Stichometry as a Useful Tool in Reconstructing the Original Dispositions

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What is "Stichometry"? The term is not well known among scholars of the New Testament. *Stichos* is the written line in a Greek text, *metrein* means to measure. In Greek poetry, of course, the size of a poem is measured by counting the hexameters or the lines of other metres. But in prose? How can a reasonable person begin to count the lines of a Gospel or a Pauline letter?

In this paper I want to introduce the surprising discoveries that can be made. I think they have to be explained, but it's not possible just to ignore them.

Let me first make some observations. Then I will describe what we know about the ancient use of the *stichos*. A special field is the proportion of the so-called *golden ratio*, my third point. A demonstration of the stichometrical approach with reference to three New Testament books follows, before the summary of my thesis.

1. Early Observations

It began in spring 1973, more than 40 years ago. I prepared a seminar on Acts at Rice University in Houston, TX, and examined the structure of Stephen's speech in Acts 7. In looking at the Nestle text (at that time still the older 25th edition), I noticed by chance that two larger sections dealing with the Patriarchs (7:2-16) and with the time of Moses (7:17-34) seem to be of the same size. I counted the lines, and behold, they had 41 lines each.

Then I began to analyse the New Testament writings on the basis of the Nestle-lines. I could publish first results in my "Kompositionsanalyse des Markusevangeliums" in ZThK 1977. Among other things, I found that the Galilee section Mk 3:7–8:21 is exactly one third of the whole Gospel, 505 of 1515 Nestle-lines, and (after the opening summary in 3:7-12) the two semi-sections in 3:13–6:6a

and 6:6b–8:21 have 246 and 245 each, i.e., they are of equal size.[1] Of course, such sums depend upon delimiting the main sections. The caesuras must be discussed in terms of content. On the other hand, the proportions found by counting the lines can confirm a proposed outline.

In order to demonstrate that not only the author of Mark was interested in proportions, my article also contains similar results in John's Gospel and Romans: John 1–6 and John 7–12 (without 7:53–8:11, of course) have almost the same size, with about 624 and 636 Nestle-lines. In Romans, ch. 1–4, 5–8 and 12–16 (until 16:23) have 251, 255 and 262 Nestle-lines each; the two ethical sections Rom 12–13 and 14:1–15:13 have 80 lines each.[2] It seems that the ancient authors paid attention to the length of a text and its parts. How did they technically do it?

2. The Stichos *as Standard Line in Ancient Prose Texts*

The ancient *stichos* was rediscovered in classical philology in a series of extensive studies around the year 1880. I have described the results in my article of 1999: "Schreiben nach Maß. Zur Stichometrie in der antiken Literatur". I tried to include all available references and all the research I could obtain. This is what I learned:[3]

In Greek and Latin prose a standard line was used for measuring the size of books or of parts thereof. Presumably the Greek *stichos* was originally defined by fifteen syllables, like the average hexameter. The Latin *versus* had sixteen syllables, as the Greek *stichos* did explicitly in late antiquity. That the *stichos* was used by publishers for paying the scribes and calculating the prices is well-documented. Librarians used it for determining the original size of the books. There are also quite a few references indicating that stichometry helped the readers to find a particular passage.

In the manuscripts stichometrical information appears at three places. The subscription of a single writing very often contains the total of its *stichoi*, i.e., the so-called *Totalstichometrie*. The oldest references for the New Testament are in Papyrus 46 of the early 3rd century. At the end of Romans, e.g., one reads: *stich[ōn] Ἀ* = one 1000 of *stichoi*. Secondly, stichometrical sums are given in

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[1] F.G. Lang, "Kompositionsanalyse des Markusevangeliums", *ZThK* 74 (1977), 1-24, esp. 13, 10.

[2] Lang, Kompositionsanalyse, 17-18.

[3] F.G. Lang, "Schreiben nach Maß. Zur Stichometrie in der antiken Literatur", *NT* 41 (1999), 40-57, esp. 42-49.

bibliographical texts, e.g., in the biographies of Diogenes Laertius or in old lists of the biblical canon. Thirdly, in old manuscripts a letter of the alphabet is put on the left margin after units of 100 lines, the so-called *Marginalstichometrie*; the oldest biblical reference is Codex B Vaticanus (4th cent.) in some books of the Old Testament.

