leaves from an Epigrapher’s Notebook: Collected Papers in Hebrew and West Semitic Palaeography and Epigraphy, HSS 51 (Winona Lake, IN: Eisenbrauns, 2003) (first published in 1982), 344–350; Bruce Zuckerman, “Pots and Alphabets: Refractions of Reflections on Typological Method,” Maarav 10 (2003): 89–133.

12 Marc Z. Brettler, “The Ein Gedi Torah Scroll?” TheTorah.com (27 September 2016) http://thetorah.com/the-ein-gedi-torah-scroll/ (accessed 16 December 2017), suggests concerning EGLev, “Perhaps a later scribe preferred an older, archaic style of hand-writing.”

13 Ada Yardeni, Textbook of Aramaic, Hebrew and Nabataean Documentary Texts from the Judaean Desert and Related Material, 2 vols. (Jerusalem: Hebrew University, 2000), 2.[159], agrees that “the dating of documents is often based on a relative chronology and is not precise.”

14 Colette Sirat, with the collaboration of Michèle Dukan, Écriture et civilisations (Paris:
In best-case scenarios, bold paleographers may even attempt to give date ranges narrower than the working life of an individual scribe. In most cases, however, I would suggest that this is unrealistically precise, and paleographers should allow for wider ranges of possible dates. Either way, we must never forget that—given the uncertainties and unpredictability of historical processes—these ranges are in fact probability distributions (similar to the below-mentioned radiocarbon dating results), even if humanities scholars are less adept at recognizing and reporting their error. In other words, though the error is difficult to quantify in reality, a paleographer might suggest a date of 75 CE for a hypothetical manuscript, with an (unverifiable) margin of error of ± 25 years to produce a date range of 50–100 CE. But if we (somewhat more realistically) view this as a confidence interval of one standard deviation, that means that there is a 68.2% probability that the actual date falls within that range. In order to achieve a higher degree of confidence—say 95.4%—we would then need to expand the proposed range to 25–125 CE. This level of precision may perhaps be possible for Hebrew scripts in a relatively well-documented period such as the first century CE, but such precision is almost universally recognized to be impossible in the poorly documented period from the second to the sixth centuries CE. Since the possible dates of EGLev bridge these two periods—

See also the cautious warning of Colette Sirat concerning overly precise paleographic dating, even in the relatively well-documented period of the Dead Sea Scrolls, in Colette Sirat, “Les rouleaux bibliques de Qumrân au Moyen Âge: du livre au Sefer Tora, de l’oreille à l’œil,” CRAI 135, no. 2 (1991): 415–432, esp. 418: “Nous savons que les rouleaux de Qumrân sont antérieurs à 68/70, ceux de Massada à 73, ceux de Murabba’at à 135. Peut-on les dater avec plus de précision? Une chronologie fondée sur l’évolution de la lettre hébraïque a été élaborée par F.M. Cross. Il semble difficile cependant d’accepter cette chronologie. En effet, nous ne connaissons pas la provenance de ces rouleaux et aucun d’eux n’est daté. De plus, elle est basée sur une conception linéaire de l’évolution des écritures qui ne nous semble pas correspondre aux réalités de l’histoire. Nous nous bornerons donc à parler de périodes sans tenter d’utiliser des datations plus précises.”

Sirat, Les papyrus, 22, suggests it is only possible to provide rough dates within broad periods of about three centuries. Engel, Development of the Hebrew Script, concludes her comprehensive analysis of the scripts of the period with the suggestion that “although
and because of the inherent imprecision in any form of typological dating—we must be prepared to accept broader ranges of possible dates as the result of typological paleographic dating methods than Yardeni allows in her proposed range of approximately fifty years. Thus, not only is Yardeni’s date improbably early, but I would suggest that it is also improbably precise, bringing her into direct conflict with other evidence for dating the scroll. When paleographic dating is understood as making probabilistic statements rather than absolute-looking date ranges, this better highlights the possibility of a productive synthesis between traditional paleographic methods and other indicators of date (especially radiocarbon dating), which is quickly and rightly becoming common practice for dating ancient manuscripts.

2.2  Paleographic Analysis of the En-Gedi Leviticus Scroll

In order to facilitate a paleographical analysis of EGLev, let us propose a number of illustrative writing samples for comparison from the period between the first and the eighth centuries. We will first reconsider the two comparanda proposed by Yardeni, as well as several samples from across this period. These have been selected from the preserved texts based on four criteria: 1) stylistic similarity to EGLev; 2) the confidence and specificity with which they can be dated; 3) similarity of writing material; and 4) geographic spread.

2.2.1  Comparanda

A = Israel Museum, Shrine of the Book, 11QTemplea, Scribe B (late first century BCE or first century CE).

Yardeni’s first comparandum, 11QTemplea (or 11Q19)—the famous Temple Scroll—was discovered in cave 11 in the vicinity of Qumran. The bulk of the scroll is written in a hand paleographically attributable to the late first century BCE or first century CE, and it was almost certainly finally deposited in the cave during the First Jewish War against Rome (66–73 CE). In 1990–1991, 11QTemplea was dated in Zürich to a radiocarbon age of $2030 \pm 40$ BP (calibrated to a 1σ range of 97 BCE–1 CE, according to the 1986 dataset). 11QTemplea is written in it is now possible to trace the script’s evolution and to recognize its different types and subtypes, we are still far from the ability of a precise dating” (Eng. summ., p. 19).

17  For its principal publication, see Yigael Yadin, Megillat ham-Miqdāš (The Temple Scroll), 3 vols. and supplement (Jerusalem: Israel Exploration Society, 1977) (Heb.); ibid., The Temple Scroll, 3 vols. and supplement, rev. ed. (Jerusalem: Israel Exploration Society, 1977–1983). A complete digital scan of the entire scroll can be seen at http://dss.collections.imj.org.il/temple (accessed 10 January 2018).

18  G. Bonani, M. Broshi, I. Carmi, S. Ivy, J. Strugnell, and W. Wölfl, “Radiocarbon Dating of the Dead Sea Scrolls,” ʿAtiqot 20 (1991): 27–32.
an elegant formal hand with even lines falling neatly below dry ruling lines. Its strokes are generally straight, angular, and of a homogenous thickness. Many letters have decorative adornments, but the serifs are often subtle. The script leans to the left.

**B** = Israel Antiquities Authority, 5/6ḤevPsalms (second half of first century CE or early second century).

Yardeni’s second comparandum, 5/6ḤevPsalms (or 5/6Ḥev 1b), was discovered in the Cave of Letters in Nahal Ḥever, and it was finally deposited in the cave during the Second Jewish War with Rome (132–135 CE). It is paleographically attributable to approximately the second half of the first century CE or early second century. 5/6ḤevPsalms is written in a well-executed, calligraphic formal hand in neat, straight lines hanging just below ruled guidelines. The strokes are mostly straight and of homogenous thickness, and the resulting angular script generally leans to the left. The scribe consistently includes additional decorative strokes and subtle serifs.

**C** = Israel Antiquities Authority, SdeirGenesis (late first century CE or early second century).

SdeirGenesis (or Sdeir 1) was claimed to have been discovered in an unidentified cave in Wadi Sdeir, where it was apparently finally deposited during the Second Jewish War with Rome (132–135 CE). It is paleographically attributable to approximately the late first century CE or early second century. The script is an elegant, formal hand, written in neat, straight lines hanging well below the ruled guidelines. The straight but soft strokes betray some minimal (inconsistent) differentiation between thick horizontal and thin vertical strokes, and the relatively thick strokes give the script a somewhat heavy appearance. The vertical strokes generally lean to the left and often end in a sharp tip. The scribe makes regular use of additional ornamental elements and subtle serifs.

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19 For its principal publication, see Peter Flint, “1b. 5/6ḤevPsalms,” in *Miscellaneous Texts from the Judean Desert, DJD XXXVIII* (Oxford: Clarendon, 2000), 141–166, pls. XXV–XXVII. High-resolution digital images of the scroll can be seen at http://www.deadseascrolls.org.il/explore-the-archive/manuscript/5_6Hev%201b%20891-1 (accessed 10 January 2018).

20 For its principal publication, see Catherine Murphy, “1. SdeirGenesis,” in *Miscellaneous Texts from the Judean Desert, DJD XXXVIII* (Oxford: Clarendon, 2000), 117–124, pl. XXII. High-resolution digital images of the scroll can be seen at http://www.deadseascrolls.org.il/explore-the-archive/manuscript/WS1-1 (accessed 10 January 2018).
D = Israel Antiquities Authority, Mur 24 (134 CE).

