Li Yeh Encyclopedia Article

Li Yeh

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1192-1279

Chinese Mathematician

In 1248, Li Yeh developed a new system of notation for designating negative numbers, using a cancellation mark drawn across the numerical symbol. He was also notable for the application of what he dubbed the "celestial unknown" in polynomial equations.

Li Yeh, who also went by the name Li Chih, lived during the period of the Sung Dynasty (960-1279), which up until 1127 had controlled all of China. In that year, however, an attack by the nomadic Juchen people of the north—hitherto putative allies of the Sung—forced the government to retreat southward. With its capital at Hangchow, perhaps the largest city in the world at its time, China enjoyed a second flowering during the period of the Southern Sung.

Despite the fact that it was occupied by "barbarian" invaders, mathematical scholarship continued in northern China, where Li Yeh made his home. He appears to have been serving as governor over the region of Chun Chou when he published his highly regarded *T'se-yuan haiching* or *Ceyuan haijing* (Sea mirror of circle measurements). The latter, which included his use of the symbol for negative numbers, presented 170 problems involving right triangles inscribed in circles or vice versa.

In both the *Sea Mirror* and *Yigu yanduan* (New steps in computation), Li Yeh applied his method of the "celestial unknown" (what modern mathematicians would call a variable), using polynomials in solving equations. It is possible that he had the manuscript of *New Steps* destroyed, however: according to one story—perhaps apocryphal—he ordered his son to burn all his books other than the *Sea Mirror.*

By 1234, the Mongols had replaced the Juchen in northern China, as they would replace the Sung in the south in 1279, a year that marked the establishment of the Yüan (Mongol) Dynasty. During his later years, Li Yeh served as director of an astronomical bureau under the Mongol emperor Kublai Khan (1215-1294), who is reported to have admired his scholarship greatly.