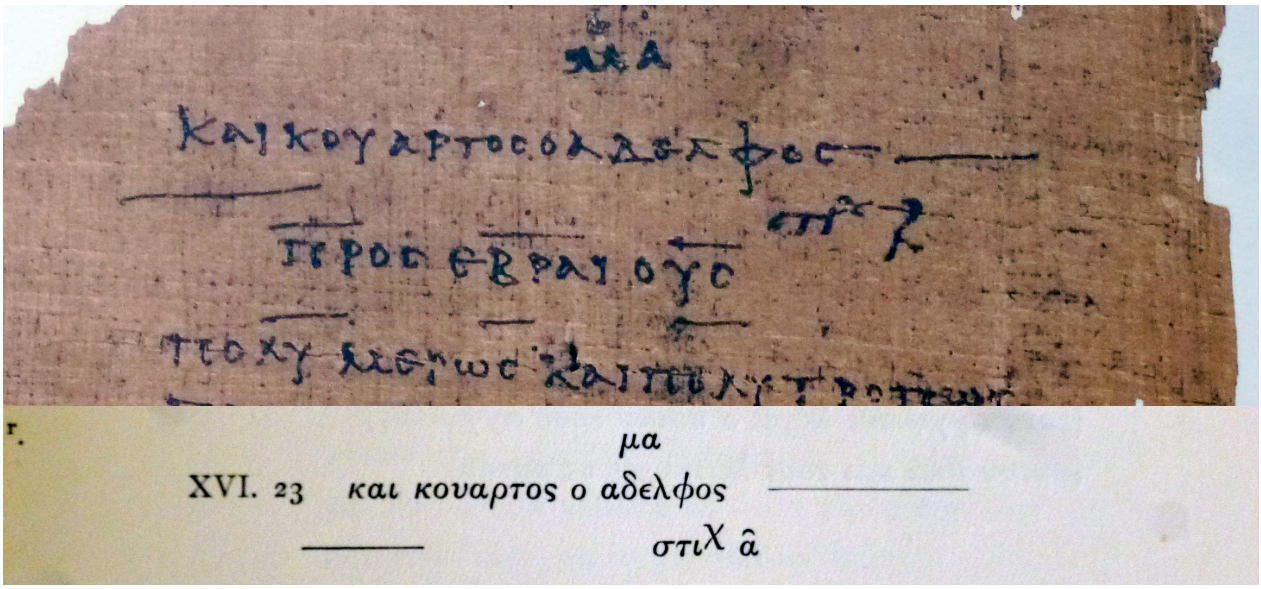

Fig. 1. Papyrus 46: Stichometrical subscription at the end of Romans

The age of this system is remarkable. The oldest author whose manuscripts contain stichometrical sums is Herodotus (5th cent. BC). The last Greek manuscripts with stichometrical sums were written in the late Middle Ages. The *stichos* was used for about 2000 years. The system disappeared with the downfall of Byzantium and with the invention of printing in the 15th century.

Thus far, this description of stichometry is accepted among classical philologists. Yet not all of them are aware that the *stichos* was also used by authors.[4] It served as the standard measure in rhetorical instruction and in literary production. There are three important proofs (quoted on my homepage): Menandros Rhetor (3rd cent. AD) taught his students, for example, that a funeral address should not exceed 150 *stichoi*. In Quintilianus (1st cent. AD) we learn that the *versūs* could easily be counted on wax tablets of one *versus* width. Finally, Josephus (1st cent. AD) estimated the size of his 20 books of Antiquities – generously rounded up – at 60,000 *stichoi*. Many other proofs are presented in my article of 1999. When writing a book the author had to decide about its genre,

4 Lang, Schreiben, 49-54.

including its size; its disposition implied the proportions of its parts. I contend that even the apostles and evangelists of the New Testament applied the *stichos*, as all educated authors did at that time.

