Stifel (Styfel, Styffel, Stieffell, Stifelius, or Stieffel), Michael | Encyclopedia.com

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(*b*. Esslingen. Germany, ca. 1487; *d*. Jena, Germany, 19 April 1567)

mathematics, theology.

Stifel was the son of Conrad Stifel. Nothing is known about his education except that, on his own testimony, he knew no Greek.[1]. He was a monk at the Augustinian monastery of Esslingen, where he was ordained priest in 1511. Reacting to the declining morality of the clergy and the abuses committed in the administration of indulgences, Stifel became an early follower of Luther. While studying the Bible he came upon the numbers in Revelation and in the Book of Daniel.[2].

After 1520 he became increasingly preoccupied with their cabalistic interpretation, for which he used a "word calculus" (*Wortrechruat*). In the malevolent great beast designated in Revelation by the number 666 he saw Pope Leo X[3]. Stifel aroused the suspicion of the bishop of Constance and of his vicar-general by giving absolution without receiving indulgence money and by composing a song in honor of Luther[4]. Realizing that his life was in danger. Stifel escaped in 1522 to Kronberg in the Taunus Mountains, seeking refuge in the castle of a knight named Hartmut, a relative of Franz von Sickingen. He soon had to flee again[5] and went to Wittenberg, where Luther lodged him in his own house. The two became friends, and in 1523 Luther obtained Stifel a post as pastor at the court of the count of Mansfeld. Two years later Stifel became pastor and tutor at Castle Toilet in Upper Austria, in the service of the widow of a nobleman, Wolfgang Jörger[6]. The persecution unleashed by Ferdinand I of Bohemia against the new religious teaching forced Stifel to return to Luther, who procured him a parish at Annaberg. Luther accompanied Stifel there on 25 October 1528 and married him to the widow of the previous incumbent.

At Annaberg, Stifel resumed his dabbling in number mysticism, an activity that, if nothing else, revealed his skill in detecting number-theory relationships. From his reading of the Bible, he thought that he had discovered the date of the end of the world; and in *Ein Rechen-büchlin Vom End Christ* (1532) he prophesied that the event would occur at 8 o'clock on 18 October 1533.[7] On 28 September 1533 Luther implored him not to spread his fantastic notions. Stifel could not be dissuaded, however; and as he vainly warned his assembled congregation of the coming of the end, he was arrested and subsequently dismissed from his post.[8] Through the intervention of Luther–who forgave his "little temptation" (*kleine Anfechtlein*) –and Melanchthon, he finally received another parish, at nearby Holzdorf, in 1535.

Now cured of prophesying, Stifel devoted himself to mathematics. He enrolled at, and received his master's degree from, the University of Wittenberg, where Jacob Milich was lecturer on mathematics.[9] Stifel gave private instruction in mathematics, and among his pupils was Melanchthon's son-in-law Kaspar Peucer. The years at Holzdorf were Stifel's most productive period. At the urging of Milich he wrote *Arithmetica integra* (1544), in which he set forth all that was then known about arithmetic and algebra, supplemented by important original contributions.[10] In his next work, *Deutsche arithmetica* (1545), Stifel sought to make his favorite branch of mathematics, the coss (algebra) or "artful calculation" (*Kunstrechnung*), more accessible to German readers by eliminating foreign words.[11] His last book written at Holzdorf was *Welsche Practick* (1546).[12]

The peaceful years in Holzdorf ended suddenly after the Schmalkaldic War (1547), for the "Hispanier" drove off all the inhabitant.[13] Stifel fled to Prussia, where he finally found a position in 1551 as pastor at Haberstroh, near Königsbrg.[14] He lectured on theology and mathematics at the University of Königsberg and brought out a new edition of Christoph Rudolff's *Coss*, which first appeared in 1525 and had since become unavailable. He undertook the republication at the request of a businessman named Christoff Ottendorffer, who paid the printing costs. Stifel reproduced Rudolff's text in in its entirety, as well as all 434 problems illustrating the eight rules of the *Coss*. To each chapter of the original text he appended critical notes and additional developments, most of which he drew from his *Arithmetica integral*.[15] Stifel's additions are much longer than the corresponding sections of Rudolff's book.[16]

