

The Recipe for Beer in Codex *Marcianus Graecus* 299: A New Critical Text with Historical and Linguistic Commentary

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Abstract: *This article clarifies uncertainties about the date, origin, brewing procedure, and text of a technical treatise on brewing beer that has been central to the ancient history of food and drink. This recipe for beer, found in an alchemical codex associated with the epitomized works of Zosimus of Panopolis, cannot plausibly be earlier than the Byzantine period. Ethnography involving an Ethiopian informant provides a model for assigning temporal values to the brewing procedures in the technical treatise. Based on a comparison with other Byzantine texts, the bread from which the beer is made must be baked incompletely before being used for brewing. The text of the recipe is emended, because the fermenting vessel cannot be a ‘cage’ and is very likely the ‘ceramic bread-oven’ that is used also in other alchemical procedures.*

Keywords: *beer, alchemy, Zosimus of Panopolis, ethnography, codicology*

The recipe for ζύθος, ‘beer,’ associated with the works of the fourth-century CE alchemist Zosimus of Panopolis has often been adduced in the reconstruction of ancient Mediterranean and Mesopotamian brewing practices, though it is difficult to date and to situate in a cultural context.¹ Its position in the alchemical manuscript tradition suggests that the text could originate in Byzantine Egypt as early as the seventh century CE and that a

¹ Unger, *Beer in the Middle Ages*, 18; Hornsey, *A History of Beer*, 46-50; Forbes, *Studies*, 70-71; Hartman and Oppenheim, *On Beer*, 40, n. 22, citing Lucas, *Ancient Egyptian Materials*, 3rd ed., 17, 20-21; Lucas, *Ancient Egyptian Materials*, 2nd ed., 7, 10-11.

scribe included it in the codex *Marcianus Graecus* 299 (hereafter **M**), containing the works of Zosimus, sometime between the tenth and the eleventh centuries CE, which is the paleographical date of the main scribal hand in **M** supported by most scholars.²

On the other hand, the text of the beer recipe could originate in the tenth to eleventh centuries CE, contemporary with its codex, or have been produced and added later than that date range, since the hands of later additions to **M** are typically dated to the fourteenth and fifteenth centuries CE. In any case, a firm *terminus ante quem* for the recipe is established by references to it in Early Modern scholarship with Reinesius (1640 CE). Whenever it was added to **M**, we remain uncertain whether it was a composition of the scribe, or whether it was copied from another, unknown text. Considering these uncertainties, it may originate in the early Byzantine period and be the earliest complete recipe for beer that survives anywhere.³ On the other hand, it may be middle Byzantine, contemporary with **M**, or it may be late Byzantine in origin. The codex **M** was the personal possession of the late Byzantine Cardinal Bessarion (d. 1472), who donated it to the Republic of Venice upon his death.⁴

I describe the text in question as a “recipe,” meaning a set of instructions for the production of edible food or drink for people, because, if one follows the ζύθος recipe, as Gibbs did in his experimental archaeology project, it will produce beer.⁵ I call it a complete recipe for beer because many early texts relating to beer do not contain sufficient information to complete the brewing process and require substantial guesswork, as Hartman and Oppenheim note (1950: 6) with respect to the famous neo-Babylonian text at the Metropolitan Museum of Art (86-11-386). The ζύθος recipe

² Roberts, “Framing a Middle Byzantine,” 75 and n. 46.

³ Bottéro, *The Oldest Cuisine*, 91. The *Hymn to Ninkasi* (ca. 1800 BCE) is the most explicit source for the brewing process in Mesopotamia, but it does not constitute a transparent recipe for brewing beer; see Damerow, “Sumerian Beer,” 3. McGovern, *Uncorking the Past*, 69, calls the *Hymn to Ninkasi* “the earliest beer ‘recipe’,” but notes the many ambiguities. Civil, “A Hymn,” 76-82, reconstructs the brewing process in the hymn. No similar recipe survives for Pharaonic Egypt; see Tallet, “Food in Ancient Egypt,” 319.

⁴ Roberts, “Framing a Middle Byzantine,” 75.

⁵ Gibbs, “De Re Cervisia,” 1-17.

requires some guesswork, too, but much less than the ancient Near Eastern texts, and the occasion of this article is to clarify some of the uncertainties that remain.

The recipe, which describes a beer made from bread, has been part of the scholarly approach to ancient brewing for more than two hundred years, since Gruner's 1814 *editio princeps*.⁶ There remain problems of interpretation in the Greek text, which I hope to elucidate through reference to other late antique and Byzantine literature.⁷ The research resulted in a new reading of the text that requires a new edition and so the paper begins with the text, translation, and apparatus criticus, and this is followed by a historical commentary, comparative ethnographic evidence, and a linguistic discussion of selected problems in the text. The historical commentary shows the uncertainties of establishing a *terminus ante quem* and a *terminus post quem* for the recipe, the possibility that the text originates or was collected in the reign of Byzantine Emperor Heraclius (r. 610-641), and proposes that the ζύθος recipe was added to **M** because that Greek word appears elsewhere in the codex, in the genuine work of Zosimus. The linguistic commentary resolves problems with the interpretation of the Greek words ὠμότερος, 'more raw,' and κλουβός, 'cage,' arguing that ὠμότερος must be read in its culinary meaning 'more raw, less cooked,' and that κλουβός should be emended to read κλίβανος, 'ceramic bread-oven,' in the recipe. Throughout the study, I demonstrate why the ζύθος recipe must be disassociated with the alchemist Zosimus and must not be interpreted as a survival of much earlier, Pharaonic beer production. Reconstructions of Bronze Age beer production that employ such an interpretation are contaminated with the details of the ζύθος recipe, which has two important results: 1) the reconstruction of Bronze Age beer production is unreliable; and 2) scholars should not use reconstructions of Bronze Age beer production to interpret the ζύθος recipe, because the former may be contaminated by the latter.

⁶ Gruner's work made the ζύθος recipe available to a much wider readership, but the text had been analyzed and critiqued already by T. Reinesius in his work of 1640, on which Gruner relies.

⁷ This is the method recommended by Wahlgren, "Byzantine Literature," 528.

1. *De Codice et Editionibus Commentariisque*

M = Codex *Marcianus Graecus* 299 f. 162r, s. X aut XI

Reinesius = Reinesius, T. *Variorum Lectionum Libri III Priores*. Altenburg: Otto Michael, 1640. Commentarium in pagina 483.

Gruner = *Editio princeps*. Gruner, C.G. *Zosimi Panopolitani De Zythorum Confectione Fragmentum Nunc Primum Graece ac Latine Editum*. Sulzbach: Cum Typis Seidelianis, 1814.

CAAG = Berthelot, M. and Ruelle, C.E. *Collection des anciens alchimistes grecs*. Vol. II. Paris: Georges Steinheil, 1963 [1888]. Editio in pagina 372 graeca.

Olck = Olck, F. T. "Bier," in G. Wissowa, ed. *Paulys Real-Encyclopädie der Classischen Altertumswissenschaft*, Dritter Band. Stuttgart: Metzlerscher Verlag, 1899. Editio in pagina 459.

Nelson = Nelson, M. *The Barbarians Beverage: A History of Beer in Ancient Europe*. London: Routledge, 2005. Editio in pagina 127 n. 32.

περὶ ζύθων⁸ ποιήσεως· λαβὼν κριθὴν λευκὴν, καθαρίαν, καλὴν, βρέξον ἡμέραν α', καὶ ἀνάσπασον ἥ καὶ κοίτασον ἐν ἀνηνέμῳ⁹ τόπῳ ἕως πρωΐ· καὶ πάλιν βρέξον ὥρας ε'· ἐπίβαλε εἰς βραχιώνιον ἀγγεῖον ἡθμοειδὲς, καὶ βρέχε. προαναξήρανε ἕως οὗ γένηται ὡς τύλη¹⁰· καὶ ὅτε γένηται, ψῦξον ἐν ἡλίῳ ἕως οὗ πέσῃ· μαλίον γὰρ πικρόν. λοιπὸν ἄλεσον καὶ ποίησον ἄρτους προσβάλλων ζύμην ὥσπερ ἄρτον¹¹· καὶ ὅπτα ὁμότερον· καὶ ὅτ' ἂν ἐπανθῶσιν, διάλυε ὕδατι γλυκεῖ καὶ ἥμιζε διὰ ἡθμοῦ ἢ κοσκίνου λεπτοῦ. ἄλλοι δὲ ὀπτῶντες ἄρτους βάλλουσιν εἰς {κλουβὸν} <κλίβανον>¹² μετὰ ὕδατος, καὶ ἐψοῦσι μικρόν, ἵνα μὴ κοχλάσῃ, μήτε ἦ χλιαρόν, καὶ ἀνασπῶσι καὶ ἡθμίζουσιν· καὶ περισκεπάσαντες¹³, θερμαίνουσι καὶ ἀνακρίνουσιν¹⁴.

