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Origin of the Numerals on the St. Gallen Dated Coins of 1424

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Abstract

A numeral display in a tenth century manuscript that had resided in the library of the St. Gallen monastery is compared with the unusual characters on a Plappart of St. Gallen. The similarity of the numerals and characters on the Plappart strongly indicates that these characters are the intended date 1424. Another well documented Plappart of nearly identical design is dated using the contemporary Arabic numerals, typical of positional numbers of fifteenth century Europe.

Historical Background

Our modern Positional Numbers (PN) filtered into and across Europe from several sources and by different routes starting in the tenth century AD. Until the fifteenth century, Roman numerals dominated the expression of numbers including dates on coins and the amounts of money in ledgers. This article tracks two of the major players in disseminating PN, characterized by the nine numerals plus zero. These were medieval Italian bankers and merchants, and clerics of the Christian Church. To help appreciate and solidify the evidence for the evolution of PN in St. Gallen, this article provides background on the application of PN over time by the Italians and the Christian Church, their sources of information and the distinct symbols that each used to write the positional numbers.

Knowledge of PN in Europe progressed in isolated areas and with limited acquaintance or appreciation for its arithmetic mechanics and value. Roman numerals were only a representation of value while PN had the additional benefit permitting easy calculations without the need for a counting device, such as the medieval counting board or abacus. Northern Italians learned much about PN from visiting scholars, students, and translators from England, France and Italy itself on their long-term visits to Andalusia (Islamic Spain), especially Seville and Toledo, during the tenth to twelfth centuries. Among the earliest was the cleric Gerbert of Aurillac, born in southwest France, c 945. He returned home to Reims where he recorded his elementary and incomplete knowledge of PN. Gerbert taught other clerics how to add quantities using a collection of discs called counters, each inscribed with one of the nine numerals, which he manipulated on a board with columns. There was no concept of a zero numeral, which could be represented as an empty space on his counting board. Gaining great respect in Rome, Gerbert was elevated to Pope Sylvester, 999 until his death in 1003[1].

The Italian financiers of northern Italy, especially Genoa and Venice, ended their use of counter arithmetic, a method based on moving tokens on a marked surface, well before the invention of printing with moveable type and probably no later than c 1350[2]. Until the middle of the 12th century, northern Italians recorded Roman numerals in their ledgers. By the first quarter of the fourteenth

1 G. Ifrah, The Universal History of Numbers (London 2000 [1994]), p. 579.

2 F.P. Barnard, The Casting-Counter and the Counting Board (Oxford 1917), p. 105.

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century, northern Italians started to introduce long-distance payments, called bills of exchange[3]. At that time, they usually wrote Arabic numerals in their business accounts while the rest of Europe limited PN primarily to recording of dates and page numbers on manuscripts. More widespread among western Europeans during the fifteenth century, academics wrote Arabic numerals in astronomical tables[4]. One astronomical table, c 1452–1458, residing in the library of the St. Gallen monastery has a generous display of Arabic numerals[5]. Teaching and mastering of arithmetic with PN did not greatly improve until after 1482 when an anonymous author from Treviso, Italy released a primer on business arithmetic with PN. The Italian innovation of double-entry bookkeeping, which spurred the adoption of Arabic numerals in commerce, did not become prevalent among Italians and their European enclaves until the sixteenth century[6]. Until the first quarter of the 16th century, areas outside Italy retained Roman numerals and their counting boards or lined cloth. The guilds of counting specialists (commonly known as Rechenmeister in German) had promoted local laws forestalling use of PN in commercial ledgers[7]. Further discouraging PN, simplified notation such as plus and minus signs appeared only in the seventeenth century[8].

The influence of the Italians and their facility with PN can be traced along land trade routes leading east and west. The Italians dominated the Champagne Fairs, located to their west, in the 11th and 12th centuries[9]. They trekked laboriously with goods such as sugar and alum over the Alps. The path over the Alps to the area of St. Gallen was tortuous but feasible by the late 1300s. One of the major routes connected Bruges (now in Belgium), Basel, Zürich and St. Gallen[10]. In the twelfth through fourteenth centuries, Italian financiers managed the mining areas of Hungarian and German cities located to their north and east[11].

From 1297, Genoa and Venice mastered long-distance travel by ship carrying tons of goods. They mostly abandoned the routes over the Alps and sailed directly to the Lowlands and Bruges, the focal point for buying and selling goods from England, France, Spain and Italy, and by the end of the fourteenth century from German cities.

A strong disagreement concerning land interests existed between the farmers in Appenzell with the abbot of St. Gallen and his monastery, a separate entity from the town of St. Gallen. In 1424, Appenzell and the town of St. Gallen concluded a treaty[12]. The issuance of several varieties of 1424 dated Plappart coincided with the conclusion of this treaty. Possibly the town and the abbot struck separate issues to declare the right of each to strike coins.