Mur 24 consists of a series of farming contracts on papyrus found in Wadi Murabba’at and internally dated to the 20th of Shebat, year 2 of the redemption of Israel by Shim’on b. Kosiba (134 CE).21 The bulk of Mur 24 (fragments A–I), though a documentary text, was uncharacteristically inscribed in the skilled formal bookhand of a professional scribe, albeit not as neatly and carefully as might be expected for a literary scroll. This rare example of an explicitly dated formal hand from the second century is thus an important comparandum for our purposes.

The text of Mur 24 is written parallel to the fibers in somewhat uneven lines. The letters generally respect a virtual baseline and are upright or leaning slightly to the left. The scribe incorporates ornamental additions and distinct serifs, and the script is clearly legible, though the letters are not consistently well executed. The strokes are typically homogeneous and somewhat straight, but also frequently slightly rounded.

E = Israel Museum, Shrine of the Book?, P. Yadin 44—5/6Ḥev 44 (134 CE).

5/6Ḥev 44 is one of a series of three related documents (5/6Ḥev 44–46) written by the scribe Joseph b. Simon concerning the division of leased land in En-Gedi.22 It was written in En-Gedi on 28 Marḥeshvan in the third year of the Bar Kokhba revolt (134 CE).23 Unlike most documentary texts (but like Mur 24), 5/6Ḥev 44 was written in an elegant, calligraphic, formal (proto-)square script of a professional scribe undoubtedly accustomed to copying literary

21 For its principal publication, see J.T. Milik, “24. Contrats de fermage, en hébreu (an 133),” in Les grottes de Murabba’at, ed. P. Benoit, J.T. Milik, and R. de Vaux, DJD 11 (Oxford: Clarendon, 1961), 122–134, pls. XXXV–XXXVII. High-resolution digital images of the papyrus can be seen at http://www.deadseascrolls.org.il/explore-the-archive/manuscript/MUR24-1 (accessed 10 January 2018). See also Yardeni, Textbook, 1:107–112, 2:[50–51]. Milik gives the date 133 CE, whereas Yardeni gives the date 134 CE.

22 Yigael Yadin, Jonas C. Greenfield, Ada Yardeni, and Baruch A. Levine, The Documents from the Bar Kokhba Period in the Cave of Letters: Hebrew, Aramaic and Nabatean-Aramaic Papyri, JDS 3 (Jerusalem: Israel Exploration Society, 2002), 39–70; Yardeni, Textbook, 1:113–118, 2:[52–54]. A digital image of the papyrus can be seen at http://www.deadseascrolls.org.il/explore-the-archive/image/B-300483 (accessed 10 January 2018).

23 The date is not converted in its principal edition, but is given as 134 CE in Yardeni, Textbook, 1:113, 2:[52] and Michael Owen Wise, Language and Literacy in Roman Judaea: A Study of the Bar Kokhba Documents (New Haven, CT: Yale University Press, 2015), 197. Lawrence H. Schiffman, “Witnesses and Signatures in the Hebrew and Aramaic Documents from the Bar Kokhba Caves,” in Semitic Papyrology in Context: A Climate of Creativity. Papers from a New York University Conference Marking the Retirement of Baruch A. Levine, ed. Lawrence H. Schiffman, CHANE 14 (Leiden: Brill, 2003) 165–186, esp. 174, gives the date as 135 CE.
scrolls. As an explicitly dated bookhand from second-century En-Gedi, 5/6Ḥev 44 is an invaluable comparandum for dating EGLev.

The text is written in neat, straight, closely packed lines parallel to the papyrus fibers. The script is small, with a rough sense for a baseline and generally leaning to the left. The letters were carefully executed, paying attention to the ornamental additions prevalent in formal hands of the period. The scribe does not consciously differentiate between the relative thickness of vertical and horizontal strokes. A distinctive feature of his scribal practice is the use of large X's as space fillers at the ends of lines.

F = Yale University, Beinecke Library Inv. DPg 25 = P. Dura 11 (c. 165?—c. 256 CE) (see Fig. 1 above).

Yale University, Beinecke Library Inv. DPg 25 (P. Dura 11) is a liturgical poem written in Hebrew. It was discovered in a fill near the synagogue in Dura-

24 Cf. Yardeni in Yadin et al., Documents from the Bar Kokhba Period, 42; Wise, Language and Literacy, 200.
25 Robert Du Mesnil Du Buisson, “Un parchemin liturgique juif et la gargote de la synagogue à Doura-Europos,” Syria 23, no. 1 (1939): 23–34.
Europos, belonging to a Jewish community which may have had connections to the Persian Orient. This Roman frontier fortress-city was destroyed by the Sasanians c. 256 CE and never reoccupied, so the manuscript cannot postdate this date. If the Jewish presence in Dura-Europos is indeed related to the establishment of the Roman garrison, then the poem was likely written down after the Roman conquest of the city from the Parthians c. 165 CE and the construction of the synagogue soon thereafter, but we cannot be certain.

P. Dura 11 is written in a noncalligraphic, semiformal hand, characterized by a lack of precision. Its cramped, uneven lines are not guided by ruling lines, and the somewhat large letters vary in size (avg. about 4 mm bilinear height). Its relatively thin but inconsistent strokes vary in thickness from letter to letter, but the writer does not consciously distinguish between the relative thickness of the horizontal or vertical strokes. The script is mostly unadorned, except when decorative elements have become integral parts of the letters. The handwriting has a slight general slant counterclockwise from vertical. Letter formation varies greatly within the small fragments, with several peculiar features (e.g., the almost horizontal left diagonal of mem and the protrusion of the roof of qoph to the right of its right downstroke).

G = Universität zu Köln, Papyrussammlung Inv. 5853—the Cologne Ketubah (417 CE) (see Fig. 2 below).

This famous Cologne Ketubah was written in Aramaic and Greek in Hebrew script in Antinoopolis, Egypt, and it is internally dated to November 15, 417 CE.
FIGURE 2  Detail of the Cologne Ketubah
COURTESY OF THE INSTITUT FÜR ALTERTUMSKUNDE AN DER UNIVERSITÄT ZU KÖLN, UNDER THE CREATIVE COMMONS ATTRIBUTION 4.0 INTERNATIONAL LICENSE HTTPS://CREATIVECOMMONS.ORG/LICENSES/BY/4.0/ (ACCESED 12 JANUARY 2018)
It is written on papyrus in a fairly neat, elegant, semiformal script, though the lines are not entirely even. The strokes are characteristically thin and frequently curved. While lacking many of the adornments of more formal hands, it frequently has the exaggerated serifs so common in the semiformal scripts of this period.

H = Zoora Aramaic Inscriptions 34 and 36 (466 and 468 CE) (see Figs. 3 and 4 below).

Zoora 34 and 36 are two Jewish Aramaic tombstones from Byzantine Zoora (south of the Dead Sea), which share almost identical iconography and were almost certainly written by the same hand.\textsuperscript{33} Zoora 34 is an epitaph for a

\textsuperscript{33} Meimaris et al., Inscriptions, 64–66, pl. xv. A survey of the inscriptions based on script style and iconography highlights these two examples as most evidently being by the same scribe, but there are several other epitaphs in similar formal hands that may perhaps also have been written by the same person. Further detailed study of the hands in the Zoora inscriptions would be helpful for identifying individual writers. For now, Zoora 34 and 36 will serve our purposes well.
person who died in 466 CE,\textsuperscript{34} and Zoora 36 for a person who died in 468. In both, the text is painted with red paint on white sandstone tombstones in a professional, calligraphic hand very different from most of the crude hands reflected in the Zoora inscriptions. Average letter height on Zoora 34 is about 2 cm. The texts are written without guidelines in neat, but not perfectly straight lines. The strokes are of even thickness and frequently have some rounding, which softens the harsh angularity of the formal script. Most letters lean slightly to the left. The scribe includes ornamental additions and subtle serifs on many letters. In many respects, Zoora 34 and 36 may be the most similar dated comparanda we have, supporting the possibility of a relatively late dating of EGLev.

I = En-Gedi Synagogue Mosaic Floor (mid- to late fifth century CE).

A series of mosaics from the floor of the same synagogue in which EGLev was discovered serve as a natural point of comparison.\textsuperscript{35} The older synagogue

\textsuperscript{34} There is an internal contradiction of one year in the dating formulae used in Zoora 34, which its editors resolve in favor of a date of 466 CE.

