Mathematicians of the Middle Ages

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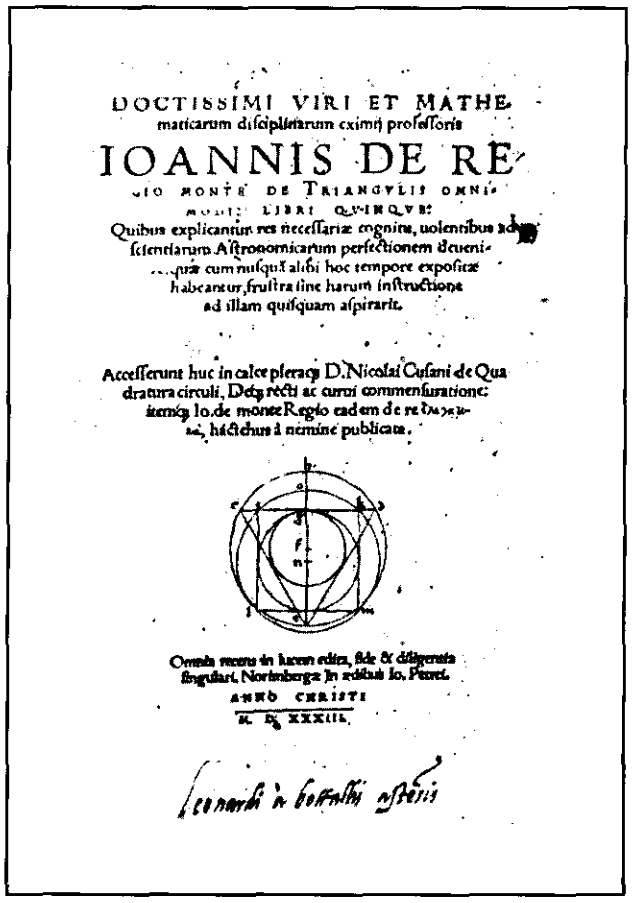
> *It is not knowledge which is dangerous, but the poor use of it.*
>
> —Hrotswitha

The period from the late fifth century A.D. to the Renaissance is sometimes viewed as a rather dismal period in which there was little intellectual development. However, many scholars around the world made significant and creative contributions to all fields of study, including mathematics.

Hrotswitha of Gandersheim (A.D. 935–1000): The first British woman mathematician of record, Hrotswitha was a Benedictine nun. During her time, the best, and often only, place for a woman to receive an education was a convent. Well-read and creative, she was known for writing original, poetic moral dramas and local history. Additionally, she studied mathematics and science, recording arithmetic and geometry lessons not only for her own studies, but for the education of other women in her convent. Interestingly, it seems that her ideas about astronomy and physics predated those of Nicholas Copernicus and Isaac Newton by about 500 years—she wrote that the sun is the center of the universe and that its gravitational pull "holds in place the stars around it much as the earth attracts the creatures which inhabit it." (For more on Nicholas Copernicus and Isaac Newton, see vignettes 41 and 47.)

Qin Jiushao (1202–1261): In the mid-1230s, the Mongols were in the process of conquering North China. During this time, Chinese mathematician Qin Jiushao studied mathematics in the Board of Astronomy, which happened to be caught in the fighting. To forget his unhappiness at living in a war zone, he devoted himself to the study of, as he put it, "mysterious and vague matters." The result of his studies was his *Shushu jiuzhang (Mathematical treatise in nine sections,* 1247). In this influential work, he presented various problems and their solutions, including improved methods for solving polynomial equations of various degrees. Additionally, Qin's work, and that of his contemporaries, represented the beginning of an important development in Chinese mathematics: abstraction. Previously, Chinese mathematicians had focused on problems that had some practical application in everyday life. (For more on Chinese mathematics, see vignettes 4, 8, 22, 48, 71, and 89.)

Johannes Müller (1436–1476): The work of German astronomer Müller, generally known as **Regiomontanus**, greatly contributed to the establishment of trigonometry as a branch of mathematics. Having translated Ptolemy's *Almagest,* he determined that scholars who studied this work would benefit from a systematic approach to the relationships of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Title page of Regiomontanus' **De triangulis omnimodi** *and* **De quadratura circuli** *(Nuremberg, 1533).*

sides and angles in triangles, something the *Almagest* lacked. The first half of his *De triangulis omnimodi* (*On triangles of every kind*), written in 1463 and published in 1533, dealt with plane triangles and the second half with spherical triangles. Truly wishing his readers to understand his methods, he provided clear examples of his work, an improvement upon earlier European trigonometry texts. (For more on Ptolemy, see vignette 41.) ★

Activities

1. Read about the life of **Hildegard von Bingen** (A.D. 1098–1179), an abbess in medieval Germany who did considerable work in the fields of science, cosmology, and music.

2. Explore the foundations of the transition in medieval China from an emphasis on applied mathematics to an acceptance of pure mathematics. For what purposes were each of these fields studied?

3. Solve this problems from Regiomontanus' *De triangulis:* In triangle *ABC,* suppose the ratio $\angle A : \angle B = 10 : 7$ and the ratio $\angle B : \angle C = 7 : 3$. Find the three angles and the ratio of the sides.

4. What are some of the contributions of other medieval mathematicians?

Related Reading

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