Separate from commercial interests, the churches of western Europe created their own internal schools to train their clerics to read Latin and perform simple arithmetic. St. Gallen was one of the chief centers of monastic learning from at least the 10th century. For example, in this monastery, Notkker Labeo (c 950–1022) likely translated some of the arithmetic of the sixth-century Irish monk Boethius, who wrote on finger counting[13]. In 947, Otto I granted the abbot of the St. Gallen monastery a mint at Rorschach, 6 miles (about 10 km) away. The significance of Rorschach will be described later.

The depiction of the nine numerals plus zero in Europe evolved between their first recording in Spain in the tenth century and their continuing evolution in

3 P. Spufford, Power and Profit (London 2002), p. 71.

4 J. W. Durham, The Introduction of "Arabic" Numerals in European Accounting, in: Accounting Historians Journal 19/2 (1992), pp. 25–55. <http://www.accountingin.com/accounting-historians-journal/volume-19-number-2/the-introduction-of-arabic-numerals-in-european-accounting/>.

5 St. Gallen, Stiftsbibliothek (archive of manuscripts), Cod. Sang. 610, Ruler on page – Computistic Texts and Tables; Lives of Saints and Martyrs; Casus sancti Galli etc., <https://www.e-codices.unifr.ch/en/csg/0610/bindingRulerS>.

6 Durham (n. 4).

7 K. Menninger, A Cultural History of Numbers (Göttingen 1958 (German)), (Cambridge, MA 1969 (English)), pp. 426–427.

8 F. Cajori, A History of Mathematical Notation, Volume 1 (London 1928), pp. 201–216.

9 Spufford (n. 3), p. 69.

10 Spufford (n. 3), p. 230, map.

11 Spufford (n. 3), pp. 352–371.

12 Encyclopedia Britannica, www.britannica.com › place › monastery-of-Saint-Gall.

13 D. E. Smith, History of Mathematics (Boston 1923), p. 196.

the sixteenth century. Hill illustrated these abundant forms[14]. Ifrah remarked that many of these forms are similar except for their rotation. Church scribes typically tilted their parchment scrolls when copying text and probably accounted for the various rotations of the numerals[15]. The earliest forms are collectively called Gobar numerals, meaning "in the dust", because the Arabs wrote them on a powdered surface. By the thirteenth century the numerous hand-copied versions of the Gobar numerals took a different appearance, named Arabic numerals, a precursor to modern forms.

1424 St. Gallen Plappart
With Complete Date Using Arabic Numerals

The Arabic numerals were typical of those used by the Italian merchants and bankers from the middle thirteenth century. An example taken from Hill is shown in *Figure 1.*

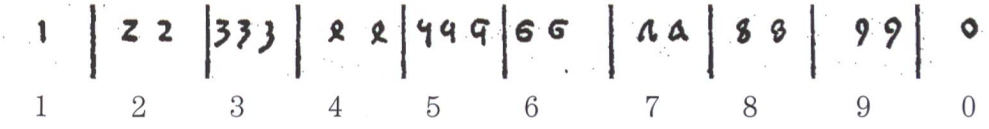

Figure 1: The nine positional numbers and zero from a collection of thirteenth century European manuscripts[16].

Starting in 1297, the merchants of northern Italy rerouted their commercial traffic from land to sea between Italy and Bruges. This logistical change suggests that at least rudimentary knowledge of PN, commonly applied by the Italians at Bruges, reached St. Gallen over the land route via Basel and Zürich by the end of the 13th century. These Italian merchants likely provided an awareness of PN in St. Gallen but not necessarily how to calculate with them. It cannot be ruled out that the Italian financiers and managers in the mining areas of western German cities had a role in informing St. Gallen, but this role would be less significant.

In 1424, St. Gallen struck a silver coin with a denomination called a Plappart shown in *Figure 2.* As noted in many sources, this is the first European coin struck with an Anno Domini date using PN[17]. The date uses the contemporary Arabic numerals. Re-enforcing the conclusion that Bruges was the source for the numerals, Zürich and Schaffhausen struck undated coins whose reverses were nearly identical to the 1424 Plappart of St. Gallen.

Figure 2: St. Gallen, Plappart, 1424, Arabic numerals, Leu Auction, 22 Oct, 2002, Levinson V-1a, illustrated coin from author's collection

14 G. F. Hill, The Development of Arabic Numerals in Europe (Oxford 1915), pp. 28–125.
15 Ifrah (n. 1), p. 586.
16 Hill (n. 14), Table 4.
17 R. Levinson, The Early Dated Coins of Europe 1234–1500, Second Edition (Clifton 2019), p. 231.