⁸ ὡς brevis est. ζῦθος Dio Chrysostom *Oratio* 32.82 et Photius, *Lexicon*, s.v. ζῦθος, sed **M** manifesto legitur ζύθων. Vide figuram 3. Variatio potis dialecticis proponit lectionem non mutandam esse.

⁹ ἀνηνέμῳ **M**, Reinesius, CAAG. ἀνημέμῳ Gruner et ἀνειμένῳ coniecit. ἀνειμένῳ Olck, Nelson.

¹⁰ τίλη **M**. τύλη Gruner et alii secuti sunt.

¹¹ ὥσπερ < πρὸς > ἄρτον Olck.

¹² κλουβὸν **M** et omnes, sine sensu. Reinesius κλουβὸν affirmavit et sensum 'aenum' coniecit, sine exemplo. κλουβὸν dubatavi et delevi, atque κλίβανον conieci.

¹³ περισκευάσαντες Olck.

¹⁴ ἀνακρίνουσιν **M**, Gruner, CAAG, et ἀνακλίνουσιν coniecit Gruner.

About the making of beers: Taking good, clean, white barley, soak it for one day, and draw it out and lay it out in a place without wind until the next morning; soak it again for five hours; toss it into a perforated ‘bracelet’ vessel, and soak it. Let it dry until such time as it becomes like a cushion; and when it does, dry it out in the sun until it falls apart; for the little hairs are bitter. Grind the remainder and make bread, adding leaven as for bread. And bake it incompletely; and when it rises, break it up into fresh water, and strain it through a strainer or fine sieve. Others bake the bread and toss it into a bread-oven with water, and they heat it a little bit, so that it neither boils nor is warm, and they draw it out and strain it. Then they cover the oven all around, heat it, and check on it.¹⁵

2. *Historical and Codicological Context*

The text of the ζύθος recipe is derived from the *recto* of folio 162 of the codex **M**, currently in Venice at the Biblioteca Nazionale Marciana.¹⁶ The text stands at the end of the authentic, but epitomized, work of Zosimus entitled *Thirty-five Chapters to Eusebeia on the Sacred and Divine Art*.¹⁷ It is often stated that the recipe is contemporary with the alchemist and dates to the fourth century CE, but **M** is dated between the tenth and eleventh centuries CE.¹⁸ **M** is the earliest manuscript of Zosimus, providing a potential *terminus ante quem* for

ἀνακλίνουσιν Olck, Nelson.

¹⁵ All translations by the author.

¹⁶ Halleux and El Gammal, *Les alchimistes grecs*, IX, 202 n. 22; Mertens, *Les alchimistes grecs*, IV, xlv, lix. The codex is in Venice, *Biblioteca Nazionale Marciana*, Gr. Z. 299 (=584). A scanned copy of the entire codex is available at <http://www.internetculturale.it/>. See Figure 3.

¹⁷ This title is missing in **M**, as Gibbs notes, “De Re Cervisia,” 6, but has been restored from its table of contents. See Mertens, *Les alchimistes grecs*, IV, lv–lvii.

¹⁸ For the 4th-century date, see Gibbs, “De Re Cervisia,” 6; Hornsey, *A History of Beer*, 48; Samuel, “Brewing and Baking,” 538; Keyser, “Alchemy,” 358; Forbes, *Studies*, 70; Lucas, *Ancient Egyptian Materials*, 2nd ed., 10. For the date of the codex, see Roberts, “A Greek Alchemical Epigram,” 9; Roberts, “Framing a Middle Byzantine,” 73; Martelli, “Greco-Egyptian,” 297; Mertens, *Les alchimistes grecs*, IV, xxii. See Roberts, “A Greek Alchemical Epigram,” 83, for broader context of **M** as our earliest witness to the ancient Greek alchemical tradition.

the texts it contains, and internal evidence indicates that the beginning of the reign of the Byzantine Emperor Heraclius (r. 610-641) is the *terminus post quem*.¹⁹ **M** is largely the work of a single scribe, but additions were made by other hands after its creation in the margins and on blank pages, and the beer recipe is one of these.²⁰ Those later hands are most often dated to the fourteenth and fifteenth centuries CE. The beer recipe is therefore very unlikely to be the work of Zosimus. Since the recipe was added to **M** directly following the epitomized work of Zosimus, a period between the tenth and eleventh century is the earliest the recipe could have been included in the codex, but that does not indicate much about the date and source of the beer recipe.

Halleux and El Gammal state that the chronology and cultural source of the technical treatises in the alchemical corpus, such as the ζύθος recipe, are unknown, but that copyists were especially keen to include the details of processes that originated in “the East,” including Egypt.²¹ The word ζύθος suggests an Egyptian source but does not firmly demonstrate it. Ζύθος is the ancient Greek word for Egyptian beer, found for example in the work of Theophrastus (*De caus. pl.* 6.11.2) and Strabo (*Geo.* 17.1.14; 17.2.5). It is distinct from βρῦτος, which refers to Thracian and Anatolian beer, and from the Byzantine word φουκᾶς, which can refer to beer, but rarely, since beer is uncommon in Byzantine culture.²² However, by the first century BCE, ζύθος could also refer to ‘beer’ without geographic specificity, as in the work of Posidonius, which is cited in Strabo (3.3.7, beer among the Lusitanians) and Athenaeus (4.152c-d, beer among

¹⁹ Mertens, *Les alchimistes grecs*, IV, xxi.

²⁰ Halleux and El Gammal, *Les alchimistes grecs*, IX, 202, n.22; Nelson, *Barbarians Beverage*, 23; Mertens, *Les alchimistes grecs*, IV, xxii-xxiii, lix. See Figures 1 and 2 herein for the obvious difference between the hands responsible for **M**.

²¹ *Les alchimistes grecs*, IX, 8, 10.

²² For βρῦτος, see Nelson, *Barbarian's Beverage*, 20-21; Archil. F 42 West. For φουκᾶς, see Dalby, *Tastes of Byzantium*, 90-91; Rautman, *Daily Life*, 104, 214. See Simeon Seth (tenth century CE) for a rare example where φουκᾶς clearly means ‘beer,’ in Langkavel, *Simeoni Sethi*, 118-119. Reinesius, *Variorum Lectionum*, 483, errs in making a close association between the ζύθος recipe and φουκᾶς.

the Celts), which complicates the question of the cultural origin of the recipe.

Following Halleux's lead about the eastern or Egyptian source of the technical treatises, there are potential but still speculative chronological refinements that could be made, because Byzantine scholars are more likely to have had the opportunity to collect and copy Egyptian alchemical texts before 639, when the Byzantine Empire was driven out of Egypt, than after this date, and the reign of Heraclius was otherwise supportive of this enterprise. Moreover, the ζύθος recipe does not contain necessarily late Greek words, as some technical treatises do, and it does not contain specific reference to Arabic sources.²³ There is nothing in the language that specifies the date of the beer recipe as later than **M**, but the indications that it predates **M** are speculative and circumstantial.

The Emperor Heraclius ruled at a tumultuous time of persistent conflict with the Sassanid Empire and Arabian conquest of many territories previously held by the Byzantine Empire, including Egypt in 639. Heraclius was also a patron of alchemical scholarship, and it is likely that he was the impetus for scholars to start collecting and compiling the texts that constitute the alchemical corpus.²⁴ Considering the plausibly Egyptian origin of the beer recipe and its lack of late or Arabic linguistic features, the text may have been produced during the reign of this emperor, between 610-641, in Egypt, but separate from the alchemical corpus represented in **M**, as part of the scholarly activity of collecting and copying alchemical texts that Mertens and Martelli posit under the auspices of Heraclius. In this scenario, the alchemical writings that constitute **M** and the beer recipe made their way to Constantinople, possibly under the same pressures that caused the Byzantine military to evacuate Syria between 636-639 and that caused the Emperor to move from Antioch to Constantinople in 638/9.²⁵ The writings of Zosimus made

²³ Berthelot and Ruelle, *CAAG*, II, 359 (French). This work is double paginated, and so page numbers must specify if it is the Greek or the French section; Roberts, "Framing a Middle Byzantine," 73-74, n. 43.

²⁴ Martelli, "Greco-Egyptian," 229; Mertens "Graeco-Egyptian Alchemy," 222.