\textsuperscript{35} For a good image, transcription, and survey of scholarship, see Lee I. Levine, “The Inscrip-
of stratum III was renovated in the mid- to late fifth century CE, at which time these new mosaics in stratum II were apparently laid. These mosaics reflect multiple different, but similar hands, and can be considered together. The medium of inlaid tile decreases the precision of the script, but the inscriptions are clearly intended to reproduce the contemporary semiformal script, sometimes displaying its distinctive serifs. The additional decorative strokes and shading of more formal hands are lacking.

J = Oxford, Sackler Library Papyrology Room, Antinoopolis P. 47 + P. 48 (sixth to eighth century CE?) (see Fig. 5 below).

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Dan Barag, "En-Gedi: The Synagogue," in *Ancient Synagogues Revealed*, ed. Lee I. Levine (Jerusalem: Israel Exploration Society, 1981), 140–145.

36 Dan Barag, "En-Gedi: The Synagogue," in *The New Encyclopedia of Archaeological Excavations in the Holy Land, 11*, ed. Ephraim Stern (Jerusalem: Carta, 1993), 405–409, esp. 407–408.
P. Ant. 47 + 48 are two parchment fragments of a large scroll preserving parts of 1–2 Kings. It was discovered during excavations in Antinoopolis, Egypt, a site which also yielded numerous Greco-Roman papyri from the third to the sixth centuries CE (as well as smaller numbers from the second and seventh to eighth centuries). As such, McHardy suggests that the Kings fragments may likewise date from the third to the sixth centuries, and Birnbaum argues alternatively for a date in the fifth century or sixth century. Sirat dates it to the fifth or sixth century, and Dukan seems to prefer a date in the sixth or seventh century. Olszowy-Schlanger argues for the possibility of a later date for P. Ant. 47 + 48 based on the fact that Coptic materials were discovered at Antinoopolis up to and beyond the Muslim conquest and its paleographic similarity to early scripts from the Cairo Genizah. Yardeni and Engel also suggest a later date, perhaps in the seventh or eighth century. The dating of the scroll is complicated by a dearth of suitable comparanda at the beginning of the range of possible dates, the reverse situation of what obtains in our attempt to date EGLev.

P. Ant. 47 + 48 is written in a neat, calligraphic formal hand characterized by a high degree of precision and consistency. The lines fall slightly below the ruled guidelines. Its script inclines slightly to the left, and base strokes descend to the left. Most strokes are gently curved, but the letters are generally square in shape. Downstrokes tend to end with a sharp rounded tip. The scribe consciously differentiated between thick horizontal and thin vertical strokes, but the contrast is not always obvious.

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37 For a discussion of the large size, see Sirat, Les papyrus, 35–38, 119.
38 W.D. McHardy, "Appendix (Nos. 47–50): Hebrew Fragments," in The Antinoopolis Papyri, Part i, ed. C.H. Roberts (London: Egypt Exploration Society, 1950), 105–106, esp. 105. In her earlier work from 1990, Engel, Development of the Hebrew Script, 44, 62, accepted a presumed date for P. Ant. 47 + 48 (her manuscript number Bcl 1) from the third to the seventh centuries based on archeological context, but she now prefers a later date.
39 Birnbaum, Hebrew Scripts, 1:223–225, no. 183.
40 S.A. Birnbaum, "A Sheet of an Eighth Century Synagogue Scroll," VT 9, no. 2 (1959): 122–129, esp. 124.
41 Sirat, "Rouleaux bibliques," 426.
42 Michèle Dukan, La Bible hébraïque: Les codices copiés en Orient et dans la zone séfarade avant 1280, Bibliologia 22 (Turnhout: Brepols, 2006) 13, 32.
43 Judith Olszowy-Schlanger, "On the Hebrew Script of the Greek-Hebrew Palimpsests from the Cairo Genizah," in The Jewish-Greek Tradition in Antiquity and the Byzantine Empire, ed. James K. Aitken and James Carleton (Cambridge: Cambridge University Press, 2014), 279–299, esp. 295.
44 Yardeni, Book of Hebrew Script, 85 fig. 103; Edna Engel and Mordechay Mishor, "An Ancient Scroll of the Book of Exodus: The Reunion of Two Separate Fragments," Israel Museum Studies in Archaeology 7 (2015): 24–61, esp. 53.
K = Staatliche Museen zu Berlin—Ägyptisches Museum und Papyrussamm­lung, Inv. No. 8492 (seventh or eighth century CE?) (see Fig. 6 below).

P. Berlin 8492 is a papyrus fragment containing Hebrew liturgical poetry, which was found somewhere in the Fayum.\textsuperscript{45} Given the use of papyrus and the fact that it was found along with similar Arabic papyri dated by Sachau to the eighth century CE, Steinschneider suggests that it can hardly be dated later than the eighth century.\textsuperscript{46} Chwolson concurs, placing the earliest of the Berlin fragments in the seventh century and the latest in the eighth.\textsuperscript{47} The Academy of Hebrew Language website entry suggests a date in the eighth century,\textsuperscript{48} whereas the LDAB/Trismegistos database suggests a more conservative date from the fifth to the ninth centuries.\textsuperscript{49}

P. Berlin 8492 is written in an elegant formal hand in many respects very similar to that of EGLev. The lines are straight and neat, but somewhat cramped. The letters are frequently adorned with additional decorative strokes, but the serifs are more subdued than in many semiformal hands. Horizontal strokes are regularly thicker than vertical strokes, though the differentiation is not consistently observed. The script inclines slightly to the left, and base strokes descend to the left.

L = MS London-Ashkar (seventh or eighth century CE) (see Fig. 7 below).

MS London-Ashkar consists of two recently reunited large fragments of Exodus, one in the possession of the Duke University Library (the Ashkar fragment), and the other the property of Stephan Loewentheil of the 19th Century Rare Book and Photograph Shop in New York (the London fragment, having previously been in the possession of Jews' College in London). It has been dated on the basis of radiocarbon dating and paleographic analysis to the seventh or eighth century CE.\textsuperscript{50}

MS London-Ashkar is written in a neat formal hand in clean columns and straight lines written below the ruled guidelines. The script leans ever so

\textsuperscript{45} Sirat, \textit{Les papyrus}, 110. The precise find location is unknown; cf. D. Chwolson, \textit{Corpus Inscriptionum Hebraicarum} (St. Petersburg: Imperial Academy of Sciences, 1882), 121.

\textsuperscript{46} Moritz Steinschneider, "Hebräische Papyrus-Fragmente aus dem Fayyūm," \textit{zĀS} 17 (1879): 93–96, no. 6, esp. p. 96.

\textsuperscript{47} Chwolson, \textit{Corpus Inscriptionum Hebraicarum}, 125.

\textsuperscript{48} See http://maagarim.hebrew-academy.org.il/Pages/PMain.aspx?mishibbur=902003&mmt15=0010001010%2066 (accessed 6 December 2017).

\textsuperscript{49} See http://www.trismegistos.org/text/113861 (accessed 6 December 2017).

\textsuperscript{50} Birnbaum, "Sheet," 122–129; Engel and Mishor, "Ancient Scroll," 25. Sirat, "Rouleaux bibliques," 427, prefers a later date in the tenth or eleventh century, but this appears to be too late.
FIGURE 6  P. Berlin 8492, photo # P_08492_R_001
COURTESY OF THE STAATLICHE MUSEEN ZU BERLIN—ÄGYPTISCHES MUSEUM UND PAPYRUSSAMMLUNG
slightly to the left, and there is little or no differentiation between the thickness of horizontal and vertical strokes. It is characterized by regular use of additional ornamental, diamond-shaped strokes on certain letters, as well as subtle serifs on others.