Stifel returned to playing with numbers, as is evident from his next published book, *Ein sehr wunderbarliche Wortrechnung* (1553).[17] At odds with his colleagues, especially Andreas Osiander, as a result of theological controversies, and urged to return to Holzdorf by his former congregation, he returned to Saxony in 1554. His first post there was as pastor at Brück, near Wittenberg. He then went to Jena, following his friend Matthias Flacius,[18] and lectured on arithmetic and geometry at the university. In 1559 he was mentioned in the register as "senex, artium Magister et minister verbi divini."[19] By this time he apparently had given up his pastorate. Stifel's life in Jena was made difficult by theological disputes until Flacius, from whom Stifel had become alienated, found a successor (Nikolaus Selnecker) for him in 1561.[20] Stifel bequeathed the latter a long work on *Wortrechnung* that was never printed.[21]

In his books Stifel offered more than a methodical exposition of existing knowledge of arithmetic and algebra:[22] he also made original contributions that prepared the way for further progress in these fields. A principal concern was the establishment of generally valid laws. He contended that to improve algebra, it was necessary to formulate rules the validity of which was not limited to special cases, and which therefore could advance the study of the entire subject.[23] He was, in fact, the first to present a general method for solving equations, one that replaced the twenty-four rules traditionally given by the cossists (and the eight that appeared in Rudolf's *Coss*).[24] For example, he pointed out that basically there was nothing different about problems with several unknowns, a type for which Rudolff had introduced a special name.[25] Similarly, he asserted that the symbol "dragma" for the linear member could simply be omitted.[26] Stifel introduced into western mathematics a general method for computing roots that required, however, the use of binomial coefficients. He had discovered these coefficients only with great difficulty, having found no one to teach them to him nor any written accounts of them.[27] Stifel also surpassed his predecessors in the division of general polynomials and extraction of their roots, as well as in computing with irrational numbers.

The second chapter of *Arithmetica integra* is devoted entirely to the numerical treatment of Euclidean irrationals (binomials, residues, and so forth), a topic that Fibonacci had planned to discuss.[28] Stifel's exceptional skill in number theory is evident in his investigation of numerical relationships in number sequences, polygonal numbers, and magic squares.[29] Particularly noteworthy is his contribution to the preliminary stages of logarithmic computation. The starting point for this type of computation was attained by correlating a geometric series with an arithmetic series. This can be seen in Stifel's explanation of the cossists' symbols:

$0 \cdot 1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 \cdot 6 \cdot 7$

$1 \cdot 1x \cdot 1z \cdot 1c \cdot 1zz \cdot 1\beta \cdot 1zc \cdot 1b\beta$

On this occasion Stifel introduced the term "exponent" for the numbers of the upper series.[30] In correlating the two number sequences he extended the use of exponents to the domain of the negative numbers in the manner shown below.

Stifel suspected the importance of his innovation, stating: "A whole book might be written concerning the marvellous things relating to numbers, but I must refrain and leave these things with eyes closed." [31] He did, however, provide a table that made it possible to carry out logarithmic calculations. Stifel approached the concept of the logarithm from another direction as well. He was aware of both inversions of the power, the root, and the "logarithmus." He discussed "division" of a ratio by a number, obtaining, for example, in the case of (27:8) "divided" by 3/4: .[32] In contrast, Stifel saw the "division" of a ratio by a ratio as a way of finding exponents. Thus, by means of continuous "subtraction," he obtained from the equality (729:64) =(3:2)*x* the "quotient" x=6; and in the case of _(2187:128)=$(27:8)^x$, the result was *x*=2 1/3. [33]

Stifel was also a pioneer in the development of algebraic symbolism. To designate the unknowns he used *A,B,C,D,* and *F*, as well as the traditional *x*[34] For the powers he employed *Az*, $x^3 = AAA$, $x^4 = FFFF$, and so forth–not just the traditional *z* (*census*).[35] He simplified the square root sign from to ., and later to alone. [36] In one instance he closely approached modern symbolism, writing as . [37] Other, more cumbersome designations for unknowns and the root used in *Deutsche arithmetica* were not adopted by later mathematicians. [38] The only operational signs that Stifel employed were + and –; other operations were indicated verbally. Equality was designated either in words or by a point, as in 1*x*. .[39]