²⁵ Kaegi, *Heraclius*, 256-257.

their way into Arabic sources also, and into other Byzantine manuscripts, but none of these bear witness to the beer recipe, which is unique to **M** and copies of it.²⁶

The beer recipe appears in **M** directly after the work of Zosimus and directly before a recipe for lye on the *verso* of folio 162.²⁷ The manuscript tradition has accumulated technical treatises such as this over time as copyists sought to explain difficult alchemical texts. A potential motivation for the recipe's addition to **M** is the mention of ζύθος as one of the names of the 'divine water' that makes alchemy possible at **M** f.156r, in the fifth chapter of Zosimus' *Thirty-five Chapters to Eusebeia*.²⁸ Here I differ from Mertens, who argued that the beer recipe and the lye recipe contained nothing alchemical and were added on blank pages of **M** only for the personal purposes of a scribe.²⁹ On the contrary, the beer recipe and the lye recipe both mention ζύθος, and it is reasonable to suggest that they were either composed or copied from another source by a scribe whose curiosity was engaged by the following passage of Zosimus' epitomized writings (**M** f.156r), as printed in Berthelot and Ruelle, *CAAG*, II, 184 (Greek):

Πρῶτον δεῖξαι δεῖ ὅτι σύνθετον τὸ ὕδωρ τοῦ θεοῦ ἐκ πάντων τῶν ὑγρῶν, ἔχον τὴν σύγκρασιν, καὶ διὰ πάντων τῶν ὑγρῶν ὀνομάζεται. Καθάπερ τὸ στερεὸν σύνθεμα δι' ἐνὸς ἐκάστου αὐτῶν εἶδους ἐκάλεσεν, οὕτως καὶ τὸ ὑγρὸν δι' ἐνὸς ἐκάστου ὑγροῦ ὕδωρ θεῖον, διὰ δὲ μυρίων ὀνομάτων τὰ δύο συνθέματα καλοῦσιν. Καλεῖται ὕδωρ θεῖον δι' ἄλμης, διὰ ὕδατος θαλασσίου, διὰ οὔρου ἀφθόρου, δι' ὄξους, δι' ὀξάλμης, δι' ἐλαίου κικίνου, ρεφανίκου, βαλσάμου, γάλακτος γυναικὸς ἀρρενοτόκου, καὶ γάλακτος βοδὸς μελαίνης, καὶ δι' οὔρου δαμάλεως, καὶ προβάτου θηλείας· τινὲς οὔρου ὀνείου· ἄλλοι καὶ ὕδατος ἀσβέστου, καὶ μαρμάρου, καὶ φέκλης, καὶ θείου, καὶ ἀρσενίκου, καὶ σανδαράχης, καὶ νίτρου, καὶ στυπτηρίας σχιστῆς, καὶ γάλακτος πάλιν ὀνείου, καὶ αἰγείου, καὶ κυνίνου· καὶ

²⁶ El Khadem, "Translation of a Zosimus Text," 168-178. It is important to note here that the tradition of alchemy at Panopolis continued after the Arab conquest, as Mertens notes in "Alchemy, Hermetism," 170; Mertens, *Les alchimistes grecs*, IV, lix.

²⁷ Berthelot and Ruelle, *CAAG*, II, 372-373 (Greek).

²⁸ Mertens, *Les alchimistes grecs*, IV, lviii-lix, Berthelot and Ruelle, *CAAG*, II, 184 (Greek), 182 (French).

²⁹ *Les alchimistes grecs*, IV, lix.

ὔδατος σποδοκράμβης, καὶ ἄλλων ὑδάτων ἀπὸ σποδοῦ γινομένων· ἄλλοι καὶ μέλιτος, καὶ ὀξυμέλιτος, καὶ ὄξους, καὶ νίτρου, καὶ ὔδατος ἀερίου, καὶ Νείλου, καὶ ἄρκτου, καὶ οἴνου ἀμηναίου, καὶ ῥοῖτοῦ, καὶ μορίτου, καὶ σικερίτου καὶ ζύθου· καὶ ἵνα μὴ τὰ πάντα ἀναγινώσκω, διὰ παντὸς ὕγρου.

First of all it is necessary to point out that ‘the water of sulphur’ is a compound of all other liquids, since it comprises a mixture, and it is named after all liquids. Exactly as one calls a solid mixture after just one of its parts, so they call the liquid mixture ‘divine water’ after just one liquid, and they call these two kinds of mixtures by thousands of names. ‘Divine water’ is called ‘brine,’ ‘sea water,’ ‘pure urine,’ ‘vinegar,’ ‘vinegar sauce,’ ‘oil of the kiki-tree,’ ‘cabbage oil,’ ‘balsam oil,’ ‘milk of a boy’s mother,’ ‘milk of a black cow,’ ‘steer’s urine,’ and ‘cow’s urine.’ Some call it ‘donkey’s urine,’ others call it ‘lime water,’ ‘marble water,’ ‘water of tartar,’ ‘water of sulphur,’ ‘water of orpiment,’ ‘water of realgar,’ ‘water of sodium carbonate,’ ‘water of split alum,’ and ‘milk’ again, ‘of a donkey,’ ‘of a goat,’ or ‘of a little dog.’ Some call it ‘potash water,’ and the water of other liquids originating from ash. Others call it ‘honey,’ ‘vinegar honey,’ ‘sodium carbonate honey,’ ‘water of the air,’ ‘water of the Nile,’ ‘water of the Great Bear,’ ‘cinnabar wine,’ ‘pomegranate wine,’ ‘part wine,’ ‘cider,’ and ‘beer.’ Since I have not recounted everything, it can be called after any liquid.

Divine water can mean many things. It is “a kind of universal dyeing product, able to deeply change the nature of treated materials.”³⁰ According to Zosimus, it is composed of all the liquids mixed together, including ζύθος. Ζύθος is one of the myriad names used for divine water. The appearance of the word ζύθος and the discussion of the liquids originating from ash in *Thirty-five Chapters to Eusebeia* may have motivated a scribe to seek out further information about ζύθος and lye, and then to add the beer recipe and the lye recipe, from another source or from personal experience, on a blank folio at the end of this section.

Berthelot and Ruelle posited the existence of a Byzantine manual of technical treatises dated from the eighth to tenth century CE that was drawn on in these later additions to **M**, but we have

³⁰ Martelli, “Greco-Egyptian,” 306. See also Martelli, “Divine Water,” 5-22.

no evidence for this.³¹ The Egyptian content of the beer recipe is plausibly indicated by the word ζύθος, a technical term for ‘beer from Egypt.’³² This evidence is weak because ζύθος also had the generic meaning ‘beer’ by the first century CE, a meaning it retains in Katharevousa Greek. The possible Egyptian origin of the recipe in addition to Heraclius’ probable enthusiasm for alchemy and historical circumstances in Egypt during his reign suggest that the beer recipe could have been collected in Egypt in the seventh century CE, but the foundation for this claim remains speculative and circumstantial.³³

On the other hand, it is clear that the beer recipe must be dissociated from Zosimus and that the uncertainties about its date and geographical origin problematize its value as evidence for ancient Egyptian beer. The recipe has been used in arguments about ancient Egyptian beer to supplement with a supposedly late antique witness much earlier information. This earlier data is derived from Egyptian records, tomb paintings, models depicting brewing deposited in tombs, and ethnographic evidence from the production of *bouza*, a traditional bread beer introduced to Egypt in or before the nineteenth century CE from points further south in Africa.³⁴ Both *bouza* and the ζύθος recipe are taken as accurate representations of much earlier Pharaonic beer production.³⁵ This has led to the understanding of ancient Egyptian beer as a bread beer, which is not necessarily the case.³⁶ Subsequent analysis of some beer residues on ancient Egyptian vessels has demonstrated that the grain was not baked as bread before fermentation.³⁷ There may be bread beer in

³¹ Berthelot and Ruelle, *CAAG*, II, 360 (French).

³² Unger, *Beer in the Middle Ages*, 21; Nelson, *Barbarian’s Beverage*, 23; E. Peruzzi, “À propos de l’origine,” 138.

³³ Martelli, “Greco-Egyptian,” 297.

³⁴ Tallet, “Food in Ancient Egypt,” 319-21; Samuel, “Brewing and Baking,” 537-539.

³⁵ Unger, *Beer in the Middle Ages*, 18; Hornsey, *A History of Beer*, 46-50; Lucas, *Ancient Egyptian Materials*, 2nd ed., 7-10.

³⁶ Samuel, “Brewing and Baking,” 538-539. While Tallet acknowledges Samuel’s work, he persists in the error she sought to correct in “Food in Ancient Egypt,” 319-321.

³⁷ Unger, *Beer in the Middle Ages*, 18; Samuel, “Brewing and Baking,” 538-

Egypt (and Mesopotamia), but there was plenty of variation in the production of beers, and it is incorrect to claim that Egyptian beer was a bread beer based on the evidence of the ζύθος recipe and the modern Egyptian fondness for *bouza*.³⁸ The historical importance of the ζύθος recipe and the *bouza* recipe in this argumentation is testament to the lack of explicit recipes from ancient Egypt and Mesopotamia and to the status of the ζύθος recipe as the most detailed early recipe for beer that survives anywhere.