2.2.2 Comparative Description of EGLev

EGLev (see Figs. 8 and 9 below), is written in a formal, elegant, and well-executed calligraphic (proto-)square hand. There is a general impression of a virtual baseline, though not consistently respected. The lines are straight and neat, with letters hanging directly from roughly evenly spaced ruled dry lines an average of about 4 mm apart (visible in the form of horizontal cracks in the parchment running across the entire preserved part of the first sheet of the scroll, even though burning and digital unrolling of the scroll have created some distortions). The script is quite small, with letters averaging between 1.5–2.0 mm in bilinear height. Even accounting for shrinkage due to carbonization,
FIGURE 8
EGLevABF master view
COURTESY OF BRENT SEALES AND SETH PARKER
the small, dense writing is clearly remarkable, being more typical of the early periods than that of later Torah scrolls, with their increasing preference for larger formats and scripts.\footnote{Colette Sirat, Hebrew Manuscripts of the Middle Ages (Cambridge: Cambridge University Press, 2002), 27.}

One of the most distinctive features of EGGLEv is the conscious differentiation between thick horizontal and thin vertical strokes.\footnote{In the discussion that follows, each comparandum will be referred to by the letter assigned to it in the listing of the comparanda above, either as exhibiting the same (=), similar (≈), or different (≠) features relative to EGGLEv.} Such a degree of shading is uncommon in the Judean Desert scrolls and in hands from the third to the eighth centuries, and is usually only found in some of the most self-consciously calligraphic of scribal hands (≠CJK; ≠ABDEFGHIL; for earlier examples, see 4QSam\textsuperscript{b}, 4QJosh\textsuperscript{a}, and 4QPse\textsuperscript{a}; for an example roughly contemporary with EGGLEv, see Oxford, Bodleian Library, Ms. Heb. d.89 [P] i).\footnote{Cf. Frank Moore Cross, “The Development of the Jewish Scripts,” in Leaves from an Epigrapher’s Notebook (first published in 1961), 3–43, esp. n. 28, 33 n. 153; ibid., “Paleography of the Dead Sea Scrolls,” in EDSS, 379–422, esp. 386. The lack of comparable, well-shaded Hebrew hands from the third to the fifth centuries is at least as likely to be the result of historical accidents of preservation as it is an indication that calligraphic hands from this period did not feature shading. The best example—Oxford, Bodleian Library, Ms. Heb. d.89 (P) i—is a small fragment of Exodus discovered in Oxyrhynchus in 1925, which is a remarkably close parallel to EGGLEv, and probably roughly contemporary. Unfortunately, its text is too poorly preserved to serve as an adequate comparandum for our argument. Ms. Heb. d.89 (P) i was discovered in a mound alongside Greek papyri from the third to the fifth century and other Hebrew fragments dated by Cowley to around 400 CE; A.E. Cowley, “Notes on Hebrew Papyrus Fragments from Oxyrhynchus,” JEA 2 (London: Egypt Exploration Fund, 1915): 209–213, esp. 210, 213. Engel, Development of the Hebrew Script, 44, likewise suggests a date no earlier than the third century for the Hebrew Oxyrhynchus papyri. Cf. also Bernard P. Grenfell and Arthur S. Hunt, “D. Graeco-Roman Branch,” in Archaeological Report (Egypt Exploration Fund) (London: Egypt Exploration Fund, 1904–1905): 13–17, esp. 13. See also Sirat, Les papyrus, 32, 123, pl. 83. Yardeni, Book of Hebrew Script, 73, dates it paleographically to the second or third century CE without providing her reasons for this early date. Given the limited nature of the evidence, however, a date in the fourth (or even fifth) century certainly cannot be excluded. If anything, a roughly third or fourth century date for Ms. Heb. d.89 (P) i may now be confirmed on the basis of EGGLEv. Furthermore, artistic preferences in the Hebrew scripts often correspond to similar fashions within the broader, dominant cultural milieu; see Sirat, Écriture et civilisations. In this regard, it is perhaps worth comparing the increasing calligraphic use of shading (in this case, thick verticals and thin horizontal) in Oriental Greek hands in the third to the sixth centuries CE, especially in the biblical majuscule and sloping pointed majuscule stylistic classes; see Guglielmo Cavallo, “Greek and Latin Writing in the Papyri,” in The Oxford Handbook of Papyrology, ed. Roger S. Bagnall (Oxford: Oxford University Press, 2009), 101–148, esp. 132–133; ibid., Ricerche sulla maiuscola biblica, Studi e testi di papirologia.} As such,
it strongly indicates the formal character of the script of EGLev. The script is oriented with a general left-leaning slant at an inclination of about 20° counterclockwise from vertical, though the left leg of aleph leans strongly to the right (=ABCDEGHIJKL; ≠F; typical of formal and semiformal hands throughout the early periods). The letters aleph, gimmel(?), zayin, tet, lamed, nun, ‘ayin, tsade(?), and shin all have additional decorative strokes (=BCDEJL; ≈ AHK; ≠ FGI; typical of formal hands from around the first century CE onwards). Bet, dalet, he, kaph, final mem, samekh, qoph, resh, and taw are adorned with subtle serifs on their upper horizontal strokes (=ABCDEJL; ≈FG; ≠I; characteristic of formal hands throughout the early periods, with the exception of taw). The letters bet, kaph, nun, pe, and tsade are unusually tall relative to their width, creating large interior spaces (=BG; ≠ACDEFHIJKL).

While it is impossible to give an exhaustive paleographic analysis of each individual letter form here (see Figs. 10 and 11 below), in her detailed paleographic analysis of the script of EGLev, Yardeni rightly points out numerous close parallels with her early comparanda. In many respects, EGLev certainly is similar to the latest phases of the formal Hebrew script attested in the Dead Sea Scrolls. Most of the letter forms are quite typical of the first- and second-century scripts, and virtually all can find parallels somewhere in the voluminous early materials (in inscriptions, if not scrolls). As discussed above, however, that in and of itself is insufficient to ensure a date for EGLev in the second half of the first to the beginning of the second century CE, given the lack of resolution in our paleographic typologies for the periods in question. There are no prominent features from scripts from the second and first centuries BCE to compel an early dating. Nor are there any features that can be demonstrated to be incompatible with a third- or fourth-century CE dating.

On the other hand, there are significant features in the script of EGLev that suggest a date typologically later than the first- and second-century parallels. Some of these advanced developments were seen already by Yardeni, who nevertheless suggests that EGLev does not postdate the chosen comparanda. Viewed in isolation, these features do not necessarily preclude a first- or second-century date, but these late features never occur in combination in...
any scrolls from the first and second centuries, suggesting that EGLev should be dated somewhat later.

First, the left leg of the *he* of EGLev intentionally and consistently begins below the roof (≡HIK; ≈C; ≠ABDEFGJL; mixed forms in Zoora inscriptions, but the separated form clearly predominates in the fifth and sixth centuries), a feature which can occasionally be found in early (usually ossuary) inscriptions and cursive (e.g., Mur 18, an Aramaic loan bill dated to 55 CE), but appears usually only in the form of accidental and exceptional cases in scrolls from the first and second centuries, suggesting a date from the third century or later.

Second, final *mem* is particularly important for dating EGLev, because the left downstroke frequently (almost always?) starts below the roof, creating an opening in the top-left of the letter that is not a feature in scrolls from the first or second century (though it can be found in some inscriptions), but is common in later periods (≡GHIK; ≈CJ; ≠ABDEFL; closed form predominant throughout in Zoora, but open becomes more common in the 5th century). Furthermore, final *mem* barely drops below the baseline established by most other letters, whereas earlier forms tend to be larger and drop further down below the baseline (≡EFGHJKL; ≈BCD; ≠A).

Third, the left leg of *taw* in EGLev has shifted to the right and downward, such that there is either a clear four-way “+” intersection between the left leg and roof or the left leg starts to descend from a point on the roof to the right of its left tip in a sort of fully developed “T” pattern (≡DGJKL; ≈EHJ; ≠ABC; Zoora evidences a period of transition, with mostly the older form in the fourth century and mostly transitional forms later, with the “T” form becoming more prominent from the fifth century onwards). The transition to this form from the earlier “-” form where the roof moves right from below the top of the left leg has hardly

56 As noted also by Yardeni in Segal et al., “Early Leviticus Scroll,” 17.
57 In an exceptional case, 11Qtglob regularly, but not always, has the left leg separated from the roof.
58 Birnbaum, *Hebrew Scripts*, 1288, suggests that this is the norm from the fourth and fifth centuries CE. Engel, *Development of the Hebrew Script*, 166–169, notes that the open form of *he* is typical from the late Roman period onward, though it has earlier precursors.
59 As noted also by Yardeni in Segal et al., “Early Leviticus Scroll,” 18.
60 Engel, *Development of the Hebrew Script*, 185, observes that the open form of final *mem* is first found in calamus writings in the late Roman period and peaks in the Byzantine period. Birnbaum, “Sheet,” 126, considers open final *mem* characteristic of the fourth to the seventh centuries.
61 11Qtglob is another somewhat exceptional example (though not unique among the Qumran scrolls) with its very small final *mem*. The gradual shrinking of this letter was already well underway in the first century CE, but final *mem* of the same height as other bilinear letters became the norm in later scripts.
FIGURE 10A EGLEV paleographic chart
FIGURE 10B EGLev paleographic chart
begun in scrolls from the first and second centuries, but seems to have taken place primarily sometime around the third to the fifth centuries. Concurrent

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62 Though it can occasionally be found in ossuary inscriptions, e.g., Birnbaum, *Hebrew Scripts*, 1:177 no. 95. Yardeni, *Textbook*, 2:210, specifically notes Mur 24 (comparandum D) as an early example of the crossed intersection transitional form from the second century CE, and indeed the similarity to EGLev is remarkable, even if the *taw* in Mur 24 is exceptionally developed for its period.