Stifel made a thorough study of magic squares and polygonal numbers for a nonmathematical purpose. [40] He correlated the twenty-three letters of the alphabet with the first twenty-three triangular numbers, thereby establishing connections between words and numbers. [41] He called such *Wortreclrnung* "the holy arithmetic of numbers."[42] For example, from the number 666 he derived the sentence "Id bestia Leo"and the equality 2.5 ages = 1,260 days that he found in the book of Daniel yielded the sentence "Vae tibi Papa, vae tibi." Although Stifel's work at Holzdorf is most admired today, he declared that he valued his "word calculus" above all the computations he had ever made. [43]

The development of Stifel's scientific ideas was decisively influenced by Jacob Milich, who recommended that he study Campanus of Novara's translation of Euclid. [44] He also proposed that Stifel write a comprehensive work on arithmetic and algebra (which became *Arithrnetica integra*). [45] To prepare for the latter project Stifel worked through Rudolff's *Coss* without assistance. [46] He had already studied proportions in the writings of Boethius, and had long been acquainted with contemporary arithmetic books, such as the *Margaritaphvlosophica* of Gregor Reisch (1503) and the works of Peter Apian (*Eva ne tre wind wolgegrïndete Ungerweysung aller Kaaffinarnrs Rechnang*, 1527) and Adam Ries (*Rechnung tiltf der Lvnilien an Federn in Zalmass and gewicht aul allerley, handierung genua*, 1522). [47] (He especially admired Ries's book.) [48] Stifel conscientiously named the authors from whom he had taken examples and never neglected to express his appreciation. [49] The enthusiasm with which he followed Milich's advice[50] to collect mathematical writings is obvious from the large number of authors he cited.[51]

Stifel's achievements were respected and adopted by contemporary mathematicians, although, like Clavius, they often did not cite him.[52] The last edition of *Arithmetica integra* appeared in 1586, and the last of the *Coss* in 1615. After that, mathematicians surpassed Stifel's level of knowledge in symbolism and logarithms, and they opened new fields of research. It is for both these reasons that his work fell into neglect. He was, in fact, the greatest German algebraist of the sixteenth century.

NOTES

1. Stifel admitted that he was “ignarus linguae graecae.” Since he knew Euclid only from the translations of Campanus and Zamberti, he turned to other scholars for assistance. See *Arithmetica integra* (cited below as *AI*), fol. 143v.

2. In these numbers Stifel saw “sealed words” (*versiegelte Worte)*. See *Wortrechnung* (cited below as *WR*), fol. B2.r

3. The numbers (LDCIMV) that Stifel obtained from the name “Leo DeCIMVs” yielded 1656, 1,000 too much and 10 too little; but he manipulated them to obtain 666 by the addition of *decimus* = 10 and by setting M = *Mysterium*.

4. “Von der Christförmigen rechtgrüudten leer Doctoris Martini Luthers . . .” (1522).

5. The castle was besieged by Franz von Sickingen’s enemies and was taken on 15 Oct. 1522. A sermon that Stifel gave on 8 Sept. is still preserved; see J. E. Hofmann, “Michael Stifel, 1487?–1567,” n. 14.

6. In the Grieskirchen congregation; see Ritter’s *Geographisch-statistisches Lexicon*, II (Leipzig, 1906), 1051.

7. On the Biblical passages see J. E. Hofmann, “Michael Stifel,” in n. 43. Other dates also were mentioned: 3 Oct. (J. H. Zedler, *Universallexikon*, XL [1744], 22); 16 Oct. (see Treutlein, p. 17, and Poggendorff, 11, 1010 – 1011); and 19 Oct. (Giesing, p. 11). *Der Biograph*, p. 473, mentions the 282nd day and the 42nd week of the year.

8. For an eyewitness report in a letter from Petrus Weller to loannes Briessmann, see Strobel, pp. 74 – 84; the German trans. of the letter is given by Grosse, pp. 19 ff.