3. *Ethnographic Comparanda*

An enterprise quite distinct from using ethnographic comparanda to reconstruct Pharaonic or Babylonian brewing is to examine the documented production of other traditional bread beers to see what light can be shed on the small number of unknown operations in the ζύθος recipe. Suggestions about how long the brew should be kept in the final vessel and the exact treatment of the bread, which is discussed in the linguistic section below, can be derived from the documented procedures of brewing bread beers using pre-industrial technology. This method is especially useful because secondary scholarship on ancient Egyptian and Mesopotamian beer cannot elucidate the problems of the ζύθος recipe, since the recipe in question has been used at various points in those scholarly reconstructions and so has contaminated them.

The rarity of references to beer in Byzantine literature necessitates the comparative approach. Byzantine references are dominated by the presence of ζύθος in alchemical recipes. Ζύθος is used in the concoction of ‘divine water’ as seen above and in the recipe for lye at **M** f.162v, as a substance with which to compare the consistency of a concoction in a text that appears at **M** f.98v, in the process for whitening pearls among the technical treatises associated with the work of Zosimus in the thirteenth-century manuscript *Parisinus Graecus* 2325 (**B**, f.157r-159v), and in the fifteenth-century manuscript *Parisinus Graecus* 2327.³⁹ Φουκᾶς, which always means

539; Samuel, “Investigation of Ancient Egyptian,” 489.

³⁸ On bread beer in the ancient Near East, see Hartman and Oppenheim, *On Beer and Brewing Techniques*, 11.

³⁹ Halleux and El Gammal, *Les alchimistes grecs*, IX, 12, 177.

a mixture of wine, vinegar, mead, or beer, is mentioned with the meaning ‘beer’ in connection with medicine and in the process for softening ivory in the work of Simeon Seth.⁴⁰ The ethnographic comparanda are valuable because these texts that mention beer in the alchemical manuscripts and in Simeon Seth do not clarify the textual uncertainties of the recipe.⁴¹ The comparative evidence also has the benefit of familiarizing readers with brewing practices in general, against which background the details of the ζύθος recipe can be clearly seen.

Bouza from Egypt and *t’alla* from Ethiopia are both bread beers made using simple technology similar to that available to alchemists in the Byzantine period.⁴² The main contributions ethnographic evidence makes to our understanding of the ζύθος recipe are on the issue of underbaking or overbaking the bread and the duration of fermentation. Egyptian *bouza* involves underbaking and so points towards the underbaking of the bread in the ζύθος recipe, but I have gathered ethnographic evidence that points towards the opposite. I interviewed Dr. Berhanu Demeke, who has witnessed the preparation of *t’alla* on many occasions, and this beer uses overbaked, almost burnt bread in the brew. There is nothing about *bouza* that makes it more useful as comparanda than *t’alla* is, since, like *t’alla*, it is a bread beer made using simple technology, indigenous to areas south of Egypt. Here are the recipes for *bouza* and *t’alla*.⁴³

⁴⁰ Dalby, *Tastes of Byzantium*, 91; Langkavel, *Simeoni Sethi*, 118-119.

⁴¹ See Samuel, “Brewing and Baking,” 544, on the value of comparative evidence.

⁴² On *t’alla*, see Abbink, “Competing Practices of Drinking,” 11; Holcomb, “Oromo Marriage,” 108 n. 1; Selassie and Selassie, “An Ethiopian Medical Text-Book,” 163; Tegebba Birru and Cowley, “The Kunfāl People,” 100.

⁴³ *Bouza* recipe from Lucas, *Ancient Egyptian Materials*, 2nd ed., 6-7, and *t’alla* recipe from my interview.

	<i>bouza</i>	<i>t'alla</i>
Malting and grinding	"A good quality of wheat is taken; the dirt and foreign material are picked out and the wheat is coarsely ground."	Soak barley and teff for a day or two until the grain germinates. Dry it and grind it.
Making the dough	"Three quarters of the ground wheat are put into a large wooden basin or trough and kneaded with water into a dough, yeast being added. [...] The remaining quarter of the wheat is moistened with water and exposed to the air for some time, after which, while still moist, it is crushed."	They mix the clean dry leaves of hops with the ground grain. They soak it for three days: 1 part barley/teff, 3 parts hops. This produces a frothy, bubbly mixture. Sometimes they add yeast to speed up the process. They make a separate dough of teff, sorghum, and sometimes maize, mixed with cold water.
Cooking the bread	"The dough is made into thick loaves, which are baked, though only lightly, so as not to destroy the enzymes or to kill the yeast."	Cook this dough on a flat top ceramic or metal oven, well done and almost black on both sides. The dark bake is important for the aesthetics of the final product.
Fermenting the brew	"The loaves are broken up and put into a vessel with water and the crushed moist wheat added: the mixture ferments on account of the yeast present in the bread, though in order to induce a quicker fermentation a little old bouza from a previous brewing is often added."	Move the grain and hops mixture into a different vessel, and break up the bread into the mixture. Leave it for two or three days. It is ready "when it has integrated into one thick, mud-like, dark concoction." Add dried hops stems and sprinkles of ground and whole roasted grain. Add water in an amount about half the volume of the whole mixture. After a few days, the clear liquid rises above the sediment.

Straining and finishing the brew	“After fermentation, the mixture is passed through a hair sieve, the solid material being well pressed on the sieve with the hands.”	They use a metal sieve and strain the mixture to remove the clear <i>t’alla</i> from the sediment. They may use a sieve also when they serve <i>t’alla</i> in individual cups.
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The section on cooking the bread reveals that bread beers can purposefully underbake the bread or overbake the bread, and so they document the two possible interpretations of ὁμότερον in line 5 of the ζύθος recipe.

The comparative evidence also provides suggestions for how long some of the processes in the ζύθος recipe would likely take. Our recipe gives no indication of how long the brewing takes in either of the options for finishing the drink that it presents. After indicating one day and five hours for germinating and malting the barley, we do not know how long the bread remains in the water before being strained out, and we do not know how long the liquid is left to ferment after straining. The *t’alla* recipe indicates a time of about ten days from germinating the grain to consuming the drink: three or four days for preparing the ingredients and six or seven days for the fermentation of the beverage. The *bouza* recipe does not add to the temporal discussion.

Reading the ζύθος recipe alongside the *t’alla* recipe provides a model for assigning temporal values to the actions described. “Break it up into fresh water, and strain it through a strainer or fine sieve” are two actions with an unspecified interval between them; the *t’alla* recipe suggests an interval of two or three days before straining. “Others bake the bread and toss it into a bread-oven with water, and they heat it a little bit, so that it neither boils nor is warm, and they draw it out and strain it.” This sentence illustrates the other possible procedure specified by the ζύθος recipe. Again, the *t’alla* recipe suggests that the interval between putting the bread in the water and straining it is two or three days. The end of the ζύθος recipe states: “Then they cover the oven all around, heat it, and check on it.” We do not know how long the beverage is kept in this condition of being gently heated, but the checking on it is presumably to determine when the beverage is ready. Being guided by the

t'alla recipe suggests that the interval of time between straining the solids out of the brew and using or drinking it is three or four days.

4. *Linguistic Considerations I: ὠμότερος*

The word ὠμότερον in line 5 of the ζύθος recipe has resulted in differences of opinion among scholars, some thinking that the recipe says to bake the bread more intensely than ordinary bread and some thinking that the recipe says to bake the bread so that it is less cooked, i.e., more raw, than ordinary bread. In its sentence, καὶ ὅπτα ὠμότερον, it appears as if it could be the neuter accusative singular used adverbially, but rather it is an attributive adjective used substantively, with ellipsis of its noun, since ἄρτον ‘bread,’ at the end of the previous sentence, can be supplied from context.⁴⁴ Nelson translated the word as “more strongly” relying on the translation of the text in Berthelot and Ruelle, who render ὠμότερον as “plus fortement.”⁴⁵ This reading goes back to Gruner, who translated ὠμότερον as ‘vehementius,’ and added the note ‘igne vehementiori,’ ‘with a more intense heat.’⁴⁶ This posits a metaphorical meaning of ὠμός, ‘harsh, fierce,’ resulting in the notion that the recipe instructs the reader to cook the bread ‘with greater intensity’ than usual. Other scholars have opted for the concrete meaning of the word, Gibbs translating it as “bake it partially” and Irby-Massey and Keyser translating it as “bake it rather raw.”⁴⁷

A review of Byzantine texts of the tenth century CE shows that the comparative form of ὠμός is most often used to describe a harsh or ferocious quality of human beings or animals.⁴⁸ Contemporary Byzantine culinary texts are more instructive, such as the tenth-cen-

⁴⁴ Smythe, *A Greek Grammar*, 1021.

