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(*b.* Tenby, Pembrokeshire, Wales, ca. 1510; *d.* London, England, 1558)

*mathematics.*

Recorde was the second son of Thomas Recorde, whose father had come to Wales from Kent, and of Rose Johns of Montgomeryshire. He graduated B.A. from Oxford in 1531 and was elected a fellow of All Souls College in the same year. All Souls was a chantry and graduate foundation for the study and training of clerks in theology, civil and [canon law](#), and medicine. At some time he removed to Cambridge and there received the M.D. degree in 1545. According to the Cambridge records he had been licensed in medicine at Oxford some twelve years earlier, and the B.M. usually went with the Oxford license. Tradition has it that he lectured on mathematics at Oxford and Cambridge; but details of his university career, and of any degrees other than the B.A. and M.D., are lacking.

Recorde was in London by 1547, probably practicing medicine. There is no evidence that he acted as physician to any of the Tudors, although he served the government in other capacities. In January 1549 he was appointed comptroller of the Bristol mint. In October 1549, at the time of Somerset's first fall, he sided with the protector, refusing to divert money intended for King Edward to the armies of the west under Lord John Russell and Sir [William Herbert](#). He was accused of treason by Herbert (later earl of Pembroke) and was confined at court for sixty days while the mint ceased production. This was the beginning of a permanent quarrel with Herbert which had serious consequences for Recorde's later career.

From 1551 to 1553 Recorde was surveyor of the mines and monies in Ireland, in charge of the abortive silver mines at Wexford and, technically, supervisor of the Dublin mint. The venture was unsuccessful from the start. In addition to differences with the German miners over technology, and the personal animosity of Pembroke, the treasury was not able to bear the great expenses of the mines and their lack of profits. The work stopped in 1553 and Recorde was recalled. Not until 1570 was his estate compensated for some £ 1,000 due him for his services there.

In 1556 Recorde attempted to regain a position at court and laid charges of malfeasance as commissioner of the mints against Pembroke. Regardless of the merits of the case, it was a serious error in judgment on his part; Pembroke had the complete confidence of Queen Mary and [King Philip](#), and it was impossible for a minor civil servant, whose last post had ended in failure, to survive the clash with the "politic old earl." Pembroke sued for libel in a bill of 16 October 1556. The hearing was held in January 1557, with a judgment of £ 1,000 damages against Recorde awarded 10 February. Presumably Recorde was imprisoned for failure to pay this sum. His will was written in King's Bench prison and was admitted to probate 18 June 1558.

Recorde has been justly called the founder of the English school of mathematical writers. He envisioned a course of instruction in elementary mathematics and its applications for mathematical practitioners. Deliberately choosing the vernacular, he wrote simple, clear English prose of a higher quality than his scientific contemporaries or immediate successors. Recorde made a special effort to find English equivalents for Latin and Greek technical terms, but very few of his innovations were adopted by later writers. His books indicate great skill as a teacher. His use of dialogue enabled him to carry a student step by step through the mastery of techniques, and to emphasize the proper order and method of instruction. Difficult questions were deferred until an understanding of fundamentals was achieved. Recorde took a rational view of his sources and was refreshingly critical of unquestioning acceptance of established authority. The mathematical books were written in the order in which he intended them to be studied: arithmetic, plane geometry, practical geometry, astronomy, and theoretical arithmetic and algebra. Projected works on advanced astronomy, navigation, and a translation of Euclid's *Elements* probably were never completed.

The arithmetic, *The Ground of Aries* (1543, enlarged in 1552), was the most popular of all Recorde's works. The first edition dealt only with whole numbers, covering the fundamental operations, reduction, progression, golden rule, and counter reckoning. In 1552 it was enlarged to include the same operations with fractions, and false position and alligation. There are three editions of the first version: 1543, 1549, and 1550[?]. The third has been dated formerly 1542[?] or 1545[?]; but bibliographers, on the basis of the state of the title-page border, now place it between the editions of 1549 and 1552.