9. With Luther and Melanchthon, Milich was also friendly with Stifel at Annaberg and acted as the family’s physician. See *Al*, fol. (±4)r, entry of 25 Oct. 1541, *Album der Universität Wittenberg*, I (Leipzig, 1841), 195a: “Gratis inscripti . . . Michael Stifel pastor in Holtzdorff.”

10. A detailed description of the contents of the book can be found in Kaestner, *Geschichte der Mathematik*, I, 112 ff,; and in Treutlein; in Cantor; and in Hofmann, *op, cit*.

11. Stifel stated that the *regula falsi* is related to the coss as a point is to a circle. *AI*, 227r.

12. In the *Welsche Practick* (cited below as *WP*) Stifel objected to Apian’s problems, which were correct but not comprehensible to everyone. He did not wish to blame Apian but to “diligently expound” his work (see pp. 293, 337). Stifel also drew on the *“praxis italica”* in *AI*, fols. 83v. ff.

13. See *WR*. fol. A(1)v.

14. He went to Memel in 1549 and to Eichholz in 1550.

15. The title page bears the date 1553, the preface 1552, and the *explicit* 1554. Stifel made changes in the course of the printing, and thus the table of contents must be corrected. See *Coss*, fol. 179r.

16. Rudolff’s 208 pages grew to 494 in Stifel’s edition.

17. Osiander wrote on 19 Feb. 1549: “. . . Commentus est novos alphabeti numeros scil. triangulares et delirat multo ineptius quam antea" ("He has devised new numbers for the alphabet, namely the triangular numbers, and his fantasies are more absurd than before"). See B. F. Hummel, *Epistolarum historico-ecclesiasticarum saeculo XVI a celeberrimis viris scriptorum semicenturia altera* (Halle, 1780), 70 ff.

18. Like Stifel and Ottendorffer, Flacius was an opponent of Osiander.

19. Entry in *Die Matrikel der Universität Jena*, I (Jena, 1944), 320.

20. See J. E. Hofmann, “Michael Stifel,” p. 59.

21. The MS, “Explicatio apocalypseos,” is now in the Karl Marx University Library, Leipzig. The Lutheran congregation of Kronberg possesses a microfilm copy of the work. See W. Meretz, “Aus Stiefels Nachlass,” p. 5.

22. The first book of *AI* is devoted to the fundamental operations—including roots, properties of numbers, series, magic squares, proportions, the rule of three, false substitution, and the Welsh practice; the second book treats computation with irrationals, corresponding to the tenth book of Euclid; the third book takes up algebra and equations of higher degree, such as were found in the work of Rudolff and Cardano and that could be solved by employing certain devices.

The first part of the *Deutsche arithmetica* (cited below as *DA*) is devoted to “household computations” *(Hausrechnung)*: carrying out on the abacus fundamental operations and the rule of three using whole numbers. The second part is concerned with computation with fractions, with the German *Coss* or “Kunstrechnung,” and with extracting roots on the abacus. The third part, on “church computations” *(Kirchrechnung)*, treats the division of the church year.

The division of the *Coss* is the same as in Rudolff’s original edition. Stifel also reproduced Rudolff’s *Wortrechnung*, but he did not agree with its contents. Among the new elements that he added were remarks on the higher-degree equations that Rudolff had presented; on the rules of the *Cubicoss* formulated by Scipione dal Ferro and Cardano that had been published in the meantime; and a procedure for computing

Stifel’s edition of the *Coss* also contained diagrams for verifying solutions. These had been drawn by Rudolff but did not appear in the original edition. Stifel obtained them from Johann Neudörfer, a brother-in-law of the printer Johannes Petrejus. See *Coss*, fol. 172r.

23.*DA*, fol. 72v.