⁴⁵ *Barbarian's Beverage*, 127, n. 32; *CAAG*, II, 356 (French).

⁴⁶ Gruner, *Ῥοσινι Πανοπολιτάνι*, 13 and n. 4.

⁴⁷ Gibbs, “De Re Cervisia,” 6; Irby-Massey and Keyser, *Greek Science*, 251.

⁴⁸ Constantinus in C. de Boor, *Excerpta Historica*, 540; Genesisius in Lesmüller-Werner and Thurn, *Iosephi Genesii*, Reg. 1.15.4; Delehay, *Synaxarium Ecclesiae*, 30.8.17. Here I follow the methodology set out in Wahlgren, “Byzantine Literature,” who states “that progress in the understanding of Byzantine literary Greek can be made only on the basis of more work of a descriptive character and of *internal comparison within the corpus of Byzantine texts*” (528, my italics).

tury *On the Properties of Foods* by Simeon Sethi. ‘On Breads’ is the first article of the work, in which he employs ὡμότερος in its culinary sense.⁴⁹

Ἡ ἐκ τῶν ἄρτων τροφή διαφέρει τετραχῶς παρά τε τὴν τούτων ὕλην, ἥτοι τὸν σῖτον, καὶ τὴν τούτων ἐργασίαν καὶ τὸ πῦρ, ἐν ᾧ ἔγονται· πρὸς δὲ καὶ παρὰ τὴν τούτων χρῆσιν. Καὶ παρὰ μὲν τὴν ὕλην, ὅτι κρείττονες οἱ ἄρτοι οἱ ἐκ τοῦ σίτου, πυκνὴν καὶ πεπλημένην ἔχοντες τὴν οὐσίαν, ὥς μόλις ὑπὸ τῶν ὀδόντων διαιρεῖσθαι. πλείστην γὰρ οὗτοι τροφήν διδόασιν. κρείττονές εἰσι δὲ καὶ τῇ χροίᾳ τῶν ἄλλων οἱ ξανθότεροι. ἐναντίοι δὲ τούτοις εἰσὶν οἱ ῥαδίως μὲν ὑπὸ τῶν ὀδόντων θραυόμενοι, μετὰ δὲ τὴν θραύσιν ἄρεοι καὶ χαυνοὶ φαινόμενοι. παρὰ δὲ τὴν ἐργασίαν, ὅτι ὁ μάλα ἐζυμωμένος καὶ τεθλιμμένος ἄρτος εὐπεπτος· καὶ ὁ συμμέτρως μετέχων τῶν ἀλῶν λυσιτελέστερος, καὶ μάλιστα ὁ ἐν κλιβάνῳ εἰργασμένος. Παρὰ δὲ τὸ πῦρ, ὅτι τὸ πλεῖον τοῦ δέοντος πυρὸς εὐθὺς ἐν τῇ πρώτῃ προσβολῇ τὴν ἐκτὸς ἐπιφάνειαν ὀστρακοῖ. καὶ συμβαίνει κατ’ ἄμφω, μοχθηρὸν γίνεσθαι τὸν ἄρτον, ὡμὸν μὲν καὶ ἀκατέργαστον ἔχοντα τὸ ἔνδον, ὑπερωπτημένον δὲ καὶ ξηρὸν τὸ ἔξω. τὸ δὲ ἔλαττον τοῦ συμμέτρου πυρὸς οὐ κατεργάζεται καλῶς τὸν ἄρτον, ἀλλ’ ὡμότερον ἀπολείπει καὶ μάλιστα τὸ ἔνδον. ὅσοι δὲ τῶν ἄλλων ἄρτων ἐν συμμέτρῳ πυρὶ πλείονι χρόνῳ δι’ ὅλων ἑαυτῶν ὁμαλῶς ὀπτηθῶσιν, οὗτοι καὶ πέττονται κατὰ τὴν γαστέρα κάλλιστα καὶ πρὸς τὰς λοιπὰς ἐργασίας ἐπιτηδεϊότεροι γίνονται.

Food from bread differs in four ways in association with the material from which it is made, that is, the grain, the way the bread is prepared, the heat at which it is baked, and also in the way it is used. Considering the material, breads from grain are best when they have a thick and firm nature so that they are hard to chew. These breads provide more nourishment. Those that are lighter in colour than others are also better. In opposition to these are the breads that are easily broken down by the teeth and after chewing seem thin and spongy. Considering how the bread is prepared, the bread that is quite well leavened and kneaded is easily digested. Lower-cost bread is mixed with the right amount of salt, and the best bread is made in an oven. Considering the heat, the excess of proper heat immediately creates the appearance of a hard shell when put in the oven. Because of these two things it turns out that the bread is spoiled, being raw and unbaked on the inside, and being overbaked and dry on the outside. Now, too little of the proper heat does not bake the bread well, but leaves it too raw, especially

⁴⁹ Langkavel, *Simeoni Sethi*, 18–19.

on the inside. Such breads as are baked equally throughout at the right temperature for a longer time are digested better by the stomach and are more fitting for the other functions.

This text provides another context for the underbaking of bread, an operation that may be identical to the one in the ζύθος recipe. In it we have the adjective ὠμότερον closely collocated with the same noun ἄρτον. The uses of ὠμότερον in the ζύθος recipe and in Simeon Seth are syntactically parallel.

(ζύθος recipe): λοιπὸν ἄλεσον καὶ ποιήσον ἄρτους προσβάλλων ζύμην ὥσπερ ἄρτον· καὶ ὅπτα ὠμότερον· καὶ ὅτ' ἂν ἐπανθῶσιν, διάλνε ὕδατι γλυκεῖ καὶ ἥθμιζε διὰ ἥθμοῦ ἢ κοσκίνου λεπτοῦ.

Grind the remainder and make bread, adding leaven as for bread. And bake it incompletely; and when it rises, break it up into fresh water, and strain it through a strainer or fine sieve.

(Simeon Seth): τὸ δὲ ἔλαττον τοῦ συμμέτρου πυρὸς οὐ κατεργάζεται καλῶς τὸν ἄρτον, ἀλλ' ὠμότερον ἀπολείπει καὶ μάλιστα τὸ ἔνδον.

Now, too little of the proper heat does not bake the bread well, but leaves it too raw, especially on the inside.

The attributive adjective is used substantively, with ellipsis of its noun since that noun is easily supplied in context, separated from the substantive by a conjunction. In the ζύθος recipe, the verb directly precedes its object ὠμότερον and in Simeon Seth the verb directly follows it. Being guided by this text suggests that the bread in the ζύθος recipe should be baked at a lower temperature until it rises but is not baked through, before it is broken up into a fermenting vessel. The alchemical recipe is therefore similar to *bouza* preparation in this regard and not similar to *t'alla* preparation.

My investigation has turned up a culinary use of the word in question, applied to bread, where it means 'too raw,' in a text roughly contemporary with **M**, and this is cogent evidence that ὠμότερος in the ζύθος recipe means 'incompletely.' Simeon Seth's use of ὠμότερος suggests that the scribe who added the ζύθος recipe to **M**, or who composed that recipe, is likely to have understood ὅπτα ὠμότερον to mean 'bake it incompletely,' based on other middle Byzantine texts that contain recipes and notes about the preparation of food and drink.

I think we can take this one significant step further and say that

the word ὠμός and all its derivatives properly mean ‘uncooked’ when referring to food and drink in ancient and Byzantine Greek.⁵⁰ Their metaphorically extended meanings do not apply to food but are recruitments of the culinary sphere to describe other things, such as a fierce quality in animals and human beings. The metaphor likens this ferocious quality to food which has not been subjected to the cultural transformations of cooking.⁵¹ As some food is not fit for consumption because it is raw, so are some other things in our experience unmitigated and thus harsh, unpleasant, and frightening. There is no reason to import the metaphorical meaning of ὠμός back into the culinary sphere. Thus, as it stands in the alchemical text, ὅπτα ὠμότερον means ‘bake it incompletely’ or ‘bake it rawer [than usual].’

5. *Linguistic Considerations II: Ancient and Byzantine Greek κλουβός ‘cage’*

The word κλουβός ‘cage, cell, cave, kiln (?)’ at line 6 the ζύθος recipe introduces another problem of interpretation and in this section I explain the conjecture κλίβανος ‘bread-oven, large earthenware vessel with a lid’ in its place. The word κλουβός is first attested in Greek, in its earlier form κλωβός, in the Aesopic works of Babrius from the second century CE (Babr. 2.124.3), where it means ‘bird-cage.’ The word is a borrowing from Hebrew קֶלֶב *kēlūb* ‘cage, basket.’⁵² It is used in Greek mostly with the same semantics, but expanded in the context of early Christianity (4th century CE) with reference to the antics of ascetics like Anthony of Egypt and his follower St. Hilarion, who lived in cages, caves, or cells.⁵³ These earliest, second-century witnesses to the word show that it appears first in Greek-speaking authors from Syria (Babrius) and Egypt (Di-

⁵⁰ *LSJ*, s.v. ὠμός.