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1424 St. Gallen Plappart With Incomplete Date Using Gobar Numerals

The monastery of St. Gallen was quite insular. Its clerics relied on its extensive library copied from manuscripts in other ecclesiastical sources. This is clear from the 600+ online documents in St. Gallen's medieval library[18]. One manuscript in the St. Gallen library, now residing in a Zürich library, Zürich Universitätsbibliothek[19], displays one tenth-century form of the nine numerals plus zero, reproduced in the second row of *Figure 3*. These numerals are the second earliest recorded from Europe after those in the Spanish Codex Vigilanus, c 976, shown in row 1. (With the permission of the St. Gallen abbot during the fourteenth century, students removed several important manuscripts from the library. Also, Calvinists raided the library and scattered many of the older manuscripts)[20].

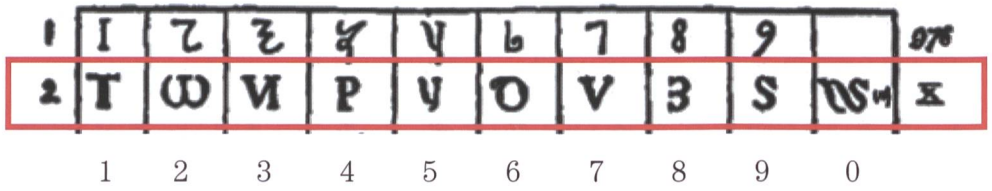

Figure 3: The first row is the earliest recorded positional numbers (lacking zero) in Europe, c 976, on the Spanish Codex Vigilanus. The second row is an extract from a tenth century manuscript in the St. Gallen library, and last reported in a Zürich library. It shows all the positional numerals including zero[21].

An example of a St. Gallen Plappart with clear lettering, *Figure 4*, appeared on the market in 2012. Levinson had described the date area as a "disaster"[22]. In the area where a date would appear, there were unidentified symbols followed by the contemporary Arabic form of the numeral four.

Figure 4: St. Gallen, Plappart, 1424, Gobar numerals, Sincona Auction, 23 May, 2012, Levinson V-1b

Possibly an engraver in St. Gallen or Rorschach first placed the second Arabic numeral 4 in the date, 1424, before proceeding to complete the first three numerals. A more likely case is that he received from another engraver in Rorschach an incomplete die with the Arabic numeral 4. He was not fully familiar with the western numerals and sought out a reference to complete the date. The numerals shown in the second row in *Figure 3* served his purpose.

The engraver did what he could to complete the first three numerals in the date, reproduced in *Figure 5*. Being unfamiliar with the numerals, he made clear errors. Since a typical practice among medieval copyists was to hold a document sideways, this rotation can explain why the second character, a numeral "2" in the Gobar date, is tilted from that in the tenth-century manuscript.

18 St. Gallen, Stiftsbibliothek (n. 5).
19 Hill (n. 14), p. 29, Note 2.
20 G. C. Alston, Abbey of St. Gall, in: The Catholic Encyclopedia (New York 1909).
21 Hill (n. 14), Table 1, rows 1 and 2.
22 Levinson (n. 17), p. 231.

Figure 5: The first two numerals on the Plappart appear to be a Gobar form of the 1 and 2 as in row 2 of the tenth century manuscript, followed by a space or unclear image, and concluding with the Arabic numeral 4. The numeral 2 is rotated from that in the manuscript.

Big and Little Bears

The design of the two date varieties of 1424 both show a standing bear at the foot of the saint. The appearance of the bear itself exists in two varieties, a big and a little bear. The Plappart in *Figure 2* showing an Arabic date has a large bear while another offered in an auction had a small bear[23]. The 1424 Plappart with the Gobar date in *Figure 4* shows a small bear. E. Tobler et al.[24] also showed the small-bear variety with a Gobar date although described as an Arabic date. The author is not aware of a Plappart with Gobar date and a large bear. At this time, no significance can be attached to the differences with the bear and the style of the date numerals.

Conclusion

In 1424, St. Gallen struck a silver coin with a denomination called a Plappart. As noted in many sources, this is the first European coin struck with an Anno Domini date using a style of Arabic numerals common in fifteenth century Europe. Italian merchants residing in Bruges in the late thirteenth century were the likely source for these Arabic numerals in St. Gallen.

St. Gallen also applied another style of positional numbers, which this article has identified as one form of the Gobar numerals recorded in a tenth century manuscript kept in the library of the St. Gallen monastery. Being unfamiliar with the Gobar numerals, the engraver incorrectly chose the numerals for the intended date of 1424.

Possibly the monastery at St. Gallen and the nearby mint at Rorschach had separate responsibilities for striking these two Plappart coins.

23 Münzen und Medaillen AG, Auction 71, 18–19 May, 1987, lot 1241.

24 E. Tobler – B. Zäch – S. Nussbaum, Die Münzprägung der Stadt St. Gallen 1407–1797 (St. Gallen 2008), p. 69, number 3a.

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