24. Stifel reduced the three cases of the quadratic equation, $x^2 + a = b$, $x^2 + b = ax$, and $x^2 = ax + b$, to the standard form $x^2 = \pm ax \pm b$. By “extracting roots with cossic numbers” he obtained his rule called AMASIAS: , where the plus and minus signs correspond to those of the standard form. See *AI*, fols. 240r f.; and Treutlein, *op. cit*., 79. Stifel knew of the double solution only for $x^2 + b = ax$ (*AI*, fol. 243v). He avoided negative solutions, although he recognized negative numbers as those less than zero. (*AI*, fol. 48r). An equation of which the solution happened to be zero can be found in *AI*, fol. 283r.

25. For the term *quantitas*, see *AI*, fol. 257v; it was also used by Cardano (see *AI*, fol. 252r).

26.*DA*, fol. 17v.

27.*Ibid*., fol. 72v. The table with binomial coefficients can be found in *AI*, fol. 44v; *DA*, fol. 71v. and *Coss*, fol. 168r.

28. See article on Fibonacci in this Dictionary, IV, 612, n. 7.

29. A detailed account is given by Hofmann in “Michael Stifel 1487? – 1567,” 13 ff.

30.*AI*, fol. 235.

31. “Posset hic fere novus liber integer scribi de mirabilibus numerorum sed oportet ut me hic subducam et clausis oculis abeam” (*AI*, fol. 249v). Translation from D. E. Smith, *History of Mathematics*, II (New Yor, 1925), 521.

32. Stifel distinguished between fraction *(Bruch)* and ration *(Verhältnis)*, and wrote the latter as a fraction without a fraction line. Nevertheless, he conceived of the ratio as a fraction; the quotient was its “name.” Thus, 4:3 had the name 1 1/3. See *WP*, pp. 36 ff.; and *Coss*, fol. 135v.

33. Frist Stifel obtained, as the result of two “subtractions,” $(2187:128) = (27:8)^2\ (3:2)$ and then, because $(3:2) = (27:8)^{1/3}$, $(2187:128) = (27:8)^{2\ 1/3}$. The details are in *AI*, fols. 53v ff. On computation with fractional power exponents and fractional radical indices, see *Coss*, fols. 138r f.

34.*AI*, fol. 254r.

35.*DA*, fol. 74v.

36. As Rudolff originally had it in the *Coss*.

37.*DA*, fol. 71r.

38. See *DA*, fol. 61v. Stifel extended the cumbersome symbols for the square root and cube root as far as the sixth root (*DA*, fol. 62r). The designations for the unknowns in the *DA* (see fols. 20 ff.) are x = 1 Sum:or 1 Sum *A*:, x^2=1 Sum:Sum; and so on, up to x^{11} (*DA*, fol. 70v).

39.*Coss*, fol. 351v. He also uses points to indicate inclusion of several elements in the same operation, as in . *Al*, fol. 112v.

40. The number 666 of the “great beast” appeared in *Ein Rechen Büchlin vom End Christ* (fols., H 4v and 5r) as the sum of all the cells of a magic square.

41. See *WR*, fol D2r. For Stifel, i = j and u = v = w; Rudolff’s alphabet, however, had twenty-four letters, since he included w.

42. See *WR*, fol. A(1)r.

43. See *Coss*, fol. 487v.

44. See *Al*, fol. 226v.

45.*Als*, fols. (α4) v.

46. See *WR*, fol. B(1)r; *Coss*, fol. A2r.

47.*Al*, fols. 55 f., 250r; *Coss*, fol. 23r; *Al*, fol. 102r: *WP*, fol. A2v.

48.*Al*, fol. 226v. *DA*, for. 31r.

49. The problems come from Peter Apian, Cardano, Johann Neudörder, Adam Ries, Adamus Gigas, Rudolff, and Widmann.

50.*Al*, fol. (α4)v.

51. Stifel names the following: Apian, Boethius, Campanus, Cardano, Nicholas Cusa, Dürer, Euclid, Gemma Frisius, Faber Stapulensis, Jordanus de Nemore, Neudörfer, Ptolemy, Reisch, Ries, Rudolff, Sacrobosco, Schöner, Theon of Alexandria, Zamberti, and Widmann.