63 Birnbaum, *Hebrew Scripts*, 1:287, suggests that this form with the left stroke issuing from the top bar “does not seem to appear before the fourth and fifth centuries; however, already in the third and fourth centuries a transition form leading to it seems to have existed: the top of the left stroke is joined to the horizontal, so that the left stroke now issues from the bar.”
with this change, the left end of the roof of *taw* in EGLev appears already to be at an early stage of developing a subtle serif (=DGKL ; ≈EH?; ≠ABCFIJ).64

Other less prominent features may also slightly favor a later date. In many hands from the first and second centuries *waw* and *yod* are virtually indistinguishable, but they are clearly distinguished in length (rather than shape) in EGLev, a feature which is characteristic of later hands (=CDFGIJKL; ≈ABE).65

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64 Birnbaum, *Hebrew Scripts*, 1:289, suggests that the development of a tick at the start of the top stroke began in the third century C.E. Yardeni, *Textbook*, 2:210, observes the beginning of this serif already in the Post-Herodian period, and it is also seen in P. Dura 151.

65 Yardeni in Elisha Qimron and John Strugnell, *Qumran Cave 4.v: Miqṣat Ma‘aše Ha-Torah,*
The kaph of EGLev is normally narrow, but sometimes has a longer roof stroke (e.g., the kaph at i.8.4.2)\(^{66}\) than is characteristic of the first and second centuries (=FGIJL; ≠ABCHK). Final nun is short and relatively straight, which tends to be a late typological development (=BHI; ≈CJL; ≠ADEFGK). ‘ayin is large and rounded on the right, whereas examples from the first and second centuries tend to be smaller and more angular (=GHJKL; ≠ABCDE). Yardeni also notes that nonfinal nun sometimes has a fully developed “roof” stroke (e.g., the nuns at i.2.5.2 and i.8.2.2), which is a relatively late decorative feature.\(^{67}\)

Thus, while Yardeni is certainly correct that in many ways the hand of EGLev is very close to those of the first and second centuries,\(^{68}\) these significant typological developments beyond documented bookhands in scrolls from the first and second centuries CE would seem to suggest dating EGLev later than the early second century. Early precursors for some of these features can be found (particularly in inscriptions or cursive),\(^{69}\) but the combination of these late features does not occur in extant scrolls from the first and second centuries.\(^{70}\) Such belated introduction into the calligraphic, formal bookhand of features already evident sporadically in early inscriptions and cursive is not unexpected. This later dating is further supported by many close similarities with Zoora 34 and 36 (comparandum H) of the fifth century, clearly demonstrating the long-term stability of the formal script.

On the other end of the spectrum, EGLev consistently has earlier forms than comparanda from around the 6th–8th centuries. In conjunction with the extensive similarity with late hands of the Dead Sea Scrolls, this undoubtedly means that EGLev cannot be dated paleographically later than perhaps the

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\(^{66}\) DJD X (Oxford: Clarendon, 1994), 23, says the difference in length between waw and yod only develops gradually in the Byzantine period.

\(^{67}\) I.e., column i, line 8, word 4, letter 2.

\(^{68}\) Yardeni in Segal et al., “Early Leviticus Scroll,” 18.

\(^{69}\) See especially the famous unprovenanced Uzziah reburial inscription in the Israel Museum, commonly assumed to date from the first century BCE to the first century CE, which has he with a separated left leg, final mem open at the top-left (even in medial position!), and “+”-shaped intersection of the left leg and roof of taw. See http://www.imj.org.il/en/collections/353990 (accessed 13 December 2017). See also SdeirGenesis (comparandum C), where the left downstrokes of he and final mem are almost, but not quite, separated from their roofs.

\(^{70}\) For a combination of many of these late features in a relatively early Oxyrhynchus papyrus in a (proto-)square hand—even if less formal than EGLev—see British Museum MS. Or. 9180 A, which Birnbaum, Hebrew Scripts, 1222–223, no. 182, dates paleographically to the fourth century CE.
fourth or fifth century (the period of Zoora 34 and 36). This is not the place to trace all of the later developments in the Hebrew script, but a representative example is in order. The \textit{aleph} of EGLev, with the relatively straight and simple left leg leaning to the right (\(=\text{D}; \approx \text{ABCEHIJ}; \neq \text{FGKL}; \text{tends to become more vertical in later periods\}) and the intersection between the central diagonal and left leg at the top tips of each stroke (\(=\text{ABCDHI}; \approx \text{EF}; \neq \text{GJKL}; \text{in time the intersection tends to move down the left leg; Zoora inscriptions show both forms, indicating a period of transition\}), probably indicates a date before the sixth or seventh century at the latest.

In sum, most of the features of the script of EGLev are equally compatible with dates within the range of the first to the fourth centuries CE. A pattern of significant features fit better in the third or fourth century, whereas there are no features that clearly suggest the first or second century over and against the third or fourth century. Significant differences from later comparanda make it unlikely that EGLev was written after the fifth century. Thus, based on examination of the script, I would suggest dating EGLev to around the third or fourth century CE, with only a small probability of it having been written in the second or fifth century.

3 Supporting Arguments

As observed above, there are compelling paleographic reasons to suggest a date for EGLev in the third or fourth century CE, but much of the evidence is ambiguous and imprecise. Indeed, the very nature of paleographic evidence and method often precludes definitive answers, especially at the level of precision necessary for dating EGLev. For this reason, it is crucial that we also consider several independent, nonpaleographic supporting arguments that can provide important additional evidence for dating the scroll.

3.1 Archeological Context

According to archeological evidence, the synagogue at En-Gedi was burned to the ground somewhere between the middle of the sixth century CE and the beginning of the seventh century. A horde of coins was discovered in a house adjacent to the synagogue, the latest of which dates to the early years of Justinian I (reigned 527–565 CE; coins datable up to about 540 CE), which led Barag et al. to conclude that the synagogue was destroyed in religious persecution under Justinian in the middle of the sixth century.71 Another horde consist-

71 Dan Barag and Yosef Porath, “The Synagogue at En-Gedi,” Qad 3, no. 3 (1970): 97–100
ing of thousands of low-value bronze coins was found in the niche for the Torah ark in the synagogue itself, and an initial screening by Bijovsky suggests that the latest date to the period between 498–538 CE. Two later coins from Justin II (565–578 CE) and a gold tremissis of Maurice (582–602 CE)—the latter of which was found in a thick layer of ash from the destruction—were discovered in the village of En-Gedi in undisturbed stratigraphic contexts. This fact leads Yizhar Hirschfeld to date the destruction to the end of the sixth or early seventh century during a Saracen raid, but Bijovsky considers this evidence insufficient to move the date back that far. The destruction of the village and synagogue between the mid-sixth and early seventh centuries necessarily puts an upper limit on how late EGLLev could have been copied.

The apparent location of EGLLev in the synagogue's Torah ark suggests that it was still in active use within the community that maintained it. If Yardeni's proposed early date were accepted, that would imply that the scroll was nearly 500 years old when the synagogue was destroyed, which I suggest is highly unlikely. On the one hand, in recent years scholars have become increas-
ingly aware that ancient books often had long useful lifespans. The evidence of Roman book collections collected by George Houston suggests an average useful lifespan of around 150–200 years for papyrus bookrolls, though on rare occasion books may have been preserved for 300–500 years. Manuscript evidence from Judean Desert find sites in close geographical proximity to En-Gedi suggest similar distributions, as the large majority of scrolls are generally thought to date around 50–150 years prior to their final deposition in their respective caves during the First and Second Jewish Wars against the Romans. Rare exceptions from Qumran cave 4 are generally dated about 200–300 years before the destruction of the site. Thus, while it is not in principle impossible that a scroll would survive intact for 500 years, on average it is intrinsically highly improbable that any given scroll in active use by the ancient Jewish community of En-Gedi would be close to 500 years old. If dating ancient manuscripts is indeed a matter of weighing probabilities, this fact surely argues strongly against Yardeni’s proposal for an early date for EGLev. A date for EGLev in the third to the fifth centuries CE, however, would fit well with expectations based on the archeological context, since the scroll would have been approximately 50–350 years old when the synagogue was destroyed.