3. How to Achieve the Golden Ratio

In analysing the disposition of Matthew, I was highly surprised to find the *Golden Ratio*. In the meantime I had shifted to the international edition of the *Greek New Testament* (*GNT*, 3rd edition 1975) since the new paragraphing of the Nestle-Aland edition of 1979 no longer fit my needs. The Sermon on the Mount was 240 *GNT*-lines, the following part about Jesus as wonder-worker was 147, so the ratio of Mt 8:1–9:34 and 5–7 was 147 / 240 = 0.6125, very close to the irrational number of the golden ratio, i.e. 0.6180339… Did this happen by chance or was it done intentionally? Later on, in analysing Acts, the same surprise: the first main section (after the prologue) 1:12–11:18 had 900 *GNT*-lines, the rest of the book 1457, the ratio is 0.6177…, even closer to the golden ratio.[5]

Similar proportions, by the way, were discovered by classical philologists in books of Plato, Isocrates or Lucian. In Plato's Phaedros we read the following maxim for the first time: "Every speech must be put together like a living creature, with a body of its own; it must be neither without head nor without foot, but it must have a middle and extremities that are fitting to one another and to the whole in the written work."[6] The phrase "have a middle and extremities" seems to allude to the Greek term of the golden ratio: "divide in the middle and external ratio".[7] The ancient authors were apparently used to dispose their books in such a way. Yet how were they able to achieve this proportion?

I happened to find a solution by counting the *GNT*-lines of Acts.[8] Several units of the outline are 18 lines in *GNT*, which turned out to be 21 *stichoi* of 15 syllables. 21 is a wonderful number. It can be divided by 3, but it is also the sum of 8 plus 13. So we get to a particular numerical series, the so-called *Fibonacci series*. Each number is the sum of the two numbers before: 1, 2, 3, 5, 8, 13, 21, 34 etc. The ratio of two successive numbers is more and more approaching the golden ratio, e.g. 5/8 = 0.625, 8/13 = 0.6153…, 13/21 = 0.6190…

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5 Lang, Schreiben, 40-41 with note 4.

6 Plato, *Phaidrus* 264C; cf. Lang, Schreiben, 55-56.

7 Euclides, *Elementa* 6, 30; cf. F. Seck, "Die Komposition des 'Panegyrikos' ", in: *idem* (ed.), *Isokrates* (WdF 351; Darmstadt 1976), 353-370, esp. 365-366.

8 Cf. F.G. Lang, "Ebenmaß im Epheserbrief. Stichometrische Kompositionsananlyse", *NT* 46 (2004), 143-163, esp. 150.

How old is this series? Is it possible that an ancient author used it? The terms *Fibonacci series* and *Golden Ratio* are relatively young, from the 19th century. However, the oldest reference for the series is in Nicomachos of Gerasa, that is 2nd century AD, and there is a well-founded thesis that Hippasos of Metapont, a disciple of Pythagoras, used it in developing the irrationality of the golden ratio in the 5th cent. BC.[9] So the series seems to be quite old, older even than Euclides, who taught how to construct the golden ratio geometrically.

Yet I must admit that there is no evidence in the ancient handbooks of rhetoric that the numbers of this series are to be used in disposing a book. Only by analysing the writings of the New Testament have I found proportions of this kind, and I found them everywhere (see my homepage). Apparently it was such a common tool among educated authors that they used it without writing about. It is the same in architecture or fine arts, where in analysing a sculpture like Polykleitos' Doryphoros one can detect many Fibonacci proportions, though theoretical instructions are missing.[10] Perhaps Polykleitos' theoretical book, his *Canon*, dealt with approximations, but it is lost.[11]

4. Proportions in Mark, Matthew and Acts

Let me demonstrate in a stichometrical cross-check how the Fibonacci series can explain the observations I made in the modern N.T. editions. The computer makes it possible to divide the Greek text of a book into lines of 15 syllables. The next step is the analysis of the structure according to content. That is the basis for the analysis of the proportions. I give you some results of three of the larger books.