⁵¹ Goody, *Cooking, Cuisine, and Class*, passim; Lévi-Strauss, *The Raw and the Cooked*, passim.

⁵² Beekes and van Beek, *Etymological Dictionary*, 719; *LSJ*, s.v. κλωβός; Sophocles, *Greek Lexicon*, s.v. κλουβός; Chantraine, *Dictionnaire*, s.v. κλωβός; Grimme, “Hethitisches im Griechischen,” 19.

⁵³ E.g., Philostorgius 10.11.9 for St. Anthony; see Winkelmann, *Philostorgius*. See Lampe, *Patristic Greek*, s.v. κλουβός, for a ‘monk’s cell.’

onysius Periegetes and Herodian).⁵⁴

The problem is that, in order for the word to make sense in the ζύθος recipe, it must be a vessel capable of holding a large amount of liquid, making it a *hapax legomenon* in this meaning.⁵⁵ It must be something that can be the object of the verbs ἔψω ‘heat, boil,’ θερμαίνω ‘heat,’ περισκεπάζω ‘cover,’ and ἀνακρίνω ‘inspect, check.’ The difficulty of this word was identified already in the work of Jacob Meursius (1614) and Thomas Reinesius (1640). Reinesius conjectured the meaning ‘ahenum,’ i.e., aenum, ‘a bronze or copper vessel,’ for κλουβός (Reinesius 1640: 483), rejecting the general uncertainties about the word found in Jacob Meursius (1614: 249). Gruner followed Reinesius in this interpretation. This conjecture is based on nothing other than the correct realization that κλουβός must be a vessel. An aenum is not necessarily a large vessel or one with a cover, and it seems that Reinesius is relying on his knowledge that copper vats were used in later European brewing.

One document where κλουβός also has an unusual meaning provides a potential clue to its meaning in the ζύθος recipe. A papyrus from the fifth or sixth century CE includes, on a list of items loaded on a ship for a journey, one κ[ύθρ]α ἀπὸ κλουβοῦ, ‘pot from the kiln (?)’ (*POxy.* 16.1923.14).⁵⁶ The editor here conjectures a new meaning for κλουβός.⁵⁷ The restoration κ[ύθρ]α is reasonable in context, since this word is used at least two further times in the manifest to refer to generic containers for various foodstuffs, without need for restoration, and possibly as many as five times, including the restorations. The designation ἀπὸ κλουβοῦ may mean an empty and unused pot, fresh from the kiln, but we are on firmer ground with the interpretation that this pot comes from some sort of cage in which it was stored.

The papyrus editor’s conjectured meaning ‘kiln, oven’ may not

⁵⁴ Babrius 2.124.3; Dionysius Periegetes, *Ixeuticon*, 1.1, see Garzya, *Ixeuticon*; Herodian, see Boissonade, *Herodianou Epimerismoi*, 72, line 5.

⁵⁵ Gruner, *Zosimi Panopolitani*, 16, says it is used here in an almost unheard of sense of the word.

⁵⁶ Grenfell *et al.*, *The Oxyrhynchus Papyri*, XVI, 201.

⁵⁷ There is a second papyrus that seems to use the word, in the variant spelling χλουβοῦ, in the same meaning: P.Berl.Sarisch. 22.3 (7th century CE): ἀπὸ χλουβοῦ β, “two from the oven/kiln[?].”

seem particularly helpful in clarifying the meaning of κλουβός in the ζύθος recipe, but if we consider these texts together, a solution presents itself. It is clear that ‘cage, cell, or cave’ does not work well for either instance of κλουβός. The two unusual meanings together, kiln/oven and large vessel, point to another ancient Greek word with similar phonetics.

Κλίβανος or κρίβανος is also used in alchemical preparations.⁵⁸ It is a ‘covered earthen vessel, wider at bottom than at top, wherein bread was baked by putting hot embers round it,’ ‘potter’s oven,’ i.e. ‘kiln,’ ‘hollow, cavern in a rock,’ and, according to Dalby, “a portable, dome-shaped earthenware oven whose most obvious use was to bake bread.”⁵⁹

Two possibilities emerge to explain the use of κλουβός to mean a large vessel capable of containing liquid, brewing beer, and being heated from the outside as it is in the ζύθος recipe.⁶⁰ Firstly and most likely (Possibility 1), the scribe responsible for the ζύθος recipe in a hypothetical earlier source or the scribe responsible for adding it to **M** may have intended to use the word κλίβανος, which appears elsewhere in **M** in alchemical preparations. A review of all uses of κλωβός, κλουβός, κλίβανος, κρίβανος and their variants and derivatives reveals that the κλ- spelling for κλίβανος is the only one found in Egypt, and so one writing κλίβανος in the transcription of an alchemical recipe, from an oral or a written source, may confuse it with κλουβός, just by an accident of copying.⁶¹ I note also

⁵⁸ Martelli, “Greek Alchemists,” 309 and n. 138.

⁵⁹ *LSJ*, s.v. κρίβανος. Dalby, *Tastes of Byzantium*, 101; Martelli, “Greek Alchemists,” 309.

⁶⁰ Dalby, *Tastes of Byzantium*, 101, makes it clear that the heat was applied to the κλίβανος from the outside.

⁶¹ The chief reason I prefer Possibility 1 is based on further general observations on the use of κλουβός in Greek literature. Among the texts indexed in *Thesaurus Linguae Graecae*, κλουβός/κλωβός or its derivatives κλουβίον/κλωβίον, and yet others that are not treated in our ancient or Byzantine lexica, such as κλουβίς/κλωβίς and κλουβάκις, appear 158 times in sixty-four works. The majority of these texts are Byzantine and ecclesiastical and therefore are reasonable comparanda for the ζύθος recipe. Κλωβός and its derivatives appear eighty-two times in thirty-three works and κλουβός and its derivatives appear seventy-six times in thirty-one works. The balanced distribution of the two forms suggests that they are spelling or dialect variations of a reasonably

that κλουβός, not κλωβός, is the variant of that word used in Egypt. Similarly, a scribe working with **M** may make this spelling or word choice mistake when writing the ζύθος recipe on a blank page in the codex; the scribe made several other spelling mistakes, as specified in the edition printed above.

Secondly, and more susceptible to scholarly scrutiny (Possibility 2), the semantics of κλουβός may have shifted and expanded into fields occupied by κλίβανος in the Byzantine period by the well-known process of reinterpretation that is especially common in loan words.⁶² In this case κλουβός became a semantic doublet for κλίβανος; its semantics and pragmatics were contaminated by or assimilated to those of κλίβανος through a process of reinterpretation by folk etymology. Κλουβός, a word that originally meant ‘cage,’ and later meant ‘cave,’ became associated with another word that meant ‘cave,’ i.e. κλίβανος, and, because of similar phonetics, was sometimes used to refer to other meanings of κλίβανος, such as ‘kiln/oven’ and ‘covered earthen vessel.’⁶³

Phonetically, the two words begin with the fairly detailed pattern [κλ-V-β-V-] and differ only slightly thereafter. The alternation of the sound represented by Greek iota and that represented by the Greek diphthong omicron-epsilon is well-attested in world languages because they share a high, front articulation. We see an example of this alternation even in the ζύθος recipe, where the scribe writes τίλη when clearly intending to write τόλη, ‘cushion.’ The point here

well-known range of objects, larger and smaller as determined by the use of the simplex form or of the diminutives in -ις, -ίον, and -ακις. Κλουβός is the Egyptian form and κλωβός is more common elsewhere in the Greek-speaking world. This data shows that κλουβός never replaces κλίβανος in broad usage. If it assimilated the broader semantics of the latter word, according to Possibility 2, there is no evidence it replaced it, except the potential that it did in the ζύθος recipe. Papyrological evidence witnesses the continued use of both words; in these everyday contexts, κλουβός never displaces κλίβανος or κρίβανος. In every text κλουβός/κλωβός means some variety of cage, for animals or people, until the Saint’s life of Athenogenes in Maraval, *Passion inédite*, where the persecuted Christians of Cappadocia refer to the church as the κλωβός in secret meetings.

⁶² Anderson, “Historical Linguistics,” 237.

⁶³ For the meaning ‘cave,’ see Lampe, *Patristic Greek*, s.v. κλουβός.

is that the assimilation of κλουβός to κλίβανος is much more likely to occur in Egypt, where these forms of the words occur, and much less likely to occur in Anatolia, where κλωβός and κρίβανος are more common. The reasons that Anatolia is not likely to be the site of this possible assimilation is both because the vowel represented by omega rarely alternates with the vowel represented by iota due to their differential articulation and because the rho in κρίβανος is very unlikely to support the assimilation of κλουβός to the former word, though alternation of the sounds corresponding to rho and lambda are common in Greek and globally, as we see in κλίβανος/κρίβανος.