3.2 Radiocarbon Dating

As radiocarbon dating methods and measurements continue to improve, paleographers have begun to appreciate the value of this content-independent measurement of time. Indeed, in many cases, radiocarbon dating may provide

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78 George W. Houston, Inside Roman Libraries: Book Collections and Their Management in Antiquity (Chapel Hill, NC: University of North Carolina Press, 2014), 175; see also Drew Longacre, “A Book about Books and a Collection on Collections,” Marginalia Review of Books (21 May 2016) http://marginalia.lareviewofbooks.org/book-books-collection -collections-drew‑longacre/ (accessed 24 July 2017). Cf. Craig A. Evans, “How Long Were Late Antique Books in Use? Possible Implications for New Testament Textual Criticism,” BBR 25, no. 1 (2015): 23–37.

79 Cf. Mladen Popović, “Qumran as Scroll Storehouse in Times of Conflict? A Comparative Perspective on Judaean Desert Manuscript Collections,” JSJ 43 (2012): 551–594, esp. 562–564. For a full listing, see B. Webster, “Chronological Index of the Texts from the Judaean Desert,” in The Texts from the Judaean Desert: Indices and an Introduction to the Discoveries in the Judaean Desert Series, ed. Emanuel Tov, DJD XXXIX (Oxford: Clarendon, 2002), 351–446, though this resource must be used with caution, due to its many inaccuracies. Of course, it is possible that some of the Qumran scrolls were deposited before the First Jewish War, but that would only make them younger at the time of their deposition and strengthen our argument here.

80 These data, therefore, hardly support the proposed early dating, allowing at best for the unlikely possibility of such a date, contra Segal et al., “Early Leviticus Scroll,” 4.
reliable ranges of probable dates even more precise than traditional paleographic typologies can reasonably be supposed to allow, especially in cases where paleographic typologies are based on low-quality and low-quantity datasets. As noted above, this is precisely the case with the study of the development of the formal Hebrew (proto-)square script from the second to the sixth centuries CE, exponentially increasing the relative weight that should be given to the radiocarbon dates.

A sample presumed to be from EGLev was radiocarbon-dated in conjunction with the publication of the scroll, and the results are published as supplementary material in the *Science Advances* article. EGLev was delivered by its excavators to the Israel Antiquities Authority (IAA) in a box (box 198) containing charred material (the intact part of the scroll had not by that point been isolated from the surrounding material for further study). The sample to be dated was taken from the carbonized material surrounding the chunk we now know to be EGLev before the material was transferred to archival boxes. Thus, while the published, intact portion of EGLev was not itself sampled, the IAA is fairly confident that the sample was taken from the same material. Nevertheless, given the fact that the sample was not taken from a contiguous portion of the scroll and that the original contents of the box are not entirely clear to me, we must admit some degree of uncertainty as to whether the sampled material was in fact originally from EGLev or another source, such as perhaps another scroll from the Torah ark or perhaps even the wood of the Torah ark itself. Only a further sample from part of the contiguous remains of EGLev (ideally the top margin) is likely to clear up the ambiguity entailed in the sampling.

Elisabetta Boaretto at the Weizmann Institute D-REAMS Radiocarbon Laboratory dated the selected “charcoal” sample using the Accelerator Mass Spectrometry technique within a single standard deviation to 1754 ± 40 BP. Calibrated according to the OxCal v.4.3.2 program, that yields the following probability distribution. There is a 68.2 % probability that the parchment (if indeed it was that) came from an animal that was killed between 235–340 CE. Expanding our sights to include a 95.4 % confidence interval, the probability for the date of the skin is distributed as follows: 140–160 CE (2.0 %), 165–200 CE (4.2 %), and 205–390 CE (89.2 %). In other words, there is a high probability that the sample should be dated somewhere between 235–340 CE (68.2 %), and an even higher probability that it should be dated somewhere more broadly in the third or fourth century (approximately 90 %). There is a small probability that it could

81 Beatriz Riestra of the IAA, personal communication. To the best of my knowledge, there is no explicit before-and-after documentation of the sampling available for further verification.
be dated to the mid- to late second century (just over 6%). The combined probability of the sample dating from the period between 50–125 CE as suggested by Yardeni, however, is negligible. Thus, if the sample was indeed from EGLev, radiocarbon dating strongly supports our suspicion that the proposed early date is improbable. Instead, it indicates a probable date in the third or fourth century at 90% confidence, with the most likely interval from about 235–340 CE.

Of course, this radiocarbon dating has additional complicating factors, which must be taken into account. For example, of the five internally dated documents from the Second Jewish War (dated between 128–135 CE) that were subjected to radiocarbon dating in the 1990–1991 and 1994–1995 series, four yielded good dates (at or near 1σ), but XḤev/ Şe 8a (internally dated to 135 CE) was dated to 1758 ± 36 BP,82 which calibrates according to the 2013 dataset on the OxCal v.4.3.2 program to 235–335 CE (68.2%), with a 2σ range covering a period from 140–385 CE. This distribution is strikingly similar to that of EGLev, and yet the actual date of writing unexpectedly falls somewhat outside the 2σ range.83 Nevertheless, XḤev/ Şe 8a is dated somewhat later than Yardeni’s proposed early date for EGLev, so the results from EGLev would have to be even further removed from the actual date of writing than the anomalous (and as yet unexplained), problematic XḤev/ Şe 8a results for Yardeni’s dating to hold up. Yet in the archeological reports, treatment records of the IAA, and lab results from the Weitzmann Institute, I see no reason to suspect either contamination or laboratory error in the results for EGLev. They conform well to the expected age of the material based on the archeological context and other circumstantial evidence discussed in this article. EGLev was burned in antiquity, remained buried in situ for well over 1000 years, and was never the object of chemical treatments in the hands of conservators, making it an ideal candidate for radiocarbon dating. There is very little opportunity in the known afterlife of the charred remains for any contamination to have occurred, and the normal δ¹³C value (−21.2‰ PDB) and carbon content of 45.5% are consistent with a clean parchment sample.84 Any possible contaminants were likely removed in the pretreatment cleaning process, though the details of this process are not

82 A.J. Timothy Jull, Douglas J. Donahue, Magen Broshi, and Emanuel Tov, “Radiocarbon Dating of Scrolls and Linen Fragments from the Judean Desert,” Radiocarbon 37, no. 1 (1995): 11–19.
83 At the time, the authors noted that it could be calibrated according to the 1986 dataset based on a ten-year average to 133–386 CE (2σ), a range that does include the actual date of writing, but the difference is negligible, and the date remains problematic.
84 Unfortunately, on this basis we cannot exclude the alternative possibility that the sample was wood.
reported in the article. Thus, if the sampled material was indeed originally from EGGLEv, all indications suggest that the reported radiocarbon dates are likely to correspond well to the actual date of writing. This range of dates, however, is inconsistent with Yardeni’s early dating of EGGLEv.

3.3 Bibliographic Analysis
In the study of the development of the Hebrew book it is essential to consider not only the script, but also all the material features that make these textual artifacts “books.” Several such bibliographic/voluminological details of EGGLEv may be significant for its proper dating. One of the most important is that the scroll was apparently originally rolled around a wooden roller. The micro-CT scan shows a well-preserved solid inner core in the most protected parts of the scroll where complete revolutions have been well preserved. This core cannot be parchment, but looks very similar to what might be expected from the distorted cellular structure of burned wood. Wooden rollers of this type are well documented in Greco-Roman book production, but Haran argues that they were adopted relatively late in Palestinian Jewish book production. As far as we can tell, such rollers were infrequent in scrolls known from the first and second centuries CE, but are well known in later rabbinic literature (e.g.,