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[9] S. Heller, "Die Entdeckung der stetigen Teilung durch die Pythagoreer" (1958), in: O. Becker (ed.), *Zur Geschichte der griechischen Mathematik* (WdF 33; Darmstadt 1965), 319-354, esp. 346; cf. F.G. Lang, "Disposition und Zeilenzahl im 2. und 3. Johannesbrief. Zugleich eine Einführung in antike Stichometrie", *BZ* 59 (2015), 54-78, esp. 70-73.

[10] Cf. D.E. Gordon / F. de L. Cunningham, "Polykleitos' 'Diadoumenos': Measurement and Animation", *Art Quarterly* 25 (1962), 128-142, esp. 128-129; Lang, Ebenmaß, 162 note 51.

[11] Cf. F. Hiller, "Zum Kanon Polyklets", in: *Marburger Winckelmann-Programm 1965* (Marburg 1966), 1-15, esp. 4 with note 8: "Bei jedem Werke wird das Schöne [ἐν ἔργῳ γε παντὶ τὸ μὲν καλὸν] gleichsam aus vielen auf ein Gesamtmaß ausgerichteten Teilzahlen [ἐκ πολλῶν οἷον ἀριθμῶν εἰς ἕνα καιρὸν ἡκόντων] kraft einer bestimmten Symmetrie und Harmonie zustande gebracht [ὑπὸ συμμετρίας τινὸς καὶ ἁρμονίας ἐπιτελεῖται]" (Plutarchus, *Moralia* 45c-d [De audiendo, 13], perhaps referring to Polykleitos' *Canon*).

