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(*b*. Staffelstein, upper Franconia, Germany, 1492; *d*. Annaberg-Buchholz, Germany, 30 March 1559)

mathematics, mining.

The son of Contz and Eva Riese, Adam (who always signed himself simply "Risz" or "Ries"[1]) came from a wealthy family. Little is known about his youth and nothing about his education. In 1509 he was at Zwickau, where his younger brother Conradus was attending the famous Latin school, and in 1515 he was living in Annaberg, a mining town. Ries finally settled at Erfurt in 1518, working there until 1522 or 1523 as a *Rechenmeister*. He benefited greatly from his contact with the university humanists, who gathered at the house of Georg Sturtz, a rich physician from Annaberg.

Ries wrote his first two books while at Erfurt: *Rechnung auff der linihen* (1518), of which no copy of the first edition is known, and *Rechenung auff der linihen vnd federn* (1522), which had gone through more than 108 editions by 1656. Sturtz encouraged Ries to study algebra—or *Coss*, as it was then called-which had slowly become known in Germany during the second half of the fifteenth century. Sturtz also, recommended certain authors: Johann Widman, who had given the first lecture on algebra in Germany (at Leipzig in 1486), and Heinrich Schreiber (or Grammateus, who taught Rudolff at Vienna), whose arithmetic book of 1518 contained sections on algebra incorporating an improved symbolism. Among the books that Sturtz made available to his friend was an old one—and, as Ries stated, "cast-off" (in the sense of "disordered" or "uncared-for")—containing a group of essays on algebraic topics.[2] Ries was therefore able to compose a *Coss* while still at Erfurt. He completed the book in Annaberg, where he had resettled about 1523, and dedicated the manuscript to Sturtz.[3]

In 1525 Ries married Anna Leuber, by whom he had eight children. He then purchased his own home and became a citizen of Annaberg. He held important positions in the ducal mining administration: *Rezessschreiber* (recorder of mine yields, from 1525), *Gegenschreiber* (recorder of ownership of mining shares from 1532), and *Zehnter auf dem Geyer* (calculator of ducal tithes, 1533–1539). While fulfilling his official responsibilities he still found time to continue teaching arithmetic. He ran a highly regarded school, and improved and revised his books. During this period he wrote a comprehensive work, *Rechenung nach der lenge, auff den Linihen vnd Feder*, which far surpassed his books written at Erfurt, especially in the number of examples. Most of the work had been completed by 1525; but it was not published until 1550, after Elector Maurice of Saxony had advanced the printing costs. Because the expense was so great, the book was reprinted only once, in 1616.

The year 1539 was decisive for Ries. Duke Georg, an intransigent defender of Catholicism, was succeeded by his brother Heinrich, who favored the Lutherans. The change in rulers ended the religious troubles with which Annaberg, like so many other German cities, had been aficted.[4] In the same year Ries received the title "Churfürstlich Sächsischer Hofarithmeticus." During this period Ries prepared a revised edition of his *Coss*, in which he referred to the achievements of his contemporaries Rudolff, Stifel, and Cardano.[5] This was his last work. In all his arithmetic books (but with greatest detail in the one of 1550) Ries described how the computations were done, both on the abacus and with the new Indian methods. He employed the rule of three to solve many problems encountered in everyday life. While asserting that he had found "proper instruction in only a few places" in the arithmetic of his predecessors Ries failed to set forth the logical foundations of the subject. Instead, he simply presented formulas with the command "Do it this way."

Ries did, however, furnish the student with a great number of exercises. The steps to be followed were presented in detail, and the reader could check the correctness of answers by following the procedure used to obtain them. Ries surpassed his predecessors in the presentation of his material: it was clear and orderly, and proceeded methodically from the simpler to the more difficult.

Besides the section on gauging, the *Rechenung nach der lenge* contains an extensive section entitled "Practica," in which Ries solves problems according to the "Welsh practice" through the use of proportional parts.[6] In addition he treats problems taken from recreational mathematics, solving them according to the *regula falsi*. Particularly noteworthy is the fact that in his table of square roots the fractions are repeated in a manner that prepared the way for the use of decimal fractions.[7]

In the *Coss*, too, Ries proves to be a good mathematician. He recognized that the Cossists employed a superfluous number of distinct types of equations. He knew about negative quantities and did compute with them.

Ries composed a work that was commissioned by the city of Annaberg, *Ein Gerechnet Büchlein auff den Schöffel, Eimer vnd Pfundtgewicht* … (1533), which contains tables of measures and prices from which one could immediately determine the cost of more than one of an item for which a unit price was given, and a *Brotordnung*. From the latter one could directly read off the correct weight for loaves of bread when grain prices varied and the price of an individual loaf was held constant.

It is not known how Ries learned Latin. While in the Erzgebirge he gained a thorough knowledge of mining and of mining problems that lend themselves to computation. At Erfurt he obtained the mathematics books of Widman, Köbel, and Grammateus, and he also saw the book from which Widman had taken his examples, which ultimately stem from the *Algorismus Ratisbonensis*.[8]

Ries furnished precise information on the sources of his *Coss*. As early as 1515 he had solved algebraic problems in Annaberg with a coin assayer named Conrad.[9] Later he studied a revision of al-Khwārizmī7rsquo;s *Algebra* prepared by Andreas Alexander.[10] His principal source, however, was the old book he had received from Sturtz.[11] The contents of this work included al-Khwārizmī's *Algebra* in the translation by Robert of Chester, the *De numeris datis* of Jordanus de Nemore, the *Liber augmenti et diminutionis* of "Abraham," and a Latin and a German algebra (1481).