85 I am grateful to Hans van der Plicht for being willing to discuss some of the technical issues regarding the radiocarbon dating.
86 Segal et al., “Early Leviticus Scroll,” 7. Emanuel Tov, “Scribal Aspects of the Manufacturing and Writing of the Qumran Scrolls,” in Jewish Manuscript Cultures: New Perspectives, ed. Irina Wandrey, Studies in Manuscript Cultures (Berlin: De Gruyter, 2017), 29–48, esp. 45, agrees that EGGLEv had a wooden bar, while accepting Yardeni’s early date in the first or second century CE.
87 Cf. Segal et al., “Early Leviticus Scroll,” 7. The solid core is missing in parts where complete revolutions are no longer intact, leaving the inner core exposed and likely to fall out. Thus, there is good reason to suppose that the solid core originally went through the entirety of the intact scroll. Brent Seales and Seth Parker kindly provided a video of the scans and discussed several technical aspects of the digital unrolling of EGGLEv. Parker also observed in personal communication that the inner portions of the parchment would have been more likely to have been preserved (as is the case in EGGLEv) if the inner core was filled with wood, rather than being empty.
88 For a typical cross-section of a wooden rod, see http://bruker-microct.com/applications/wood/wood002.htm (accessed 30 November 2017).
89 Mario Capasso, Volumen: aspetti della tipologia del rotolo librario antico (Naples: Procaccini, 1995), 73–98.
90 Menahem Haran, “Torah and Bible Scrolls in the First Centuries of the Christian Era,” Shnaton 10 (1986–1989): XVI–XVII, 93–106 (Heb. with Eng. sum.), esp. p. 101.
91 Cf. Emanuel Tov, Scribal Practices and Approaches Reflected in the Texts Found in the Judean Desert, STDJ 54 (Leiden: Brill, 2004), 117–118. Daniel Stökl Ben Ezra, Qumran: Die Texte vom
reconsidering the date of the en-gedi leviticus scroll

m. Yad. 3.4; b. B. Batra 14a; y. Meg. 1.71d; Sof. 2.5) and medieval scrolls. Most of the Dead Sea Scrolls were not discovered rolled up in situ or with sufficient remains from their beginnings or ends so as to exclude the possibility of their having originally been attached to a wooden roller. In most cases where the evidence is sufficient to make a determination, however, such rollers were lacking. The only confirmed example among the Dead Sea Scrolls is 4Q82 (4QXIΙ8), where the innermost layers at the end of the scroll are still preserved wadded together around part of a wooden stick.92 11Q11 (11QapPs) was originally thought to have been rolled around a wooden stick, but the conservationist Elena Libman has since shown that the inner core was in fact tightly folded and tied parchment from the end of the scroll.93 11Q4 (11QEzekiel) has also been informally suggested as a possible example of a scroll with a wooden roller, but I have not been able to verify the validity of this suggestion.94 A few sticks have been found in the caves around Qumran, but I am not aware of any indications for their use as rollers for scrolls.95 The scroll being read in the paintings from the synagogue at Tel en-Gedi was originally thought to have been rolled around a wooden stick, but the evidence is insufficient to make a determination.

92 Patrick W. Skehan, “Cave 4 of Qumran (4Q). Report of Mgr. Patrick W. Skehan” in P. Benoit et al., “Editing the Manuscript Fragments from Qumran,” BA 19, no. 4 (1956): 86–88, esp. 88, describes 4Q82 thus: “The Minor Prophets MS, 4QXIΙ8, is for the most part in exceptionally poor and blackened condition, with its leather often wadded together in disintegrating lumps of a number of layers, very difficult to separate; the lower edges of a series of columns remain in one instance, curled around a part of the stick on which the scroll was rolled, and practically turned to glue. Nevertheless, a considerable quantity of text ranging from early in Hosea to as far as Nahum, has thus far been identified, and with further work this winter more can be recovered.” Catherine M. Murphy kindly alerted me to this reference and made her research on this scroll available to me.

93 Mika S. Pajunen, “How to Expel a Demon: Form- and Tradition-Critical Assessment of the Ritual of Exorcism in 1QApocryphal Psalms,” in Crossing Imaginary Boundaries: The Dead Sea Scrolls in the Context of Second Temple Judaism, ed. Mika S. Pajunen and Hanna Tervanotko (Helsinki: Finnish Exegetical Society, 2015), 128–161, esp. 150 n. 61.

94 This possibility was suggested to me by an anonymous reviewer, but I am not aware of any published arguments. Edward Herbert, “4. 11QEzekiel,” in Qumran Cave 11.II: 11Q2–18, 11Q20–31, ed. Florentino García Martínez, Eibert J.C. Tigchelaar, and Adam S. van der Woude, DJD XXIII (Oxford: Clarendon, 1998), 15–28, pls. 11 and 11V, esp. pp. 15–16, concludes (based on an examination by H.J. Plenderleith) that the scroll was hollow, allowing water to run through its inner core and fill up with sand grains.

95 In a SBL paper dated 19 November 2017, Oren Gutfeld and Randal Price reported that they found a 46 cm-long stick embedded into jar fragments when excavating in Cave 53 near Toten Meer und das antike Judentum, Jüdische Studien 3 (Tübingen: Mohr Siebeck, 2016), 30, notes two examples of wooden rollers from Qumran (11Q11 and 4Q82), though he agrees that many scrolls did not have them.

96 Patrick W. Skehan, “Cave 4 of Qumran (4Q). Report of Mgr. Patrick W. Skehan” in P. Benoit et al., “Editing the Manuscript Fragments from Qumran,” BA 19, no. 4 (1956): 86–88, esp. 88, describes 4Q82 thus: “The Minor Prophets MS, 4QXIΙ8, is for the most part in exceptionally poor and blackened condition, with its leather often wadded together in disintegrating lumps of a number of layers, very difficult to separate; the lower edges of a series of columns remain in one instance, curled around a part of the stick on which the scroll was rolled, and practically turned to glue. Nevertheless, a considerable quantity of text ranging from early in Hosea to as far as Nahum, has thus far been identified, and with further work this winter more can be recovered.” Catherine M. Murphy kindly alerted me to this reference and made her research on this scroll available to me.

97 PAM 41.964 and a photograph taken by Orit Kuslanski in 2014 for the IAA make it fairly clear that the material inside (and sticking out both on top and bottom) of the wadded material is a smooth, straight, wooden stick with a diameter of about 0.7 cm.
Dura-Europos lacks wooden rollers.\textsuperscript{96} Thus, as far as the evidence permits evaluation, it appears that wooden rollers were uncharacteristic of scrolls from the first and second centuries CE (though not entirely unattested) and only became a normal feature somewhat later. Furthermore, even if a few of the Qumran scrolls did have wooden rollers at their ends (as in 4Q82), it is interesting to note that EGLev has a roller preserved at the beginning of the scroll, possibly in agreement with rabbinic prescriptions for adding rollers at both the beginnings and ends only of Torah scrolls (e.g., \textit{b. B. Batra} 14a; \textit{y. Meg.} 1.71d). Overall, the presence of such a roller at the beginning of EGLev suggests a date from the third century or later.

Furthermore, Barag claims that EGLev was found next to the remains of “a wooden disc set at the base of a rod on which a scroll was rolled,” as well as “a small seven-branched silver lamp, possibly one of the decorations of the Torah ark curtain or one of the ornaments of the mantle of the Torah scroll.”\textsuperscript{97} While it is not certain that the disk and decoration were ever attached to EGLev or that either they or the wooden roller were attached during the initial production of the scroll (rather than being added later), the possibility is suggestive. Circular bases and ornaments on Torah scrolls are all unattested in Hebrew scrolls from the first and second centuries CE.

Another factor potentially important for dating EGLev is the composition of its ink, which the editors claim is likely to have contained metals, based on the higher density of the ink in the micro-CT scan in comparison with the surrounding material.\textsuperscript{98} Iron gall inks began to replace carbon-based inks in late antiquity (perhaps around the fourth century CE?),\textsuperscript{99} but the precise history of this transition remains unknown. Nevertheless, recent studies have identified earlier mixed inks that are carbon-based, but contain metallic elements,

\footnotesize{Qumran, which they suggest may have been used for packing jars; see http://www.liberty.edu/media/1147/archaeology/SBL_Qumran_section_paper_2017_sm.pdf (accessed 15 January 2018). They kindly sent me a photograph, and it seems clear that this stick was not specially prepared as a roller for a scroll. Mireille Bélis, “The Unpublished Textiles from the Qumran Caves,” in \textit{The Caves of Qumran: Proceedings of the International Conference, Lugano 2014}, ed. Marcello Fidanzio, STDJ 118 (Leiden: Brill, 2016), 123–136 (127), also found a stick in a jar in the Amman collection containing artifacts from Qumran. She informs me, however, that this and another she found in Cave 11 do not appear to be suitable for attaching to a scroll.}

\begin{footnotesize}
\footnotesize{\textsuperscript{96} For a good image, see Kraeling, \textit{The Synagogue}, pl. LXXVII. For a discussion of Torah scrolls in ancient Jewish art (mostly from the diaspora), see Rachel Hachlili, \textit{Ancient Jewish Art and Archaeology in the Diaspora} (Leiden: Brill, 1998), 354–357.}

\footnotesize{\textsuperscript{97} Barag, “En-Gedi: The Synagogue,” 408–409.}

\footnotesize{\textsuperscript{98} Seales et al., “From Damage to Discovery,” 2.}

\footnotesize{\textsuperscript{99} Cf. Sirat, \textit{Les papyrus}, 22.}
\end{footnotesize}
though it remains controversial whether these are accidental contaminants or intentional additives. Some papyri from Herculaneum (before 79 CE) contained quantities of lead,\(^{100}\) and some papyri from Egypt (second century BCE to third century CE) contained copper.\(^{101}\) Some Dead Sea Scrolls likewise may have had corrosive, metallic, mixed inks, though again it is debated whether or not these were intentional additives.\(^{102}\) The elemental compositions observed in Dead Sea Scrolls by Nir-El and Broshi, however, would be unlikely to produce the same degree of visible contrast between ink and substrate evident in the imaging of EGLev.\(^{103}\) Given current knowledge of ink compositions, the probable presence of metal in the ink of EGLev is possibly suggestive of a relatively late typological development, but a date in the first or second century CE cannot be precluded.