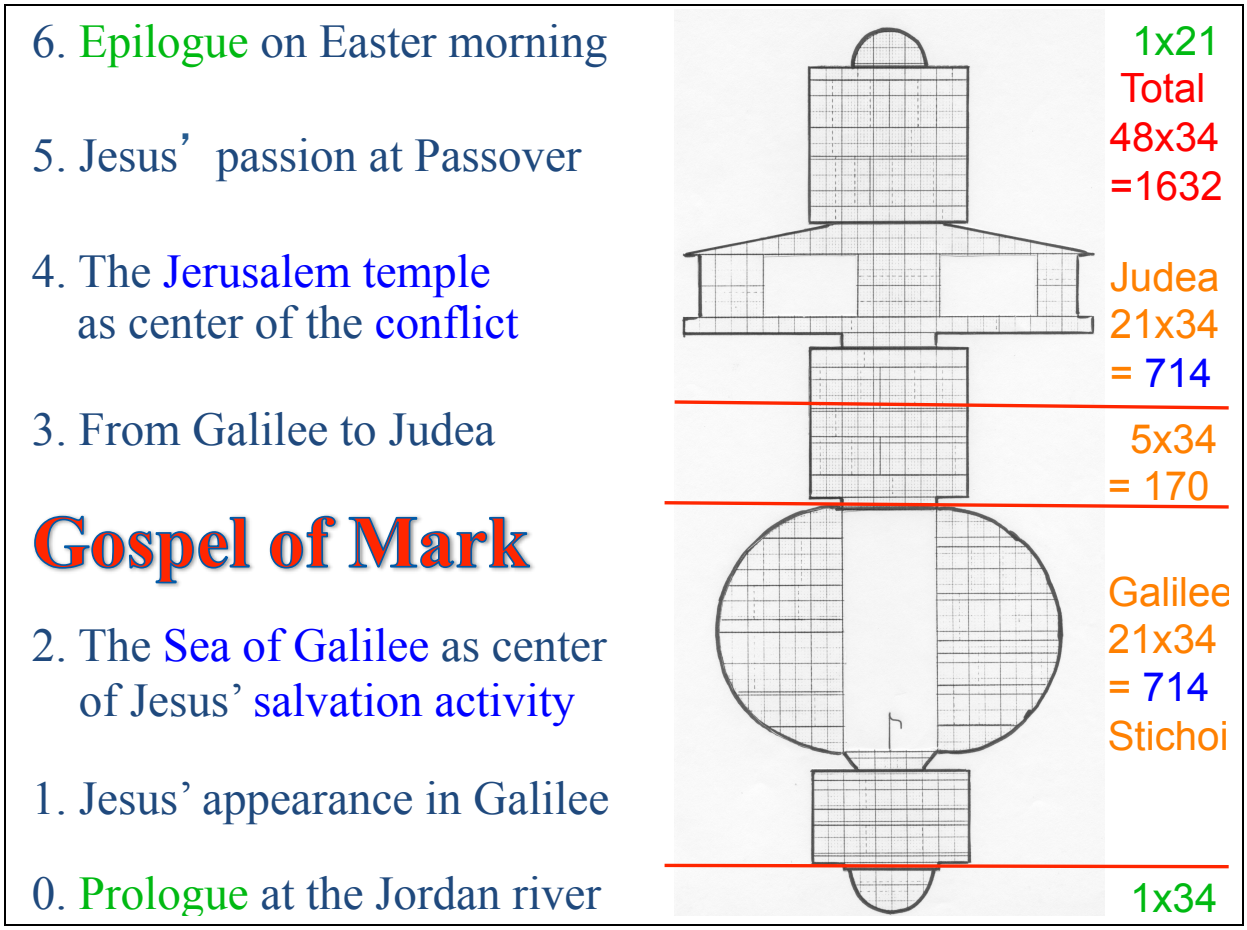

Fig. 2. The Gospel of Mark: Jesus' way from the Sea of Galilee to the Jerusalem temple

First, the Gospel of Mark. I have tried to visualize the way to the cross here. It begins with the prologue, the baptism at the Jordan River, then the two sections in Galilee. Then, after the journey to Judea, the two sections in Jerusalem and the epilogue on Easter morning. It is a nicely concentric composition. Here are the proportions:[12] The prologue with 34 *stichoi* indicates the *modulus*. The Galilee sections together are 21x34 *stichoi*, and the Judea sections (including ch. 10) have exactly the same size as well. The journey in between is 5x34, so that the total sum of Mark is 48x34. Please notice the *Fibonacci numbers*. Finally, epilogue and prologue are approximately in the golden ratio: 21 / 34. Isn't that a disposition similar to an artfully elaborated sculpture?

[12] Cf. F.G. Lang, "Maßarbeit im Markus-Aufbau. Stichometrische Analyse und theologische Interpretation" I/II, *BN* 140 (2009), 111-134; 141 (2009), 101-115: summarizing tables see I, 124-125.