Three phenomena can be identified that may have conditioned the semantic shift: 1) both κλουβός and κλίβανος are containers; 2) both words can mean ‘cave;’ 3) both words have a similar phonetic shape. Each of these factors may have prompted Greek-speakers to associate the words. Κλουβός in the ζύθος recipe is a large, coarseware ceramic vessel with a cover, which is set in coals to heat it. It is used as the fermenter for ζύθος. Similar vessels are used for baking bread and for firing small ceramics. Κλουβός in the ζύθος recipe means κλίβανος, and it comes to do so by one of the two processes I outline above.⁶⁴

⁶⁴ The following comparanda are in support of Possibility 2, the reinterpretation of κλουβός that I consider less likely than Possibility 1. Ancient Greek κάδος ‘jar, vessel’ is an early, post-Mycenaean loanword from West Semitic *kd* (Beekes and van Beek, *Etymological Dictionary*, 614; Masson, *Recherches*, 44; Lewy, *Die Semitischen*, 102; Muss-Arnolt, “Semitic Words,” 89). The word *kd* ‘jar’ is found in Ugaritic, Phoenician/Punic, Hebrew, Aramaic, and beyond (del Olmo Lete, *A Dictionary*, 424). It appears in Archilochus F 4 West, in Anacreon F 17, in a Cypriot Syllabic inscription from Salamis dated around 600 BCE, in Herodotus 3.20, in Sophocles, Aristophanes, and so on. It becomes an extremely productive word in Greek, generating about a dozen derivatives including formal units of liquid measurement, implements and procedures for voting, and designations of a variety of different vessels for drinking, storing, measuring, and for deposition in tombs (*LSJ*, s.v. κάδδιχος, κάδδος, κάδιον, and κάδος). The derivatives reveal that their meanings have been contaminated by the semantics of other, phonetically similar Greek words. The uses of the variant κάδδιχος ‘jar, κάδος’ reveal that it was reanalyzed by Greek-speakers to be composed of two prepositions or adverbs, κατά ‘down, according to’ and δίχα ‘in two, split, apart from’ (Beekes, *Etymological Dictionary*, 614). This new understanding promoted the

6. *Pragmatic Considerations: κλουβός and κλίβανος in the Alchemical Corpus*

Probably the strongest evidence that κλουβός means κλίβανος is the appearance of κλίβανος elsewhere in **M** and elsewhere in the alchemical corpus. In a technical treatise on dyeing leather in the Persian style found at **M** f.118r-v, the text instructs the reader to place a liquid preparation in a terracotta vase, and then to place this vase in a κλίβανος preheated to a very hot temperature, and to use this oven for the final preparation of the substance in the vase.⁶⁵ We have here a parallel for the use of a κλίβανος in a technical treatise in **M**, similar to the ζύθος recipe. The κλίβανος is not a receptacle

use of the word in measuring and in voting, as the notions of the underlying Greek words relate to dividing, halving, discriminating, and decision-making. Moreover, some forms of the Greek verb καταδύω, ‘go down, plunge into, sink away, be overcome with shame,’ are nearly homophonous with κάδος-derivatives (καδδύσαι, epic feminine nom. aorist participle < καταδύω), which seem, again, to conceptually support the expansion of the use of these derivatives in measuring and voting. The ubiquitous Latin word *urna* is a loanword from ancient Greek ὕρχη ‘an earthen vessel for pickled fish,’ which, in turn, is very likely a loanword from West Semitic (Lewy, *Die Semitischen*, 102; Muss-Arnolt, “Semitic Words,” 90-91). The semantic contamination of interest takes place in the Latin language, where the centrality and semantic expansion of *urna* seems supported by the pre-existing Latin word *urinor*, -ari. As Varro explains with his folk-etymologies, *urnae dictae, quod urinant in aqua haurienda ut urinator. urinare est mergi in aquam* (Varro, *De Lingua Latina*, 5.126.4-5.127.1 in Goetz and Schoell, *M. Terrenti Varronis*. The Latin verb *uro*, -are, seems similarly to support the wide use of *urna*, particularly in funerary contexts. See Quintilian, *Declamationes Maiores* 10.2.6-10.2.7 in Håkanson, *Declamationes XIX Maiores: ...nunc tenebras inanis et longas oculis flentibus noctes iuxta somnum mariti pervigil et tantum deserta metitur, [non desiderio fictus aut fucatus habitu nec, ut somniorum vanitate conspicitur, sed experta non totum mori hominem illud, quod nec flammis uritur nec cineribus extinguitur nec urnis sepulcrisque satis premitur, expectat] nunc ista carcere obseratam animam et repugnantem magico iuvenem cogitat ferro...*

⁶⁵ See preliminaries on these technical treatises above. I note that this one, unlike the ζύθος recipe, demonstrates knowledge of Arabic alchemical traditions in its mention of νατήφ ἐν Αράβοις; Halleux and El Gammal, *Les alchimistes grecs*, IX, 46, line 11; see Roberts, “Framing a Middle Byzantine,” on the evidence of Arabic in the Greek alchemical tradition; Κλίβανος is used three times in this sentence at **M** f.118v, and there is no doubt that the intended meaning is ‘bread oven.’ See Halleux and El Gammal, *Les alchimistes grecs*, IX, 46, lines 15-18.

for liquid in this recipe but it shows that this terracotta oven was known as an alchemical tool among those preparing various substances. A treatise for dyeing leather is not in its nature so different from a treatise on brewing beer. They may each have made their way into **M** in a similar way. Because of the Arabic influence on this text, it could not have been collected in Egypt as part of the original activity of recording and collecting that has been hypothesized under Heraclius, but it was probably included in **M** by the originator of the codex in the tenth or eleventh century, copied from an unknown text with Arabic influence.

In this recipe we have three uses of κλίβανος, meaning bread-oven, which relate to the single use of κλουβός in **M**. Two technical treatises, one certainly showing Arabic influence (leather), the other lacking evidence of Arabic influence (beer), both make reference to a large vessel capable of containing liquid. The leather recipe names this κλίβανος, and uses it in one of its unmarked uses, as a bread-oven, but this time it is used to heat liquid contained in another vase. The beer recipe names its vessel κλουβός, a word that does not elsewhere signify a vessel capable of containing liquid, unless, in the papyri, κλουβός refers to a ‘kiln’ quite similar to a κλίβανος. This is not the track I pursue here. I think that the copyist or author of the ζύθος recipe meant to write κλίβανος but wrote κλουβός instead. An emendation correcting κλουβός is warranted by the evidence I present here and below.

Advances in digitization have put the text of **M** at our fingertips. I present here the portion of **M** f.118v containing the three uses of κλίβανος, followed by the text showing κλουβός in the ζύθος recipe.

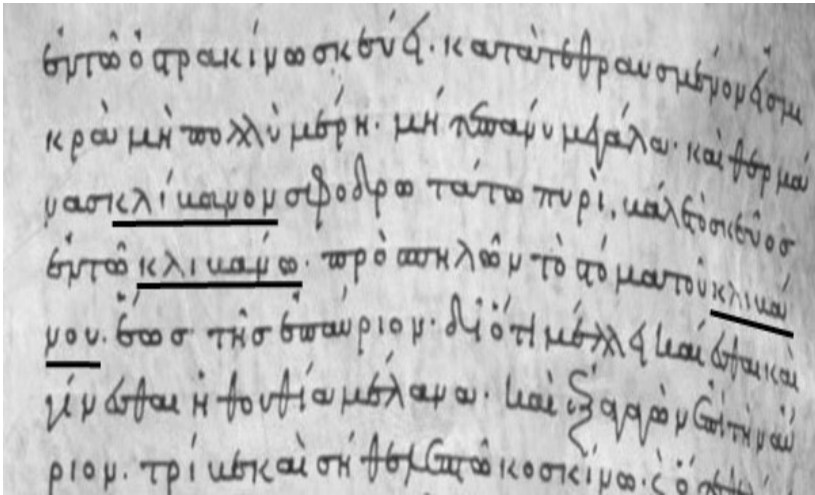


Figure 1: The three uses of κλίβανος, indicated by underlining, in the recipe for dyeing leather at **M** f.118v.

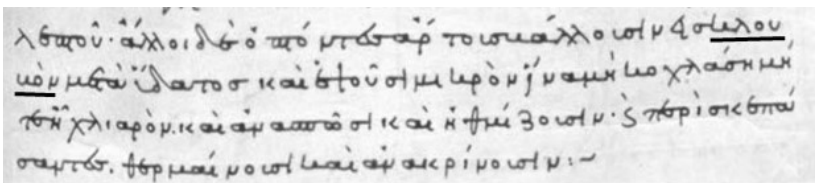


Figure 2: The single use of κλουβός at **M** f.162r, indicated by underlining.