3.4 Format and Layout

In a 2016 survey of the column layouts of late Herodian and post-Herodian scrolls from the Judean Desert, Kipp Davis has suggested a diachronic development within high-quality literary scrolls moving from wide to narrow columns.\(^{104}\) According to Davis, there are few (if any) good examples of late or post-Herodian scrolls from Qumran with tall, narrow columns, and most scrolls

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100 Emmanuel Brun, Marine Cotte, Jonathan Wright, Marie Ruat, Pieter Tack, Laszlo Vincze, Claudio Ferrero, Daniel Delattre, and Vito Mocella, “Revealing Metallic Ink in Herculaneum Papyri,” *Proceedings of the National Academy of Sciences of the United States of America* 113, no. 14 (2016): 3751–3754, http://www.pnas.org/content/113/14/3751.abstract (accessed 10 October 2017).

101 Thomas Christiansen, Marine Cotte, René Loredo-Portales, Poul Erik Lindelof, Kell Mortensen, Kim Ryholt, and Sine Larsen, “The Nature of Ancient Egyptian Copper-Containing Carbon Inks is Revealed by Synchrotron Radiation Based X-ray Microscopy,” *Scientific Reports* 7 (2017): 15346 https://www.nature.com/articles/s41598-017-15652-7 (accessed 1 December 2017).

102 Tov, *Scribal Practices*, 53–54. See also Yoram Nir-El and Magen Broshi, “The Black Ink of the Qumran Scrolls,” *DSD* 3, no. 2 (1996): 157–167, who conclude that metals detected in Qumran scrolls are nonintentional, such that “The Qumran scrolls, as well as the manuscripts from the times of the Bar Kokhba Revolt, predate the use of ink spiked with metal additives” (167). Ira Rabin recently reasserted the metallic composition of some Dead Sea Scrolls in a 2016 SBL paper; for an abstract, see https://opus4.kobv.de/opus4-bam/frontdoor/index/index/docId/39189 (accessed 15 January 2018). She is currently involved in a large-scale reinvestigation of ink composition in the ancient Mediterranean world, which will hopefully shed more light on this area of study.

103 Seth Parker, personal communication. This is due both to the minimal metal content and similarity in profiles between the ink and parchment.

104 Kipp Davis, “High Quality Scrolls from the Post-Herodian Period,” in *Gleanings from the Caves: Dead Sea Scrolls and Artifacts from the Schøyen Collection*, ed. Torleif Elgvin, Kipp Davis, and Michael Langlois (London: T&T Clark, 2016), 129–138.
from Qumran have columns between a 1:1 and 2:1 height-width ratio. In contrast, approximately half of the literary scrolls from sites from the Second Jewish War exhibit high columns of over 30 lines and narrow columns of less than 10 cm in width. Tall, narrow columns became standard for quality biblical scrolls in later periods (e.g., comparanda J and L, as well as Oxford, Bodleian Library, Ms. Heb. d.89 [P] i, which would have had about 25–30 letter spaces per line). This profile suggests a gradual transition towards tall, narrow columns that was only beginning in the first and second centuries CE. EGLev is reconstructed with columns of 35 lines at a height of about 15.6 cm (just under half preserved) by its editors, who also calculate that column I averages 31–35 letter spaces per line and column II averages 34–37. Column I measures 4.3 cm in width on the ABF master view, and column II measures 5.2 cm, measured from their straight right margins to their notional left margins. The columns of EGLev, therefore, are laid out between a 3:1 and 4:1 height-width ratio, which is certainly in keeping with the trajectory identified by Davis. The original measurements are more difficult to evaluate due to shrinkage from the carbonization of the scroll, but even if we factor in shrinkage of 20–30 %, the columns would still be significantly narrower than 10 cm. Further study is necessary to write a full history of column layouts in the periods in question, but the tall, narrow columns of EGLev appear to reflect a relatively late typological development, and a date in the third or fourth century CE is somewhat more probable than one in the first or second century, though we cannot preclude an earlier date.

107 Consideration of the margins, initial blank space, and overall dimensions are less relevant for our purposes.

105 Cf. also the useful survey in Tov, Scribal Practices, 82–99, who associates the large writing blocks of scrolls from outside of Qumran with de luxe editions. Tov notes that many early Qumran scrolls have large numbers of lines per columns, but he does not give the column widths for these examples. Indeed, most of these early manuscripts with tall columns also have columns wider than 10 cm, only strengthening the weight of Davis's observation.

106 Segal et al., “Early Leviticus Scroll,” 7–8.

107 Gareth Wearne reminds me of a similar development in fashion in Greek books from the period. High-quality literary rolls containing prose works increasingly came to be written in tall, narrow columns from the first century CE onwards, with a normative range of 4.5–7.5 cm for the column width (poetry was written in wider columns); see William A. Johnson, Bookrolls and Scribes in Oxyrhynchus (Toronto: University of Toronto Press, 2004), 100–108. Johnson sees a slight increase in the average column width in the third century, but it is not entirely clear whether this is statistically significant. According to Eric G. Turner, The Typology of the Early Codex (Philadelphia, PA: University of Pennsylvania Press, 1977), 36–37, a similar aesthetic preference also influenced the appearance of early codices.

108 At most, we can say that the relatively small dimensions of the scroll are suggestive.
4 Conclusion

Dating ancient manuscripts based on script alone is always a bit of a tenuous endeavor, but this is especially the case in poorly documented periods and styles, which advises caution in paleographically dating EGLev.\textsuperscript{109} Much of the evidence is ambiguous and imprecise. Nevertheless, a series of important typological developments evident in the hand of EGLev suggests a date slightly later than the Dead Sea Scrolls of the first and second centuries, but clearly earlier than comparanda from the sixth to the eighth centuries. The supporting evidence from archeological context, bibliographic/voluminological details (wooden roller and metallic ink), and format and layout (tall, narrow columns)—each individually indeterminate—reinforces the suggestion that EGLev should probably be dated within the period from the third to the fifth centuries CE. As such, I would suggest that EGLev should be dated to the third or fourth century CE, with only a slight possibility that it could have been written in the second or fifth century.\textsuperscript{110} If the sample subjected to radiocarbon dating was indeed originally part of EGLev, a date in the third or fourth century would be particularly secure. This argument for a later dating is not based on the absolute exclusion of a first- or second-century date on the basis of any individual piece of evidence, but rather a pattern of script- and nonscript-related features in EGLev that are uncharacteristic of scrolls from the first and second centuries, but appear to fit well in the third and fourth centuries. The cumulative evidence makes for a compelling probabilistic case for such a later dating. If this dating is correct, EGLev is an unprecedented example of a formal Hebrew

\textsuperscript{109} A final word of thanks is in order to several additional colleagues who commented on drafts or oral presentations of this article, including Mladen Popović, Eibert Tigchelaar, George Brooke, Steve Mason, Gareth Wearne, Gemma Hayes, Ayhan Aksu, and Hanneke van der Schoor.

\textsuperscript{110} Perhaps this could be quantified best with a \(1\sigma\) range of approximately 300 ± 75 CE.
script on a soft writing support from third- or fourth-century Palestine. And as Engel and Mishor note, "any written material that can be assigned to that 'silent era' is of inestimable value." 111 112

111 Engel and Mishor, "Ancient Scroll," 25.
112 As this article went to press, I learned of the sad passing of Ada Yardeni on 29 June 2018. She will be remembered as one of the foremost Hebrew paleographers of our time, whose legacy will no doubt live on in the work of many who, like me, have been profoundly influenced by her work.