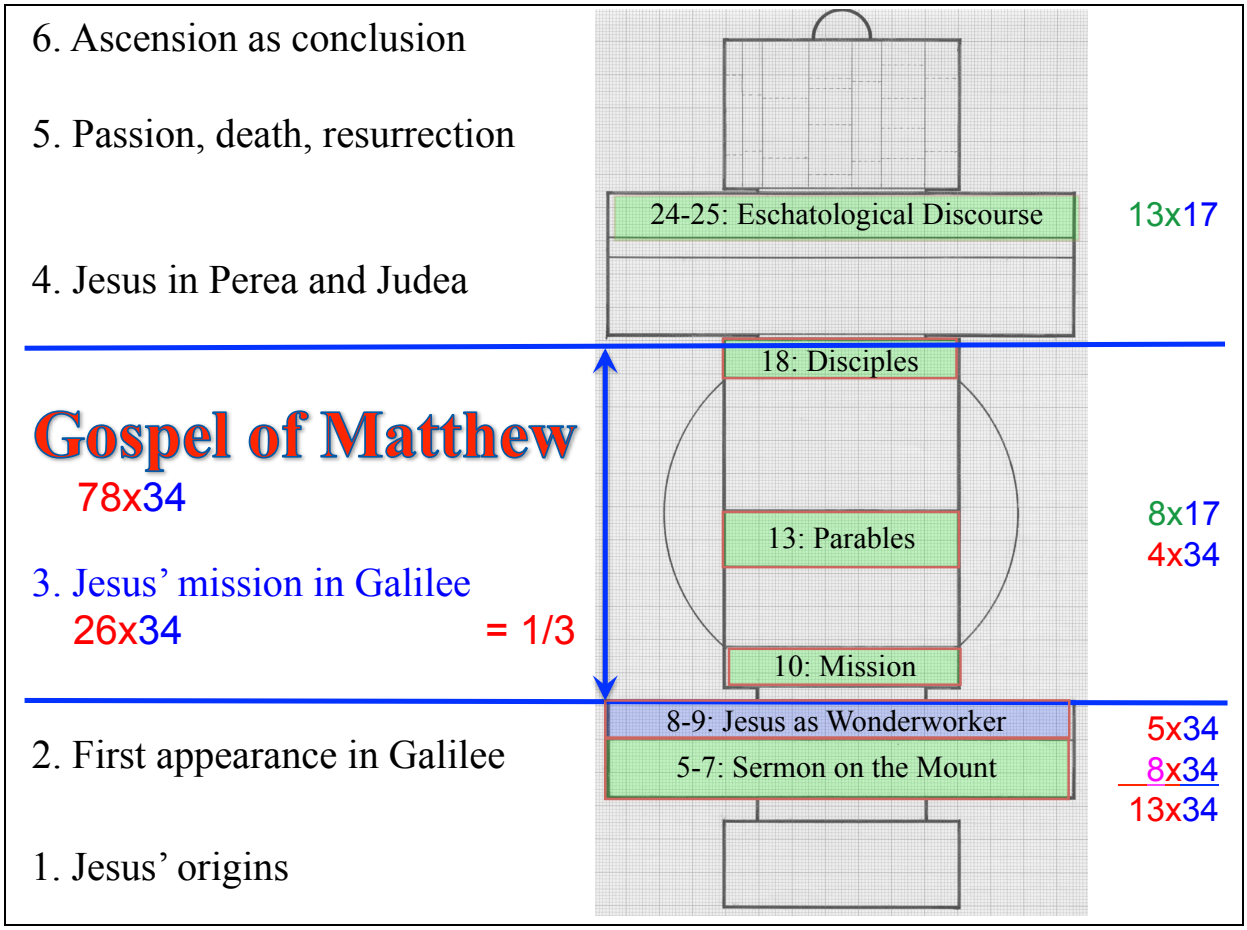

Fig. 3. The Gospel of Matthew: Jesus' teachings as the basis of the Church

My second example is the Gospel of Matthew. The outline is visualized as a floor plan of a cathedral with five main sections and an apse: at the beginning Jesus' origins, at the end his passion and resurrection, finally the ascension, in the middle the three sections of his public ministry. Typical in Matthew are the five great sermons structuring his activity from Galilee to Jerusalem. Now, some striking proportions: The middle section Mt 10-18 (beginning in 9:35) is exactly one third of the whole Gospel, with 26x34 of a total of 78x34 *stichoi*. The golden ratio between ch. 8-9 (until 9:34) and the Sermon on the Mount in ch. 5-7 is achieved by the Fibonacci numbers 5x34 / 8x34, the parables ch. 13 are half the size of ch. 5-7 (with 4x34), and the ratio between the parables and the eschatological discourse ch. 24-25 is 8/13. Matthew's beautiful concentric outline is also the result of a careful stichometrical disposition.[13]

[13] These observations are not as yet published, but see > Gliederungstabellen > Matthäus.