We can note by seeing these together that the hand that copied the text on f.118v is not the hand that added the ζύθος recipe. Note the differential kappas at the head of the words in question and the deluxe clarity of the text at f.118v in comparison to the greater economy of space at f.162r.⁶⁶

There is no difficulty in distinguishing κλουβός from κλίβανος here. It is not my contention that we have misread κλουβός. The text says κλουβός but cannot mean κλουβός, because this must be a vessel for fermenting beer. My contention is that the scribe wrote κλουβός while intending to write κλίβανος, with which the scribe was familiar from reading the texts in **M**, and I have emended the

⁶⁶ The very high quality of the main text of the codex is noted in Roberts, “Framing a Middle Byzantine.”

text of the ζύθος recipe to reflect this.

Two technical treatises found in the thirteenth-century alchemical codex **B**, *Parisinus Graecus* 2325, demonstrate uses of the object κλίβανος that are even closer to the vessel in the ζύθος recipe. In a recipe detailing various treatments of pearls at **B** f.156r-159v, mentioned above as one of the alchemical uses of ζύθος, there are four preparations for whitening pearls. Two of these involve ζύθος, specified at 8.4 and 8.11.⁶⁷ One at 8.9 involves ‘milk of a white dog’ as the operative liquid, reminding us of the names of ‘divine water’ discussed above.⁶⁸ The fourth treatment for whitening pearls instructs the reader to combine the pearls with bread dough and bake in an oven or a κλίβανος ‘bread-oven,’ and that will whiten them. This technical treatise reveals that alchemists had beer, ovens, bread-ovens, and dough at their disposal. It supplies a context for the association of ζύθος with a κλίβανος, an association that provides great clarity as an interpretive tool for the ζύθος recipe. One cannot combine underbaked bread and water in a cage and produce beer. One could easily repurpose the portable, lidded κλίβανος, which is ordinarily heated from the outside as specified in the ζύθος recipe, put partially baked bread and water in it, and use the lid that is a standard part of the κλίβανος to cover it for fermentation.

Based on this comparanda, I suggest that in the ζύθος recipe the alchemist underbakes the bread in a κλίβανος, then breaks it up and throws it back in the κλίβανος with water, this time heating it just a little. Time passes (likely two or three days) and the alchemist strains out the bread. Sometime after that (likely three or four days), the alchemist checks to see if it has fermented into beer.

In a late codex containing parts of the alchemical corpus, *Parisinus Graecus* 2327 (**A**), dated to 1478 CE, there is a recipe detailing the procedure for the ‘whitening of split arsenic.’⁶⁹ Part of the procedure is as follows.

καὶ λαβὼν σανδαράχην, λειοτρίβησον μετὰ ὄξους· Βαλὼν εἰς β' θήκας, βάλε εἰς κλίβανον, καὶ ἄρας τὴν αἰθάλην, ἔχε ἀρσενίκην καὶ σανδαράχην.

⁶⁷ Halleux and El Gammal, *Les alchimistes grecs*, IX, 177, 180.

⁶⁸ Halleux and El Gammal, *Les alchimistes grecs*, IX, 180.

⁶⁹ Berthelot and Ruelle, *CAAG*, II, 391 (Greek).

And taking the realgar, grind it to a fine powder with wood sorrel. Divide it into two boxes, toss them into the bread-oven, and having captured the vapour, you have realgar and arsenic.

I draw your attention only to the syntactic similarity of κλίβανος here to the use of κλουβός in the ζύθος recipe.

ἄλλοι δὲ ὁπτῶντες ἄρτους βάλλουσιν εἰς κλουβὸν μετὰ ὕδατος...

Others bake the bread and toss it into a κλουβός with water...

These uses of κλίβανος in the alchemical corpus, in the same syntactical position as κλουβός in the ζύθος recipe or associated with ζύθος in the procedures for whitening pearls, strongly suggest that our text of the recipe needs to be emended, replacing the non-sensical κλουβός with κλίβανος. I present a photograph of **M** f.162r below.

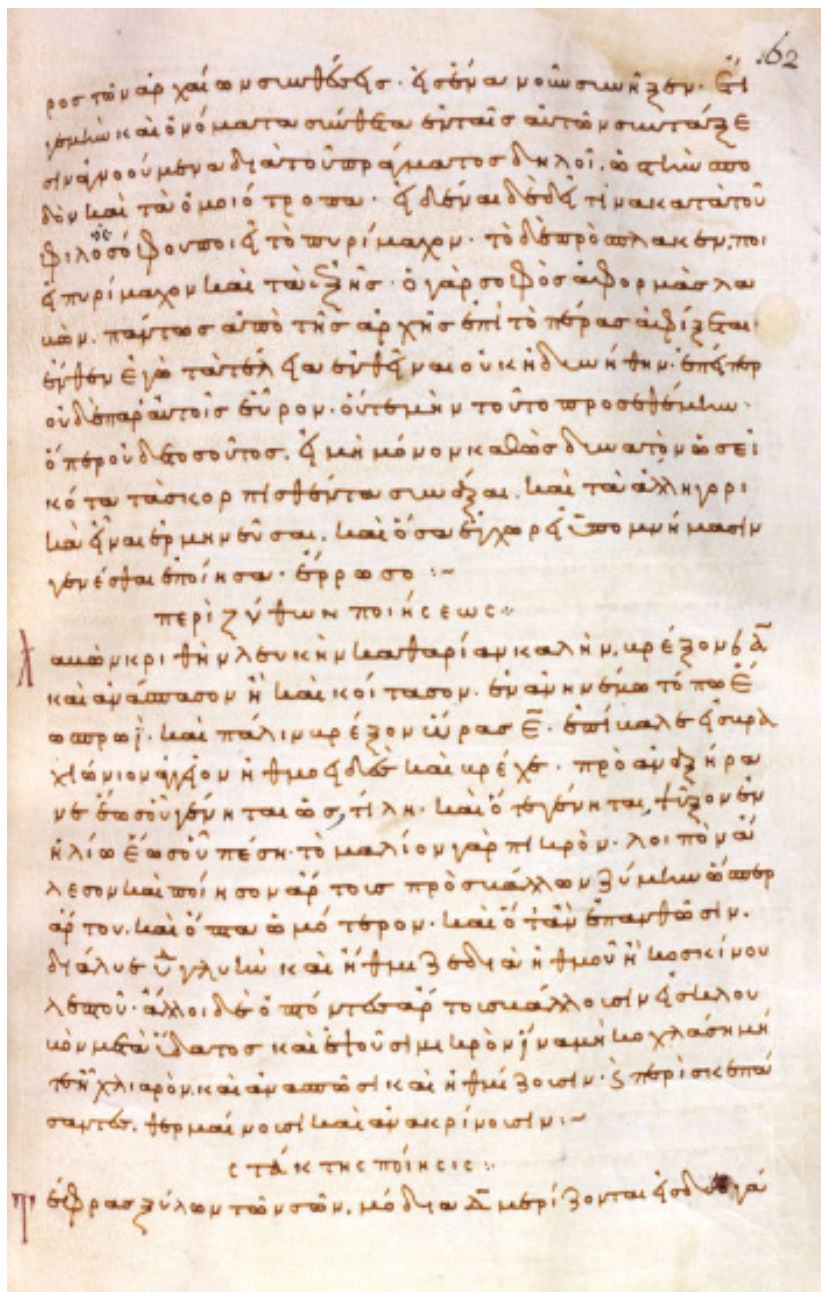
7. Conclusion

The ζύθος recipe is significant in the world history of food and drink but scholars have not reached consensus on its date, place of origin, relationship to the other texts in its codex, or the meaning of certain words it contains. By drawing together scholarship from Classics, Byzantine studies, and ancient Near Eastern studies I hope to have provided a starting point for future research on the recipe, which could be as early as the Byzantine Emperor Heraclius, about three hundred years later than the alchemist Zosimus, but many uncertainties about the date remain, meaning that it could be contemporary with its codex in the tenth or eleventh centuries, or could be yet later. References to ζύθος in genuine works of Zosimus are likely to have prompted the recipe's inclusion in *Marcianus Graecus* 299. The date of the recipe and its alchemical context suggest that it should be used in the reconstruction of ancient Egyptian or Mesopotamian brewing only as an ethnographic comparandum, not as a survival of brewing practices from millennia earlier. Byzantine parallels show that the ζύθος recipe specifies that the bread should be cooked incompletely before being added to the fermenter and that the word κλουβός should be read as κλίβανος, 'ceramic bread-oven,' in the recipe.

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Figure 3: Folio 162r of *Marcianus Graecus* 299.

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