*The Pathway to Knowledge* (1551) is a translation and rearrangement of the first four books of Euclid's *Elements*. Like Proclus before him, and Ramus later, Recorde separated the constructions ("things to be done") from the theorems ("things to be proved"). Proofs are not given, but explanations and examples are provided. Pedagogically, Recorde felt that it is not easy for a student to understand at the beginning both the thing that is taught and the reason why it is so.

*The Gate of Knowledge* dealt with measurement and the use of the quadrant. It has been lost and possibly was never published, although in the *Castle* it is referred to as complete.

*The Castle of Knowledge* (1556), on the construction and use of the sphere, is an elementary Ptolemaic astronomy with a brief, favorable reference to the Copernican theory. The often-cited edition of 1551 is a “ghost.” The *Castle* is based chiefly on Ptolemy, Proclus, Sacrobosco, and Oronce Fine, but is much more than a synthesis of earlier writers. More than in any other of his books, Recorde was concerned here with sources. He devoted considerable space to a critical examination of the standard authorities, offering corrections of textual errors in the Greek authors and suggesting that the mistakes of Sacrobosco and others were caused by their lack of knowledge of Greek.

*The Whetstone of Witte* (1557) was the only one of Recorde's books not to have seen at least two editions, no doubt because it was less immediately useful to the London craftsmen than were his other works. It contains the “second part of arithmetic” promised in *The Ground of Artes* (from the arithmetic books of Euclid) and elementary algebra through quadratic equations. It is based on German sources, especially Johann Scheubel and Michael Stifel, and the algebra uses the German cossic notation. With Recorde's addition of the “equal” sign this algebra became completely symbolic. Although it is derivative, there are several noteworthy features: the use of zero coefficients in algebraic long division; the use of arbitrary numbers to check algebraic operations rather than the check by inverse operations; and the treatment of quadratics. Recorde did not admit negative roots but did use negative coefficients in equations. All quadratics are written with the square term equal to roots plus or minus numbers, or numbers minus roots. He still had to give the three usual rules of solution; but, in the case of an equation with two positive roots,  $x^2 = px - q$ , he stressed the solution using the relation between the roots and coefficients:  $r_1 + r_2 = p$ ,  $r_1 r_2 = q$ .

In addition to his mathematical works, Recorde published *The Urinal of Physick* (1547), dedicated to the Company of Surgeons. A promised anatomy has not survived. A traditional medical work on the judgment of urines, full of sensible nursing practice, the *Urinal* is less modern than his mathematical works and less critical of authority.

Recorde was not only an able teacher and a skillful textbook writer but was also one of the outstanding scholars of mid-sixteenth-century England. He was well trained in mathematics, and was familiar with Greek and medieval texts as well as contemporary developments. His intelligent attitude toward authority, and his appeals to reason and observation, anticipated in a more moderate manner the anti-Aristotelianism of [Petrus Ramus](#). Recorde was learned in medicine and the law. He was an able Greek scholar who stressed the importance of a knowledge of that language for an accurate understanding of sources. He had a wide range of learning in various fields: he was a historian interested in the antiquities of Britain, a collector of manuscripts, and one of the first students of the Anglo-Saxon language.

Recorde had no international reputation because all of his works were in English and on an elementary level. In England, however, his books remained the standard texts throughout the Elizabethan period. A generation of English scientists, especially the non-university men, stated that Recorde's books had been their first tutors in the mathematical sciences. The excellence of the English school of mathematical practitioners, fostered by growing geographical interests, has been attributed to the high quality of the vernacular movement in applied science begun by Recorde.

## BIBLIOGRAPHY

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II. Secondary Literature. W. G. Thomas of Tenby, Pembrokeshire, who discovered the King's Bench records concerning Recorde and the Earl of Pembroke, is publishing a full account of the case.

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