Les nouvelles théories des rapports mathématiques du XIVe au XVIe siècle. Sabine Rommevaux.
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In his *On the ratios of velocities in motions* (1328), Thomas Bradwardine proposed that in motions the velocities are proportional to the ratios of forces to resistances, so that when the ratio of force to resistance is doubled, the velocity is doubled; when the ratio of force to resistance is tripled, the velocity is tripled; and so forth. This sounds like the view often ascribed to Aristotle, except that Bradwardine, and those who accepted his view in the succeeding centuries, understood the doubling, tripling, etc., of ratios differently than we understand it now. So, for example, for Bradwardine the ratio 9:1 is double the ratio 3:1, and the ratio 27:1 is triple the ratio of 3:1. (If one is talking simply of numbers, 6 is double 3 and 9 is triple 3, but what happens with ratios is not the same — ratios are understood to be relationships between two magnitudes, not simple magnitudes.) When historians first began to understand what Bradwardine intended, they translated it into modern mathematics, saying, for instance, that what Bradwardine meant was equivalent to saying that velocities vary as the logarithm of F/R. If, however, such an anachronistic translation is made, it is difficult to follow what was really at issue in late medieval debates over the ratios of velocities in motions. Consequently, repeated efforts have been made to explain the mathematics involved in actors' terms.

In *Les nouvelles théories des rapports mathématiques du XIVe au XVIe siècle*, Sabine Rommevaux provides the most complete and accurate survey so far of the mathematical theory lying behind Bradwardine's dynamic law. She treats what Bradwardine had to say as the first beginning of a new theory, and what Nicole Oresme had to say in his *On the ratios of ratios* and in his *Algorithm of ratios* as the full elaboration of the theory, concentrating only on the mathematics and not on its application to velocities of motions. She calls Bradwardine's and Oresme's theories of proportions new, although they derive ultimately from Euclid's *Elements of Geometry* as translated into Latin, particularly via Arabic intermediaries. She also describes in some detail a selection of authors who defended an alternative view to that of Bradwardine, Oresme, and their followers: Blasius of Parma and Volumnius Rodulphus, among others. According to the alternative view, whereas ratios are relations between two magnitudes, each ratio has a denomination expressing its quantity or size. Ratios with the same denomination are equal. When in the theory of Bradwardine and Oresme ratios are added to make compound ratios, in the alternative view ratios are combined by multiplying their denominations. Historians of mathematics have struggled to understand how these alternative understandings of operations on ratios were related to each other. Rommevaux explains what was going on as clearly as it can be explained given the evidence known so far. In the second half of the book, she edits, translates into French, and summarizes Oresme's *Algorithm of ratios*. Many concepts, such as "mediate denomination," which have long remained obscure, are clarified by the examples in Oresme's *Algorithm of ratios*, although just where one would like unambiguous evidence, some manuscripts of Oresme's work read "two" (*duo*, *binarius*, *dualitas*, or "duo vel medietas" [179]), where Blasius of Parma (otherwise quoting Oresme) says "half," or *moitié* (*medietas* [162]), in explaining denominations in the phrase "half a double ratio."

Although Rommevaux traces only the theories of mathematical ratios of Bradwardine and Oresme and of those who proposed alternatives making use of the concept of denomination, Renaissance specialists may be interested to know that it was partly Renaissance translations of Euclid's *Elements* from Greek to Latin (Commandino, 1572) that led later mathematicians to accept as genuine the fifth definition of book 6 (now thought to have been added by Theon), saying that a ratio is said to be composed of ratios when the quantities of the ratios multiplied together make something (96–97). Ultimately, the new-old theory of ratios reintroduced in the Renaissance from the Greek led to the obsolescence of the theory developed by Bradwardine and Oresme based on medieval translations.

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