52. See Hofmann, "Michael Stifel 1487?–1567," 31, n. 94.

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I. Original Works. Stifel's works include *Ein Rechen Büchlin vom End Christ, Apocalypsis in Apocalypsin* (Wittenberg, 1532); *Arithmetica integra*, with preface by Melanchthon (Nuremberg, 1544; 1545; 1546; 1548; 1586); *Deutsche arithmetica, inhaltend Haussrechnung, deutsche Coss, Kirchrechnung* (Nuremberg, 1545); *Rechenbuch von der welschen und deutschen Practick* . . . (Nuremberg, 1546); *Ein sehr wunderbarliche Wortrechnung. Sampt einer mercklichen Erklärung ettlicher Zahlen Danielis unnd der Offenbarung Sanct Iohannis* ([Königsberg], 1553); *and Die Coss Christoffs Rudolffs. Die schönen Exempeln der Coss. Durch Michael Stifel gebessert und sehr gemehrt* (Königsberg, 1552–1553 [colophon dated 1554], 1571; Amsterdam, 1615).

Lists of Stifel's theological writings and songs are in J. E. Hofmann, "Michael Stifel 1487?–1567" (see below), and in the articles by G. Kawerau and W. Meretz cited below. Illustrations of the title pages of Stifel's books are given by Hofmann and Meretz.

II. Secondary Literature. See *Allgemeine deutsche biographie*, **VI** (1893), 208–216; *Der Biograph*, VI (Halle, 1807), 458–488; F. J. Buck, *Lebensbeschreibung der preussischen Mathematiker* (Königsberg, 1764), 34–38; M. Cantor, *Vorlesungen über Geschichte der Mathematik*, 2nd ed., II (Leipzig, 1913), 430–449; C. J. Gerhardt, *Geschichte der Mathematik in Deutschland*(Munich, 1877), 60–74 J. Giesing, *Stifels Arithmetica integra* (Döbeln, 1879); J. Grosse, "Michael Stiefel, der Prophet," in *Westermanns Monatshefte*, no. 85 (Oct. 1863), 1–40; J. E. Hofmann, "Michael Stifel 1487?–1567," Sudhoffs Archiv . . .,supp. Number 9(1968); and "Michael Stifel," in *Jahrbuch für Geschichte der Oberdeutschen Reichsstädte*, Esslinger Studien, **14** (1968), 30–60; G. Kawerau, "Stiefel (Styfel)," in *Realencyclopädie für protestantische Theologie und Kirche*, 3rd ed., X (Leipzig, 1907), 74–88, and XXIV (Leipzig, 1913), 529; A. G. Kaestner, *Geschichte der Mathematik*, I (Göttingen, 1796), 112–128, 163–184; W. Kaunzner, "Deutsche Mathematiker des 15. und 16. Jahrhunderts und ihre Symbolik," *Veröffentlichungen des Forschungsinstitutes des Deutschen Museums für die Geschichte der Naturwissenschaften und der Technik*, ser. A, no. 90 (1971); W. Meretz, "Uber die erste Veröffentlichung von Kronbergs erstem Pfarrer Michael Stiefel," in *Jahresberichte des Kronberger Gymnasiums, die Altkönigsschule* (Jan. 1969), 15–20; and "Aus Stiefels Nachlass," *ibid.* (Feb. 1969), 5–6; J. E. Montucla, *Histoire des mathématiques*, 2nd ed., I (Paris, 1799), 614; G. C. Pisansky, *Historia litteraria Prussiae* (Königsberg, 1765), 228; G. T. Strobel, *Neue Beiträge besonders zur Literatur des 16. Jahrhunderts*, I, pt. 1 (Nuremberg–Altdorf, 1790), 3–90; P. Treullein, "Das Rechnen im 16. Jahrhundert" in *Abhandlungen zur Geschichte der Mathematik*, 2 (1879), 1–124, esp. 17 f., 33 ff., 42 f., 48 ff., 77 ff.; and F. Unger, *Die Methodik der praktischen Arithmetik* (Leipzig, 1888), see index, 239. Concerning a MS from 1599 with solutions to problems from the *Coss*, see D. E. Smith, *Rara arithmetica* (Boston–London, 1908), 493.

For further bibliographical information, see especially Hofmann, Kawerau, and Meretz.

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