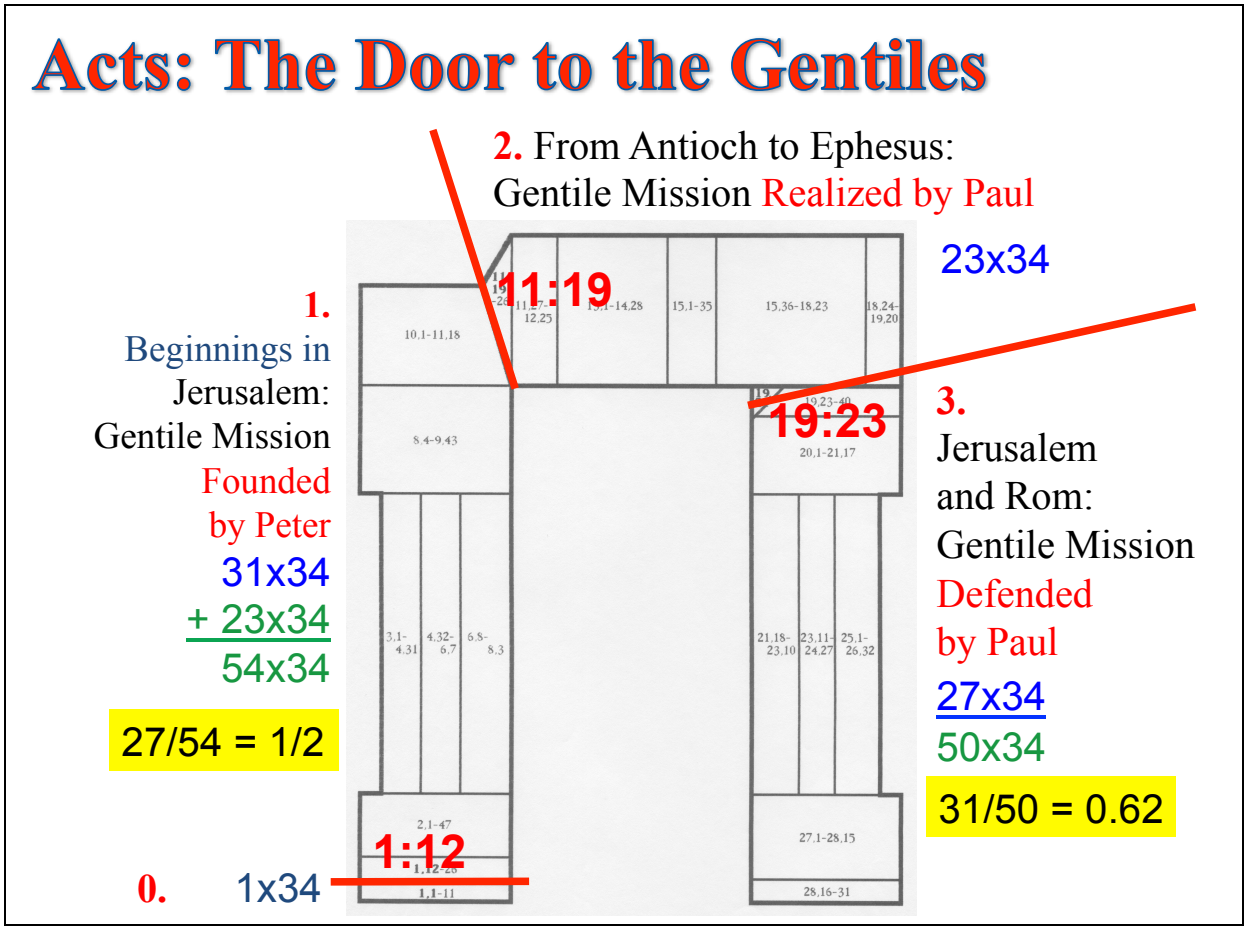

Fig. 4. The Acts of the Apostles: A door to the Gentiles (cf. 14:27)

Finally, for the main sections of Acts this picture of a door illustrates the analysis of the content. The overall theme of Acts is the Gentile mission of the early Church, its foundation, its realization and its justification. The main caesuras are put before 1:12, 11:19 and 19:23. I cannot discuss these here in detail.[14] Yet notice the most important proportions, which are calculated with the modulus of 34 *stichoi* again, as indicated in the prologue. The three main sections (without prologue) have together 81x34 *stichoi*. The first and second main sections have 31x34 and 24x34, together 54x34 *stichoi*. The third one is exactly a third of the total, with 27x34. The ratio between the first one and the two following main sections is 31x34 / 50x34 = 0.62, i.e. approximately the golden ratio.

5. Summary

In summary, this stichometrical approach was developed as an attempt to explain some surprising proportions found by chance. The more the dispositions of New Testament writings are analysed on the basis of *stichoi*, the more it be-

[14] See > Gliederungstabellen > Apostelgeschichte.

comes obvious how carefully the authors elaborated their works even in formal respect. In terms of aesthetics most writings can be regarded as “high literature”. The proportions described on the basis of *stichoi* and Fibonacci numbers are a strong argument, I think, for the originality of the reconstructed dispositions. The analyses of all other writings of the New Testament can be seen on my homepage www.stichometrie.de.