Because Ries's *Coss* was never printed it had little influence on the development of mathematics.[12] His arithmetic books enjoyed a different fate. Between 1518 and 1656 they went through more than 100 editions in cities from Stettin to Augsburg and from Breslau to Zurich,[13] Ries did more than any previous author to spread knowledge of arithmetic, the branch of mathematics most useful in arts and trade. He was a pioneer in the use of Indian numerals. Ries soon became synonymous with "arithmetic"; to this day, "nach Adam Ries" signifies the accuracy of a calculation.

NOTES

1. See E. Deubner, *Nach Adam Ries*, p, 109; and Roch, *Adam Ries*, p. 79.

2. The book, now Codex Dresdensis C 80, once belonged to Widman.

3. It was partially published by Berlet in 1860 and again in 1892.

4. Ries's name appeared on the list of Lutheran citizens of Annaberg that Duke Georg requested city officials to prepare. He was not persecuted for his religion, however; obviously his services were needed. See Roch, *op. cit.*, p. 21.

5. No study has yet been made of the extent to which Ries utilized the new knowledge in preparing this revision, which exists, in Ries's own handwriting, in an incomplete MS volume in the Erzgebirgsmuseum, Annaberg-Buchholz. This volume also contains an introduction to arithmetic, the old *Coss*, and a German translation of the *Data*. See Berlet, p. 27.

6. In *Regula proportionum*, Ries alludes to their relationship to the rule of three. See 121r.

7. For example, gantze und 358 tausend-teil." See the arithmetic book of 1550, fols. Aa IIIv and Bb IIr ff, and the arithmetic book of 1574 (available in facsimile), fols, 84v ff.

8. See Berlet, p. 34. Widman also took examples from the Bamberg arithmetic book of 1483, which had borrowed problems from the *Algorismus Ratisbonensis*. See Kaunzner, pp. 26, 102 ff.

9. See Berlet, p. 53.

10. On Andreas Alexander, see *Neue deutsche Biographie*, I (1953), 195 f. The original MS of (his revision is lost, but there are four copies done by Ries and his sons Jakob and Abraham. See Curtze's ed. in Abhandlungen zur Geschichte der Mathematik, 13 (1902), 435–651.

11. For the marginal notations made by Ries, see Kaunzner, p. 35.

12. Three extracts written later can be found in the Sächsische Landesbibliothek, Dresden. On this matter see Roch, Adam Ries, p. 62. Stifel admired Ries's examples and incorporated many of them in his Deutsche Arithmetica.

13. For the printing history, see Smith, p. 139; and F. Deubner, "Adam Ries."

BIBLIOGRAPHY

A complete bibliography of Ries's works, including MSS, is in F. Deubner, "Adam Ries" (see below); most of them also are listed in D. E. Smith, *Rara arithmetica* (see below).

Secondary literature includes Bruno Berlet, *Adam Riese, sein Leben, seine Rechenbücher und seine Art zu rechnen…* (Leipzig-Frankfurt, 1892); Moritz Cantor, *Vorlesungen über Gesehichte der Mathematik*, II, pt. 2 (1900), 420–429; Dorothy I. Carpenter, "Adam Riese," in *Mathematics Teacher*, 58 (Oct. 1965), 538–543; Fritz Deubner, *Nach Adam Riese. Leben und Wirken des grossen Rechenmeisters* (Leipzig-Jena, 1959); and "Adam Ries, der Rechenmeisters des deutschen Volkes," in *Zeitschrift für Geschichte der Naturwissenschaften, der Technik und der Medizin*, **1** , no. 3 (1964), 11–44; Hildegard Deubner, "Adam Ries— Rechenmeister des deutschen Volkes. Teil II, 1," in *Schriftenreihe für Geschichte der Naturwissenschaften, Technik und Medizin*, **7** , no. 1 (1970), 1–22; Wolfgang Kaunzner, "über Johannes Widmann von Eger…," in *Veröffentlichungen des Forschungsinstituts des Deutschen Museums für die Geschichte der Naturwissenschaften und der Technik*, ser. C, no. 4 (1968); Willy Roch, *Adam Ries. Ein Lebensbild des grossen Rechenmeisters* (Frankfurt, 1959); and *Die Kinder des Rechenmeisters Adam Ries*, vol, I of Veröffentlichungen des Adam-Ries-Bundes (Staffelstein, 1960); D. E. Smith, *Rara arithmetica*, 4th ed. (New York, 1970), 138–140, 250 ff.; F. Unger, *Die Methodik der praktischen Arithmetik in historischer Entwicklung* (Leipzig, 1888), 48–53; Kurt Vogel, "Adam Riese, der deutsche Rechenmeister," in Deutsches Museum. *Abhandlungen und Berichte*, **27** , no. 3 (1959), 1–37; and "Nachlese zum 400. Todestag von Adam Ries(e)," in *Praxis der Mathematik*, **1** (1959), 85–88; and H. E. Wappler, "Zur Geschichte der deutschen Algebra im 15. Jahrhundert," in *Programm Gymnasium Zwickau* (1887).

Additional articles on Ries are cited in all works on the history of mathematics; for literature from the period 1544–1900, see especially the article by H. Deubner cited above.

Kurt Vogel